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## PUBLICATIONS OF THE DIRECTORATE OF HISTORICAL SERVICES

### Semi - Annual Histories

History of the Air Defense Command, Jan-June 1951 (Secret)
History of the Air Defense Command, July-Dec 1951 (Secret)
History of the Air Defense Command, Jan-June 1952 (Secret)
History of the Air Defense Command, July-Dec 1952 (Secret)
History of the Air Defense Command, Jan-June 1953 (Secret)
History of the Air Defense Command, July-Dec 1953 (Secret)
History of the Air Defense Command, Jan-June 1954 (Secret)
History of CONAD/ ADC, July-Dec 1954 (Secret)
History of CONAD/ ADC, Jan-June 1955 (Secret)

### Special Studies

o. Title

*The Air Defense of Atomic Energy Installations, March 1946-December 1952,* by Thomas A. Sturm (Secret)

*The Use of Nuclear Weapons in Air Defense, 1952-1953,* by Denys Volan (Top Secret)

*The Identification Problem in the Air Defense of the United States, 1946-1954,* by Denys Volan (Secret)

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*Emergency Air Defense Forces, 1946-1954,* by Lydus H. Buss (Secret)

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*Organization and Responsibility for Air Defense, 1946-1955,* by Thomas A. Sturm (Secret)

*Seaward Extension of Radar, 1946-1956,* by Lydus H. Buss (Secret)

ies of these publications and their supporting documents may be obtained upon request from
of Historical Services, Headquarters Air Defense Command, Ent AFB, Colorado Springs, Colorado,
or the USAF Historical Division, Air University, Montgomery, Alabama.

HISTORY
of the

CONTINENTAL AIR DEFENSE COMMAND
and the
AIR DEFENSE COMMAND

January - June 1955

Directorate of Historical Services
Office of Information Services

## FOREWORD

This, the second edition of the combined CONAD/ADC History, consists of three self-sufficient parts. Part I is the record of the major developments within CONAD/ADC from January through June 1955. Each of the members of the Historical Office contributed to its preparation, under the editorship of Mr. Denys Volan. Parts II and III are monographic studies on particular aspects of the history of the continental air defenses. Part II was written by the undersigned; Part III by Mr. Lydus H. Buss. Data and documentation on the subjects contained in past lower unit and command semiannual volumes was reworked in the studies. Also, any important information on the subjects which for reasons of time, oversight, or security never found its way into the semiannual volumes was included.

Mrs. Betty Terry typed the plates from which the final manuscript was printed. Security and reproduction details incident to the compilation of the volumes of supporting documents were handled by S/Sgt Alfred M. Rodgers, S/Sgt Derril E. Howell, and A/2C Elaine Yaugo.

Colorado Springs
1 December 1955

Thomas A. Sturm
Director of Historical Services

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*Detailed tables are included in the separate parts of the narrative

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Part I

## HISTORY OF THE PERIOD

January - June 1955

General Earle E. Partridge
Commander in Chief, Continental Air Defense Command
Commander, Air Defense Command

PREFACE

The following narrative treats of the major developments within CONAD/ADC during the first six months of 1955 from the perspective of the command headquarters. For the story in its entirety, the reader is referred to the histories of the Joint Air Defense Forces/Air Defense Forces and the Joint Air Defense Divisions/Air Divisions (Defense) for the same period.

The history was prepared by the members of the Directorate of Historical Services. Invaluable assistance was provided by staff members of ADC, ARAACOM and NAVFORCONAD. Where coverage of a subject is sparse, or where it has been omitted from the narrative, the reader's attention is directed to the existence of nine volumes of supporting documents which accompany the history. These supplementary volumes contain a wealth of information which corroborates statements in the text and provides additional information on other pertinent topics. They will be made available on request.

Notification of errors or possible misrepresentations in the text, and suggestions as to improvements which may be made in the format and content of future editions will be sincerely appreciated.

DENYS VOLAN
Editor

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CHAPTER FOUR: TACTICAL OPERATIONS AND PROCEDURES



CHAPTER FIVE: SAGE



CHAPTER SIX: ORGANIZATION



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## INTRODUCTION

On 31 May 1955, General Benjamin W. Chidlaw retired from active duty. The four years in which he played a leading role in air defense constituted the most significant span of time in post-war air defense history. Taking over command of ADC from Lieutenant General Ennis C. Whitehead in 1951, he guided the air defense effort through a spectacular growth which saw the resources of the command greatly increased in effectiveness and new weapons systems planned which were destined to revolutionize the theory and practice of air defense.

Just before he retired, General Chidlaw wrote General Twining with the purpose of pointing out "certain particular areas of concern, which... will require far more than normal emphasis if we are to move out rapidly toward an acceptable air defense capability."[1] In view of his exceptional position of vantage during the years from 1951 to 1955, it will be instructive to note his comments on the progress made in the past and the obstacles still remaining to be overcome.

Although General Chidlaw recognized that "very substantial progress" had been made over the past few years, he put particular stress upon the need for greater emphasis in air defense, "because of the generally accepted fact that the threat has increased at a much more rapid rate than had been believed possible..." He added the sobering thought that, "Frankly, I must admit that I am not at all certain that our position, vis-a-vis that threat, has done

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1. General B. W. Chidlaw to General N. F. Twining, 28 May 1955 (DOC 495).

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much more than hold its own."

On the subject of research and development, General Chidlaw said that the Air Force had, over the years, "concentrated our research and development efforts against 'the most probable' course of action of the enemy and even conditioned that upon the availability of physical evidence through intelligence sources." "As a result," he said, "we are now possibly faced with a high altitude threat we cannot combat effectively." Despite continued pleas and protestations on the part of ADC, he continued, "we still do not have an approved project for a long range fighter-interceptor; we are deficient in ground radar performance; and we are extremely susceptible to general system degradation through enemy employment of electronic jamming devices."

In his discussion of manpower, General Chidlaw noted that the command, the newest in the Air Force family, had been in a stage of rapid expansion over the past three years, and issued the following words of warning:

> If we are to meet already approved programs -- programs designed and projected against the growing threat -- the command must continue to expand as we complete our growth to the approved 69-squadron strength; as we add additional prime and gap-filler radars; as we add Airborne Early Warning and Control squadrons; and as we go into full implementation of the SAGE program. Then, too, the additional staff and operations work-load incident to matters connected with the organization and operation of CONAD has been quite significant and shows little signs of abaiting...I submit...that unless we man adequately this defense system which we are expending billions of dollars to build, an atomic D-day could find us losing the battle for want of the proverbial nail.

Turning to the broad field of public works, he sympathized with the Air Force predicament of combating the "outmoded and clumsy machinery, the many hurdles and the frustrating tendency to delay which compound our difficulties." However, he felt obliged to point out that:

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> The provision of essential operational facilities for our 69-squadron Fighter-Interceptor program, and our 12-squadron Airborne Early Warning and Control program now appears to be a serious bottleneck in achieving at the earliest practicable time a proper state of readiness. Furthermore, the deplorable lack of dependent housing in this Command (particularly at many of our remote and isolated bases) is not only contributing to our reenlistment problem, but it has a direct effect upon our state of combat readiness...I urge sincerely a concerted effort to satisfy at least the minimum public works requirements of the Air Defense Command.

These were not the only major areas in which CONAD and ADC were experiencing difficulties. In a lengthy appendix to his letter, General Chidlaw enumerated and described additional problems. Though his intent was to point out these problem areas, nevertheless he reiterated that progress had also been achieved.

> The establishment by the JCS of the "Joint" Continental Air Defense Command was a distinct step forward. Each day brings further and gratifying evidence of a healthy "team-play" spirit between the various Service components of CONAD. I detect, too, a growing awareness throughout the Air Force of the importance of the air defense mission...

In conclusion, General Chidlaw stressed the need for even more emphasis on the importance of the air defense mission to the nation.

> In closing, I can only urge again as you have heard me urge so many times in the past that the Air Force, the Joint Chiefs of Staff, and the National Security Council continue to stress that our security rests upon the maintenance of a strategic striking force so powerful as to insure the destruction of the enemy, and an air defense system so effective as to insure our retaliation and prevent this destruction of the United States. All other military requirements pale into insignificance when we face the threat squarely. I am convinced that an air defense capability which will furnish a comparable deterrent to aggression to that posed by SAC can be achieved, if we put our hearts into it. Furthermore, its cost in terms of the return it promises towards insuring our national security, our way of life and everything our people hold dear -- real and ideal -- is not, by that yardstick, extravagant.

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In the spring of 1955, a distinguished group of civilian and military men, working under the supervision of the Massachusetts Institute of Technology, arrived independently at the same basic conclusions reached by General Chidlaw.[2] Of their study report (Project LAMP LIGHT), ADC noted: "The study...points up the fact that to provide an ultimate system requires more money, time and materials than is presently allotted for Air Defense purposes."

Essentially, LAMP LIGHT underlined General Chidlaw's call for increased awareness and emphasis for air defense. ADC's work in the past spoke for itself; tangible progress had been little short of fantastic. Nevertheless, both General Chidlaw and LAMP LIGHT agreed that CONAD was doing little more than holding its own against the encroaching threat. In General Chidlaw's words, what was needed beyond the present and programmed resources, was "a far more than normal emphasis, if we are to move out rapidly towards an acceptable air defense capability."

In the discussion of the most salient air defense activities of the period from January to June 1955 which follows, the command's preoccupations to hold the line so painfully won, and to anticipate and prepare for the crisis still to come, are revealed.

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2. MIT, Defense of North America: Final Report of Project LAMP LIGHT, 15 Mar 1955, in 4 vols (DOC 496); also ADC Study on Project LAMP LIGHT Report, 10 May 1955 (DOC 497).

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## CHAPTER ONE: SURVEILLANCE

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# THE COMBAT ZONE*

## THE ACTIVE SURVEILLANCE SYSTEM

The surveillance network of the continental United States in June 1955 consisted of 75 radar stations and ten control centers of the Permanent radar net, four radar stations and one control center of the Mobile Program, and seven Lashup radar stations. Farther to the north, the Pinetree chain of radars, eight of which were operated and manned by ADC, provided earlier warning. Five picket ships were on station full-time off the east coast, and one AEW&C station was on full-time duty off the west coast. Added to this far-flung system was the Ground Observer Corps of volunteer civilian watchers, affording a detection and tracking capability against low-flying aircraft in strategically important areas of the country. This collection of land and sea-based radar stations, control centers, and ground observers, was deployed primarily for the defense of the most vital target areas of the nation.

The majority of the stations, namely those of the Permanent and Pinetree systems, contained up-to-date facilities, were well-situated and constructed, and operated with modern equipment. Others, such as the Lashup stations, consisted of make-shift facilities with temporary quarters and antiquated equipment, and were to be eliminated when the stations of the Mobile and Gap-Filler programs were constructed. The four Mobile radar stations were the first of their program to be put in operation, but were compromises with the desired end, employing interim-type equipment pending the installation of more modern radars programmed

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* The Combat Zone was defined in ADC's 1954-1960 Requirements Plan as the area encompassed by a line representing the maximum limit of contiguous radar cover around the United States and certain parts of Canada and Mexico.

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for them.

The Mobile stations represented a net gain of four stations to the active ground radar net in existence six months earlier. However, this quantitative gain did not represent the only improvement in surveillance. Qualitatively, every station gained in effectiveness as a result of greater experience, of beneficial modifications or additions to its equipment, and of procedural integration into a more efficient overall combat organization.

THE PERMANENT RADAR SYSTEM

Operational Status. The Permanent Net continued to be the mainstay of the surveillance system of the combat zone during 1955. All 75 stations in the net were operational, although from time to time disabilities resulted in dropping a few of them temporarily from the "Fully Operational" category to "Sustained Operational." In June, for example, seven Permanent sites were in the latter category. In the case of four, (P-24 at Cutbank AFS, Montana; P-71 at Omaha AFS, Nebraska; P-70 at Belleville AFS, Illinois; and P-75 at Lackland AFB, Texas) the reported deficiency was their possession of the FPS-4 interim height finder which was scheduled for elimination. Station P-51 at Moriarity AFS, New Mexico, had a shortage of ground radio repairmen and operators, and communication center specialists, causing it to drop out of the "Fully Operational" category for the time being. Personnel problems also plagued P-81 at Waverly AFS, Iowa. Station P-76 at Mt. Laguna AFS, California, was reported as "Limited Operational" pending installation of its permanent height-finder.[1]

The GPA-27 Modification of the FPS-3. The most important program designed to improve the performance of the existing surveillance network during the first half of 1955 was the project to modify the FPS-3 search radars with the GPA-27

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component.[2] The purpose of this program, which had been conceived in 1954, was to boost the performance of the FPS-3 to give it a capability of detecting one square-meter targets at 175 nautical miles at an altitude of 65,000 feet.

The GPA-27 was programmed for 44 FPS-3 radars in the critical double perimeter areas (including most of those in the Permanent radar net, and certain Mobile stations which were still under construction). It was hoped that all programmed FPS-3 sites, 125 in number, would be equipped eventually with the GPA-27. Certain Canadian sites were also scheduled to receive the GPA-27, but by mid-1955, no agreement on this program had been completed with the Canadian authorities. The total GPA-27 deployment was to provide complete coverage at 65,000 feet in the double perimeter areas.

Although ADC was impatient to realize the benefits of the GPA-27 as soon as possible, it was cautious not to act prematurely. In March 1955, the Rome Air Force Depot advised that the GPA-27's could be installed in half the programmed time if ADC agreed to splitting the set's two channels and installing each at a separate site, with retrofit of the second channel to be completed at a later date. The command did not favor this plan because it believed that the lack of dual-channel capability would delay the SAGE implementation schedule and because the Mobile sites which were destined to receive the GPA-27's would not be ready in time for the stepped-up installation dates.[3]

ADC was alert to the possibility of slippage in the GPA-27 installation schedule. Normally, AMC would have the mission of installing the equipment, but ADC was doubtful of its sister command's ability to meet the heavy workload of installing radars of the Mobile and Gap-Filler programs at the same time as the GPA-27. To insure that the installation would be made without de-

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lays, ADC proposed that the manufacturer of the equipment do the work.[4]

The installation schedule for the first 44 GPA-27's called for work to begin in May 1956 and be completed in February 1957. These relatively early dates presented ADC with the need for accelerating the training of personnel to operate the new equipment. Two alternatives were considered. Either personnel could be trained by the Air Training Command in advance of the installation of the radars (ATRC was contemplating the early modification of its own FPS-3's), or the contractor could provide an instructor to accompany the installation teams to instruct all military personnel at the radar station. In ADC's opinion, the second alternative was the better because it would result in a "tremendous saving" of manhours and travel funds, as well as increase the number of personnel who could participate in the training. Nevertheless, the Command's view did not prevail and ATRC undertook to train specified quotas of ADC personnel.[5]

In early estimates, ADC had taken the optimistic view that no further building construction would be needed at FPS-3 sites to house the GPA-27, but early in 1955, revised estimates caused ADC to anticipate a certain amount of new construction at temperate-type installations. In addition, it was found advisable to request arctic towers for all GPA-27 sites.[6]

The AN/CPS-6B. During the latter part of 1954, a decision had been reached by ADC and Headquarters USAF to eliminate the CPS-6B from the surveillance net and replace it with the FPS-3/GPA-27 combination and, in certain locations, the FPS-7. Replacement was to start in mid-1957 and be completed by mid-1959.[7] These dates made it impossible for the conversion to be made prior to the implementation of SAGE, and the question arose as to the compatibility of the CPS-6B with SAGE in the interim period. It was believed by some that the

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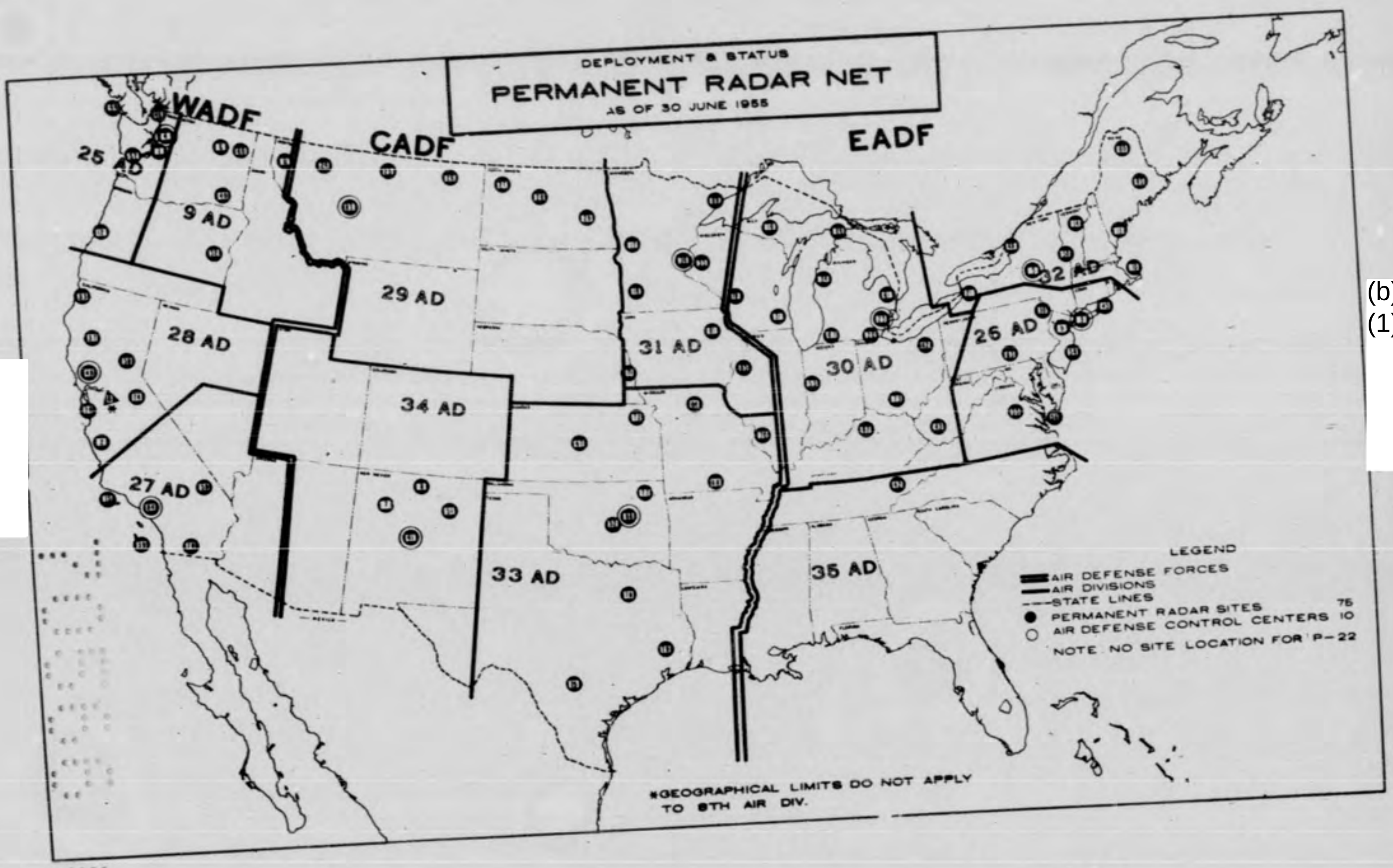

DEPLOYMENT & STATUS
PERMANENT RADAR NET
AS OF 30 JUNE 1955
WADF
CADF
EADF
25 AD
9 AD
28 AD
27 AD
29 AD
34 AD
33 AD
31 AD
30 AD
35 AD
26 AD
32 AD
LEGEND
AIR DEFENSE FORCES
AIR DIVISIONS
STATE LINES
PERMANENT RADAR SITES 75
AIR DEFENSE CONTROL CENTERS 10
NOTE NO SITE LOCATION FOR P-22
*GEOGRAPHICAL LIMITS DO NOT APPLY TO 8TH AIR DIV.


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radar would require modification in order to eliminate clutter so that its surveillance data could be transmitted over SAGE's data transmission system. However, a test held at P-21 and P-30 convinced an ADC-EADF team that through proper use of beam blanking, tilt adjustment, and video mapping-out, the MTI could be improved so that it would be compatible with SAGE.[8]

Two important modifications to the basic radar set had been made in 1954: the addition of a low-noise receiver and a single tube modulator. During operations in 1955 both these innovations proved their worth in increased performance and decreased maintenance.[9]

In the second year of its operation, the OA/347 early warning component of the CPS-6B continued to experience magnetron troubles. Although the QK 254 magnetron was in good supply after the serious shortages of 1954, the operation of the magnetron at 1.5 megawatts instead of the specified two megawatts did not satisfy ADC, because of the resulting decrease in range.[10] Procedures for the operation and shelf maintenance of the magnetron were published by the General Electric Company, but although improved performance was noted in some instances as a result, there were many squadrons which experienced little or no improvement.[11]

The FPS-7 Radar. During the fall of 1954, ADC approved the production-development by the General Electric Company of a 10-megawatt, klystron-driven, long range, search and height radar.[12] The new radar was designated the AN/FPS-7. With an expected capability of detecting one-square-meter targets at line-of-sight ranges up to 100,000 feet altitude and 300 nautical miles, the AN/FPS-7 was programmed to provide complete coverage in the double perimeter areas at 100,000 feet.[13]

Early in 1955, a revised deployment plan for the FPS-7 was completed in

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ADC. Significant features of the plan were as follows: 33 FPS-7's were to be deployed in a first increment, 30 of which were to be sited in Permanent and programmed stations in the United States, and three in Canada. Priorities of installation were to follow closely the implementation of the SAGE system until mid-1958, after which time priorities would be determined by target importance (production of the equipment by this time being expected to overtake the SAGE schedule). Under this deployment program, ten CPS-6B's were to be replaced by FPS-7's.[14]

Although they promised considerable benefits to surveillance, the FPS-7 and the GPA-27 were, nevertheless, still untried. ADC was in the position, however, of having to express its specific needs before the facts were forthcoming. In January 1955, ADC notified USAF of the specifications needed to meet the Soviet progress in offensive air warfare.[15]

> Prime radars must be designed with a detecting and tracking probability of 95-98 per cent on moving targets, with the equivalent of one square meter of reflecting surface, at ranges up to 250 nautical miles and at altitudes up to 65,000 feet. These radars must be available as soon as possible but no later than 31 December 1956. By 1959-60, the capability of prime radars must provide for the detection of "cruise" type missiles, with a reflecting area equivalent to one-quarter square meter, at altitudes up to 100,000 feet while maintaining a horizontal coverage of 250 nautical miles and a probability of detection of 95-98 per cent.

Backup Search Radars. The dual channels, which were a feature of both the GPA-27 and the FPS-7, caused ADC to question the need for backup radars such as the FPS-8. ADC was undecided over this problem in view of a lack of knowledge as to the performance of the dual channel equipment, but in April, the policy was established that emergency search equipment of any kind would not be required where dual-channel GPA-27's were programmed.[16]

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## THE PERMANENT RADAR NET

| Site No. | Sq. No. | Location | Prime Search Radar | Prime Height Finder | Backup Search | Backup Height |
|---|---|---|---|---|---|---|
| 1 | 635 | McChord AFB, Wash. | CPS-6B | FPS-6 | | FPS-6 |
| 2 | 775 | Cambria AFS, Cal. | FPS-3 | FPS-6 | FPS-8 | FPS-6 |
| 6 | 638 | Curlew, Wash. | FPS-3 | FPS-6 | | FPS-6 |
| 7 | 769 | Cont. Divide AFS, N.M. | FPS-3 | FPS-6 | | FPS-6 |
| 8 | 767 | Tierra Amarilla AFS, N.M. | FPS-3 | FPS-6 | | FPS-6 |
| 9 | 646 | Highlands AFS, N.J. | CPS-6B | FPS-6 | FPS-8 | FPS-6 |
| 10 | 762 | No. Truro AFS, Mass. | CPS-6B | FPS-6 | FPS-8 | FPS-6 |
| 11 | 680 | Yaak, Mont. | FPS-3 | FPS-6 | | FPS-6 |
| 12 | 761 | North Bend AFS, Ore. | FPS-3 | FPS-6 | FPS-8 | FPS-6 |
| 13 | 654 | Brunswick NAS, Me. | CPS-6B | FPS-6 | FPS-8 | FPS-6 |
| 14 | 764 | St. Albans AFS, Vt. | CPS-6B | FPS-6 | | FPS-6 |
| 15 | 669 | Santa Rosa AFS, Cal. | FPS-3 | FPS-6 | FPS-8 | FPS-6 |
| 16 | 665 | Calumet AFS, Mich. | FPS-3 | FPS-6 | | FPS-6 |
| 17 | 739 | Wadena AFS, Minn. | FPS-3 | FPS-6 | | FPS-6 |
| 18 | 787 | Chandler AFS, Minn. | FPS-3 | FPS-6 | | FPS-6 |
| 19 | 676 | Antigo AFS, Wis. | FPS-3 | FPS-6 | | FPS-6 |
| 20 | 661 | Selfridge AFB, Mich. | CPS-6B | FPS-6 | | FPS-6 |
| 21 | 763 | Lockport AFS, N.Y. | CPS-6B | FPS-6 | | FPS-6 |
| 24 | 681 | Cutbank AFS, Mont. | FPS-3 | FPS-6 | FPS-8 | FPS-4 |
| 25 | 778 | Havre AFS, Mont. | FPS-3 | FPS-6 | FPS-8 | FPS-6 |
| 26 | 779 | Opheim AFS, Mont. | FPS-3 | FPS-6 | FPS-8 | FPS-6 |
| 27 | 780 | Fortuna AFS, N.D. | FPS-3 | FPS-6 | FPS-8 | FPS-6 |
| 28 | 786 | Minot AFS, N.D. | FPS-3 | FPS-6 | FPS-8 | FPS-4 |
| 29 | 785 | Finley AFS, N.D. | FPS-3 | FPS-6 | FPS-8 | FPS-6 |
| 30 | 648 | Benton AFS, Pa. | CPS-6B | FPS-6 | | FPS-6 |
| 31 | 755 | Williams Bay AFS, Wisc. | CPS-6B | FPS-6 | | FPS-6 |
| 32 | 636 | Condon, Ore. | FPS-3 | FPS-6 | | FPS-6 |
| 33 | 777 | Klamath AFS, Cal. | FPS-3 | FPS-6 | FPS-8 | FPS-6 |
| 34 | 752 | Empire AFS, Mich. | CPS-6B | FPS-6 | | FPS-6 |
| 35 | 674 | Osceola AFS, Wis. | CPS-6B | FPS-6 | | FPS-6 |
| 37 | 776 | Pt. Arena AFS, Cal. | FPS-3 | FPS-6 | FPS-8 | FPS-6 |
| 38 | 666 | Mill Valley AFS, Cal. | CPS-6B | FPS-6 | FPS-8 | FPS-6 |
| 39 | 670 | San Clemente I. AFS, Cal. | FPS-3 | FPS-6 | FPS-8 | FPS-6 |
| 40 | 637 | Othello, Wash. | FPS-3 | FPS-6 | | FPS-6 |
| 42 | 663 | Lake City AFS, Tenn. | FPS-10 | FPS-6 | | FPS-6 |
| 43 | 783 | Guthrie AFS, W. Va. | FPS-3 | FPS-6 | | FPS-6 |
| 44 | 758 | Neah Bay AFS, Wash. | FPS-3 | FPS-6 | FPS-8 | FPS-6 |
| 45 | 773 | Montauk AFS, N.Y. | FPS-3 | FPS-6 | FPS-8 | FPS-6 |
| 46 | 757 | Blaine AFS, Wash. | FPS-3 | FPS-6 | | FPS-6 |
| 47 | 793 | Hutchinson NAS, Kans. | FPS-10 | FPS-6 | | FPS-6 |
| 49 | 655 | Watertown AFS, N.Y. | FPS-3 | FPS-6 | | FPS-6 |
| 50 | 656 | Saratoga Springs AFS, N.Y. | FPS-3 | FPS-6 | | FPS-6 |
| 51 | 768 | Moriarity AFS, N.M. | FPS-3 | FPS-6 | | FPS-6 |
| 52 | 746 | Tinker AFB, Okla. | FPS-10 | FPS-6 | | FPS-6 |
| 53 | 782 | Rockville AFS, Ind. | FPS-10 | FPS-6 | | FPS-6 |
| 54 | 770 | Palermo AFS, N.J. | FPS-3 | FPS-6 | FPS-8 | FPS-6 |
| 55 | 647 | Quantico Marine Base, Va. | FPS-3 | FPS-6 | | FPS-6 |
| 56 | 771 | Cape Charles AFS, Va. | FPS-3 | FPS-6 | FPS-8 | FPS-6 |
| 57 | 759 | Naselle AFS, Wash. | FPS-3 | FPS-6 | FPS-8 | FPS-6 |
| 58 | 668 | Mather AFB, Cal. | FPS-3 | FPS-6 | | FPS-6 |
| 59 | 750 | Boron AFS, Cal. | FPS-3 | FPS-6 | | FPS-6 |
| 60 | 760 | Colville, Wash. | FPS-3 | FPS-6 | | FPS-6 |
| 61 | 754 | Port Austin AFS, Mich. | FPS-3 | FPS-6 | | FPS-6 |
| 62 | 662 | Brookfield AFS, Ohio | FPS-3 | FPS-6 | | FPS-6 |
| 63 | 772 | Claysburg AFS, Pa. | FPS-3 | FPS-6 | | FPS-6 |
| 64 | 790 | Kirksville AFS, Mo. | FPS-10 | FPS-6 | | FPS-6 |
| 65 | 765 | Charleston AFS, Me. | FPS-3 | FPS-6 | | FPS-6 |
| 66 | 753 | Sault Ste Marie AFS, Mich. | FPS-3 | FPS-6 | | FPS-6 |
| 67 | 781 | Ft. Custer, Mich. | FPS-3 | FPS-6 | | FPS-6 |
| 68 | 797 | Fordland AFS, Mo. | FPS-3 | FPS-6 | | FPS-6 |
| 69 | 756 | Finland AFS, Minn. | FPS-3 | FPS-6 | | FPS-6 |
| 70 | 798 | Belleville AFS, Ill. | FPS-3 | FPS-6 | | FPS-6 |
| 71 | 789 | Omaha AFS, Neb. | FPS-3 | FPS-6 | | FPS-6 |
| 72 | 738 | Olathe NAS, Kans. | FPS-3 | FPS-6 | | FPS-6 |
| 73 | 664 | Bellefontaine AFS, Ohio | FPS-3 | FPS-6 | | FPS-6 |
| 74 | 774 | Madera AFS, Cal. | FPS-3 | FPS-6 | | FPS-6 |
| 75 | 741 | Lackland AFB, Tex. | FPS-3 | FPS-6 | FPS-8 | FPS-6 |
| 76 | 751 | Mt. Laguna AFS, Cal. | FPS-10 | FPS-6 | | FPS-6 |
| 77 | 796 | Bartlesville AFS, Okla. | FPS-10 | FPS-6 | | FPS-6 |
| 78 | 745 | Duncanville AFS, Tex. | FPS-10 | FPS-6 | FPS-8 | FPS-6 |
| 79 | 747 | Ellington AFB, Tex. | FPS-10 | FPS-6 | FPS-8 | FPS-6 |
| 80 | 766 | Caswell AFS, Me. | FPS-10 | FPS-6 | | FPS-6 |
| 81 | 788 | Waverly AFS, Iowa | FPS 3 | FPS-6 | | FPS-4 |
| 82 | 784 | Ft. Knox, Ky | FPS-3 | FPS-6 | | FPS-6 |
| 85 | 791 | Hanna City AFS, Ill. | | | | |

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Height-Finding Radars. ADC's needs for future height-finders were expressed to USAF in January 1955:[17]

> Future ADC search radars should be designed to provide height data simultaneously with the initial detection. Height data at all ranges should be accurate to within plus or minus 1,000 feet of the actual height of the target. The equipment must be capable of providing height data on aircraft, with the equivalent of one square meter reflecting surface, at ranges up to 250 nautical miles and at altitudes up to 65,000 feet. This capability must be available to the Air Defense Command as soon as possible but no later than 31 December 1956. By 1959-60 the height finding capability must be improved to provide altitude coverage up to 100,000 feet on targets with the equivalent of one-quarter square meter reflecting surface and without a reduction in range or accuracy.

Only one of ADC's programmed radars was deemed capable of meeting the immediate Soviet threat, and that one -- GE's AN/FPS-6 -- was designed with a maximum performance characteristic of 60,000 feet. For the future threat there was nothing in the blueprint stage which offered encouragement to ADC.

In mid year, ADC's operating height finders were the FPS-6 (being installed), FPS-4, FPS-5, and CPS-4, in addition to the height component of the CPS-6B. Of these, all except the first mentioned were destined for replacement.

The FPS-4, originally programmed as a "permanent" height finder, was now regarded by ADC as "incapable of performing the air defense mission with the search equipment it assists."[18] This opinion was confirmed by a report of an Operational Suitability Test conducted by the Air Proving Ground Command in January 1955.[19] The set was revealed to be

> operationally unsuitable because of its limitations in range coverage and altitude accuracy for control of present day operational interceptors...Because of the marginal capabilities revealed through this test, redesign programs directed towards improvement of the AN/FPS-4 Radar Set are not recommended.

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The FPS-6 appeared to be the mainstay of the surveillance network for some time to come. It was programmed for all direction centers in the double perimeter areas for the first quarter of FY 1957. By mid-1958, it was hoped that all direction centers throughout the system would possess two of the sets.

Operation of the first FPS-6's in the fall of 1954 disclosed "bugs" which were confirmed in 1955. The most important of these was the failure of the QK 338 magnetron to produce the five megawatts of power expected of it without burning out at an alarming rate. Attempts to overcome this difficulty in production failed, and ADC was reconciled to using up a large quantity of tubes on hand before it could benefit by new tube developments. It was rumored that a klystron tube was to be developed which would be capable of the desired performance, but specific details were lacking.[21]

Unlike the troublesome magnetron on the OA/347 kit of the CPS-6B, the FPS-6 magnetron was not responsible for a considerable loss of range capability. ADC estimated that an approximate loss of only 2.5% of range would result. Although annoying, this loss was considered by ADC to be "an acceptable tolerance" under the circumstances. The FPS-6 was also scheduled to have the following modifications made to its indicators: a change of the 90-200 mile range sweep to 0-200 miles and an increase in height indication from 60,000 to 75,000 feet. Those indicators which were manufactured prior to August 1955 were to be modified in the field.[22]

<u>Lashup Stations and Equipment</u>. Seven sites were operational in mid-1955 employing non-permanent type radars. These sites bore the designation Lashup and were located as follows:[23]

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| | | | |
|---|---|---|---|
| L-1 | Walker AFB, N.M. | 686th AC&W Sq. | CPS-5D |
| L-2 | Davis-Monthan AFB, Ariz. | 684th AC&W Sq. | TPS-1D |
| L-3 | Kirtland AFB, N.M. | 687th AC&W Sq. | CPS-5D/CPS-4/TPS-1D |
| L-4 | Ft. Ord, Cal. | Det 1, 666 AC&W Sq. | CPS-5D |
| L-5 | Ellsworth AFB, S.D. | 740th AC&W Sq. | CPS-5D/CPS-4 |
| L-6 | Portland, Ore. | 689th AC&W Sq. | CPS-5D/TPS-10D |
| L-7 | Gt. Falls AFB, Mont. | 903d AC&W Sq. | TPS-1D/MPS-8 |

For some time, both WADF and EADF had made strong representations at Headquarters ADC in favor of allocating a mobile search radar at each division headquarters for use as an emergency radar in the event a prime radar went out of commission at one of the radar stations. ADC had rejected such suggestions in the past, but the persistence of WADF, in particular, caused it to reexamine the question. A special staff study, however, confirmed ADC's previous objections.[24]

Integration of ARAACOM's TPS-1D's. Quite understandably, USAF was concerned over ADC's unwillingness to propose that ARAACOM's TPS-1D acquisition radars be integrated into the gap-filler system. In stating its objections, however, ADC pointed out that the quality of the TPS-1D's scope presentation was not good enough for the SAGE data transmission system. In ADC's view, this automatically eliminated the TPS-1D from a gap-filler role wherever the SAGE system was to be installed, i.e., over most of the continental surveillance area.[25] ADC determined to replace all of its own TPS-1D prime radars with the FPS-14 gap-filler radar prior to the advent of SAGE.[26]

Radiation Hazards from High-Powered Radars. The introduction of high-powered radars, such as the FPS-7 and the FPS-6 presented problems not previously experienced by ADC. Informal information about radiation hazards to personnel

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and equipment, caused ADC to request ARDC to investigate the problem and provide separation criteria to prevent crystal burnout and blanking of the scopes of other radars in the vicinity. A dangerous possibility was the explosion of high-test gasoline, fuse caps, and ammunition and rockets by the radiation. Delay in obtaining the information caused repeated protests to ARDC, culminating in a request that higher priority be given to the investigation.[27]

Radiation hazards were only one important phase of the general problem of radar interference, however. For years, ADC had received complaints from other agencies that its radars were interfering with theirs. The problem had been brought to the attention of USAF before, but early in 1955 it had become so troublesome that ADC strongly urged that an agency, such as the RAND Corporations, be given the task of studying it and recommending a course of action.[28]

Evaluation of Radar Performance. Prior to the formation of ADC's Evaluation Flights (ECM) in 1954, calibration had consisted of peaking a station's equipment periodically, probing the radiation pattern to establish the station's tracking capability on a B-29 aircraft (with little regard for its detection capability), and then virtually forgetting about it until the next scheduled calibration.[29] New techniques put into force at the time the evaluation flights were activated consisted of provision for continuous measurement of a station's performance, with corrective action being taken immediately after low performance was discovered.

The new technique resulted in less reliance upon calibration-type missions for routine performance checks, permitting a more concentrated flying effort in those abnormal cases where flying was specifically required. Training functions of radar evaluation flights took on an added significance because AC&W squadrons and air divisions performed some of the activities previously

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done by evaluation personnel only. Aside from tactical evaluations, the radar evaluation flights' services were requested for a specific station only when that station's performance was known to be abnormal. Thus, the routine nature of radar calibration was largely replaced by expert investigation. Some flexibility of performance was recognized by taking into account atmospheric refraction variations and the resultant changes in the shapes of radiation patterns. ADC's thinking on this important subject was articulately presented in its manual on radar evaluation, issued to the field in October 1954.

An other interesting development was Lincoln Laboratories' announcement of an MTI evaluator. Although it was too early for an accurate assessment of the device, ADC lent its full support to continuance of the development.[30]

Quality control was another technique in maintaining a high state of radar performance. In February and March 1955, the technique was tested in five air divisions, with successful results. The procedure was analogous to that employed in industry, i.e., a constant sampling being made of the detection and tracking of aircraft by a station and compared to a standard.[31]

## RADAR MAINTENANCE

<u>The Chidlaw Plan</u>. In late 1954, USAF had approved an ADC proposal to augment military personnel at each heavy radar site with civilian technicians. This proposal, known as the Chidlaw Plan, was designed to overcome the disadvantages of quick military personnel turnover, which deprived the stations of experienced technicians.[32] Once approved, the Chidlaw Plan was executed with dispatch. By June 1955 all heavy radar stations had been provided with an electronics

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engineer, two radar technicians, a radio technician and a Diesel-power technician. A separate contractor firm had been retained for each of ADC's three defense force regions to train and provide the required civilian augmentation technicians.[33]

Although there was not sufficient perspective to evaluate thoroughly the new program by June, certain benefits were already recognized. Turnover of military technicians rose during the period but outages of equipment remained normal, testimony to the aid civilian technical personnel provided. It was anticipated that equipment outages would decrease in proportion to the experience of the new civilian technicians.

Financially, the new program promised considerable benefits. Until the augmentation personnel were put to work, ADC had been employing civilian technical instructors, provided under contract by the Philco and RCA Corporation, at each of its sites. These instructors were originally hired to instruct military personnel in the intricacies of the station equipment and not as maintenance technicians. The Chidlaw Plan made it unnecessary to retain the technical instructor program, and such contracts with Philco and RCA were, consequently, terminated in June 1955. In addition, the Chidlaw Plan made it unnecessary to rely as heavily as before upon the services of technical representatives of the manufacturers of equipment. Hitherto, where new equipment of a complicated nature was concerned, technical representatives had been provided to demonstrate operation and maintenance. Because of the military personnel turnover, they were obliged to remain at the installations for a period of as long as several years. The Chidlaw Plan, although not entirely dispensing with them, made it unnecessary to retain their services for such a long time. It was expected that technical representatives would perform their services for a period of months instead of years.

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It was estimated that it cost the government about $1500 monthly for the services of a technical representative as compared with about $800 for a Chidlaw Plan technician.

The Master Overhaul Schedule. During the latter half of 1954, ADC had been engaged in the preparation of a master overhaul schedule. This elaborate schedule was designed to eliminate the conflict between maintenance activities at the radar stations and operational needs. In the past, preventive maintenance had suffered because of overriding operational needs -- with a consequent overall depreciation of equipment. The master overhaul schedule eliminated this discrepancy by providing a meticulously-prepared time schedule of maintenance operations which permitted both operational and maintenance planning to be performed more reliably.[34] Interestingly, the new schedule resulted in better overhaul operations by visiting AMC teams. In the past, visits by AMC maintenance crews were hampered by conflicts with operational programs with a resultant demoralization of the maintenance personnel. As a result of the sure knowledge that their efforts would not be hampered, and that they had a fixed period of time for their activities AMC crews were able to do a better job.

Maintenance Procedures Manual. Prior to May 1955, technical information about radar equipment was to be found only in a wide variety of publications, and a veritable reference library of information was required at radar installations. So long as the experience level of AC&W personnel remained low, recourse to these many publications was indispensable. Realizing this difficulty, ADC determined to consolidate the pertinent information from these many publications into an accessibl maintenance procedures manual. It was duly prepared and issued to the field in May 1955.[35]



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THE MOBILE PROGRAM

Status. Only five of the 84 mobile sites programmed in the first three phases were operating by mid-1955, and of these only one was fully operational. This was site M-87, the control center at Dobbins AFB, Georgia. The other four -- M-88 at Amarillo AFB, Texas; M-91 at Texarkana, Arkansas; M-97 at Ellsworth AFB, South Dakota; M-129 at McDill AFB, Florida -- were on either a "limited" or "sustained" operational status. Progress in implementating the first three phases of the Mobile program was as follows:[36]

| | 1st Phase | 2d Phase | 3d Phase |
|---|---|---|---|
| No. of sites | 39 | 21 | 24 |
| Surveys rec'd | 38 | 20 | 23 |
| Surveys appr'd by ADC | 38 | 20 | 23 |
| Surveys appr'd by USAF | 38 | 20 | 22 |
| Const. contr. awarded | 32 | 9 | 0 |
| Constr. accepted | 19 | 0 | 0 |
| Elect.inst. begun | 11 | 0 | 0 |
| Sites oper'l | 4 | 0 | 0 |

ADC was not content with the progress of the Mobile program. Slippages in operational dates forced the Command to take a pessimistic view of the chances of meeting the operational deadline for the three phases. In March, ADC outlined the reasons for the delays: (a) actual design and construction of sites were considerably in excess of the estimated times used in establishing operational dates for the USAF Program Guidance Documents; (b) difficulty in obtaining real estate made it necessary to resite several locations; (c) equipment required for installation of communications facilities was not available, e.g., the lack of arctic towers

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for the MPS-11 and the FPS-8 and delay in the installation of telephone facilities; and (d) in some cases AMA teams were not ready to start work when the sites were made available to them. USAF was asked to call a meeting of all agencies concerned in order to solve these problems.[37]

<u>The Proposed Fourth Phase of the Mobile Program</u>.[38] A revised Fourth Phase Mobile program, jointly prepared by ADC and the RCAF/ADC, was submitted to USAF on 18 March 1955. The purpose of this program was to provide contiguous radar coverage northward from the combat zone perimeter to about 200 nautical miles north of the Mid-Canada Line.

One of the principal aims of the Fourth Phase was the extension of high altitude coverage against a jet-bomber force. At altitudes below 15,000 feet, detection was to be provided by the Doppler fence on the Mid-Canada Line, and tracking was to be performed by the FPS-3's and FPS-14's of the proposed Fourth Phase. This program was to be completed in four increments. The first, with an operational date in 1957, was to contain three direction centers with FPS-3 radars deployed to fill the gaps in the coverage between the NEAC chain and the line Moisie-St. Margarets-Sydney. This area was deemed to be of particular importance because of the heavy concentration of critical targets to the southwest and because of the identification difficulties generated by the high volume of local and transoceanic air traffic.

The second increment, also with a 1957 operational date, was to consist of six heavy radars of the FPS-7 type on the Dawson Creek-Hopedale segment of the Mid-Canada Line itself, and two on the westward extension of this line. The coverag from these would extend the existing Pinetree chain to about 230 nautical miles north of the Mid-Canada Line while raising the cover to 35,000 feet altitude. The third increment, to be completed in 1958, was to contain ten additional direction

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centers, while the fourth, also for 1958, was to contain five more. Both of these increments included the stations required to fill the coverage at lower altitudes between the Mid-Canada Line and the Pinetree Line. Initial study indicated that most of the radars should be of the improved FPS-3/GPA-27 type. To increase the high altitude capability throughout, some FPS-7's were to be programmed for the two latter increments as well.

Associated with the Fourth Phase Mobile program were to be sufficient gap-filler radars to provide low altitude coverage down to 500 feet. On the Mid-Canada Line, the low altitude coverage was to be provided by the Doppler system, as has been mentioned. Southward, however, gap-fillers would fill in the spaces up to the border. It was estimated that approximately 110 of these would be needed.

THE GAP-FILLER PROGRAM

<u>The Program</u>. In January 1955, USAF notified ADC that the Gap-Filler program had been phased as follows. There were to be 423 stations in all: 125 to be operational during FY 1956; 225 by FY 1957; 323 in FY 1958; and the total of 423 completed in FY 1959. The FY 1955 program contained authority to construct 108 sites in the United States and 17 in Canada. However, ADC was informed that no surveys of Canadian sites were to be made until the entire program was agreed upon between the two countries. Consequently, all 125 were to be located in the United States.[39]

A target date of 31 March 1955 was set for the completion of site surveys for the first 125 stations. In several instances, it was not possible for the siting teams to complete negotiations for obtaining land in the vicinity of the originally programmed sites within the time alloted for completing the sur-

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veys. In these cases, ADC authorized the defense forces to site the stations in locations originally programmed for the second increment.[40]

This substitution of locations caused no difficulty at higher level. In fact, USAF directed that ADC not wait until sites were firm before submitting its total requirements, preferring a list of tentative sites for the entire program of 423 stations. The objective of this request was to facilitate negotiations with Canada by holding discussions on a single program rather than intermittent talks based upon piecemeal -- though firm -- requests.[41] The required list of tentative sites for the entire program was forwarded in April.[42]

Criteria for the selection of parent stations for the gap-filler sites were determined by ADC in April. Primary consideration in the choice was to be parent station coverage and approach routes, as well as compatibility with SAGE subsector boundaries. Parent sites were required to be within the same subsectors as the gap-fillers, and to possess maintenance responsibilities for the gap-fillers.[4]

The pressure placed upon the siting teams to meet quotas within rigidly prescribed time limits caused ADC to reconsider the personnel requirements for the siting effort. The initial requirement for personnel was based on the workload created by siting the first 125 gap-fillers. The second and third increments, however, were approved shortly thereafter, and the additional burden was placed upon the same teams. USAF was advised that in the EADF region the 26th, 30th, and the 32d Air Divisions would require two teams instead of the one originally established, if the siting schedule was to be met. In the WADF area, four siting teams in all were required, one for each of the WADF divisions. CADF indicated that no additional augmentation was required for its area.[44]

ADC had known for some time that the radar set for the gap-filler stations was to be the FPS-14. However, the command was discontented with the extent of its

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information about this radar. The FPS-14 was to be obtained under a production-development program and changes in the characteristics of the equipment had been incorporated after preparation of the specifications without notification to ADC. Disturbed at this state of affairs, ADC asked ARDC to convene a symposium on the FPS-14.[45] While waiting for this briefing, information reached the Command that a klystron-driven version of the FPS-14, the FPS-18, was in the blueprint stage, and that the first production model was destined for the 126th site in the program.[46]

Surveys for the gap-fillers had been conducted on the premise that the radars would be mounted upon 70-foot towers. In May, alarmed at reports that it might not be feasible to operate the radars on the towers, ADC asked ARDC to conduct an immediate investigation into the problem. The possibility of a negative report was an unpalatable prospect. Resiting for many of the stations would be necessary.[47] Radomes were also deemed necessary by ADC for all gap-fillers, the protection being desired because of the prospect of damage to the antenna while they were unattended.[48]

The siting teams were directed in February, in addition to the real estate normally required for the gap-filler sites, to make provision for the acquisition of a fire-break area around each site endangered by the possibility of grass and tree fires.[49]

THE GROUND OBSERVER CORPS

<u>Organizational Progress</u>.[50] The basic criteria for measuring progress in the GOC were: (1) the number of active observer posts, and (2) the number of volunteers. During the early part of 1954 it was discovered that a uniform method of reporting the number of volunteers was not being followed throughout the air defense system. In some instances, volunteers were being carried on the rolls for more

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than two years after they had last been active, while other detachments were dropping individuals after a six-month lapse. A new regulation was published which remedied this situation, but the result showed an apparent loss of volunteers as reported to ADC headquarters. In the following statistics the decrease in numbers of volunteers reported in February 1955 is due to the corrected reporting procedure. The figures revealed, however, that there was a steady increase in the number of active and 24-hour posts.

| | 31 Aug 1954 | 28 Feb 1955 | 31 Aug 1955 |
|---|---|---|---|
| Posts required | 16,421 | 19,134 | 29,615 |
| Posts organized | 13,657 | 12,028 | 13,779 |
| Active posts | 5,452 | 7,062 | 9,230 |
| 24-hour posts | 1,427 | 1,359 | 1,598 |
| Volunteers enrolled | 370,728 | 320,188 | 354,677 |

A considerable part of the improvement noted in the preceding statistics stemmed from successful efforts to get civilian community organizations to share the responsibility for the GOC. This was done through a series of support programs launched through conferences between ADC representatives and national officers of various civilian organizations. National conferences were followed by meetings at state or regional level attended by coordinators and corresponding leaders of the civilian groups, and finally by meetings of local and filter center representatives. Among these national organizations were the U.S. Junior Chamber of Commerce, the Veterans of Foreign Wars, the American Legion, the Boy Scouts of America, the General Federation of Women's Club, and the Kiwanis International.

In coordination with the Advertising Council, the third annual advertising campaign was planned and carried out. Results reflected the increased public acceptance of the GOC..

The most significant development during the first six months of 1955,

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was the implementation of the GOC expansion program. The organization of the corps was completed in all of the 48 states, much of the previous standby organization was put on a 24-hour status, and initial steps were completed to give filter centers the responsibility for flight plan correlation.

The effect of the expansion was to increase the number of GOC squadrons from nine to 12 and the number of filter center detachments from 49 to 73. Twenty-four new filter centers were called for, and the status of completion was as follows: one was operational, 13 were completed but not yet operational, and ten were still under construction.

Operational Procedure and Training. A study of operations procedures resulted in the publication of a new standardization manual, and it was anticipated that there would be better utilization of GOC information by radar stations as a result. In addition, emphasis was placed upon more volunteer training to increase the accuracy of volunteer reporting and filtering. In this respect, a new regulation was issued in August, which specified optimum training standards for civilian volunteers in filter centers and observation posts. Also, an administrative supervisor's handbook was prepared and distributed to each volunteer administrative supervisor.

With the organization of the GOC proceeding as well as could be expected, the major goal for the immediate future was to be an increase in the operational effectiveness of the GOC by improving its detection, tracking, and identification capability. In this connection, a field study of current practices was planned.

During 1955 the following additional gains were made in obtaining equipment for the GOC: 5,500 acoustic detectors (Sound Ranging Set AN/UNS-1) were ordered for the use of the observation posts; three filter centers were relocated

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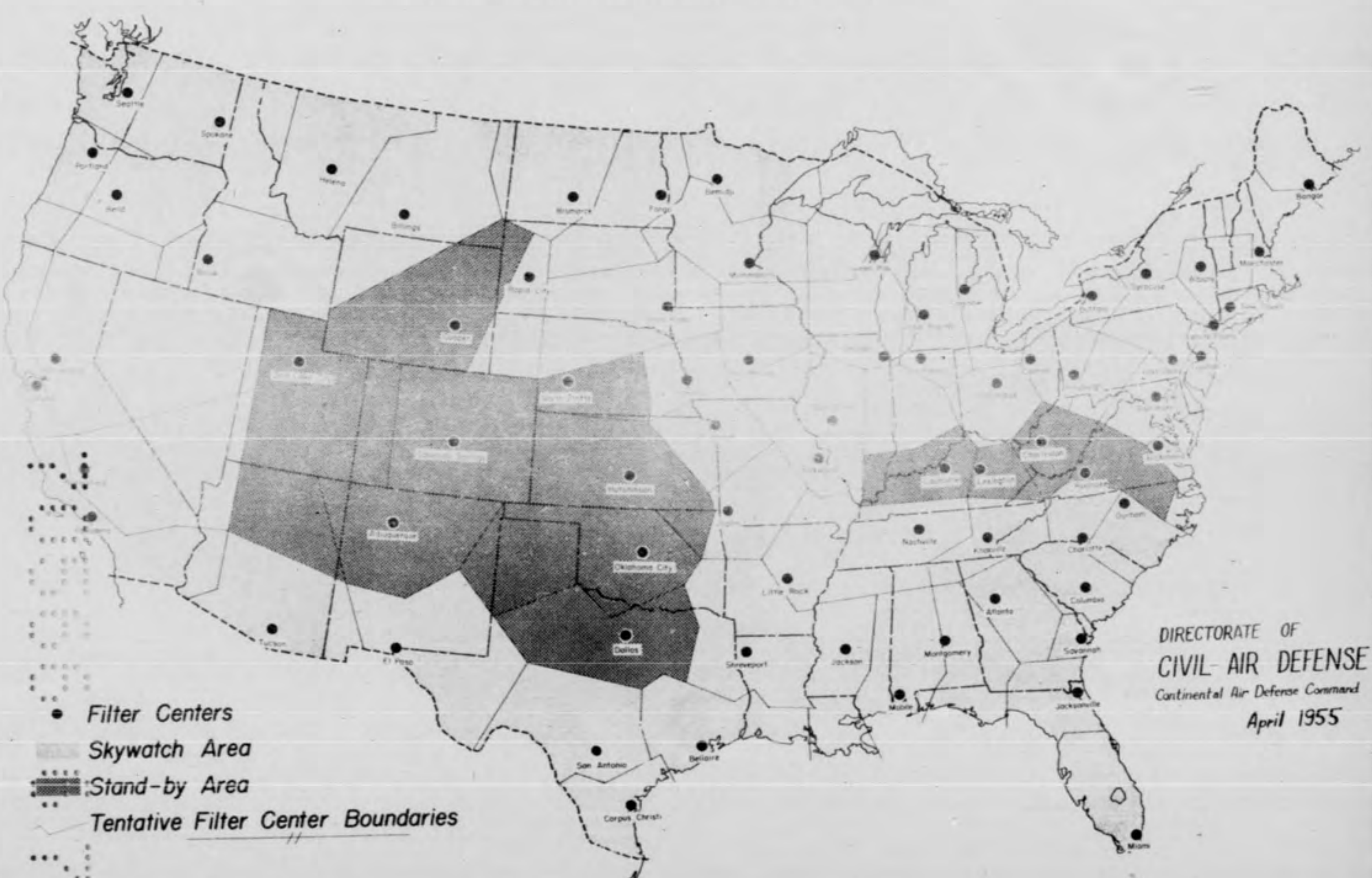
# EXPANDED GOC PROGRAM



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because of inadequate space and facilities; a new style vertical plotting board was designed, manufactured and installed in the 24 new filter centers and in three other filter centers in the previous SKYWATCH area; 503 new station wagons were procured and assigned for the use of the 73 filter centers.

Military Personnel in the GOC. A plan to permit officers to volunteer for GOC duty upon completion of their overseas tours was approved by USAF in March 1955, with gratifying results. In August, USAF announced a provision for airmen to volunteer for duty with the GOC.

The requirement for manning 24 detachments lowered the experience level of the GOC military detachments considerably. Manning statistics, as of 31 August 1955, for GOC detachment military personnel in the three Defense Forces were as follows:

| | Officers | | Airmen | |
|---|---|---|---|---|
| | Auth | Asgd | Auth | Asgd |
| EADF | 181 | 137 | 641 | 712 |
| CADF | 174 | 82 | 649 | 522 |
| WADF | 64 | 48 | 242 | 238 |

Liaison with Other Agencies. Close and continuous liaison was maintained with the RCAF's Ground Observer Corps during 1955, resulting in the joint publication of Air Force manuals on "Aircraft Recognition for the Ground Observer" and "Filter Center Operation" for use by both. This was important because in some instances communications made it necessary for observation posts along the international border to report from one country to another.

In cooperation with the Third Weather Group, plans were completed for the GOC to submit and process severe-weather reports (GOREPS), a plan approved by the United States Weather Bureau.



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PASSIVE DETECTION

The Air Defense Command had been convinced for a long time that its passive detection equipment was operationally ineffectual either to provide early warning or to analyze airborne navigational and bombing radar signals. However, ADC moved cautiously before requesting permission to withdraw its passive detection requirements, because it hoped that ARDC would come up with a substantial improvement. In late 1954, ADC placed the six PD stations on a standby status, and in March 1955, it notified USAF of its wish to cancel the 38 passive detection stations programmed for the Command.[51]

The operation of a passive detection system composed of currently available equipment would not significantly add to its capability, ADC maintained. Furthermore, once the radar net, with its northward and seaward extension programs, was in operation, there would definitely be no need for equipment of this type. In summing up its views, ADC stated that the PD system in operation neither provided early warning in advance of the radar net, nor was it able to track or identify aircraft signals in the high signal density areas in which it operated-- at least to the degree desired.

The deletion of this requirement would serve to eliminate the semi-operational stations which had proved so unsatisfactory. By way of keeping the door ajar, ADC requested that it "be kept apprised of developments in the passive detection field that may significantly increase our air defense capability."[52]

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## SEAWARD EXTENSION OF THE COMBAT ZONE

### THE GENERAL PLAN

CONAD issued an over-all seaward extension plan in June 1955 to "provide for the integration and effective utilization of Texas Towers, Picket Ships and Airborne Early Warning aircraft..."[53] One of its main aims was to show USAF Headquarters what communications were needed.[54*]

CONAD proposed two stages of operation (the plan had not been approved by the Joint Chiefs of Staff at mid-year) in the off-shore system. Phase I was based on the availability of forces by 1958; the second by 1960. During the first phase, CONAD planned to have five Texas Towers, five picket ship stations, and six AEW&C stations off the east coast; and five picket ship and five AEW&C stations off the west coast (see map following). With increased forces by 1960, CONAD planned to expand the coverage. The increase on the east coast was to be in AEW&C stations-- twelve in the second phase. The picket ship stations were to remain at five and Texas Towers at five. On the west coast both picket ship and AEW&C stations were to be increased to seven and eight, respectively. Thus, the eastern area, with its preponderance of targets and where a greater percentage of the enemy's attack was expected, would have the most forces.[55]

In the first phase, CONAD planned to place the stations of each element in a single row. Off the west coast there was to be a row of AEW&C aircraft first; beyond this a row of picket vessels. Off the east coast, there were first to be the Texas Towers, then a line of AEW&C stations, and finally, on the outside, the

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* For all operations of the three elements, CONAD asked for a minimum of 32 UHF channels and 50 other channels (families of frequencies). For details of the communications plan, see Section VII and Inclosure 2 to CONAD's operational plan of 20 June 1955.



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picket ship stations. This deployment plan was to remain the same in the second stage except that on the east coast an additional row of AEW&C stations was to be placed on the outside beyond the picket ships. Thus, the picket ship stations off the east coast would be between the rows of AEW&C stations.

CONAD would not have enough AEW&C aircraft, as currently programmed, to cover these twenty stations (12 on the east coast, eight on the west coast) continuously. Therefore, it was planned to man only part of the stations around-the-clock and cover the rest with aircraft on alert. Advance warning from the Distant Early Warning line would help in dispatching aircraft quickly. On the east coast, it was proposed to man only the outer row and the northern stations of the inner row continuously. Aircraft for the five southern stations on the inner row were to be kept on alert, ready to scramble when warning was received from the DEW line or other sources. On the west coast, only the two northern stations were to be continuously manned. CONAD noted that in actual practice this scheme might not prove feasible and that enough aircraft to man all stations continuously would be requested in its 1955 to 1965 plan.*

CONAD's reason for placing picket ships and AEW&C aircraft as it did was to provide an all-altitude radar coverage, so far as possible. AEW&C aircraft, restricted in effectiveness because of equipment limitations and lack of an airborne moving target indicator, were deployed to provide the low altitude coverage; picket ships to provide high altitude coverage. The outer row of AEW&C aircraft off the east coast in the second phase was to extend the low altitude detection capability.

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* A ratio of 7.5 aircraft was required to man each station continuously, or 150 for twenty stations. Currently, 82 aircraft were programmed.

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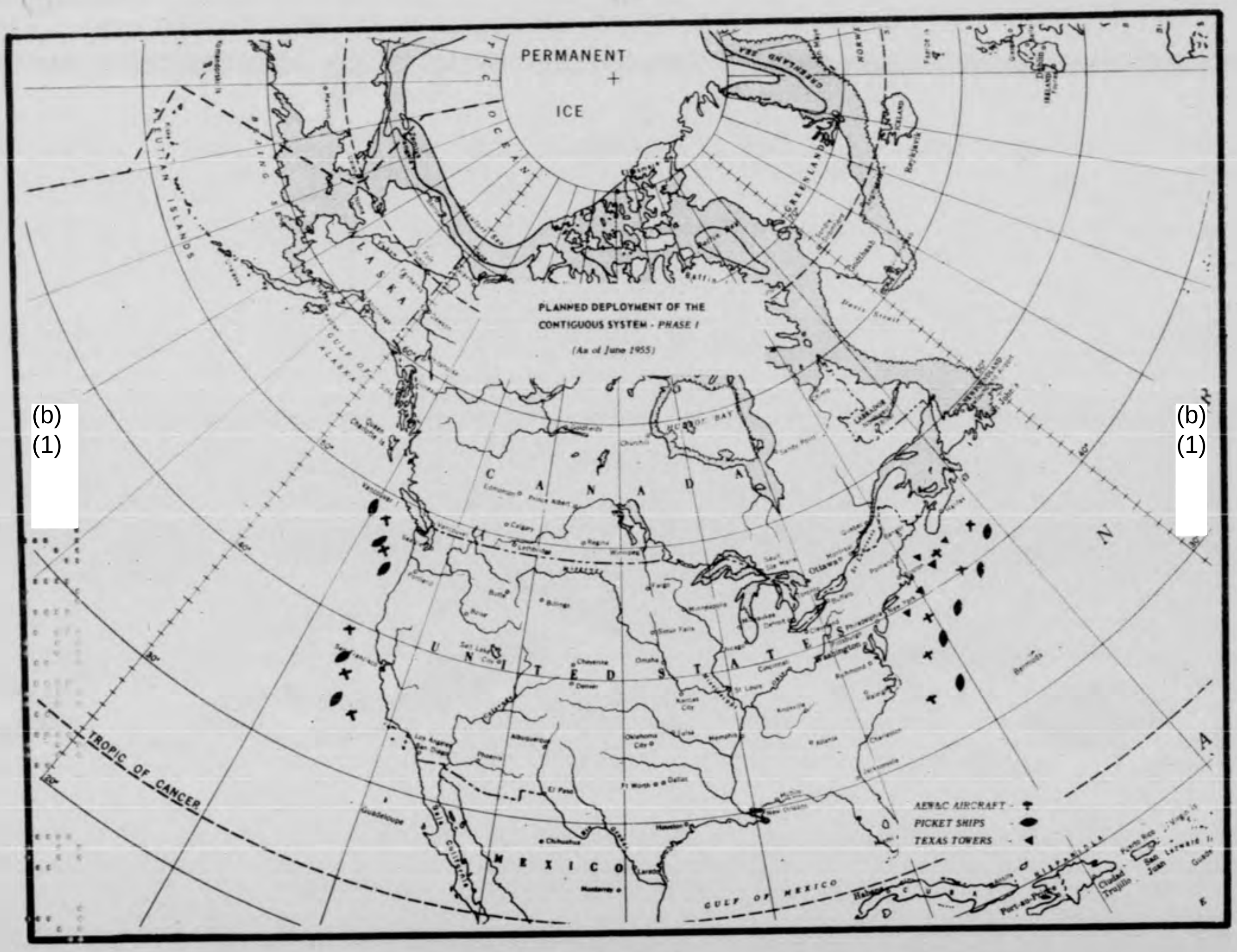

PERMANENT
ICE
PLANNED DEPLOYMENT OF THE
CONTIGUOUS SYSTEM - PHASE I
(As of June 1955)
ALEUTIAN ISLANDS
ALASKA
GULF OF ALASKA
CANADA
HUDSON BAY
GREENLAND
UNITED STATES
MEXICO
GULF OF MEXICO
TROPIC OF CANCER
AEW&C AIRCRAFT
PICKET SHIPS
TEXAS TOWERS


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THE AIRBORNE EARLY WARNING AND CONTROL FORCE

<u>Program and Status</u>. Air Force Headquarters approved an increase in AEW&C tactical squadrons from the original seven to twelve early in 1955.[56] The 12-squadron force, to be reached by FY 1959, would increase coverage to almost the full length of both coasts. CONAD's program called for seven squadrons on the east coast -- three each at Otis AFB, Massachusetts, and Seymour-Johnson AFB, North Carolina; and one at Brookley AFB, Alabama. On the west coast, three were to be at McClellan AFB, California; one at McChord AFB, Washington; and one at Norton AFB, California (see chart on following page).[57*] Wing headquarters were to be activated only at Seymour-Johnson AFB, McClellan AFB, and Otis AFB.

Five of the 12 tactical squadrons and two of the three wing headquarters were in being by mid-1955. McClellan AFB had two squadrons. Otis AFB had three. Both bases had a wing headquarters.

Included in this total were two tactical squadrons and one wing headquarters added in the first half of 1955: the 964th AEW&C Squadron and the 552d AEW&C Wing at McClellan AFB; and the 962d AEW&C Squadron at Otis AFB.[58] Two other tactical squadrons were activated in March, but this was simply a reorganization of squadrons that had been functioning for some time. The 960th, which moved from McClellan AFB to Otis AFB, was originally activated on 1 October 1953 as the 4701st Squadron. The 963d was first activated in March 1954 as the 4712th Squadron.

The 8th Air Division, which had originally been slated for inactivation

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* The first squadron scheduled for Seymour-Johnson AFB, the 966th, was originally to be activated at Otis AFB and then moved when facilities became available. But because of the shortage of facilities at Otis AFB and the difficulty the units already there were having in becoming operationally ready, the 8th Air Division Commander recommended McClellan AFB for the 966th. Both ADC and USAF agreed.

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when the wings were able to take over its duties (ca. July 1955), was given another year of life. It was also assigned directly to ADC Headquarters. There were two reasons for removing the division from WADF jurisdiction. The more important was the difficulty the AEW&C force was having in reaching operationally ready stature. All commands concerned, including WADF, felt that direct ADC Headquarters control would be beneficial in such matters as allocation of materiel and personnel.[59] The second reason was the need to straighten out the awkward channels of control that resulted when operations in EADF's area began. Until the wings under each defense force could take over, central control was obviously better. The reassignment was made on 1 May 1955.[60] At the same time, ADC asked that the division be retained because of the immensity of the job remaining in getting the program going, citing such problems as the deficiencies of the RC-121, training, and supply.[61] USAF agreed, authorizing retention until June 1956.[62]

Deliveries of aircraft kept pace with the schedule. At the end of May, for example, there were 9 RC-121C's and 8 RC-121D's at McClellan AFB and 13 RC-121D's at Otis AFB for a total of 30. The program called for delivery of 33 at this time.[63] As of mid-August there were 37 aircraft on hand (28 RC-121D's and 9 RC-121C's) out of a total of 41 programmed for delivery.[64] This was right on schedule, for two aircraft were out of the command and two were to be delivered by the end of the month.

A total of 82 aircraft were currently contracted for, the last to be delivered in September 1956. ADC planned to give each of the seven squadrons in the original program ten planes for normal operations and training. The additional planes were for attrition or command support.[65]

Aircraft and Support Deficiencies. To set up the airborne early warning force in the time desired, ADC had accepted and began operating aircraft

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## AEW&C STATUS

July 1955

| Unit | Base | Assignment | Date of Activation |
|---|---|---|---|
| Hq 8th ADiv | McClellan AFB | ADC | 1 May 1954 |
| Hq 552 Wg | " | 8th ADiv | 8 July 1955 |
| 552d E/M Sq | " | 552d Wg | 18 Dec 1954 |
| 552d P/M Sq | " | 552d Wg | 18 Dec 1954 |
| 963d AEW&C Sq | " | 552d Wg | 8 Mar 1955 |
| 964th AEW&C Sq | " | 552d Wg | 8 Mar 1955 |
| Hq 551st Wg | Otis AFB | 8th ADiv | 18 Dec 1954 |
| 551st E/M Sq | " | 551st Wg | 18 Dec 1954 |
| 551st P/M Sq | " | 551st Wg | 18 Dec 1954 |
| 960th AEW&C Sq | " | 551st Wg | 8 Mar 1955 |
| 961st AEW&C Sq | " | 551st Wg | 18 Dec 1954 |
| 962d AEW&C Sq | " | 551st Wg | 8 Jul 1955 |

## AEW&C PROGRAM

| Unit | Base | Approximate Date |
|---|---|---|
| Hq 553d Wg | Seymour-Johnson AFB | 3rd Qtr FY 1958 |
| 955th AEW&C Sq | " | 3rd Qtr FY 1958 |
| 956th AEW&C Sq | " | 3rd Qtr FY 1958 |
| 966th AEW&C Sq | " | 4th Qtr FY 1956 |
| (966th AEW&C Sq activate at McClellan AFB about 8 Nov 1955) | | |
| 957th AEW&C Sq | McChord AFB | 4th Qtr FY 1958 |
| 959th AEW&C Sq | Brookley AFB | 2nd Qtr FY 1959 |
| 965th AEWHC Sq | McClellan AFB | 8 Aug 1955 |
| 958th AEW&C Sq | Norton AFB | 1st Qtr FY 1959 |

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and equipment untested by the Air Force. Further, the aircraft had been procured by the Navy and was equipped primarily according to its needs. The aircraft had, therefore, to meet both Navy and Air Force mission requirements, and what was satisfactory for one was not necessarily satisfactory for the other.[66] Also, certain equipment required by one was not needed by the other. Complicating the problem was an intricate joint Air Force-Navy procurement system and an ineffective liaison system. This resulted in an inadequate exchange of information between the two services, delays in correction of deficiencies, and inadequate provisioning of certain components.

Among the major deficiencies in the aircraft which were listed in detail by the Air Proving Ground Command following its tests in January 1955 and by the USAF Inspector General following his survey in April, were the following: an unsatisfactory search and height finder radar; an unreliable communications and navigation system; lack of radome de-icing equipment; lack of airborne moving target indicator (AMTI) equipment; and limited crew space.[67] In addition, the IG noted that the ADC program lacked adequate logistic and personnel planning, and a maintenance program for the communications and electronics system.

ADC replied that it was well aware of these problems and had put considerable work on them.[68]* Equipment deficiencies had been discussed with all agencies concerned and a number of engineering changes and modifications had been initiated or proposed.[69] The problem was almost too large, however:

> the machinery and personnel know-how in this command and other commands for handling and keeping up with this highly complicated

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* In this connection also, ADC published in May 1955 an RC-121 maintenance standardization manual. In ADC's words, it provided a "complete text for commanders and maintenance personnel which will insure a uniform understanding of the organization, functions, and management of the wing maintenance organization."

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> weapon system has not kept pace with the numerous problems that have arisen. Patch work fixes have been applied, but complete control has eluded this command.

ADC said that some of the reasons for this difficulty were that initial provisioning had suffered because the Air Materiel Command had delayed in naming the prime depot for the aircraft, that frequent personnel changes in the USAF RC-121 Weapon System Project Office had resulted in lack of group experience, that contract allocation of certain spares and parts was under Navy authority, and that nine specific electronic systems in the aircraft were under Navy control.

ADC concluded that the aircraft had been accepted too soon, and that it should have gone first to the Air Research and Development Command and to APGC for complete testing.[70] As for support, ADC pointed out that normally when a weapons system "is procured to meet the requirements of this command rather than the requirements of another service, sufficient lead time is provided for accurate and effective provisioning [and] it wasn't until after we had received the aircraft that the principal deficiencies which are not causing the trouble were discovered."[71]

As a possible short term solution to the problems, ADC suggested that much more emphasis be placed on the AEW&C program at Air Force Headquarters. ADC felt that this might provide more manpower for monitoring the program and funds for modification, and help lower the time for shipments of spare parts and for making modifications to the equipment. What ADC was aiming for was a high priority and extensive modification project similar to the F86D project, PULL OUT.

Inadequate base facilities was another area severely hampering operations. The 8th Air Division Commander, Brigadier General Kenneth H. Gibson, reported that none of the interim operating facilities were ready at Otis AFB

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when the 960th with ten aircraft arrived in March.[72] In his words, conditions were "deplorable."[73]

Among the vital items yet to be provided at Otis AFB were a communications and electronics maintenance building, nose docks, transportation vehicles, and family housing.[74] The Air Force IG also pointed out deficiencies in the communications and electronics maintenance facilities at McClellan AFB.

By July, all of the interim facilities, with the exception of nose docks, were complete at Otis AFB.[75] Eighty-three vehicles were allocated and were being delivered. There were plans for building 470 housing units and 39 base guest houses.

ADC reported to the USAF IG that delays in construction at both McClellan AFB and Otis AFB were caused by real estate acquisition difficulties, approval requirements, and austerity standards.[76] At Otis AFB, there were such other problems as a two and one-half month lag in construction because of bad weather and a delay in procurement of nose docks caused by USAF and AMC design changes.

Operations. Full 24-hour operation at Otis AFB was still scheduled for March 1955, and at McClellan AFB for January 1957. General Gibson had detailed plans for meeting these dates, including monthly training and flying goals.[77] Each month called for an increase in the flying hours up to the requirement for full operations. His progress reports showed that his units were meeting his monthly program fairly well. In May, for example, the total airborne operations center missions scheduled were 61 for McClellan AFB and 18 for Otis AFB.[78] At McClellan AFB, 49 or 80% of these were made and at Otis AFB, 14 or 78% were made. Of the aborts, radar caused the greatest number-- 18%. An indication of the increase in hours accomplished is shown in the January figures. In this month,

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450 AOC hours were reported.[79] For May this figure was 656 hours.

Although General Gibson planned a monthly increase to reach the flying hour requirement for full operations of 172 hours per aircraft per month, he questioned the possibility of being able to maintain the aircraft at this rate.[80] According to his calculations, this number of hours would exceed the maintenance capabilities. Therefore, to meet the mission requirements, additional aircraft would be needed.

In Colorado Springs, the AEW&C Project people also thought that this rate was too high.[81] They believed that 13 to 15 aircraft per squadron would be needed, with a flying rate of around 133 to 153 hours monthly. But exactly how many aircraft would be needed could not be determined. ADC advised General Gibson that it agreed with his conclusions, but "the extent by which this goal will be missed, being dependent upon such factors as personnel, facilities, and experience, is measurable only through actual operations."[82]

Neither General Gibson nor ADC Headquarters wanted to buy more RC-121's in their current configuration. As one way of meeting this problem, General Gibson suggested shifting aircraft as needed from the resources of the 966th Squadron.[83] This was the squadron that was to be activated at McClellan AFB several months ahead of its move to Seymour-Johnson AFB. ADC considered this as one interim solution, but also suggested as a possibility, "to limit your immediate operational objectives for the AEW&C system equipped with RC-121's and to procure aircraft of advanced configuration to meet ultimate requirements in a later time period."[84]

THE TEXAS TOWER PROGRAM

Launching of the First Tower. Nearly three years after ADC first

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suggested to USAF the use of Texas Towers as sea-based radar stations, command officials watched the first of five programmed towers slide down the ways.[85]* Launched at Bethlehem Steel's Quincy, Massachusetts, Yard on 20 May 1955, it was towed some two months later to its permanent home astride Georges Shoal off Cape Cod. The builders, who were still responsible for the tower, had yet to place the permanent legs and raise the tower to its position 80 feet above the water, and to erect radar towers and communications masts. It was expected that this work would be finished by mid-November.[86] On that date, the Air Force could take over and begin installation of the remaining equipment. ADC set February 1956 as the date for air defense operations at the tower to start.[87]

Manning and Support. While the over-all construction of the first tower was coming along even better than expected, a number of operating points had yet to be settled. Until agreement was reached on them, USAF Headquarters would not approve the ADC operational plan. One of the points in question was manning. The manning for one detachment had been set at 47 by mid-1955 (6 officers and 41 airmen).[88]** However, ADC wanted a duplicate crew on shore for rotation. USAF termed this double manning a luxury and maintained that the shore crew would have nothing to do.[89] Higher headquarters agreed to the need for rotation, but suggested rotation of all personnel of the parent AC&W site (762d AC&W Squadron, North Truro, Massachusetts).

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* This tower was designated Texas Tower Two.

** A few positions were changed and added from the manning established in ADC's July 1954 operational plan which called for a crew of 41. One of the most important differences resulted from changing the concept of remote to on-station operation. Because of this, three controllers and two radar maintenance personnel were added. Also, tower upkeep personnel were added, such as a utilities supervisor and a plumber. Because the requirement for ECM equipment was removed, the positions for three ECM personnel were deleted.

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ADC vigorously defended its double manning plan, indicating that 47 was a conservative number for a crew.[90]* There were far more than 47 positions on the tower and all men would have to handle several jobs. This meant considerable cross-training. Because of these part-time jobs, the crews would have to work long hours. The ADC Surgeon said that tower duty should not be more than 15 days, with at least an equal time on shore between tours.[91] No decision had been made, however, and tours on the tower and shore of as much as 30 days were being considered. ADC pointed out also that the men coming from the tower should be given some time off rather than being assigned immediately to work at the parent site.

ADC disagreed that there would be any idleness at the shore station. For one thing, transportation difficulties would make it impossible to move an entire crew. Replacement would have to be on an individual basis so that there would be almost a constant rotation. The parent squadron would have a training program continuously for Texas tower people. Also, the shore site would be kept busy supporting the tower, and plotting and telling data from it. Tower personnel would be needed to handle these extra jobs.

The tremendous training burden that would result if USAF's proposal that each man at the shore station serve on the tower prevailed was one of ADC's main objections. Each tower crew member was to perform more jobs than his shore counterpart. In many cases, equipment at the tower and the shore site was different. For example, the AN/FPS-3A was to be the primary search radar on the tower, whereas the AN/CPS-6B was the primary search radar of the shore station. Squadron personnel would have to learn both types of equipment if they served on both stations.

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* Accommodations for 76 could be provided on the tower.

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A plan for logistics support of Texas Tower Two was reached by mid-1955 after several months of indecision. In its operations plan of 1954, ADC had proposed that the Navy move personnel and supplies and also furnish certain supplies. Emergency supply and evacuation was to be by air in this plan. However, USAF opposed the concept of Navy support, believing that the best plan was for Air Force support as far as possible.[92] Resolution of the problem resulted from a Pentagon conference between ADC and USAF representatives in March 1955.

The plan agreed upon was for normal transportation of men and cargo, other than fuel, to be by ADC-assigned helicopter.[93] Fuel was to be supplied by ships of the Military Sea Transport Service, the Navy or Coast Guard, or commercial carriers. Fresh water, other than the initial supply, was to come from sea water distilled at the tower. Emergency transportation was to be by sea or air, depending upon the availability of transportation and the nature of the emergency. Two H-21B type helicopters were authorized immediately for support of the first tower.[94*] These were assigned to the 564th Air Defense Group at Otis AFB where they would be based for maintenance and supply. The commander of the parent organization, the 762d AC&W Squadron, was to have operational control.

Four additional H-21B's were to be assigned for support of the remaining squadrons. The total of six H-21B's, with two each based at Otis AFB, Suffolk County Airport, and Brunswick NAS or Halifac, Nova Scotia, was considered enough to handle transportation to the five towers. But in an effort to insure constant availability of one helicopter and to provide for unforseen needs while the first operation was tested, two were provided for the first tower.

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* The H-21B, designed by the Piasecki Helicopter Corporation, was a large, twin-rotor helicopter of tandem configuration. In addition to its two crew members, it could carry 20 passengers or a cargo of about 4,000 pounds.

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USAF and ADC left the door open to change. The cost and efficiency of helicopter operation was to be compared to that of sea transportation. After about six months, the system was to be re-evaluated.[95] In the meantime, ADC attempted to get a definite means of alternate transportation in case the helicopter system failed at any time. As ADC knew, helicopters were difficult to maintain and could fly only in good weather.[96*]

In May, ADC issued a general planning guide for logistics support of Texas Tower Two, embracing the USAF-ADC concept.[97] On the basis of this, EADF published a detailed logistics plan for this tower covering every item of policy, supply levels, procedures, and organizational responsibility.[98]

Concept of Operations. In the June 1955 plan for seaward extension of radar, mentioned earlier, ADC considered Texas Towers an integral part and an extension of the shore-based station.[99] Their basic functions were to tell information to the shore-based direction center, accept control and direction of interceptors, and relay information from AEW&C aircraft. The Texas Tower's radar was considered to be equal to that of the shore-based station. The only difference between the shore and sea based stations was that the tower was to have no identification responsibility or interceptor scramble prerogative.

The plan for interceptor control by the tower was an important change in the concept of operations. This change was caused by a mix-up in requirements and development of data remoting equipment. ADC's original plan had been to remote all surveillance radar data from the towers to their respective shore-based direction centers. ADC did not specify a need for video remoting equip-

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* Survival time in the icy cold north Atlantic water was very short. Special survival clothing was to be issued to each man making the trip. Training in life boat usage and sea survival was to be given to each man also.

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ment,originally believing that submarine cable communications could be secured and video remoted by this means.[100] As it turned out, it was not possible to get a submarine cable facility in time for operation with the first tower and tropospheric scatter radio was substituted as the main tower to shore communications.[101]

ADC continued with its original plan, however, believing that slowed down video equipment could be used for video remoting. This concept was expressed in the ADC plan of July 1954. This equipment proved to be unsatisfactory, however, because it gave multiple returns on single aircraft and had considerable azimuth inaccuracies.[102]

Early in January 1955, ADC sent a requirement to ARDC for remoting equipment in place of slowed down video.[103] ARDC replied that it had no previous requirement for video remoting to shore based manual stations and that no effort had been made to develop such equipment. ARDC said it understood that operation at the tower was to be manual until the SAGE or AN/FSQ-7 center was in operation.[104] The SAGE center could receive the remoted data by means of the Lincoln Fine Grain Data System, AN/FST-2. ARDC advised that no equipment for remoting to the manual system could be developed "even on a crash basis, in sufficiently short time to provide a material time advantage over the programmed date of the AN/FST-2 - AN/FSQ-7."[105] This fine grain data system would not be available until 1957 and was designed only for feeding data to the SAGE computers.

ADC pursued the matter further, however, learning from Rome Air Development Center that a system known as RAFAX (Transmitter Coordinate Group OA-682/GPA-28 might do the job and was in production.[106] But USAF opposed this, recommending that all the towers be manually operated until the fine grain data system was installed:[107]

> To provide remoting equipment prior to the installation of FGD for SAGE will necessitate the re-engineering of a video transmission system such as RAFAX and installing it as an interim system.

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The developmental effort and re-engineering required will be expensive in both money and manpower.

At mid-1955, ADC had decided to change its plan and to control from the tower, although it was still in the market for a video relay if one came along. This change in plans required that the equipment and personnel for control be placed on the tower. As noted earlier, three controllers were added to the manning for each tower crew.

Future Program. ADC currently had four more towers programmed. If all went as programmed, the towers would be ready for operation about the end of January 1957.[108] But the future of two of these was uncertain. Headquarters USAF questioned the need for Texas Tower One to be located off Massachusetts on Cashes Ledge and Texas Tower Five to be located on Brown's Bank near Nova Scotia.[109] The USAF view was that the improvement in the radar planned for shore stations P-10 (North Truro) and P-13 (Brunswick NAS, Maine) would possibly make Texas Tower One unnecessary. Texas Tower Five might not be needed, they said, because the function of site M-102 (Barrington, Nova Scotia) was changed from surveillance to a direction center and heavy radar was programmed for this station.[110] USAF asked ADC to re-study the need for these towers. Early in August, ADC replied that a study had been completed and that the requirement still existed.[111]

THE PICKET VESSEL PROGRAM

Status and Program. On the east coast, the Navy was operating all five programmed picket ship stations around-the-clock by mid-July (only two had been in operation at the beginning of the year).[112] Manning these stations were six DER's (destroyer escort radar) and four YAGR's (miscellaneous auxilliary radar). The first YAGR to go into service, USS Guardian (YAGR 1), went on station Number Two on 23 June. From this date, they went on duty in stages, al-

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Captain Dennis J. Sullivan
Chief of Staff, NAVFORCONAD

Captain David W. Todd Jr.
Asst. Chief of Staff, Intelligence
NAVFORCONAD

Colonel Edward T. Ashworth
Chief of Staff, ARAACOM

Colonel Robert W. Hain
Asst. Chief of Staff, G-3, ARAACOM

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though all four YAGR's were ready for duty on 30 June. The ratio of ships to stations in general was three DER's per station and four YAGR's for three stations. The reason for the smaller number of YAGR's was that they could stay on station from 30 to 32 days; whereas the DER's could do so for only one to two weeks.

On the east coast, stations One and Five were manned constantly by DER's, and stations Two and Four by YAGR's. Station Three was manned primarily by YAGR's, with DER's filling in.

On the west coast, only one station was manned. This was manned on 30 July by USS Haverfield (DER 393). Subsequently, two more DER's went on duty in the Pacific. Their tour on station was two weeks in length.

Five stations were to be manned in the Pacific by July 1956 and six stations by July of the following year.[113*] The stations on both coasts were eventually to be manned entirely by YAGR's: Atlantic stations by mid-1957; and Pacific stations by mid-1958.

Operations. An operational plan for picket ships issued by the Commander Naval Forces Eastern CONAD in May provided that control of the picket ship active air defense functions on station was to be in the hands of the joint air defense division commander in whose sector the ship was operating.[114] Before going on station and as soon as the ship left the station, control was in the hands of the appropriate Type Commander. In the case of the DER's this was Commander Destroyers, Atlantic Fleet; for YAGR's, Eastern Sea Frontier.

When on station, a ship was to patrol within a circle 25 nautical miles in radius from the picket ship control point of the station. Ships were to be

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* The plan quoted here, which was still in force in August 1955, did not carry beyond 1958, at which time CONAD wanted seven stations on the west coast.

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considered off station when more than 25 nautical miles from the control point, or if on the station but unable to perform their mission. However, ship commanders were authorized to prescribe the course and manner in which the ship patrolled the area.

For the period December 1954 through March 1955, the DER's on station conducted a total of 131 training intercepts and 15 active intercepts.[115] The average detection range of the ships was 90 miles, with a maximum range of 157 miles. During each tour on station, the ships passed an average of 112 contacts to the ADDC's.

Since YAGR's had been on station only a short while, little evaluation of their operations had been made. However, one ship, USS Skywatcher (YAGR 3), reported in July that seven training intercepts were attempted of which five were completed.[116] The commander said that his SR-a search radar picked up aircraft at an average range of 125 miles below 20,000 feet and 188 miles above this altitude. The maximum UHF communications range with interceptors was 90 miles.

## THE EARLY WARNING ZONE*

### THE MID-CANADA LINE[117]

During the fall of 1954, specific details of the proposed Mid-Canada Line had been recommended by the Systems Engineering Group and subsequently agreed to by the United States and Canada. The SEG had recommended the installation of a single line of low-power Doppler detection stations between Labrador and Dawson Creek, using equipment developed by the Canadian Defence Research Board, and reinforced by scanning radars at selected points for the purpose of aircraft identification.

As a result of further joint planning, the Canadian government agreed to construct, finance and operate the main portion of the Mid-Canada Line between Hopedale and Dawson Creek. It was later agreed that the USAF Pinetree radar stations on the Atlantic coast, between Hopedale and St. John's, augmented by six gap-filler radars, would constitute the eastern end of the line. On the western end, it was decided that the four Pinetree stations located between Dawson Creek and Holberg would serve as the extension to the Pacific.

During the first half of 1955, the construction program on the Mid-Canada Line was concerned entirely with the line from Dawson Creek to Hopedale. The RCAF, as the design authority, employed the final report of the SEG as its guide, and worked with the Department of Defence Production, the Defence Research Board, and the contractor, the Bell Telephone Company of Canada.

As programmed, the Mid-Canada Line was to consist of 92 Doppler

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* According to ADC's 1954-1960 Requirements Plan, the Early Warning Zone consisted of the entire area of the North American continent north of the farthest contiguous coverage emanating from the continental United States.

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Detection Stations. These were to be manned during the initial period of operation, but in time, it was expected they would be unattended. For control and maintenance purposes, the line was divided into seven sections, each approximately 350-400 miles long. A Section Control Station was to be established in each section. A 36-channel microwave lateral communications system connecting the Doppler stations with the main stations was envisaged. VHF radio links were to be used to connect Section Control Stations to the Line where the line of communications did not pass through the station. Rearward communications, consisting of one voice and four teletype circuits, were to originate at four points only. The DEW Line rearward communications were to pass through the Mid-Canada Line on separate circuits. For aircraft identification purposes, ground-to-air radio facilities were to be available along the whole length of the line.

It had been intended that the system would consist of a single line of Mark II Doppler equipments. However, in order to avoid production and development delays, this plan was changed and it was decided to use a staggered line of Mark I equipment with intervals of 60 miles between stations.

The purpose of the Section Control Station was to receive and evaluate the detected signals from the Doppler stations, and to identify unknown aircraft. Only unidentified aircraft detections were to be passed rearward to the ADDC. To attain a high level of serviceability, the system was to be equipped with automatic changeover and a system of fault alarm indication. Remote control supervision was to be provided at each main station. Regular maintenance visits were to be made to the Doppler stations at two week intervals, except for emergency repairs. All major maintenance and repair was to be done at the Section Control Station. Transportation to the Doppler stations was to be performed by helicopter.

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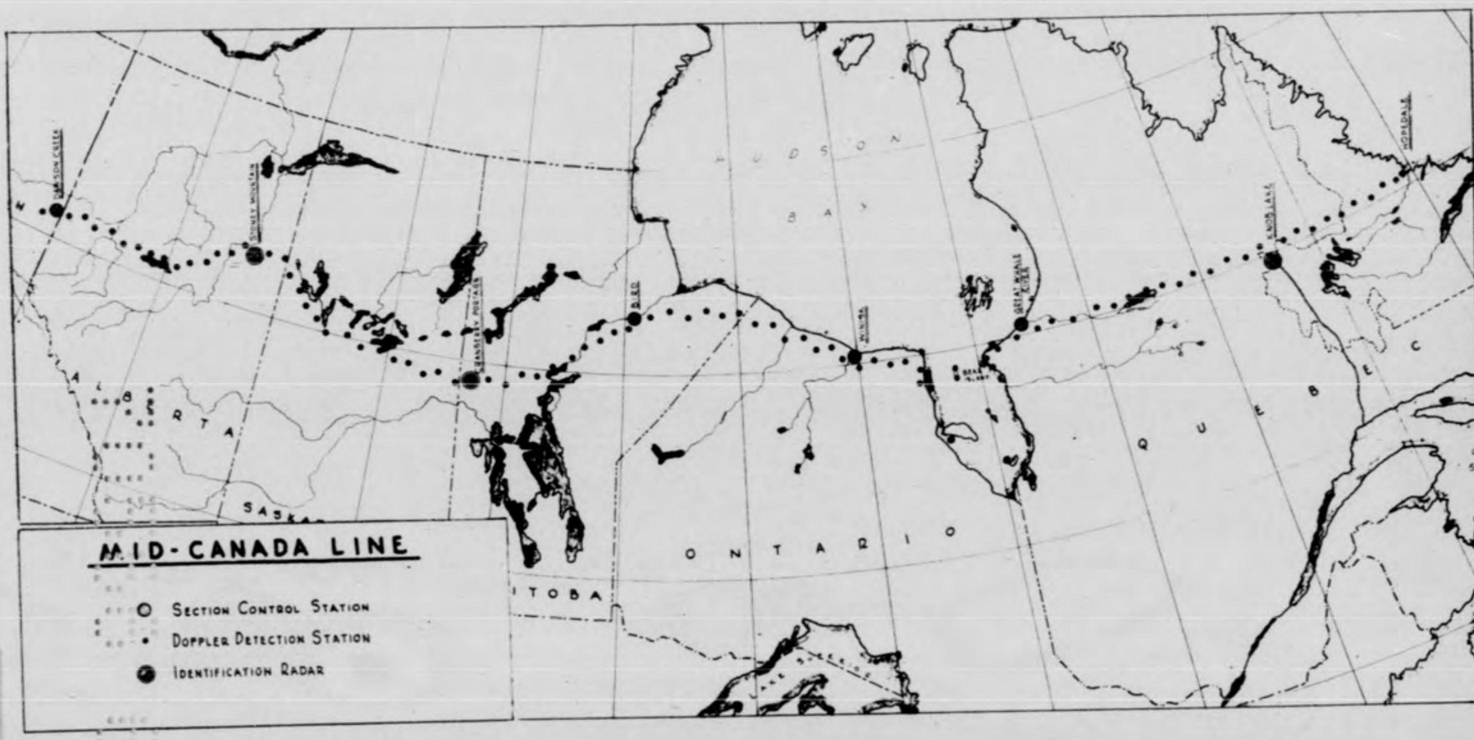
MID-CANADA LINE
SECTION CONTROL STATION
DOPPLER DETECTION STATION
IDENTIFICATION RADAR
HUDSON BAY
ONTARIO
QUEBEC
ITOBA

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All non-military aircraft intending to cross the Line were to be required to file a flight plan with a Department of Transport Air Traffic Control Center, or land for identification at a check-point airfield. A number of these latter had been selected approximately 20 miles north of the Line, at points where aircraft would normally pass. Beacons were to be provided to assist aircraft in keeping within restricted limits. Surveillance radars were to be established at Knob Lake, Cranberry Portage, and Stoney Mountain, where the volume of civil air traffic was known to be relatively high.

It was anticipated that the Mid-Canada Line would become operational by 1 January 1957, at which time it would be integrated with the DEW Line and the Pinetree System.

THE DISTANT EARLY WARNING LINE

<u>The DEW Line Operational Plan</u>. In January 1955, USAF Headquarters directed ADC to prepare an operational plan for the DEW system.[118] In view of the paucity of information about the division of responsibility between the two countries, and between the interested USAF commands, i.e., NEAC, AAC, and ADC, much difficulty was experienced in formulating a firm plan. Nevertheless, recognizing the urgent need for an operational philosophy, ADC submitted a sketch plan on 14 March 1955, developing "those portions of the plans required to enable the contractor and system designers to complete equipment specifications and general design of the system."[119]

Without the necessary knowledge, the "plan" could do no more than present ADC's position on the subject of the future operation of the line. ADC assumed that the Line would be divided four ways for operations: AAC was to operate its own segment in Alaska plus a small portion extending into Canada;

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ADC itself would undertake to operate the western Canadian segment; the RCAF, the central segment; and NEAC, the eastern segment, although ADC recognized this division as a tentative arrangement. In addition, ADC went briefly into manning details and stated its philosophy of operation.[120]

As it turned out, however, higher headquarters became cognizant of the planning difficulties presented by the huge undertaking while ADC was still engaged on its plan, and came to the conclusion that the job of coordinating the many details was more properly in its sphere of activity than ADC's.[121] USAF took steps, therefore, to remove operational planning responsibilities for the DEW Line from ADC. Furthermore, it became clear as time progressed, that Canada preferred not to be represented in the operation of the line. At a meeting of the Permanent Joint Board on Defense (PJBD) in July, the United States was authorized to man and operate the entire length of the line for the first three years at least. USAF even went beyond this, however, by removing CONAD from operational responsibility altogether -- dividing the line solely between NEAC and AAC. At the same time, an operational policy for the DEW Line was elaborated, employing substantially the same principles proposed by ADC in its sketch plan.[122]

Thus, by mid-1955, planning, as well as operational responsibilities, had been withdrawn from the Command. ADC's main responsibility in this area remained the job of determining the qualitative requirements for early warning from the DEW Line. In one large area, however, ADC, by default, retained important planning duties. In March, USAF charged ADC with the preparation of a logistics concept for the DEW Line. By June 1955, such a concept was prepared. Its basic assumptions were similar to ADC's operational plan, and it appeared that it was likely to suffer the same fate, but in July 1955, ADC was informed that USAF was

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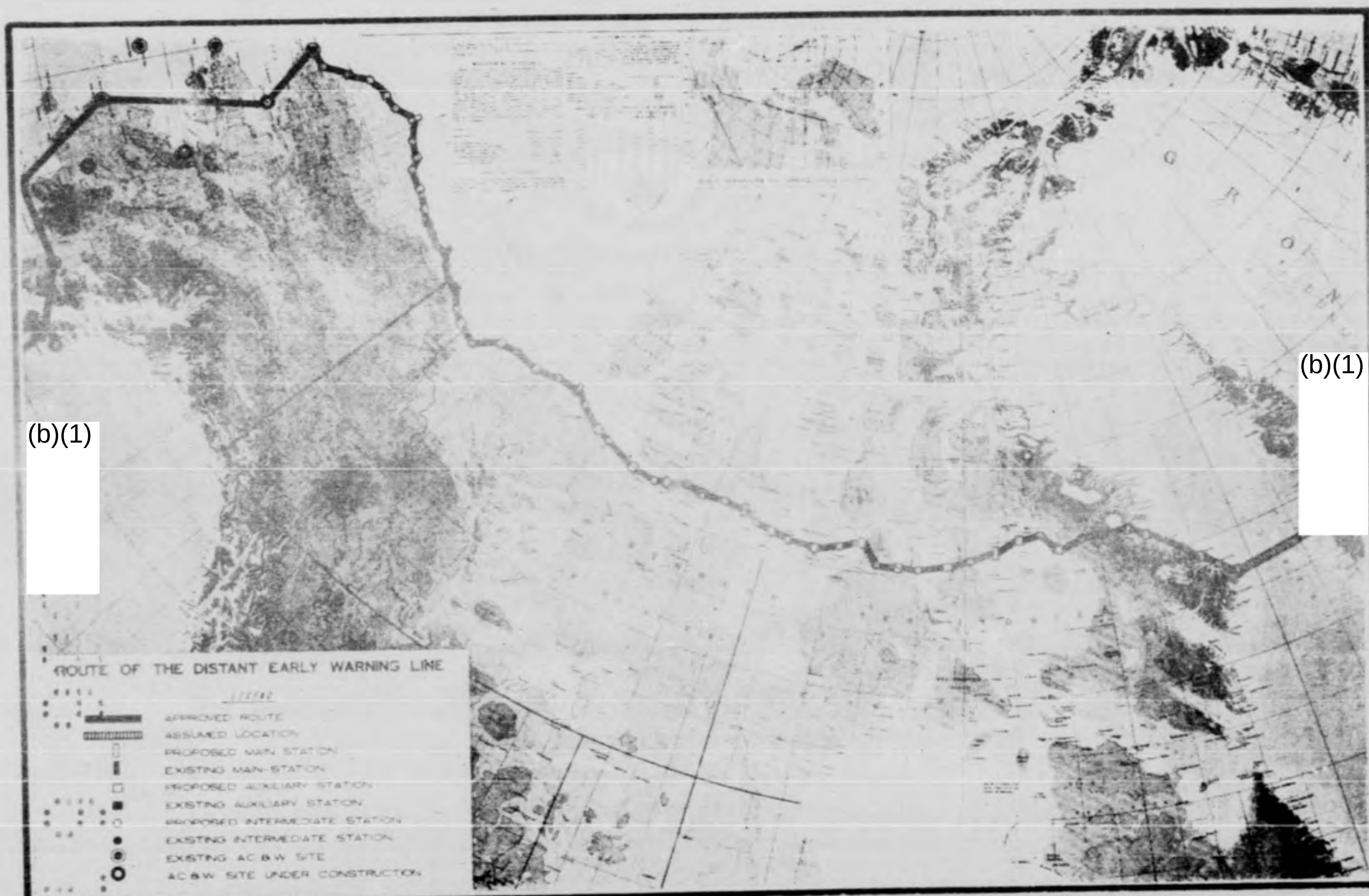
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ROUTE OF THE DISTANT EARLY WARNING LINE
LEGEND
APPROVED ROUTE
ASSUMED LOCATION
PROPOSED MAIN STATION
EXISTING MAIN-STATION
PROPOSED AUXILIARY STATION
EXISTING AUXILIARY STATION
PROPOSED INTERMEDIATE STATION
EXISTING INTERMEDIATE STATION
EXISTING AC&W SITE
AC&W SITE UNDER CONSTRUCTION

engaged in careful study of the logistics concept.[123]

The Implementation Plan. By the beginning of 1955, the main outlines of the effort had been clarified sufficiently to warrant an implementation plan.[124] The target date was set for sometime in mid-1957. The Western Electric Company was awarded a contract for the construction of the entire line. To assist that firm, a Joint Distant Early Warning Project Office (DEWPO) was established in New York City, under the executive direction of AMC with responsibility for the general overall management of the program and for serving as the contractor's point of contact within the Air Force.

The Eastern and Western Land Segments. Although the direction the line would take from Cape Lisburne to Cape Dyer had been approved by the JCS in January 1955, the two extremities of the land segment of the line had not been decided at mid-year much to the anxiety of CONAD. The western extremity was destined to be Kodiak but had not been determined by mid-year, although it appeared that the route favored was along the Alaska coastline from Cape Lisburne south.[125] Similarly, no action had been taken by the JCS on the extension of the line from Cape Dyer on Baffin Island eastward. It was ADC's opinion that the line should cross the Davis Strait to Holsteinborg in Greenland then turn south to its eastern terminus at Cape Farewell.

## SEAWARD EXTENSION OF THE EARLY WARNING ZONE

There were two proposals for the eastern sea flank of the DEW line. CONAD favored a line running from Cape Farewell, Greenland, to the Azores. The Navy proposed running the eastern line from Cape Dyer to Greenland, across Greenland, then by water to Iceland, from Iceland by water to the Faeroes, and finally by water to a termination point possibly in Scotland.[126]

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The Navy-proposed line was the closest to the Soviet mainland. It was about 1,230 miles from the nearest Soviet base on the Kola peninsula and was about six hours flying time from the east coast of the United States. The CONAD-proposed line was about 2190 miles from the closest Soviet base and about $4\frac{1}{2}$ hours flying time from the east coast.

In June 1955, the CONAD Deputy Commander, Major General Frederic H. Smith, Jr., presented the CONAD case to the Joint Chiefs of Staff. The Navy's Iceland line was not practical, explained General Smith, because it was too easy to "spoof."[127] The Russians, operating closer to home than the United States, could cross it at will just to set off false alarms. CONAD would not know what to do if the line was crossed, for crossing it would not necessarily mean an attack was coming. "The United States would have difficulty in molding world opinion to the extent that any crossing of this line would be considered a direct threat to the United States," he said.[128]

The closer, CONAD-proposed line would not have these disadvantages to the same extent, General Smith said. If crossed by a large number of aircraft, it would be close enough for CONAD's commander to say, "This is as close as I can let them get without taking action."[129] While the Russians could also spoof this line, General Smith felt that the United States would be on firmer ground in challenging their right to cross it. He suggested that the United States tell the world the purpose of the line and that "we view penetration of the line as a threat to the security of North American and ... a war provocation if penetrated in large numbers for spoofing purposes."[130]

A final point in favor of the CONAD line was flexibility. Initially, the line could run from Newfoundland to the Azores as an extension of the Mid-Canada line. Then when the northern portion of the DEW line was built the end

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could be swung up to southern Greenland. The line could also be moved shoreward to add to the contiguous system whenever desired.

The location of the western sea flank, Hawaii to Kodiak Island, had been approved by the Joint Chiefs of Staff.[131] But in July 1955, Headquarters USAF advised that because of a recommendation made by the Chief of Naval Operations, a joint Navy-Air Force group had been convened to re-study the location.[132] The CNO had proposed establishing radar along the Aleutians and then extending the line by water to Midway Island.

General Partridge objected to the fact that the group had been called without his knowledge because CONAD had been named as an important planning agency for the early warning systems.[133] His concern, he said, was that if delay continued, the sea flanks would not be ready when the land-based part was. The effect of this remonstrance was that USAF agreed to propose to the CNO that CONAD conduct the study.[134]



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CHAPTER TWO: IDENTIFICATION

REGIONAL IDENTIFICATION

A New Strategy for Identification
Navy Objections to the ADIZs
The Multiple Corridor Identification System

EMERGENCY IDENTIFICATION MEASURES

Downgrading SACs Deployment Plans
Navigational Aids
Standard Formats for the SCATER Classified ANNEXES

PROCEDURES

Air Movements Information Centers (AMIS)
Identification Procedures
A Proposal to Enlarge Aircraft Markings

ELECTRONIC IDENTIFICATION

Mark X Selective Identification Feature (SIF)
The Civil Aircraft Beacon



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## IDENTIFICATION

### REGIONAL IDENTIFICATION

A New Strategy for Identification. In December 1954, ADC had submitted to USAF a proposal to redesignate the Air Defense Identification Zones (ADIZ's) within the continental United States. The plan took into consideration the forthcoming expansion of radar coverage promised by the Mobile Radar Program, and its strategy was derived essentially from the double perimeter concept. A feature of the proposal was the creation of a "vertical plane" around the critical target areas from the ground up, making identification mandatory for all aircraft penetrating the identification zone.[1]

USAF accepted the basic strategy outlined by ADC. Several important changes were incorporated by USAF, however, which provided more stringent controls over aircraft flying through the ADIZ's, simplified ADC's proposed procedures, and made the program more acceptable to civil aviation.[2]

A conspicuous change was the elimination of ADC's vertical plane proposal. In USAF's opinion, the single line from the ground up did not provide enough security for defense because it was not wide enough to enable the radar system to acquire the detection information needed. In lieu of this, USAF established the ADIZ's from the ground up, eliminating the 4,000 foot zone which had hitherto been a free zone of entry for civil aircraft. As a result of this change, it would be necessary for aircraft to penetrate an area of from 40 to 90 miles in width under radar surveillance. The only exception to this rule was that no flight plans would be required of aircraft operating at 1500 feet or less above the terrai and at a true air speed of 110 knots or slower.



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The new identification strategy presented a picture of a relatively narrow ADIZ belt around the entire eastern target complex from Maine to Florida (see map on following page). This belt comprised the Atlantic ADIZ which was slightly expanded to conform to the anticipated seaward extension of radar coverage; the small Presque Isle ADIZ in Maine; the Canadian Security Identification Zone (SIZ); and a newly established Eastern ADIZ which extended in a wide arc from Minnesota to Florida. The vast interior of this circle of ADIZ's was termed the Eastern Defense Area, and all aircraft flying within it were exempted from identification requirements. The Knoxville ADIZ, which hitherto had embraced the Oak Ridge AEC plant, was abolished.

In the west, the Pacific ADIZ, the Northern ADIZ, and a newly-created Western ADIZ, encompassed the entire west coast (or Western Defense Area). Only the California border was without an ADIZ, but here the Southern Border ADIZ -- an identification line without depth -- afforded reasonable security in this uncongested traffic zone.

In addition to the two huge circles around the east and west target areas, ADIZ's were located along the northern border (Northern ADIZ) and in the Albuquerque area (Albuquerque ADIZ). The former belt, unlike the Southern Border ADIZ, was a zone in depth from the west coast to Michigan, where it joined the Canadian ADIZ, which continued the belt through Canadian territory to connect with the Presque Isle ADIZ in Maine. The Albuquerque ADIZ, with minor exceptions, remained the same as it had been.

The new arrangement was based on the principle that identification was to be made as far as possible from the vital targets, and where the lighter traffic volume was more conducive to positive identification. The great central area of the continental United States was termed the Central Open Area, within which no

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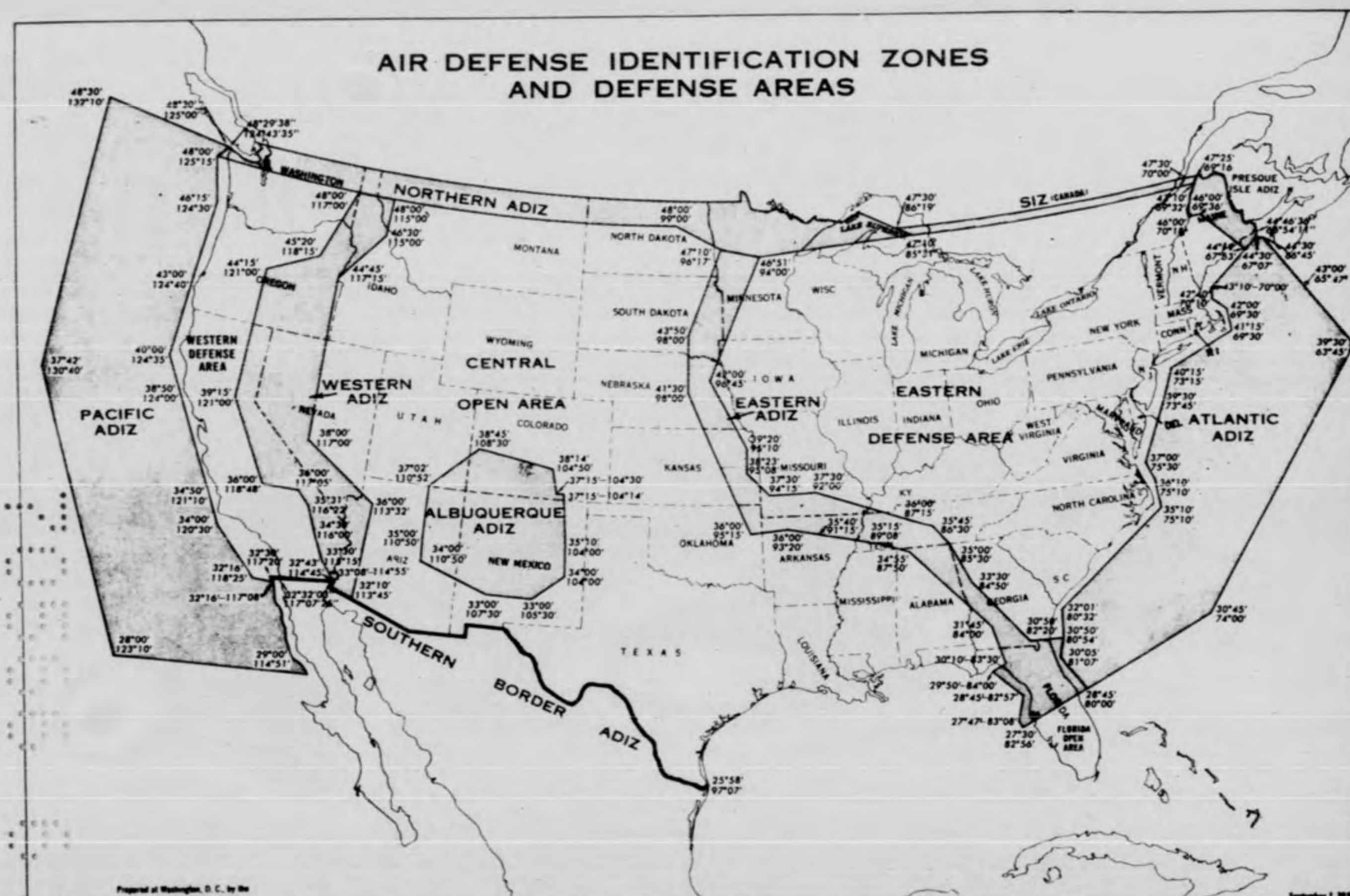
AIR DEFENSE IDENTIFICATION ZONES AND DEFENSE AREAS



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restrictions were placed on aircraft flights.

An important and troublesome exception to ADC's basic principle of a complete perimeter coverage around the country, remained, however. From the point where Texas and Mexico met on the Gulf of Mexico to western Florida, no zone of any kind existed, and aircraft were free to penetrate the country into the Central Open Area. Earlier, ADC had been adamant in insisting upon a Gulf Coast ADIZ to close this gap, but USAF persuaded ADC to postpone establishing the zone pending the extension of radar coverage along this area. The rationale behind the postponement was not only the meagre coverage which existed there, but the plea of the Navy to permit free movement of its aircraft along the coastal zone.[3]

With relatively minor objections, and those dealt with USAF's proposed procedures for the new ADIZ plan, ADC concurred in the new identification strategy -- a strategy which indeed had been born in ADC. Specific comments on a new AFR 60-22 which was prepared by USAF, was withheld by ADC pending more detailed study. By mutual agreement it was decided to make the new ADIZ's go into effect on 1 December 1955.

Navy Objections to the ADIZ's. The Navy's reaction to the proposed ADIZ's was not altogether a favorable one. Annoying to the Navy was ADC's insistence that the Pacific ADIZ came as close as possible to the Los Angeles - San Diego area shoreline. This area was especially important to the Navy because it used the waters off the coast for fleet maneuvers and carrier operations. In the Navy's opinion, conformity with ADC's flight plan requirements in the area hindered the effectiveness of its training. A Navy proposal to delete an expensive portion of the Pacific ADIZ in those waters met with strong objections by ADC, which pointed out that the lack of controls in the area would permit low-

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flying aircraft to penetrate and fly through the Southern California area without detection.[4] A mutually acceptable decision was reached, however, on this point, and a portion of the Pacific ADIZ was deleted to conform essentially to the Navy's needs.

Another feature of the proposed ADIZ plan was to extend the Pacific and Atlantic ADIZ's to conform with the proposed seaward expansion of radar coverage via picket vessels and AEW&C aircraft. It was the USAF view that the seaward identification zones become coterminous with the new coverage. This plan did not appeal to the Navy because it increased the area in which Naval aircraft would have to file flight plans offshore. A Navy proposal to reduce the new zones to the size of the previous ones was turned down by ADC and USAF.[5]

It had been mentioned above that the Navy objection to a Gulf Coast ADIZ caused ADC and USAF to agree to postpone the establishment of this zone until such a time as the radar coverage made it practicable.

A Navy request that the western edge of the Western ADIZ be slightly modified to delete the area of the naval ordnance testing station at Inyokern, was concurred in and the modification duly made.[6]

<u>The Multiple Corridor Identification System (MCIS)</u>. WADF's plan for the establishment of an MCIS in the Neah Bay-Vancouver area suffered a setback during the period. A proposal had been made in 1954 to the RCAF that an MCIS centered at the Canadian site at Holberg be created to help in the identification of flights terminating in the Seattle area from overseas. However, on consultation between ADC and its Canadian counterpart, it was decided that the new MCIS was not warranted because of the relatively low volume of traffic in the area. Furthermore, interceptors in the vicinity were inadequately deployed to make the interception for identification at the long distance involved.[7]

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On the East Coast a decision was made to abolish the Yarmouth fan of the Nantucket MCIS. Approximately 50% of the traffic entering the fan from overseas was identified prior to entry by various means, and the Command thought it practical to eliminate the fan completely.[8]

Preliminary surveys of air traffic in the New Orleans area indicated to ADC that for the time being at least the establishment of an MCIS there was not warranted. Furthermore, until the Gulf Coast ADIZ was created and radar coverage expanded in the area, a New Orleans MCIS was an academic matter.[9]

EMERGENCY IDENTIFICATION MEASURES

Downgrading SAC's Deployment Plans. Early in 1955, protracted negotiations between SAC and ADC over the question of the reduction of classification of SAC's deployment plans approached fruition. Those portions of SAC's emergency movements which pertained to flights within the United States during Yellow or Red emergencies, or during an Air Defense Emergency, were to be downgraded to unclassified. Thus, after long debate on the troublesome question, ADC was on the verge of insuring that traffic control agencies would have the necessary information of SAC movements in an emergency with which to conduct their overall planning.[10]

Navigational Aids. For more than a year ADC had been negotiating with its sister commands and the Navy to restrict the number of navigational aids to be kept on during an emergency. In late 1954, a number of navigational aids had been agreed upon and the emergency war plans of the participating agencies had been revised accordingly. At best, this arrangement had always been considered by ADC as a compromise. The navigational aids had to be left on so that USAF commands and the Navy could find their way to their destinations, but at the same time, the aids might serve as homing beacons for enemy aircraft bent on destruction. ADC had chosen a list of aids which in its opinion would do the least damage if the enemy chose to use them, and the other agencies were asked to conform their plans to this list.

In June, however, CADF reopened the question of the desirability of compromising on the emergency aids. "From continued study," CADF said, "it appears that at least 4/5 of all navigational aids available in the continental United States will be required for high priority use, even after essential traffic is grounded."[11] From this, it went on to recommend revising the SCATER plans to keep all navigational aids on during a Yellow or Red emergency, except where the division commander decided to the contrary. ADC's reaction was to reiterate the need for such a plan. According to ADC, only one-half of the navigational aids normally used in peacetime would be continued in use during an emergency, and this deletion of the remainder constituted a denial to the enemy of a possible means of homing on its targets. The aids which were to remain represented a compromise by air defense for the benefit of the offensive air arm.

Standard Formats for the SCATER Classified Annexes. A distinct advance was achieved in the SCATER program during the period.[12] For many months the air divisions had been preparing annexes containing classified information to the unclassified SCATER plans, but no standard format had been developed, in spite of many tries. At long last such a classified format was developed and published by ADC as a guide to the divisions in February 1955.

PROCEDURES

Air Movements Information Centers (AMIS). USAF's deletion of the Gulf Coast ADIZ from the new ADIZ plan had the effect of halting plans for the establishment of an AMIS at the New Orleans ARTCC -- a facility urgently proposed by the 33d Air Division. However, steps were taken in mid-1955 to create an AMIS in the El Paso ARTCC to filter flight plan information on aircraft crossing the Southern Border ADIZ.[13]

A need for AMIS's at Canadian Air Route Traffic Control Centers (ARTCC's) was expressed by ADC in March 1955. It was estimated that it would take between 18 and 24 months before the sections were established, however, because of Canadian shortages in trained personnel.[14] When the AMIS's were established, flight plans would be passed from them to the American direction centers across the border. However, the expansion of the radar system, with its consequent readjustment of station functions, would very likely make it necessary for a change in identification functions of American direction centers in the future. When this happened, Canadian flight plans would be directed to different direction centers than those planned.[15]

The safety of ARTCC's in the event of war concerned ADC considerably, a number of them being in areas which presented logical targets to an enemy. In March, Mr. Joseph Tippetts of the CAA requested General Chidlaw to give his opinion on the matter of relocating the centers to less vulnerable areas.[16] The CAA was informed that ultimate relocation depended largely upon the implementation of SAGE. A decision was withheld pending a briefing of CAA personnel on the SAGE program.[17]

<u>Identification Procedures</u>. ADC's procedural standardization program was also felt in the field of identification. In March 1955, a new regulation was issued, streamlining existing procedures, and directing conformity of operations.[18]

In January, Major General Walter E. Todd, WADF's commander, complained to ADC's Vice Commander that the morale of WADF's fighter pilots was being affected adversely by their failure to know the outcome of their reports of flight plan violations. General Smith interceded with CAA to obtain such information, but was informed that it was impractical to obtain it. For the time being ADC's efforts in this respect appeared to be checkmated.[19]

<u>A Proposal to Enlarge Aircraft Markings</u>. In March 1955, the Civil Aeronautics Board proposed the publication of a regulation making mandatory the conformity of all civil aircraft to new marking standards. Markings were to be made larger to permit easier identification by interceptor pilots. ADC readily endorsed a draft regulation to this effect, but opposition by civil pilots and airlines proved to be insurmountable. Leave was given to civil pilots, however, to enlarge their markings if they wished to do so.[20]

## ELECTRONIC IDENTIFICATION

<u>Mark X Selective Identification Feature (SIF)</u>. A positive means of electronic identification of aircraft had been a long-sought device by the Air Force. The Mark X IFF had been adopted shortly after World War II to replace the compromised Mark III equipment in use during the War. Before the Mark X could be used, however, a secure coding system had to be incorporated into it. The SIF, or Selective Identification Feature, was developed in two forms -- an automatic device which required no manupulation by the pilot in flight, and a manual system. In 1952, APGC was given the task of testing both devices for suitability (Operation PIN BALL). Phase I of the test was a limited test performed by APGC at Eglin AFB. Phase II was to be a large-scale test conducted by ADC under operational conditions.

After a long period of experimentation Phase I was ended in June 1955 with results which were disappointing to ADC and USAF. It proved conclusively that the automatic feature was not feasible for positive identification. Successive support of the equipment was required and "it presented operational problems detrimental to tactical field operations."[21] The slight increase in security it offered did not justify, according to USAF, the cost and complexity of the system. The Navy, Army, and Canada also expressed reluctance to accept the automatic feature for joint use. USAF held the door open for an automatic device, however, by continuing research and development for a cryptographically secure SIF system for joint service use.

The manual version of the SIF stood the test better than the automatic version. Although it too, was far short of ADC's needs, the decision was made to go ahead with Phase II of its suitability test. Originally scheduled to be held in the entire EADF region under large-scale operational conditions, the test was restricted to six AC&W squadrons and three fighter-interceptor squadrons of the 30th Air Division. Tentative future plans called for the manual version to be installed in military aircraft by December 1956.

In ground installations, SIF equipment was installed only at radar sites in the 30th Air Division. All other ADC radar stations were equipped with the basic Mark X ground component-- the GPA-16.

To ADC direction centers the decision to delay universal adoption of the Mark X IFF came as a disappointment. Although ADC was in the forefront in opposing an insecure IFF system, the Mark X IFF had certain advantages for surveillance. It provided an excellent beacon assist to ground radars, helping to extend detection ranges. ADC continued to watch IFF developments anxiously.[22]

<u>The Civil Aircraft Beacon</u>. Although only military aircraft were programmed to receive the SIF device, it was logical to look for a similar electronic means of identification for civil aircraft. Such a program, however, presented many problems. Questions of expense, security, and weight of equipment had much to do in deciding which categories of civil aircraft should possess IFF.

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During 1954, a basic civil aircraft beacon had been developed by the American National Development Board (ANDB) in conjunction with the CAA, and installed in aircraft of the Lake Central Airlines flying in the Great Lakes area. An evaluation of this test was made in April 1955 at a conference of interested agencies at ADC Headquarters, where it was decided that the beacon was an insecure means of identification, although of valuable assistance to ADC's surveillance radars. Tentative plans were drawn up to install the beacons in all transoceanic civil carriers. In the meantime research was to continue on an improved beacon. The value of such installation lay in the assistance the sharper signal would give to coastal radars and in the improved effectiveness of the Multiple Corridor Identification System. As a means of radar assistance, but not as a means of positive identification, ADC heartily endorsed the civil beacon program. An additional requirement in development was the need for compatibility of future beacons with ADC's ground IFF equipment.[23]

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## CHAPTER THREE: WEAPONS

ADC INTERCEPTORS
- Status of the Force
- Maintenance
- Air Crew Status and Training
- Rocketry Training
- Single vs. Two-Place Interceptors

AIR BASES

RESEARCH AND DEVELOPMENT
- Manned Interceptors
- F-101B Interceptor
- Long Range Interceptors

INTERCEPTOR MISSILES
- IM-70 (TALOS)
- IM-99 (BOMARC)
- FALCON (GAR-1)
- Nuclear Warfare

AUGMENTATION FORCES
- USAF Augmentation
- Navy Augmentation
- Air Force Reserve
- Air National Guard

ANTIAIRCRAFT IN AIR DEFENSE
- Status
- NIKE
- Guns
- Radar
- Electronic Countermeasures
- Communications
- Training
- ARAACOM Reorganization



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# WEAPONS

## ADC INTERCEPTORS

Status of the Force. At the end of June 1955, ADC's fighter force was composed of 58 all-weather squadrons, all of which were operational. This force was divided into 41 squadrons of F-86Ds, eight squadrons of F-89Ds, and nine squadrons of F-94C aircraft. During the period, the 518th FIS was activated at George AFB. No ADC squadrons deployed overseas, nor was the force augmented by any squadrons returning from overseas assignment. The air defense all-weather interceptors operated from 42 bases, on 16 of which ADC units were tenants (See chart on following page).

Maintenance. The modification projects PULL OUT, HOT WHEEL, and HOP UP, a critical shortage of fire control system parts, and the serious command-wide shortage of higher skill levels among maintenance personnel, were the major factors lowering the combat ready status of the fighter-interceptor force during the period.

Project PULL OUT, which modified F-86D aircraft, was expected to be completed in late summer, 1955, with the return of 38 aircraft from the depot to the command. However, excessive manhours were still required of maintenance personnel to make the necessary pre-depot preparation and post-depot inspection of the F-86Ds, all of which had an impact on the aircraft in-commission rate.[1]

Project HOT WHEEL, to replace all turbine wheels in F-86D aircraft, was completed. A requirement was established to inspect the turbine wheels in the aircraft after every 100 hours of operation. It was arranged for turbine wheels to be air-lifted to the depot to be inspected and returned while aircraft were



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undergoing routine periodic inspection. ADC was of the opinion that a combination of the new-type wheels and increased cooling would provide an ultimate solution to the turbine wheel failure problem.[2]

The out-of-commission rate for F-89D aircraft continued to remain high due to the replacement of inlet guide vanes on J-35 engines. But replacement was virtually completed by June 1955. Another factor affecting the combat ready rate of the F-89s was the 24 manhours required per periodic inspection of the wing-to-fuselage attach fittings, resulting in additional out-of-commission time for these aircraft.[3]

Project HOP UP was expected to be completed by the end of 1955. Approximately 40 F-94Cs were undergoing modernization at the close of the period. A program to retrofit them with Goodyear brakes was firmly established and scheduled to commence on 6 September 1955. Retrofit would be accomplished by depot assistance teams in EADF, and by sending WADF and CADF aircraft to SMAMA.[4]

Among other major modifications and improvements contemplated by ADC were: (1) incorporation of flush-mounted identification spotlights on currently operational and programmed interceptors;[5] (2) a visual sighting system, independent of the fire control system, to be developed for both the F-94C and F-89D interceptors for day and night use at low altitudes and in the event the fire control systems became inoperative against targets using ECM or evasive action; (3) installation of a USAF-approved computing optical sight (NAFFAIRS) in the F-86D aircraft;[6] (4) improvements in design of aircraft canopies and ejection seat systems along with better maintenance and thorough indoctrination of crew members in emergency escape procedures;[7] and (5) installation of a simple chaff dispensing device in the ejection seat of current fighter interceptors to aid ground radar in pinpointing the geographical point where the pilot abandoned his aircraft in an emergency.[8]

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**FIGHTER INTERCEPTOR FORCE:** June 1955

Source: Aircraft & Crew Status in Tactical Units and Armament Report, RCS: 1-AF-V14, 27 June 1955

| Air Div | Sqdn | Location | Base Asgmt | Type Acft | Acft Asgd | Acft Opr Rdy | Crews Asgd | Crews Opr Rdy |
|---|---|---|---|---|---|---|---|---|
| 9th ADiv | 31 | Larson | TAC | F-86D | 27 | 17 | 32 | 31 |
| | 323 | Larson | TAC | F-86D | 19 | 12 | 31 | 30 |
| | 445 | Geiger | ADC | F-86D | 22 | 14 | 32 | 28 |
| | 520 | Geiger | ADC | F-86D | 25 | 19 | 28 | 27 |
| 25th ADiv | 497 | Portland | ADC | F-89D | 25 | 21 | 30 | 30 |
| | 83 | Paine | ADC | F-86D | 24 | 16 | 36 | 28 |
| | 317 | McChord | ADC | F-86D | 27 | 15 | 34 | 29 |
| | 465 | McChord | ADC | F-86D | 21 | 14 | 31 | 26 |
| 27th ADiv | 94 | George | TAC | F-86D | 25 | 21 | 30 | 30 |
| | 354 | Oxnard | ADC | F-94C | 0 | 0 | 29 | 29 |
| (FI DT) | 354 | Moody | | F-94C | 19 | 9 | 0 | 0 |
| | 518 | George | TAC | F-86D | 18 | 8 | 25 | 24 |
| 28th ADiv | 84 | Hamilton | ADC | F-94C | 23 | 16 | 26 | 25 |
| | 325 | Hamilton | ADC | F-86D | 27 | 20 | 36 | 31 |
| | 413 | Travis | SAC | F-86D | 25 | 12 | 31 | 0 |
| 29th ADiv | 29 | Great Falls | MATS | F-94C | 18 | 14 | 20 | 19 |
| | 54 | Ellsworth | SAC | F-86D | 28 | 14 | 24 | 24 |
| 31st ADiv | 11 | Duluth | ADC | F-89D | 28 | 14 | 24 | 22 |
| | 14 | Sioux City | ADC | F-86D | 26 | 18 | 26 | 26 |
| | 337 | Minn-St Paul | ADC | F-89D | 24 | 17 | 20 | 19 |
| | 519 | Sioux City | ADC | F-86D | 22 | 16 | 11 | 8 |
| 33rd ADiv | 85 | Scott | ATRC | F-86D | 11 | 6 | 23 | 21 |
| (FI DT) | 85 | Grandview | ADC | F-86D | 21 | 16 | 0 | 0 |
| | 326 | Grandview | ADC | F-86D | 29 | 19 | 27 | 25 |
| 34th ADiv | 15 | Davis-Monthan | SAC | F-86D | 28 | 19 | 27 | 26 |
| | 93 | Kirtland | ARDC | F-86D | 26 | 20 | 29 | 28 |
| 26th ADiv | 2 | McGuire | ADC | F-86D | 23 | 12 | 28 | 28 |
| | 5 | McGuire | ADC | F-86D | 31 | 23 | 23 | 22 |
| | 46 | Dover | MATS | F-94C | 21 | 12 | 33 | 27 |
| | 48 | Langley | TAC | F-94C | 22 | 19 | 29 | 26 |
| | 75 | Suffolk Co. | ADC | F-86D | 23 | 7 | 27 | 26 |
| | 95 | Andrews | MATS | F-86D | 26 | 19 | 30 | 30 |
| | 96 | Newcastle | ADC | F-94C | 25 | 21 | 37 | 34 |
| | 330 | Stewart | ADC | F-86D | 27 | 14 | 29 | 25 |
| | 539 | Stewart | ADC | F-86D | 18 | 9 | 20 | 18 |
| | 331 | Suffolk | ADC | F-86D | 23 | 17 | 29 | 23 |
| | 332 | Newcastle | ADC | F-94C | 26 | 19 | 30 | 27 |
| 30th ADiv | 13 | Selfridge | ADC | F-86D | 27 | 20 | 31 | 31 |
| | 56 | Selfridge | ADC | F-86D | 30 | 21 | 27 | 24 |
| | 42 | O'Hare | ADC | F-86D | 23 | 11 | 33 | 32 |
| | 62 | O'Hare | ADC | F-86D | 26 | 11 | 30 | 28 |
| | 63 | Wurtsmith | ADC | F-89D | 27 | 17 | 31 | 26 |
| | 71 | Greater Pitt. | ADC | F-86D | 25 | 9 | 29 | 21 |
| | 86 | Youngstown | ADC | F-86D | 24 | 7 | 24 | 23 |
| | 97 | Wright-Patt. | AMC | F-86D | 4 | 0 | 29 | 29 |
| (FI FT) | 97 | Yuma | ADC | F-86D | 23 | 11 | 0 | 0 |
| | 432 | Truax | ADC | F-86D | 27 | 17 | 33 | 33 |
| | 438 | Kinross | ADC | F-89D | 15 | 7 | 26 | 15 |
| | 456 | Truax | ADC | F-86D | 27 | 17 | 23 | 22 |
| 32d ADiv | 27 | Griffiss | ARDC | F-94C | 19 | 10 | 25 | 23 |
| | 37 | Burlington | ADC | F-86D | 29 | 21 | 35 | 35 |
| | 47 | Niagara Falls | ADC | F-86D | 1 | 0 | 27 | 27 |
| (FI FT) | 47 | Yuma | ADC | F-86D | 21 | 8 | 0 | 0 |
| | 49 | Dow | SAC | F-86D | 21 | 9 | 26 | 25 |
| | 58 | Otis | ADC | F-89D | 16 | 10 | 23 | 2 |
| | 60 | Westover | MATS | F-86D | 27 | 22 | 26 | 26 |
| | 82 | Presque Isle | ADC | F-89D | 21 | 8 | 31 | 26 |
| | 318 | Presque Isle | ADC | F-89D | 7 | 0 | 27 | 27 |
| (FI FT) | 318 | Moody | | F-89D | 20 | 10 | 0 | 0 |
| | 437 | Otis | ADC | F-94C | 23 | 18 | 24 | 23 |
| 35th ADiv | 444 | Charleston | TAC | F-86D | 19 | 13 | 34 | 32 |
| | 460 | McGhee-Tyson | ADC | F-86D | 26 | 9 | 35 | 33 |
| | 469 | McGhee-Tyson | ADC | F-86D | 0 | 0 | 32 | 30 |
| (FI FT) | 469 | Yuma | ADC | F-86D | 25 | 21 | 0 | 0 |

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ADC was convinced that many bases in the command were failing to develop and maintain adequate base stock levels of aircraft parts. Because of this failure, an excessive number of AOCP/ANFE priority requisitions were submitted for items that could easily have been acquired for base stockage. The Air Defense Command hoped to reduce the command's percentage of fighter interceptors not combat ready because of lack of spare parts to 10% (AOCP 4%, ANFE 6%) by the end of July 1955.[9]

One way to attain this goal was to redistribute ADC materiel resources in such a fashion as to eliminate long-outstanding AOCP/ANFE conditions. This could be done by methodically organizing ADC's limited resources so that a fighter interceptor not mission ready at one defense force base for lack of a spare part could have this part made quickly available from a base in either of the other defense forces. This was undoubtedly a temporary approach to solving the problem. Action was taken to have AMC prime depots improve the overall supply of aircraft parts.[10]

The critical shortage of fire control system (FCS) components would not be alleviated until after the completion of Projects PULL OUT and HOP UP. Although the number of fighter interceptors not combat ready because of the lack of E-series fire control system parts decreased during the early part of the period from some 200 to about 70, ADC noted that there was no indication that this figure would continue to be reduced. In fact, by June 1955, the command had an average gross number of about 75 aircraft not combat ready for lack of one class of items alone. Warner-Robbins Air Materiel Area was requested to speed up procurement of parts, increase repair facilities, and reduce repair turn around in order to improve the support of the E-series fire control systems.[11]

The Jet Engine Field Maintenance program inaugurated in 1954 presented an opportunity to return more repairable engines to service through improved main-

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tenance facilities. In order to clarify the technical order establishing the JEFM program, ADC emphasized the following points: (1) JEFM must be authorized at air defense fighter group level, for this type maintenance support was satisfactory only when provided by a facility located on the same base as the organization being supported; (2) no ADC tactical squadron could be designated as a JEFM agency, which designation would apply only to materiel or field maintenance squadrons under the air defense fighter groups; (3) ADC planned to provide maximum possible JEFM support to all units who were tenants on air defense bases, and desired to receive reciprocal support on the bases where ADC units were tenants; (4) a clear definition of responsibility was mandatory.[12]

In addition to correcting materiel shortages and carrying out the proposed modifications, ADC was vitally concerned with the command-wide shortage of higher skill levels among maintenance personnel. The Command considered this shortage "the major factor" lowering the combat ready rates of the fighter interceptor force. The lack of highly skilled people resulted in a large back-log of routine and periodic maintenance to the point "where combat readiness rate is correspondingly lowered."[14]

In addition, ADC was disturbed by the low experience level of its maintenance officers assigned to the fighter interceptor force. However, USAF notified the command that ADC manning in maintenance officers was actually better than in other sister commands in both numbers and quality.[15]

<u>Air Crew Status and Training</u>. Along with the critical shortage of skill levels in the jet mechanic area, there was a serious shortage of F-86D pilots in the command. The average crew ration was only 1.17 in March, and dropped to 1.12 in June 1955. ADC claimed that it had only 71% of its required crew strength as the period ended.[16]

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The Air Defense Command further protested that USAF programming was unrealistic in contemplating 1.0 crew ratios for F-86D aircraft, and 1.1 ratios for F-89D and F-94C units in the command. With aircrews having to work excessive hours in order to cope with alert requirements and the aircrew shortage, their morale suffered. Also, there was a lessening desire on the part of young reserve officer pilots to stay with air defense. Pilot manning levels must be increased, argued ADC, before they had further "deleterious effects" on the operational efficiency of the command.[17]

Fighter squadrons that started the period slightly undermanned in authorized fighter pilots, saw their losses increase due to completion of tour of duty. Grossly disturbing was the fact that gains in interceptor pilots for the coming months would be insufficient to cover existing shortages and future losses. Reason for the command-wide shortage of combat crew personnel were: a decreased output of pilots from all-weather interceptor schools, which was a by-product of Project PULL OUT F-86D modernization; separations from service; and the movement overseas of all-weather units.[18]

In a desperate effort to overcome these losses, ADC requested that USAF assign limited numbers of experienced F-86 day jet fighter pilots returning from overseas duty to ADC. The command asked that they have one year of retainability after arrival at their assigned unit. It was estimated that each squadron could convert 2 or 3 well-qualified F-86 day pilots to all-weather pilots and still perform its primary mission. ADC agreed with a USAF proposal that present tours of active duty were too short, permitting all-weather pilots to leave the command at the time they attained a fully qualified status. A four-year tour of duty could be the solution to this problem.[19]

ADC even showed a willingness to accept a reduction in the present...

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fighter interceptor training school curriculum. Lowering the flying hours to 38 per pilot might be another way to meet its quantitative requirements for F-86D pilots.[20] It was fully expected that the shortage of such pilots would continue until the all-weather training schools could meet air defense requirements, possibly by the end of 1955.[21]

The command was not in accord with the current practice of overseas rotation of all-weather interceptor squadrons. The loss of a fully trained air defense unit affected the operational capability of the command and introduced certain instability factors which were not sanctioned by ADC. General Chidlaw was particularly disturbed that the rotation of F-89D units was detrimental to the air defense system insofar as the programmed F-89D/H units were the first ones scheduled to employ nuclear armament and to be strategically placed. It was considered vital that these squadrons be afforded "maximum stability in personnel, location and equipment."[22]

ADC was insistent that it urgently needed 1.5 aircrews per assigned U/E aircraft, and that any reduction in the number of crews on hand would reduce the number of aircrews available for training. Consequently, there would be a reduction in flying hours, a degradation in individual pilot proficiency, and a loss in operational effectiveness.[23]

Along with the shortage of fully qualified maintenance personnel, lack of pilot crews, and the modifications of PULL OUT and HOP UP, adverse weather conditions were a prime factor in limiting the average amount of flying time in the command. The defense forces were instructed to take advantage of weather conditions for instrument flying, to devise improved means of airspace control, and to develop such aircraft approach and departure procedures as would increase the amount of flying time and help maintain the desired levels of combat proficiency.[24]

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Major Generals Frederic Smith of ADC and Jarred Crabb of CADF took the initiative in a move to achieve a realistic minimum requirement of 700 hours flying time per month for each reasonably manned and equipped fighter squadron in the command; a minimum of 20 hours per pilot was considered an achievable goal. It was expected that such a program would cause a "definite progression in morale and training."[25]

Flying suits came in for reappraisal also. The G-4B and Mark IV anti-exposure suits were considered unsuitable for long periods of continuous wear by crews standing alert. An improved immersion suit was mandatory, claimed ADC, for the recent seaward extension of radar coverage greatly increased the amount of over-water flying by units in the command. Crews downed in extremely cold water without immersion suits would stand little chance of survival. In addition, there was agreement that the currently used T-1 pressure suits were not suitable for long periods of wear, were difficult to don, and were restrictive in vision and movement.[26]

Rocketry Training. During the period, a second weapons employment center for ADC fighter interceptors became operative at Moody AFB, Georgia. The new center (operated by the 4756th Air Defense Group (Weapons)) was assigned the task of handling two-place interceptor rocketry training, while the Yuma Center began to devote its capacity to handling single place aircraft only.[27] The mission of the 4756th was to provide training for two fighter-interceptor squadrons and 16 controller-directors per month. Sufficient F-94C and F-89D aircraft were available for training purposes, but the training center was limited by a shortage of T-33 aircraft.[28]

It was expected that Moody would augment the rocketry program to the extent that ADC could "guarantee each of the fighter-interceptor squadrons one month of rocketry firing each year."[29] This was still not enough, however; ADC

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believed that sufficient weapons ranges should exist so that rocket firing could be accomplished by units every month in order to maintain the proficiency level reached at the rocketry centers.[30]

Efforts to develop better targets and to obtain large, high speed tow aircraft continued at Yuma.* A frangible 9 x 45 radar reflective target underwent testing at Yuma and was found acceptable for use with T-33 aircraft using 6000 feet of woven nylon line. The Navy DART target was considered as a solution to the serious tow problem at that center.[32] The command watched these developments with interest, hoping to develop a target capable of being towed by UE aircraft.[33]

The high speed, high altitude B-57 aircraft was desired by the command and approved by USAF. ADC was alloted 48 of these aircraft for both training centers, but the first would not be available until the 4th quarter of FY 1956. In the meantime, 12 TB-29 additional aircraft were delivered to Yuma in July 1955 for tow target duty.[34]**

Both ADC and ATRC's Combat Training Air Force concluded that the North American Data Airborne Recorder (NADAR) would not fulfill their requirements for training and evaluation of the rocketry proficiency of their aircrews. A "firing error indicator" was desperately needed, noted EADF, in order to make live air-to-air rocketry training realistic. What was required was an effective means of scoring live aerial rocketry sorties which would increase air defense potential and improve aircrew confidence in their fire control systems.[36] Meanwhile, ADC submitted a requirement for the mounting of two AN-6 gun cameras on the wings of its fighter interceptors in order to help evaluate rocket firing by a stereo-photo process.[37] This method had been used successfully for some time at the training centers.

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* For discussion of housing conditions at Yuma, see n 31.

** For other criticisms of Yuma Center Training, see n 35.

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Still unsolved were the malfunctions that occurred when 2.75" FFAR rockets were fired by F-94C and F-86D interceptors. No definite fix was indorsed by WADC. The F-86D's were restricted from firing above 25,000 feet except in cases of emergency or combat necessity.[38] The excessive number of wild rockets fired[*] from F-94C closed breech launchers was undergoing intensive investigation. It had yet to be determined whether the cause was attributable to faulty manufacture of the launchers or to some rocket defect.[39]

Single vs. Two-Place Interceptors. During the period, the 4750th Air Defense Wing at Yuma gathered data on the relative effectiveness of single-place interceptors versus dual-configuration interceptors in the command.[40] The previous rocketry meet at Yuma, in which two-place interceptors displayed an overwhelming rocketry superiority over single-place F-86D pilots, had caused speculation among ADC planners. Did the greater effectiveness of two-place interceptors justify the "loss of performance due to increased crew requirement?" Furthermore, could the one-place interceptor pilot be trained to operate the equipment as effectively as the two-place crew?

The 4750th Air Defense Wing study group did not attempt to resolve fully this controversy, especially since rocket proficiency training was conducted under "canned conditions." It was recognized that much of the comparison between the two types of interceptors rested on the function of the particular aircraft's fire control system and pilot proficiency. Every effort was made to evaluate the basic concept of the single vs. two-place interceptor rather than merely to compare F-86D F-89D, and F-94C fighters.

The 4750th Air Defense Wing said that intuitive judgment led it to con-

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* Wild rounds were defined as those rounds which were outside of a 44 mil high by 64 mil long ellipse as they passed through the target plane.

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clude that "two-man interceptors, particularly the F-89D, are of greater value to the air defense effort than examination of the numbers of one-man and two-man interceptors in present plans for procurement would suggest." It was recognized that in the supersonic range speeds, aerodynamics argued in favor of one-man interceptors; however, in meeting current enemy bomber threats, it was concluded that the pilot of the one-man interceptor could not handle the entire job of piloting and acting as radar observer. With pressure increasing on the F-86D pilot as the interception progressed, he "must either try to fulfill the functions the radar observer would be fulfilling or sacrifice the advantage of having them fulfilled."

Two-place interceptors had the advantage in that radar observers could relieve the pilot of considerable responsibility and detail, could plan action for a second firing pass or attack against another immediate target, and could plot an attack course that would prevent a collision with the target or its debris. The tentative conclusion of the 4750th Air Defense Wing was: "Keep the two-man interceptors, the F-89D and F-94C, in the all-weather interceptor program. The more two-man interceptors, the better."

While contemplating these suggestions, ADC directed that the performance of F-86D, F-94C and F-89D interceptors be investigated at 3000-15,000 feet altitudes, and at altitudes below 3000 feet. There was need to know the capability of the various fire control systems to detect targets and lock-on under these conditions, for air defensive abilities at very low altitudes were, as yet, something of an unknown quantity.[41]

AIR BASES

ADC was successful in securing USAF's permission to program K.I. Sawyer as a two squadron base. In studying the possible and probable strike routes against the Chicago-Detroit-Cleveland-Cincinnati area, the air bases at Duluth, K.I. Sawyer,

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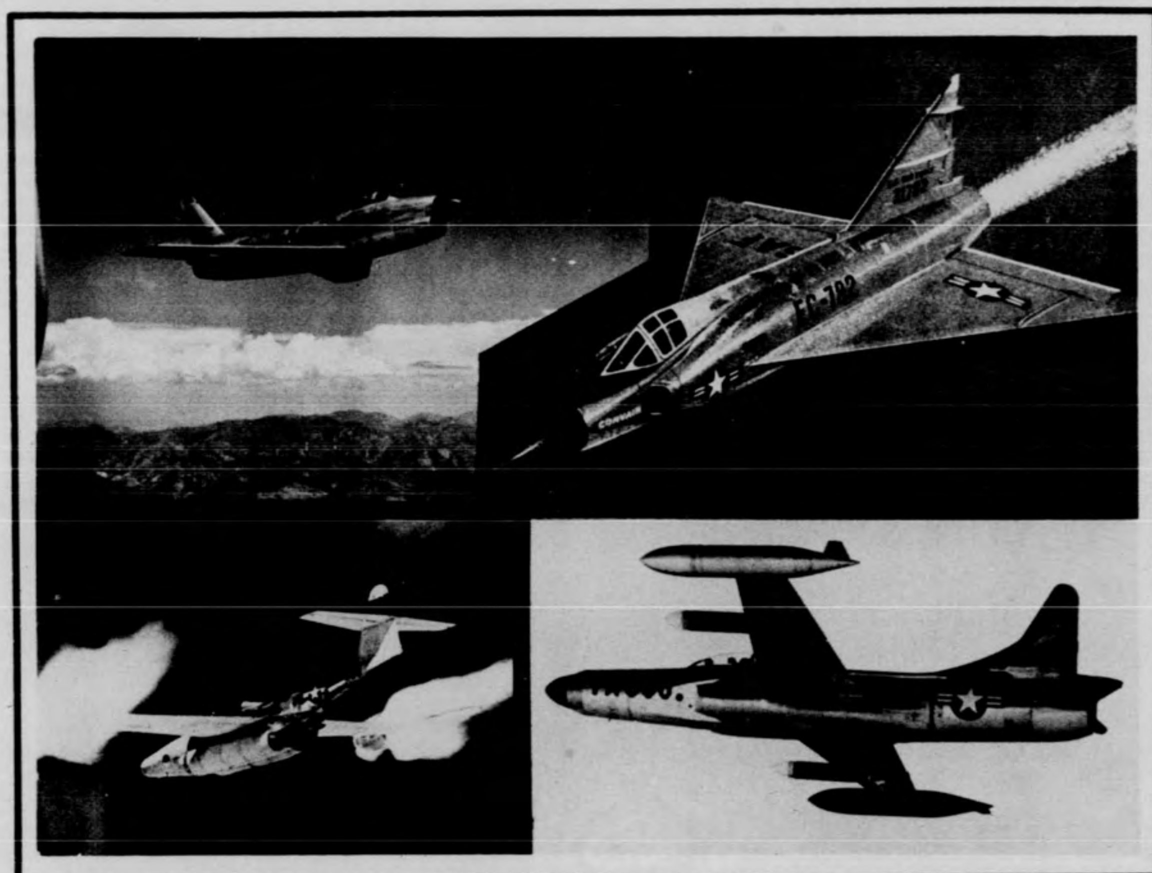

F 86 D
F 89 D

F 102 A
F 94 C

and Kinross were considered to be in choice locations. Adding a second squadron to K.I. Sawyer would permit defense support for Duluth and/or Kinross.[42]

To attain defense in depth against attacks approaching Chicago from the northeast, and Detroit from the northwest, air defense planners strongly desired the location of a fighter interceptor squadron in the Traverse City, Michigan, area. ADC was convinced that the Traverse City area alone would provide the required defense in depth and not just a "shell-like" defensive structure for these two important target complexes. This location was consistent, USAF was told, with ADC's overall plan for the air defense of the entire northeast "heartland."[43]

ADC was disturbed by the thought that the City of Chicago had the right, under provisions of the airport deed, to limit government use of O'Hare Field to 20 operations per hour at any time between 0700-2200 under VFR conditions, and four operations per hour between 0700-2400 under IFR conditions. These limitations could be imposed only when O'Hare reached 200 daily air carrier operations, which it did in the spring of 1955. Fortunately for the command, the City of Chicago did not impose any restrictions which would have affected air defense operations.[44]

Portland International Airport was also a source of concern for ADC. The fighter interceptor squadron operating from that base had long been hampered by a lack of adequate facilities. With ANG and AFRTC resuming flying from Portland, the situation had become increasingly difficult for the air defense unit. Yet, the 497th FIS there was to be one of the first units in the Air Defense Command fighter force to be equipped with F-102 aircraft, presumably in the first quarter FY 1957. Unless vigorous action were undertaken by USAF and the essential construction started at once, ADC requested permission "to develop a substitute base within the geographical area." Indications were that ADC would be granted per-

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mission to relocate the assigned interceptor squadron somewhere other than Portland.[45]

In evaluating existing bases in Southern California on which the 322d FIS could be activated, ADC concluded that Oxnard most nearly met the operational requirements to expand to a two squadron base, at an estimated cost of $2,289,192. Norton and George AFB's were considered undesirable because of terrain, heavy air traffic, and extensive expansion costs. ADC did not consider it advisable to locate two squadron bases on coast lines because of the short warning time to scramble two fighter interceptor squadrons. However, Oxnard was considered operationally better than any other existing base in Southern California, except Palmdale, which was too costly to develop for ADC use.[46]

A number of other air base problems occupied the attention of the command: (1) lack of a maintenance hangar for the additional F-86D squadron programmed for George AFB; (2) program changes to be made for Griffiss AFB to insure that only one FIS would be undergoing transition to newer aircraft at any one time; (3) use to be made of completed storage and readiness facilities at Walker AFB, which base would not be occupied by an ADC fighter squadron for another 1½ years; (4) real estate planning reports to be compiled for new air bases in the Milwaukee and Ft. Myers, Florida, areas; and (5) action to be taken on a study of combat rocket storage and supply conducted in the first quarter of 1955 which revealed that ten ADC bases and five ADC tenant squadrons on bases of other commands "do not have the rockets required to meet combat levels plus Augmentation Force requirements on base or in back-up."[47] With regard to the last problem, a concerted effort was made to distribute excess rocket stocks at certain bases to other ADC bases having less than established levels.

An ADC proposal to disperse and protect material required to support

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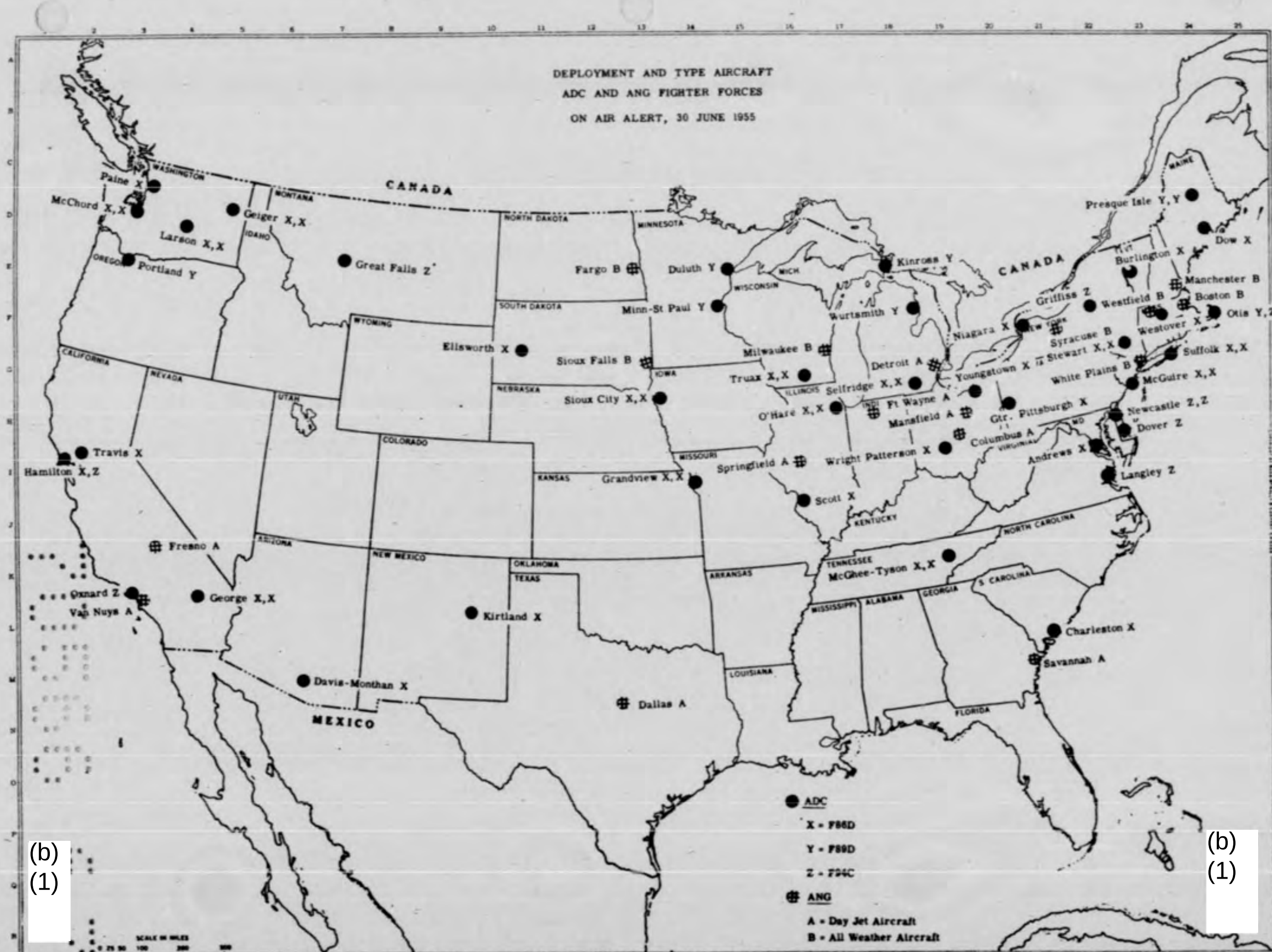
DEPLOYMENT AND TYPE AIRCRAFT
ADC AND ANG FIGHTER FORCES
ON AIR ALERT, 30 JUNE 1955
CANADA
MEXICO
Paine X
McChord X,X
Larson X,X
Geiger X,X
Portland Y
Great Falls Z
Travis X
Hamilton X,Z
Fresno A
Oxnard Z
Van Nuys A
George X,X
Davis-Monthan X
Kirtland X
Ellsworth X
Fargo B
Sioux Falls B
Sioux City X,X
Grandview X,X
Dallas A
Duluth Y
Minn-St Paul Y
Milwaukee B
Truax X,X
O'Hare X,X
Springfield A
Scott X
Kinross Y
Wurtsmith Y
Selfridge X,X
Detroit A
Ft Wayne A
Mansfield A
Wright Patterson X
Youngstown X
Gtr. Pittsburgh X
Columbus A
Niagara X
Griffiss Z
Syracuse B
Stewart X,X
White Plains B
McGuire X,X
Newcastle Z,Z
Dover Z
Andrews X
Langley Z
McGhee-Tyson X,X
Charleston X
Savannah A
Presque Isle Y,Y
Dow X
Burlington X
Manchester B
Westfield B
Boston B
Westover X
Otis Y,Z
Suffolk X,X
ADC
X = F86D
Y = F89D
Z = F94C
ANG
A = Day Jet Aircraft
B = All Weather Aircraft
SCALE IN MILES
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(b)
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combat operations was viewed cautiously by air defense spokesmen who feared that the proposal might impose serious additional duties on a combat commander. The proposal, which would establish 30-day combat readiness supply levels at ADC base installations, might conceivably mean that the base supply would be required to honor shipping directives as an AMC agency. Furthermore, large stocks of items on ADC bases for specific types of aircraft would impose problems when interceptor conversion programs went into effect.[48]

ADC felt that in order to support its dispersed fighter interceptor force, and keep it in the constant state of readiness demanded by the air defense mission, a complete materiel capability should be provided on every air base. This capability would include an adequate level of spares, together with field and organizational maintenance. Only thus could the command attain its objective: maximum self-support of each base "through the decisive phase of a general war."[49]

Assurance was requested of the Strategic Air Command that fighter interceptor and AC&W squadrons currently receiving varying degrees of support from SAC bases would continue to get sufficient support once SAC combat wings deployed after D-Day.[50]

In looking ahead to the phasing-in of the F-102 aircraft into the air defense weapons inventory, ADC noted that the J-57 engine installed in that interceptor "produces sound intensity levels of such magnitude that it will be impossible to find a location on most bases where run-up [testing of an engine installed in an aircraft] can be accomplished without creating a serious noise disturbance, both for military personnel and the surrounding civilian populace." WADC was requested to develop a portable jet engine noise silencer that would reduce the sound intensity levels produced during run-up testing. ADC already had programmed a Jet Engine Test

Cell Silencer for each of its bases which would solve the noise problem when engines were operated on test stands. The noise suppressor was scheduled to undergo testing at Castle AFB on 1 January 1956.[51]

Meanwhile, the 4750th Air Defense Wing at Yuma was instructed to develop a mobile type hazard marker to provide pilots with visual knowledge that a hazardous condition lay at the approach end of the runway. There was also a need for runway markings to define clearly the runway threshhold and aircraft touchdown area.[52] Furthermore, aircraft arresting barriers were being increased in capacity to insure that future type aircraft would not engage a barrier of insufficient capacity.[53]

Runway difficulties were apparent in other ways. The east-west runway at Presque Isle, for instance, was completely unusable during the spring because it required extensive repair. Getting interceptors airborne without use of this runway hampered air defense operations in the area, presented unsafe flying conditions, and reduced the combat effectiveness of the fighter squadrons at that base.[54] An improved runway at Presque Isle was mandatory, but it was only part of a bigger problem of runway extension and improvement throughout the command.

ADC established the requirement, and USAF concurred, that primary runways to support fighter interceptor squadron operations must be a minimum of 9000 feet in length. All primary runways deficient in length would have to be extended, or the squadron eventually relocated. CADF strongly stated its belief that runway length criteria should be based on the operating requirements for the aircraft involved, as determined by flight testing, and by considering the minimum runway length for programmed interceptors. Only in this way, could air defense planners get a flexible air defense system wherein every assigned type

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of interceptor would be able to operate safely from all the tactical bases in the command. Safety and recovery would undoubtedly be aided by runway extensions.[55]

Minimum safety criteria for interceptors armed with 2.75" rockets and/or GAR-1 rockets were set down by USAF and made applicable to alert and readiness hangars, and to aircraft parking areas. It was expected that a large measure of protection could be gained against fires, explosions, and blast pressures caused by armed aircraft. ADC was disturbed by USAF's position because adherence to the policy would mean disarming combat ready aircraft in 23 alert hangars and/or operational aprons, which would seriously limit air defense capabilities. USAF was requested to review its criteria for explosive hazards "in view of its impact on air defense."[56]

USAF did approve the requirement for one additional 23' 6" bay to be added to each alert hangar pocket. ADC planners were also busy devising alert hangar requirements for future F-102A aircraft and long range interceptors.[57]

Furthermore, turn-around shelters were requested by the command. The sensitivity of electrical equipment in current and programmed aircraft to heat, excessive humidity, and driving rain required that combat ready interceptors be protected from these elements, especially during refueling, rearming, and minor maintenance. Fourteen additional shelters per fighter squadron were requested of USAF. Specifications for shelters at least 70 feet wide and 72 feet in depth were submitted to higher headquarters for the housing of present and programmed fighters. ADC hoped to be able to maintain a high in-commission rate in its interceptor force during periods of inclement weather.[58]

RESEARCH AND DEVELOPMENT

The Air Defense Command remained deeply concerned with the potential Russian threat and admitted that the April fly-bys in the Moscow air display gave

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the command a sharp surprise, causing "sufficient upward revision of Soviet production capability for heavy bombers."[59] ADC was convinced that the Soviets had developed and produced the 21,000 pound plus turbo-jet engine used in the BISON heavy jet bomber.[60] ADC intelligence spokesmen maintained that to fail in properly crediting Russian aircraft development and production capabilities would repeat "the past mistakes of philosophical under-estimation."[61]

Manned Interceptors. The gravest urgency existed to solve the combat altitude deficiency of the present and projected ADC fighter interceptor force. Intelligence estimated that on one-way missions the Russian Type 39 bomber had an over-the-target ceiling of 53,000 feet, at speeds of Mach .80 - .85. Soviet Type 37 bombers were estimated to be capable of 57,000 feet at the same speed. Yet, there was no programmed or proposed interceptor in the air defense family of weapons that had a combat ceiling above 55,000 feet until the post-1960 time period.[62]

ADC gave consideration to four possible solutions to this serious problem: use of an auxiliary "rocket boost" assist to increase the ceiling of the interceptor or improve its climbing attack capability; possible application of "snap-up" or climbing attacks with FALCON and DING DONG rockets to meet the enemy threat; zoom techniques to give supersonic fighters a sufficient altitude "crutch" and permit them to make at least one firing pass at an enemy target; and improved engines (30,000-35,000 pound thrust class) and fire control systems with vastly increased performance. These were considered top priority projects in the research and development area of manned interceptors.

Since October 1954, ADC and various manufacturers studied the problem of utilizing rocket boost on interceptors. Convair proposed installation of two liquid rocket boost motors in the aft fuselage of F-102A aircraft. These motors

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would give 5700 pounds of thrust each and raise the combat ceiling of the aircraft from 52,500 feet to 60,000 feet. A rocket boost of 130 seconds duration made it conceivable that more than one pass might be made against 60,000 feet targets within the rocket boost time. ADC did not feel that rocket boost techniques could be applied to the F-86D that the RAND Corporation recommended to the USAF. ADC did not wish to have these aircraft out of operation undergoing modification for an extended period of time.[63]

Air defense planners were optimistic that rocket thrust augmentation, applied to F-102A and F-101B aircraft, would give them an operational altitude of 60,000 feet or higher. Applied to the F-102B and subsequent models to the F-101B aircraft, it was estimated that the rocket thrust would give these interceptors an operational altitude of 65,000 feet or higher. Improved altitude capabilities might require changes in fire control systems and allied electronic equipment.[64]

The "snap-up" or "flip-up" delivery technique with the FALCON and DING DONG rockets, which involved a "pull-up of the interceptor with minimum time before weapon release," would permit the launching of the rocket at an elevated angle. Such a tactic would allow fighter interceptor attacks to be made against targets operating at altitudes above those of the interceptor. It was difficult to know what would be the effect of these tactics against maneuvering targets.[65]

Kits were proposed by Hughes Aircraft Company to permit F-89H aircraft a snap-up capability against targets at 55,000 feet altitudes. The first F-102A and F-1-1B production models would probably not have a desired snap-up capability since USAF had no firm requirement or contract with any manufacturer for the incorporation of this feature in the fire control system program.[66]

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Through the zoom type of attack, the combat ceiling of interceptors (located at the point when the 500 feet rate of climb per minute is no longer in effect) could be raised to a higher ceiling if ADC were willing to accept a degradation in the climbing rate. Convair contemplated a plan to test zoom techniques for the F-102A aircraft in order to have it climb to 60,000 feet and stay at that altitude sufficiently long to make a firing pass and complete a mission against an enemy target. Supersonic fighters, which had a higher, faster rate of acceleration to start with, might well make good use of this altitude device.[67]

Development of the XF-103 interceptor, whose first flight was scheduled for late 1957, held some promise of providing the altitude and speed performance necessary to meet the air defense threat in the post-1960 time period. However, it appeared that this project had a rather low priority in ARDC.[68]

Meanwhile, satisfactory progress was made on the F-101B and F-102A aircraft, the two medium range all-weather interceptors that would carry the major responsibility of air defense manned interceptors by FY 1959. The F-102A met the specified performance capabilities.[69*] It was decided to require that AMTI equipment be installed in F-102A aircraft. This equipment would reduce ground clutter on the fire control system sufficiently to permit a search phase interception and an optical firing pass at altitudes below 3000 feet.[70]

Operational suitability testing of the F-102A was scheduled to begin at Eglin AFB late in 1955. The first production models of F-102As were scheduled to come off the assembly line in June 1955, with production build-up starting a

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* The F-102A was as a single place, delta wing, jet propelled, all-weather fighter interceptor aircraft. Principal dimensions were: span - 38.1 feet; length - 68.3 feet; height - 18.2 feet. The power plant was a single Pratt & Whitney J-57-P-23 turbo-jet engine with after burner. The FCS was the MG-10. Performance characteristics were: combat ceiling - 52,500 feet; combat radius - 365 NM; maximum speed - 1.2 Mach at 37,000 feet; speed at 50,000 feet - Mach 0.98; time to climb to 50,000 feet - 6.5 minutes from standstill; takeoff distance - 2050 feet; armament - 6 FALCON missiles and 24 2.75" FFAR rockets.

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## 1959 Fighter Interceptor Force
(As Programmed 24 June 1955)

Sources: ADC Program, 25 March 1955, as amended, and Project ARROW

### Eastern Air Defense Force

| Squadron Old | Squadron New | Base | Aircraft |
|---|---|---|---|
| 2 | 332 | McGuire | F-102B |
| 5 | 539 | McGuire | F-102B |
| 46 | 46 | Dover | F-101 |
| 76 | 98 | Dover | F-89J/H |
| 48 | 48 | Langley | F-102B |
| 75 | 5 | Suffolk | F-102B |
| 331 | 2 | Suffolk | F-102B |
| 95 | 95 | Andrews | F-102B |
| 96 | 96 | Newcastle | F-102B |
| 332 | 97 | Newcastle | F-102A |
| 330 | 330 | Stewart | F-102B |
| 539 | 331 | Stewart | F-86D |
| 27 | 27 | Griffiss | F-89J-H |
| 329 | 465 | Griffiss | F-102A |
| 37 | 37 | Burlington | F-101 |
| 47 | 47 | Niagara | F-102B |
| 49 | 49 | Hanscom | F-102B |
| 58 | 58 | Otis | F-89J |
| 437 | 60 | Otis | F-191 |
| 60 | 337 | Westover | F-86D |
| 319 | 319 | Westover | F-102B |
| 318 | 76 | Presque Isle | F-89J |
| 13 | 71 | Selfridge | F-102B |
| 56 | 94 | Selfridge | F-102B |
| 42 | 63 | Kansasville | F-102B |
| 62 | 62 | Kansasville | F-102B |
| 65 | -- | Wurtsmith | F-102B |
| 63 | 445 | Wurtsmith | F-89J/H |
| 337 | 432 | Truax | F-89J/H |
| 456 | 325 | Truax | F-102B |
| 71 | 42 | Gtr Pittsburgh | F-102B |
| 438 | 438 | Youngstown | F-89J/H |
| 97 | 56 | Wright Patt. | F-102A |
| 327 | 484 | K.I. Sawyer | F-89J |
| 519 | 13 | K.I. Sawyer | F-102A |
| 546 | 28 | Kinross | F-101 |
| 484 | 87 | Lockbourne | F-86D |
| 498 | 324 | Bunkerhill | F-89J/H |
| 86 | 86 | Traverse City | F-102A |
| 444 | 444 | Charleston | F-86D |
| 460 | 354 | McGhee-Tyson | F-86D |
| 74 | -- | Seymour-Johnson | F-102A |

### Central Air Defense Force

| Squadron Old | Squadron New | Base | Aircraft |
|---|---|---|---|
| 29 | 29 | Great Falls | F-102A |
| 54 | 54 | Ellsworth | F-86D |
| 483 | 52 | Minot | F-102A |
| 544 | 544 | Grand Forks | F-102A |
| 545 | 541 | Glasgow | F-101 |
| 64 | -- | Duluth | F-102A |
| 14 | 14 | Sioux City | F-86D |
| 59 | -- | Minn-St Paul | F-102A |
| 85 | 85 | Scott | F-86D |
| 326 | 326 | Grandview | F-86D |
| 15 | 15 | Davis-Monthan | F-102A |
| 93 | 93 | Kirtland | F-102A |
| 321 | 519 | Walker | F-102A |

### Western Air Defense Force

| Squadron Old | Squadron New | Base | Aircraft |
|---|---|---|---|
| 497 | 460 | Portland | F-101 |
| 83 | 321 | Paine | F-89J/J |
| 61 | -- | McChord | F-102B |
| 465 | 318 | McChord | F-102A |
| 31 | 322 | Larson | F-102B |
| 323 | 538 | Larson | F-86D |
| 98 | 518 | Klamath Falls | F-101 |
| 520 | 498 | Geiger | F-101 |
| 84 | 84 | Hamilton | F-102B |
| 413 | 82 | Travis | F-102B |
| 538 | 456 | Castle | F-86D |
| 18 | -- | George | F-102B |
| 322 | 413 | Oxnard | F-101 |
| 354 | 437 | Oxnard | F-89J/H |

*At the end of FY 1959, ADC would have:*

11 F-86D Squadrons
3 F-89J Squadrons
8 F-89J/H Squadrons
15 F-102A Squadrons
23 F-102B Squadrons
9 F-101B Squadrons

69 Total ADC FIS

(b)(1) [redacted]

(b)(1) [redacted]

year later. The first two ADC fighter interceptor squadrons to be equipped with this aircraft would receive them in the first quarter of FY 1957.

Time was of the essence in preparing ground support equipment requirements for F-102A aircraft, devising tables of equipment for them, acquiring F-102 simulators for aircrew training, and making maximum use of the time between receipt of TF-102s and the arrival of F-102A's.

ADC agreed to assume the responsibility for the mass transition training of ADC squadrons from currently operational aircraft to use of the F-102s. It was gratifying to the command to note that for the first time a trainer aircraft, almost identical to its tactical counterpart, would be available to assist in a safe, comprehensive conversion of F-102 pilots.[71]

ARDC and ADC agreed on the configuration of the F-102B, which would be a follow-on weapon system to the F-102A. Powered by a J-75 engine and employing the MA-1 aircraft and weapon control system (MX-1179 project), the F-102B was expected to have a performance of Mach 2.0 maximum speed, a combat ceiling of 55,400 feet - with a limited capability of attack at 60,000 feet; a combat radius of 375 NM; and a mixed armament load of DING DONG or GAR-1 (C). The F-102B would start reaching the Command in mid-1948.[72]

<u>F-101B Interceptor</u>. Designed as an area interceptor and companion to the F-102 all-weather interceptors, the IF-101A aircraft was redesignated the F-101B Interceptor.* The McDonnell Aircraft Company was told to give no further consideration to a single-place configuration. WADC was given the task of converting IF-101As on the production line to F-101B aircraft. High priority was

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* F-101B aircraft was as a delta wing, twin-place configuration interceptor with a radius of action of 859 NM and a speed of Mach 1.4 at a combat ceiling of approximately 50,000 feet.

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assigned to replacing J-57 engines with the improved J-79, and to improve the effective combat ceiling to at least 60,000 feet "by whatever means available."[73] The primary armament would include two DING DONG's and two GAR-1(B)'s. USAF indicated that accelerated production would deliver two-place F-101B into the command in the second quarter of FY 1958 instead of the first quarter FY 1959.[74]

Long Range Interceptors. The estimated combat radius of the F-101B made it tentatively acceptable for the long range mission in air defense. Both ADC and WADF agreed that the F-101B was "superior in all respects" to modified B-47A type aircraft for extended range and endurance abilities against enemy aircraft. The proposal to use B-47 aircraft with a 200 mile airborne search radar was recommended by Project LAMP LIGHT and supported by the 28th Air Division. Since indications were that the best developed airborne search radar known was capable of an 85% probability of detection at 50 NM or less, the B-47 proposal was not viewed favorably. Programming actions, retrofit of B-47 aircraft, and crew procurement and training would probably overlap the planned integration of other interceptors specifically designed for long range missions. For these reasons, ADC felt that the 400 F-101B aircraft to be procured by USAF could best be deployed around the perimeter of the continental United States and employed as an interim Long Range Interceptor prior to the 1962 time period.[75]

ADC was greatly disturbed that its urgent need for a Long Range Interceptor (LRIX) "on a timely basis" continued to slip year after year. It was noted that further delays beyond 1961 would "seriously hamper our ability to cope with the threat that will face us."[76] ADC favored the concurrent development of an LRIX by two aircraft manufacturers, with evaluation of an advanced all-weather interceptor to be based on flight test performance rather than on questionable design studies and mock-ups. To eliminate "excessively time-consuming" procedures,

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the command proposed that competitive development contracts be awarded immediately to selected contractors for aircraft, engines, and fire control systems. Data derived from this Long Range Interceptor competition could then be exploited to the maximum.[77]

The characteristics of the post-1962 LRIX stipulated that it must have an adequate capability against the probable manned bomber threat and the earliest intercontinental ballistic missile threat.[78] Furthermore,

> "It must be capable of operating in accordance with the oft stated ADC concept of employment at the outer edge of contiguous radar cover. This Command is willing to compromise desired characteristics as necessary to achieve the basic requirements. For example, minimum performance might be expressed as: a radius of action of 500 miles, plus 1 hour loiter at 500 miles, plus 100 miles of supersonic dash, plus 5 minutes of combat."

INTERCEPTOR MISSILES

IM-70 (TALOS). Soviet high altitude bombing capabilities caused ADC to make a strenuous effort to develop TALOS as its initial interceptor missile, with the IM-99 (BOMARC) still the primary interceptor missile of the future weapons system. There was reason to believe that the former would be available for tactical use in January - March 1958, the latter not until October - December 1959.[79*]

Effective 7 June 1955, USAF was designated the service responsible for the financing and administration of the land-based TALOS program. It would also have operational use of the IM-70 in area defense.[80] As envisaged by ADC, this interceptor missile would be an atomic carrier, having a terminal guidance capability, and a range in excess of 100 NM. However, it was expected that the initial

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* Early availability of TALOS meant that ADC could cancel its requirement for the development of MATADOR as an air defense weapon.

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weapons available for tactical employment would have a lesser capability. The early TALOS would probably be either terminal guided with an HE warhead, or employ an atomic warhead with no seeker. In either case, its range would be approximately 75 NM.[81]

There seemed to be a desire on the part of the Air Staff at USAF to plan for eight squadrons of TALOS and 40 squadrons of BOMARC in the air defense system.[82] The Air Defense Command was greatly disturbed by USAF's implication that any increase in the number of TALOS weapons "automatically results in a reduced requirements for point defense weapons such as NIKE." ADC felt that the presently programmed 61-battalion ARAACOM force was inadequate to furnish protection for the many vital targets for which protection was desired. Even with 100 NIKE battalions, "our over-all defensive capability is not equal to the threat," noted ADC Vice Commander Major General Frederic H. Smith, Jr.[83] Because of its high altitude capability, NIKE, a point defense missile in air defense planning, must be used until TALOS was available. However, it could not, in any fashion, be considered as a substitute for the area defense weapon.[84]

ADC had no intention of limiting the number of TALOS units in the air defense system. It felt that procurement of interceptor missiles should be based on the total number of enemy weapons to be destroyed, as well as upon the kill probability of the interceptor missile. Stockage of interceptor missiles and deployment of units should be readied for immediate use as the enemy appeared, whether it be in a "mass front" or over an extended period of time.[85] Due to constant delays in the IM-99 program, ADC contemplated use of 120 TALOS missiles per squadron in up to 53 squadrons.[86]

The major problem areas in TALOS development and programming appeared to be: lack of central supervision and coordination at all levels, uncertainty of

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tactical configuration of the missile, lack of information on availability of various types of TALOS missiles, uncertainty regarding kill-probability of the weapon, and failure to develop TALOS "X" (with nuclear warhead and seeker).[87]

Planning for a standard missile training center occupied much attention. Bonita Springs, Florida, had high priority as the possible site for developing an Interceptor Missile Employment Center (IMEC) for training purposes. Its proximity to Buckingham AFB would aid in scheduling target drones and drone recovery. Also Buckingham's over-water ranges, and its ability to handle the training problems contemplated with the BOMARC program, made this area a desirable site for air defense planners.[88]

In view of the time factor involved in developing standard base facilitie and keeping in mind the early operational date specified for land-based TALOS, it seemed evident that a standard base concept could not be applied to the early TALOS installations.[89]

It was intended that each tactical unit be deployed to the IMEC for initi unit training and missile launching. The center would also serve as a yearly re-training center for the tactical missile squadrons. This refresher training was considered important because the complexity of the interceptor missiles would demand re-training in order for units to retain familiarity with their weapons.

ADC was determined to make the training facilities reflect as realistic a situation as possible. Training would involve the launching of missiles at targets that involved progressively more complex tactical situations. Drones would be attacked at high, medium, and low altitudes; units would learn to cope with multiple targets; finally, multiple targets at different tracks and at different altitudes would be directed against the launching sites.

Concepts of operational employment of these interceptor missiles would

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have to be evolved through usage. The ability of land-based TALOS to make maximum use of the incoming SAGE system would also require judicious coordination.[90] Problems of deploying TALOS detachments and squadrons,[91] along with manning and logistic support, were given much consideration.[92] ADC felt that there was nothing to be gained by having active reserve or active National Guard units man air defense missile squadrons. The high degree of training required by guided missile specialists precluded the use of reserve in other than base security and installation housekeeping duties.[93]

IM-99 (BOMARC). The initial BOMARC would probably be available in mid-1959, the improved missile not until mid-1961. ADC felt that not enough emphasis was being placed on the improved BOMARC program. Requirements were not being vigorously pursued for improving terminal seeker capabilities such as IFF, low-altitude, ECM capability, infra-red look-through, increased detection, and lock-on range reliability. Yet, ADC future planning continued to rely heavily on the improved IM-99 L-401, and other Long Range Interceptor Missiles (primarily the LRIMX).[94]

Since the IM-99 was designed primarily as an area defense weapon, its deployment would undoubtedly be in areas of large industrial complexes and/or population centers. The number of IM-99 missiles required in the air defense inventory of the future would depend on many factors also: size and number of areas to be defended, number of expected enemy targets, quantity and quality of other weapons in the air defense family of weapons, kill probability, and reliability of the interceptor missiles.[95]

ARDC and ADC were making efforts to re-orient the objectives of the improved BOMARC, XF-103, and other future air defense weapon systems, to meet a NAVAHO cruise-type missile threat for the 1960-1965 time period. There seemed to

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be some hope that positive action could be taken to orient performance, fire control, and armament of these weapons towards this task. The manned and unmanned interceptor programs could no longer be directed solely toward the destruction of a manned bomber threat. A variety of both manned and unmanned interceptors would be needed to combat successfully the sum total of air-breathing targets the enemy might be expected to send against the continental United States. There appeared to be "an increasing trend to rely on industry for stimulus in our future thinking and design of weapon systems," rather than to wait for general operational requirements before assessing the "state of the art."[96]

USAF's attempt to establish a requirement for a system to detect enemy intercontinental ballistic missiles and submarine launched missiles received ADC's enthusiastic support. As conceived, an acceptable warning time would be between 12 and 20 minutes. It was expected that this detection equipment would be installed in the Arctic regions and along the east and west coasts of the United States.[97]

FALCON (GAR-1). ADC planners were primarily concerned with three problem areas in dealing with the FALCON air-to-air rocket: launching of GAR-1B (infra-red FALCON) guided rockets, training facilities and equipment for FALCON-equipped fighter interceptor squadrons of the future, and ground handling requirements for the GAR-1.

The F-89H aircraft, first ADC interceptor to include FALCON rockets in its armament, would not be able to fire infra-red GAR-1B rockets unless the E-9 fire control system was fully operational. This meant that GAR-1B's could not be launched: at very low altitudes, where ground clutter had an adverse effect on the E-9 RCS; in the event of a fire control system malfunction; or against targets using electronic countermeasures. It was obvious that the fire control system in F-89 aircraft would have to be changed to permit launchings of rockets while the RCS was

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inoperative in order for the air defense system to take maximum advantage of the weapon's capabilities.[98]

Effective training would be necessary to give the interceptor aircrew-controller team the required proficiency to use the GAR-1 and associated rocket systems.[99]* Existing flight simulators, for instance, would have to be modified to incorporate all the flight problems related to the GAR-1 missile; adequate practice ranges and suitable targets had to be programmed for synthetic and live firing of the missile; and a unit proficiency directive would have to be provided for aircrew training.[100]

ADC intended that after a short home base FALCON-familiarization period, each fighter squadron equipped with this weapon would be deployed to a weapons training center for initial indoctrination and rocketry firing. Squadrons would be required to return annually for periodic training in order to maintain unit proficiency level. Plans called for the use of both Yuma and Ft. Myers to provide the realistic training required. Prime requirements submitted to USAF included an adequate target system and assessing equipment to measure weapon miss distance. A drone target squadron to be attached to the 4750th Air Defense Wing was approved by USAF. However, ADC felt that a target towed by a manned aircraft would be more desirable if forthcoming ARDC tests proved it to be a feasible system.[101]

Ground-handling equipment for loading GAR-1 rockets on aircraft, storage and maintenance testing of these rockets, the numerical number of FALCONS to be fired yearly per fighter interceptor squadron, and combat sortie and utilization FALCON rates, were all tentatively explored by ADC planners. Requirements for FALCON missiles would remain subject to drastic review, however, depending on the

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* In the light of air-to-air rocket developments, ADC was reconsidering whether or not to resubmit its requirement for large, unguided air-to-air rocket (BIRD DOG) to be used as supplemental armament for rocket firing interceptors. See n 99 for documentation.

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development of the DING DONG weapon and its use by F-101 and F-102 aircraft.[102] Meanwhile, ARDC recommended that a salvo of 6 GAR-1 rockets be used to effect optimum kill against enemy aircraft. The best one-pass attack was considered to be a mixed load of two GAR-1B and four GAR-1 rockets for the F-89H interceptors, and three GAR-1B and three GAR-1 rockets for F-102 aircraft.[103]

Nuclear Warfare. In an effort to develop and standardize a suitable nuclear warhead for interceptor missiles -- a warhead that would be interchangeable between the various types of interceptor missiles -- ADC required an atomic warhead similar in construction to the IN-25 WASP.[*] In fact, it was assumed that the larger lethality of nuclear warheads would make interceptor missiles operationally acceptable at an earlier date (b)(1) [redacted] the IM weapons operated with high explosive warheads.[104]

Air defense we[redacted] warheads would obviously be capable of destroying both a[redacted]ermonuclear load. Even in the case of a near miss, the target craft and its weapon would be engulfed in a fire ball and eliminated completely.[105**] Destroying the enemy carrier only would actually deliver his weapon for him ahead of the desired target point, for the nuclear bomb could easily be fused for contact detonation.

Premature detonation of a thermonuclear weapon would create an extensive radio active fall-out hazard over areas in excess of 8000 square miles. This was

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* See CONAD-ADC History, July-December 1954, Docs 126-129 for further description of the WASP.

** Recent studies indicate that "when detonated, an atomic warhead, due to the neutron flux emitted during the detonation, has the capability of greatly reducing the yield of an atomic weapon which is positioned within several miles of the explosion. There is a time factor involved in this phenomenon, limiting the effect on the explosed weapon to a fairly short period after the original atomic detonation. However, even in the event of relatively large miss distances (where the target aircraft may be damaged but not immediately destroyed and is required to jettison its bomb) the yield of the bomb in the target aircraft may be significantly reduced when jettisoned." See n 105 for documentation.

(b)(1) [redacted]

true if detonation of the thermonuclear weapon occurred on or near the earth's surface. However, destruction or detonation of an atomic bomb "at heights exceeding one fireball radius will not cause any significant fall-out." Therefore, destruction of enemy nuclear bombs at high altitudes promised to give air defense forces the first opportunity to attack the problem of fall-out by eliminating the source.[106]

In May 1955, USAF established a requirement to integrate the DING DONG weapon (unguided high velocity atomic air-to-air rocket) into the F-89J weapon system. Some 230 F-89Ds would be modified to the "J" configuration and would be designed to carry externally two (b)(1) [redacted] The E-6 fire control system would also require modifi [redacted] ity of firing these weapons in addition to the prese [redacted] ckets. The Air Defense Command would be allocated some [redacted] ONG weapons system.[107]

ADC requested that the [redacted] be oriented toward providing two externally mounted DING DONG weapons per aircraft, instead of the currently programmed internal installation of one DING DONG rocket. The FY 1959 ADC Fighter Program called for all fighter-interceptor squadrons to be converted to DING DONG equipped aircraft, since the weapons were programmed to constitute the primary air defense armament in the 1957-1961 time period.[108]

ADC considered it advisable to build a concentrated DING DONG defense around the northeast industrial complex "because it is probable that large hostile formations would be employed there rather than against isolated targets."[109] Threat of DING DONG destructiveness, it was assumed, should cause the enemy to deploy a dispersed attack, which in turn would render other ADC fighter-interceptors more effective against individual raiders than against a mass raid. For this reason, ADC planned its deployment of DING DONG equipped fighters in areas where they

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(b)(1) [redacted]



could not be by-passed by enemy aircraft. The defense of SAC bases with DING DONG weapons was considered most desirable, but not possible because of the limited numbered of initial F-89J/DING DONG-carrying interceptors. It was felt that SAC bases were too numerous and dispersed for ADC to provide adequate defense for their aircraft and personnel with the limited DING DONG weapons carriers.

Underlying the revised programming of the 1959 Fighter-Interceptor Force were the assumptions that (1) large enemy formations would be most likely employed against the northeast "heartland"; (2) that the DING DONG could achieve the greatest kill-effectiveness in defending this area; (3) "that survival of this area would be a most predominant factor in [redacted] subsequent victory."[110] The new deployment, mixing aircraft t (b)(1) [redacted] rder to get the most desirabl locations for the nuclear war [redacted] nsures that the maximum number of DING DONGs will get [redacted] to minimize the amount of fall-out in the northeast tar [redacted] spersal of the enemy attack."[111]

Several major problems were anticipated in the use of nuclear warhead air defense weapons: (1) approval and construction of necessary facilities before the tactical weapons were available;[112] (2) community feeling about having these weapons stored and flown in the near proximity of their homes; (3) logistical and maintenance problems associated with the withdrawal of ADC and augmentation aircraft from bases contaminated by dangerous fall-out to refuge bases from which continued operations could be insured.[113]

Research and testing indicated that the most critical factor affecting the effectiveness of DING DONG weapons was performance of the rocket motor. To eliminate this problem and insure the availability of the weapon at the earliest possible date, ADC suggested to USAF that several potential rocket motor manufacturers be given a competitive, concurrent development of a better rocket motor.

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Also, the explosive and safety criteria of the rocket motors needed further testing.[114]

With the development of atomic weapons for defensive operations, attention was directed to protecting aircraft and air crews from the thermal and gamma radiation resulting from the bomb burst. Goggles to guard pilots against flash blindness, dosimeters to provide medical personnel with measurements of the amount of radiation received by the air crews, thermal curtains in cockpits to cut down radiation, and thermal paint to reduce the effect of thermal radiation on aircraft structures, all required cons (b)(1) [redacted] definite requirements could be agreed upon.[115]

AUGMENTATION FORCES

USAF Augmentation. [redacted]ssessed around 2100 aircraft, of which approximately 900 co[redacted]ir crews were available to the Air Defense Command during the first half of 1955 for support of the air defense mission in the event of hostilities.[116]

ADC asked USAF to consider the capability of performing an air defense mission in the future design and development of fighter and fighter-bomber aircraft of other commands. A set of requirements for the electronic and armament configuration for augmentation aircraft included: fire control systems to be designed as an integral part of the aircraft; sufficient armament load for two firing attacks; UHF voice and data-link communications to be included in the aircraft; air-to-ground and air-to-air IFF should be incorporated in the fighters; aircraft must have a one-hour availability and 15 minutes re-servicing limit. Furthermore, aircraft in the emergency forces must be capable of penetrating inclement weather and intercepting enemy aircraft in "clear air masses, day or night."[117] ADC reaffirmed its commitment to increase the kill effectiveness of augmentation aircraft by installation of a light-weight search radar on fighter and fighter-bomber aircraft scheduled to perform the air defense mission.[118]

During the period, Air Training Command did not assume the air defense mission for Perrin AFB as had been expected. ATRC needed more personnel spaces before it could assume the alert commitment for the Fort Worth-Dallas-Oklahoma City area. USAF approved spaces for 8 officers, 56 airmen, and 5 F-86D aircraft to conduct the air alert at Perrin.

ADC set the alert commitment at Perrin to two aircraft on five minutes alert, 24 hours daily. The back-up force would be composed of the ATRC augmentation force capability at that base. Fifteen F-86D's (from a total of 52 to be transferred from ADC PULL OUT assets to ATRC) were labelled for the Perrin alert mission. Personnel spaces were made available for manning by 1 November 1955. ADC demurred at an ATRC proposal to begin the desired alert on 15 January 1956, and agreed to accept 1 October 1955 as the operational date.[119]

ADC was also disturbed at the steady downward trend in the combat readiness of ATRC aircraft assigned to the air defense augmentation mission. The percentage of aircraft that were combat ready for air defense use flucuated between 40-50% of the total number of tactical aircraft assigned to Air Training Command. The possibility existed that the low combat readiness rate might cause air defense planners to be unrealistic and over-commit ATRC forces assigned to ADC for emergency use.[120]

In considering the deployment of emergency forces, USAF reminded the command that the Air Force "has a number of general war commitments in addition to air defense."[121] Forces in or adjacent to the continental U.S. should be at the disposal of CONAD on D-Day. However, it was not considered desirable "to change the primary mission of augmentation forces in order to assure availability for air defense on D-Day."[122] This would destroy international and joint agreements to

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which USAF was committed.

War-time planning could be helped by committing to CONAD, for a specific period of time prior to undertaking their primary war time mission, those forces scheduled for overseas deployment. For instance, forces scheduled for overseas deployment during the first 30 days of hostilities could be committed to CONAD for a period agreed to by the source command and CONAD; forces to be deployed D plus 30 to D plus 60 days could be commited to air defense for 20 days following the start of hostilities.[123] ADC submitted to USAF a list of proposed requirements for aircraft equipment and pilot standards which could be applied as criteria to units having an overseas deployment mission.[124]

Navy Augmentation. Naval and Marine air forces (including reserves) possessed approximately 2300 aircraft that could be made available for emergency use.[125]

The Commander Air Force, Pacific Fleet, was pushing "to a conclusion as rapidly as possible" the Navy-WADF agreement by which the former would assume the air defense of the San Diego area. It was expected that the shifting of Naval air forces from Hawaii to carry out the alert requirements at San Diego would be completed by the summer of 1955. Naval responsibilities for carrying out the air defense mission could be assumed in the near future.[126]

Meanwhile, WADF was concerned that the F-3D's, which would be the aircraft to begin standing alert at San Diego, lacked sufficient performance ability to carry out the air defense mission. ADC was willing to drop the matter for at least one year, hoping that the Navy would replace the F-3D's with the higher altitude F-3H-1N's currently receiving consideration.[127]

Navy air defense planners were also concerned with the altitude capabilities of their interceptors. "Snap-up tactics were being explored, but the

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Navy believed that these tactics were undesirable. Strenuous efforts were being made to obtain Naval fighter performance at 60,000 feet.[128]

Procedures were being evolved to insure the joint training and maximum participation of Navy augmentation shore based air forces in future air defense exercises.[129] The availability and participation in air defense of Naval and Marine Air Reserve Training Forces having some air defense capability were being explored. Plans would be developed to receive the fullest use of these forces in air defense training.[130]

Air Force Reserve. The Reserve possessed some 200 fighter bomber aircraft during the period, of which 150 were combat ready.[131]

The Continental Air Command proposed, and ADC agreed, that the D-Day assignment of Reserve fighter-bomber wings should be made to ConAC, with operational control of the tactical squadrons passed to the Air Defense Command. Responsibility for administration, materiel, and maintenance support would be discharged through ConAC and the parent wings, while operational control would be exercised through the air defense forces and air divisions. ADC would be expected to provide "advisory" assistance in the peace time training of the Reserve units.[132]

Programming of AFRES fighter-bomber squadrons included these changes in location: Indianapolis instead of Offutt AFB; Beaumont, Texas, instead of Oklahoma City; Tampa, Florida, instead of Spartanburg, S. C. The location of squadrons at Griffiss AFB, N.Y., and Birmingham, Alabama, were still in question as[133] ADC prepared to put its summer AFROTC training program into operation.[134]

Air National Guard. The ANG had approximately 1239 aircraft as of mid-1955, of which approximately 760 were combat ready.[135]

Of the seventy ANG fighter-interceptor and fighter-bomber squadrons assigned the air defense mission on D-Day, 17 ANG squadrons stood active air

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alert on 17 bases during the first half of 1955.* The air defense forces were impressed by the air defense capability of these squadrons. JCADF, for example, requested that the air alert program be expanded to include at least five more ANG squadrons in Texas, Arizona, Oklahoma, and Kansas.[136]

ADC anticipated the need and desire for expansion, and adopted a USAF criterion under which ANG squadrons should be selected for standing future air alert. Nineteen squadrons would be selected under this plan, and located in areas where ADC interceptors were not available to scramble on unidentified tracks, and where they could assist in training AC&W squadrons. These ANG units would be considered part of a "Permanent Air Alert Plan."

The remaining 48 ANG squadrons would be used in a "Rotational Air Alert Plan." Sixteen of the squadrons would be placed on alert at any one time primarily to train ANG personnel in the air defense mission. These units would be located in areas where they could supplement the air defense forces. USAF accepted the plan in principle, and the National Guard Bureau began to review the revised plan. Acceptance of it would require additional ANG squadrons and considerable new programming.[137]

Rapid manning of ANG squadrons for early air defense commitment on D-Day had always been considered of major importance in determining the outcome of any initial air battle. In planning for the recall of ANG units, ADC assumed that 50% of assigned aircraft and air crews would be available for duty within three hours after notice of mobilization, with the remaining personnel and aircraft available within 24 hours.[138] Questions were raised as to the realism of ADC's assumptions. The command was very interested in conducting a surprise exercise with ANG units to establish the time required to alert and effectively employ ANG squadrons after a state

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* See map following page 94.

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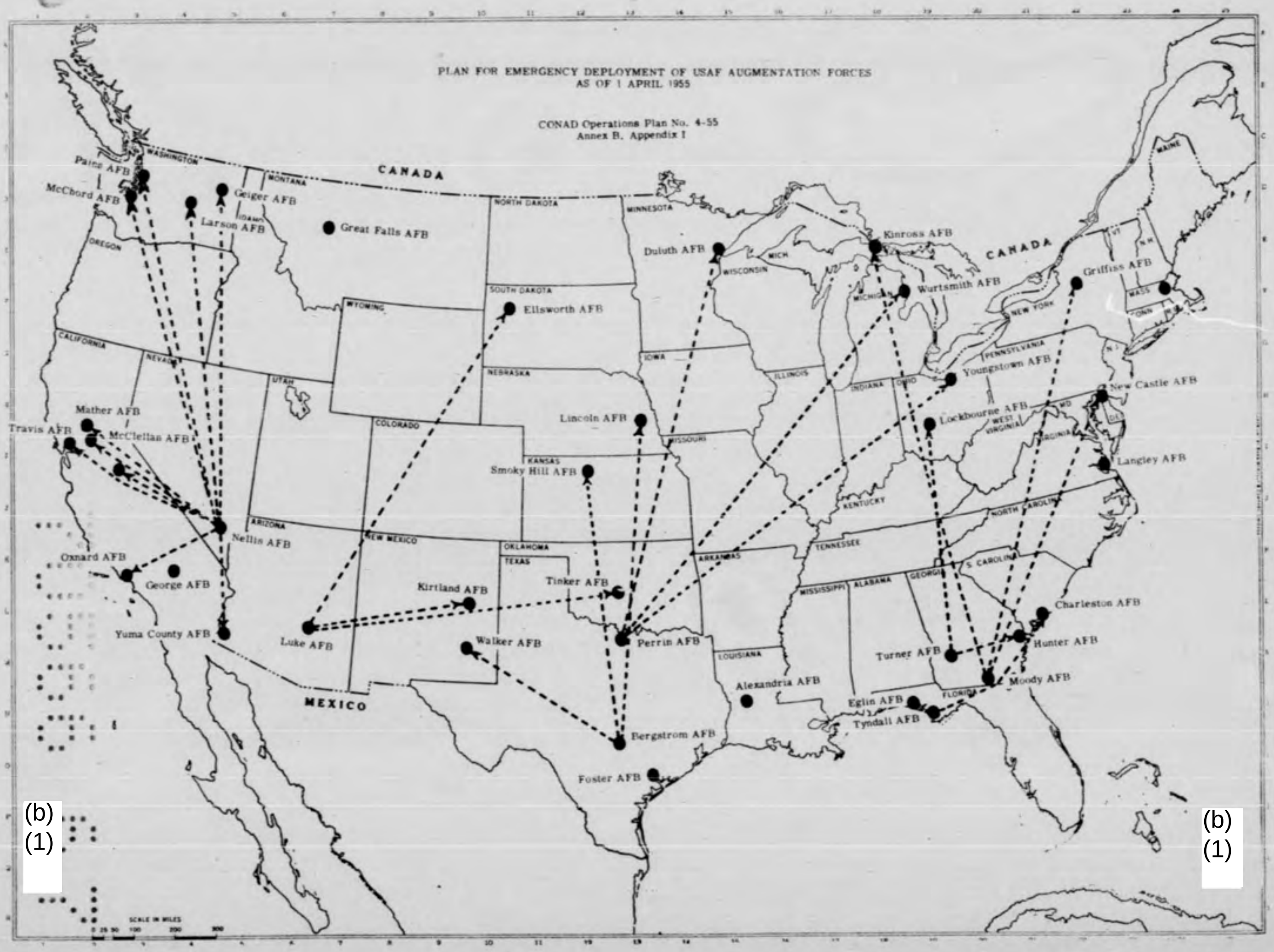
PLAN FOR EMERGENCY DEPLOYMENT OF USAF AUGMENTATION FORCES
AS OF 1 APRIL 1955
CONAD Operations Plan No. 4-55
Annex B, Appendix I
CANADA
MEXICO
Paine AFB
McChord AFB
Geiger AFB
Larson AFB
Great Falls AFB
Ellsworth AFB
Duluth AFB
Kinross AFB
Wurtsmith AFB
Griffiss AFB
Youngstown AFB
New Castle AFB
Lockbourne AFB
Langley AFB
Mather AFB
Travis AFB
McClellan AFB
Lincoln AFB
Smoky Hill AFB
Nellis AFB
Oxnard AFB
George AFB
Tinker AFB
Kirtland AFB
Yuma County AFB
Luke AFB
Walker AFB
Perrin AFB
Alexandria AFB
Charleston AFB
Hunter AFB
Turner AFB
Moody AFB
Eglin AFB
Tyndall AFB
Bergstrom AFB
Foster AFB

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of readiness had been declared. Plans were underway to carry out a recall exercise.[139]

Air defense planners studied a USAF proposal for reorganization of the ANG fighter wings to an organizational structure more compatible with the present organization of ADC. ANG fighter-bomber units, for example, would be redesignated fighter-interceptor units, with subsequent reorganization to follow as soon as all-weather jet aircraft became available. ADC was quite insistent that ANG wing headquarters should not be mobilized upon the mobilization of its subordinate units, since the wing-base type of organization was not compatible with ADC's concept of operational control of the tactical elements. According to accepted concepts, the ANG wing and group headquarters would be unnecessary, since ADC already possessed the intermediate units which would exercise administrative responsibility.[140]

ADC was also at work to pre-position additional equipment and combat ammunition at bases for D-Day and post D-Day use by ANG augmentation forces.[141] The Command was pleased by USAF's intention of bringing ANG fighter interceptor squadrons up to Air Force equipment standards for units performing the air defense mission. ANG units would also be placed in equipment category "D", wherein were the majority of ADC fighter interceptor units.[142]

## ANTIAIRCRAFT IN AIR DEFENSE*

Status. At the end of June 1955 ARAACOM's weapons force consisted of 32 NIKE battalions, eight Skysweeper battalions, 30 90mm gun battalions, and four 120mm gun battalions.[143]

The first six months of 1955 saw the initiation or completion of a variety of actions designed to improve the effectiveness of the Army Antiaircraft Command

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* The information contained in this section was provided by Lt Colonel Thomas M. Sessions of ARAACOM Headquarters.

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(ARAACOM). Fourteen new NIKE battalions were formed; the over-all deadline rate was halved; new and improved for gun ammunition fuzes were put in production; and there was a considerable increase in surveillance radars.

An analysis of ARAACOM's monthly exercises revealed the NIKE batteries averaged approximately 93% in operational capability. According to ARAACOM, these results were gratifying in that they disclosed that the NIKE Guided Missile System was even more reliable than originally expected.[144]

The status of 120mm gun battalions and 75mm Skysweeper battalions remained unchanged during the six-month period. Seven of the 90mm battalions were converted to NIKE, and one additional 90mm unit, the 33d AAA Gun Battalion, was assigned to ARAACOM and charged with the defense of the Savannah River AEC installation.[145]

NIKE. During the first half of 1955, the first NIKE underground launchers were completed and became operational. The launchers, located at Lorton, Virginia, demonstrated the practicability of underground storage, and the feasibility of constructing similar launchers throughout the continental United States. At Lorton, the safety areas required for above-ground storage had been reduced to one-third by use of the underground facility. However, studies were continued as to the desirability of using above-ground launchers in isolated areas where real estate was less expensive.[146]

Another development in the guided missile field was the initiation of a program to implement the NIKE "dual-control" concept. This plan called for two complete sets of fire control equipment to be placed in adjacent areas, and all missile launchers to be located in a common launching area. Only one administrative battery and one missile assembly, test, and fueling area would thereby be required. It was estimated that this innovation would increase NIKE fire power by 100%, while personnel requirements for the dual operation would be reduced by 20%

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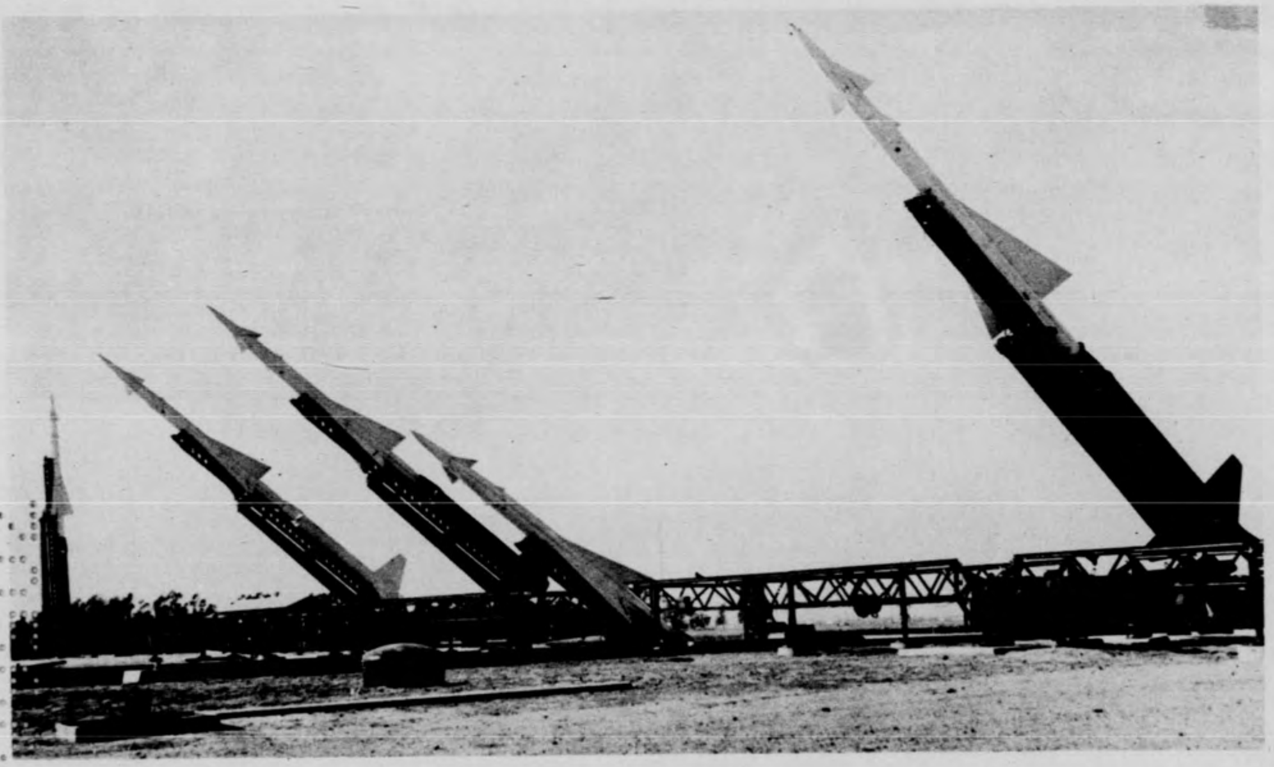

NIKE AT ITS UNDERGROUND LAUNCHER

and real estate by 30% from the requirements of two single NIKE batteries.[147]

By the end of June 1955, ARAACOM had approved 240 NIKE firing battery sites for acquisition, of which 130 sites had been actually acquired. A step forward in this respect was the resolution of the difficulties encountered earlier in the location of the Cleveland NIKE batteries. Two Cleveland sites were moved to locations which proved acceptable to the City of Cleveland, and satisfied the Army's need for a lake-front radar site.[148]

Guns. A highlight during the period was a major improvement in gun fuzes by the incorporation of point-detonating and variable-arming time features. It was expected that the Army's new T225 proximity fuze for 90mm guns would replace all of the older types of proximity fuzes in use. The superior features of the new fuze included: less vulnerability to countermeasures; reduction in the possibility of mutual interference between rounds; greater weather reliability; incorporation of a super-quick point-detonating feature; and the promise of the eventual incorporation of a more powerful, involute battery which could operate efficiently at extremely low temperatures. The latter feature was expected to eliminate the necessity of storing proximity fuzes in heated ammunition bunkers.[149]

The near-availability of the new fuze gave rise to a new policy concerning the selection and utilization of fuzes. In essence, the unit commander would possess both the new T225 and the Mechanical Time point-detonating fuzes, enabling him to select between them for any engagement. The former policy rigidly prescribed the fuze to be used: a point-detonating fuze against "tough" targets, such as multi-engined medium and heavy bombers, and Variable-Time fuzes against "soft" targets, such as light bombers and V-1 type guided missiles. The availability of the new fuze and the new policy on arming increased the flexibility

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of the antiaircraft arm and, consequently, its effectiveness.[150]

The 75mm Skysweeper also came in for its share of improvement. A newly-developed chromium gun tube was issued to units of ARAACOM equipped with this weapon. Its principal advantages were greater accuracy, a 250% increase in tube life, and elimination of the need for conducting trial fire. The wear of the new gun tube was so constant and stable that accurate muzzle velocities could be determined merely by knowing the ammunition lot, muzzle velocity, and the total number of rounds fired through the specific gun tube.[151]

The Skysweeper also was scheduled to receive a new fuze currently in production -- the T234E2, a point-detonating, self-destroying type, which armed itself about 60-200 feet from the muzzle of the gun. The impact element was so designed that either a nose or a graze contact would detonate it. The fuze also incorporated a self-destruction feature which used a centrifugal force mechanism to destroy the projectile in order to prevent damage to friendly ground installations. It was contemplated that during an engagement, one Skysweeper ammunition rack would be loaded with proximity-fuzed rounds and the other with point-detonating fuzed rounds; then, depending on the target to be engaged, the gun commander could select the fuze he desired by merely actuating a lever.[152]

Radar. Much attention was devoted to radar capabilities, coverage, and improvements during the first half of 1955. In February, Headquarters, Continental Army Command (CONARC), published the results of tests conducted to determine the ability of the NIKE Target Tracking Radar to discriminate between aerial targets in formation. No significant deviations from the original manufacturer's estimates were noted. A 90% probability of discrimination was achieved when: (a) range separation was greater than 77 yards; (b) azimuth separation was greater than 1.3° and (c) elevation separation was greater than 1.4°.[153]

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## DEPLOYMENT OF ARAACOM BATTALIONS
## 30 JUNE 1955
## AA COMMAND DATA BOOK, 1 APR-30 JUNE 1955

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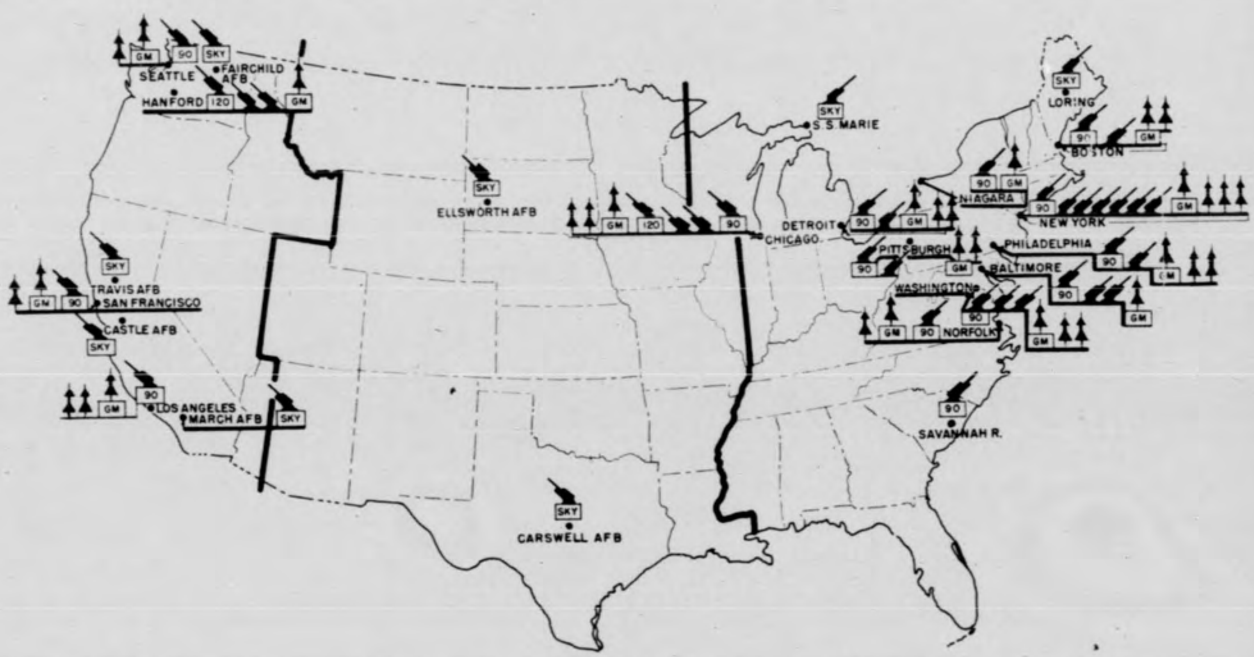


LEGEND:
90 - 1 Battalion of 90 mm guns
120 - 1 Battalion of 120 mm guns
SKY - 1 Battalion of Skysweeper
GM - 1 Battalion of Guided Missiles (NIKE)

The 47th AAA Brigade was directed by Hq ARAACOM to conduct a test to determine the compatibility of separate service radars. It was found that negligible electronic interference existed between NIKE systems and SG-2S (Navy) radars under conditions wherein operating frequencies were coordinated between the two. The question as to whether Naval harbor defense radars caused interference with the NIKE I system when the latter was tracking jet type aircraft at, or near, maximum range was not resolved.[154]

During the period 10-17 February, a test was conducted in the JEADF region to determine the number of tracks conveyed by ADDC to AA defenses; the ranges at which the targets were conveyed; and the ranges at which the tracks were acquired by AA units. It was discovered that the average range from the center of the AA defense at the time of convey was 114.2 nautical miles and that these targets were acquired by AA radars at an average range of 65 nautical miles.[155]

In April, action was initiated to procure 100 IP-281/UP indicators to meet ARAACOM requirements. This indicator was a remote PPI scope for the AN/TPS-1D radar, and its advantages included remoting of AA surveillance radar scopes; better target definition, larger displays, and consequent reduction of operator fatigue.[156]

During February and March, a survey was conducted in the WESTARAACOM area to determine the average elapsed time from the designation of a target by the AAOC to the initial pick-up of the target by surveillance and acquisition radars, and also to determine the average range of the initial pick-up. The AN/TPS-1D averaged 2.5 minutes from designation to initial pick-up, and the gun and NIKE acquisition radars averaged 2.7 minutes. The AN/TPS-1D's accomplished their initial pick-ups at an average of 75% of their maximum range and the acquisition radars accomplished pick-ups at an average of 65% of their maximum range. These figures utilized data of both jet and propeller-driven aircraft,...

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flying at various altitudes. In comparing radar effectiveness against jet and propeller-driven aircraft, it was found that, although the latter were picked up at greater ranges (74% of maximum against 63%), it took less time to acquire jet aircraft -- an average of 2.5 minutes as against 2.7 minutes.[157]

Headquarters ARAACOM recommended to the NIKE Product Improvement Committee on 6 June 55, that a radome be developed for NIKE I radars, in order to improve cold weather maintenance and reliability. Although no serious difficulties of this nature had been reported during the previous two winters, the recommendation was submitted as a result of data gathered during Project FROST JET conducted at Fort Churchill, Canada. Because of the need for extreme accuracy in the position-finding radars, conventional radomes were deemed unsuitable. It was estimated that three prototypes would be available for tests in July 1955, and if accepted, issue to specific units located in severe winter areas would begin in November 1955. The radars of the new NIKE B system were to be equipped with radomes as standard items.[158]

During the half year, ARAACOM increased its assigned surveillance radars by ten, its NIKE fire control systems by 56; and decreased its M-33 systems by 24. Comparative figures were as follows:[159]

| Radar Systems | 1 Jan 1955 | 30 June 1955 |
|---|---|---|
| AN/TPS-1D | 90 | 100 |
| M-33 | 160 | 136 |
| NIKE I | 72 | 128 |
| T-38 | 120 | 120 |
| RAWIN | Unk | 31 |

In March, a request was submitted to the Department of the Army for additional search radars for the Los Angeles defenses. An analysis revealed that,

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because of problems concerning mountainous terrain and temperature inversion, the desired radar coverage could not be obtained with the equipment on hand. The request was approved and a surveillance radar was issued to the Los Angeles defense, to be used in filling the "dead" area in the radar coverage. Three additional surveillance radars were also approved for the Savannah River, Cleveland, and Milwaukee defenses.[160]

Major field commands were directed by Headquarters ARAACOM to integrate National Guard AN/TPS-1D radars into existing AA defenses wherever feasible. These were to be manned by National Guard personnel and tied into the appropriate AA Operation Centers. When all of the units allocated to the National Guard program became operational, a total of 50 additional AN/TPS-1D's would thereby be made available to the Command.[161]

Electronic Countermeasures. During February, an anti-jamming test was conducted by the 5th AA Regional Command. A NIKE guided missile acquisition radar was jammed through its associated Mark X IFF. The jamming was visible on the PPI scopes in all three IFF modes of operation, but was eliminated by the simple expedient of turning off the IFF. Throughout the test, the target tracking radar continued to track the jamming aircraft automatically and was not adversely affected in any way. The results confirmed previous studies which indicated that even the most severe jamming on the Mark X IFF would not prevent AA units from accomplishing their mission.[162]

Communications. During February, a dial alert system was installed in the ARAACOM Tactical Teletype Network. In the event of an emergency, the alert system was to activate the net through the mere dialing of the proper code at the teletype transmitter located in the joint communications center.[163]

A policy for operating the ARAACOM Tactical Teletype Network on a

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twenty-four hour basis was also inaugurated. The net previously was operated on an eight-hour per day, five-day per week basis, for economy reasons. Coupled with the new dial alert system, the new policy made it possible for Headquarters ARAACOM to transmit classified traffic at any time and to any unit of the command in less than five minutes.[164]

In March, an additional direct circuit in the tactical teletype network between Headquarters ARAACOM and the 5th AA Regional Command Headquarters was installed. The new circuit prevented the Pittsburgh Relay Center from becoming overloaded as more AA defenses were added to the command, and eliminated the necessity for routing Chicago, Detroit, and Sault Ste Marie defense reports through the Pittsburgh center.[165]

During the half year, permanent-type fixed plant cables were installed between battery control and launcher sites at certain NIKE locations. The new cable was to replace the organic cable previously used by NIKE units, and would be capable of transmitting NIKE operational data from point-to-point up to approximately 8 miles without the use of repeaters or other auxiliary equipment.[166]

Training. During the early months of 1955, elements of two batteries of the 36th AAA Missile Battalion, the first units to conduct annual service practice with surface-to-air guided missiles, were flown to the Red Canyon, New Mexico, range from the Baltimore-Washington area. By the end of the six-month period, nine battalions had completed NIKE firing practice.[167]

In the gun battalions, a new policy was initiated in July, which permitted ARAACOM major field commanders to employ organic equipment of units at the annual service practice firing. Formerly, common equipment retained at the ranges had been used. The new authority afforded commanders an opportunity to observe the actual functioning of their own equipment under simulated battle conditions.[168]

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During each of the first six months of 1955, air defense exercises were held for the purpose of stressing continuous operation of NIKE equipment for extended periods of time; initial pick-up and engagement of targets at maximum ranges; conveying of targets between adjacent AA defenses; and reporting procedures.[169]

Training in ECM was also stressed during the period. Little improvement in the flight-phase portion of this type of training was noted, however. A survey, conducted during the first quarter of 1955, revealed that the Air Defense Command was able to furnish only 43% of the mission required and that no "X"-band electronic jamming was available. CINCONAD was notified and corrective action was requested. I the interim, schematic drawings of two relatively simple "X"-band electronic jammers were distributed to each NIKE and gun battalion. Units were encouraged to construct these jammers from materials available locally. With this device, units would be able to conduct realistic training against "X"-band electronic jamming while using targets of opportunity during normal tracking missions.[170]

<u>ARAACOM Reorganization</u>. During the first half of 1955, the structure of the command was revamped. Headquarters EASTARAACOM was deactivated, and the joint functions normally assigned to that command were assumed by the Commanding General, 1st AA Regional Command, who was further designated Army Deputy, JEADF. The Army Deputy was made responsible for coordination and liaison with JEADF on joint operational and joint training matters in that region.[171]

During May, the responsibility for the AA defenses in the 35th Air Division area was transferred from the Commanding Officer, CENARAACOM, to the Commanding General, 2d AA Regional Command at Fort Meade, Maryland. This change coincided with the transfer of the 35th Air Division from JCADF to JEADF. Antiaircraft defenses included in the transfer were the Oak Ridge AEC area in Tennessee and the Savannah River AEC area in South Carolina. Oak Ridge was to be defended by National Guard

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units to be moved to their on-site positions on declaration of a National Emergency. The Savannah River project was to be defended by Regular Army units. The 33d AAA Gun Battalion (90mm) was the first unit to move to the Savannah River area, arriving in May 1955.[172]

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## CHAPTER FOUR: TACTICAL OPERATIONS AND PROCEDURES

ALERT STATUS

- ADC Interceptors
- Augmentation Interceptors

INTERCEPT TACTICS

- Standardized Tactics for Directors and Aircrews
- Rules of Engagement
- The Intercept Computer Program
- BROFICON

THE CONTROLLER PROBLEM

STANDARDIZATION OF AIR DEFENSE PROCEDURES



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## TACTICAL OPERATIONS AND PROCEDURES

### ALERT STATUS

<u>ADC Interceptors</u>. ADC required six interceptors to be on an alert status of one hour or higher on one-squadron bases (two on five minutes and four on one hour during duty hours; two on five minutes, two on fifteen minutes, and two on one hour after duty hours).[1] On the two-squadron bases, ADC required ten aircraft on alert during duty hours and twelve after (two on five minutes and eight on one hour during duty hours; two on five minutes, two on fifteen minutes, and eight on one hour after hours). At all bases the remaining aircraft that could be made ready within three hours were kept on a three-hour reserve status.

If the requirements had been met exactly at all bases as specified at the beginning of the year, 312 interceptors would have been available within one hour during duty hours and 342 after hours.[*] The activation of the additional squadron, would have increased this to 316 and 350, respectively, by mid-year. Eighty-four would have been on the highest alert state, five minutes, at all times, since the number of bases remained at 42.

The reported number of aircraft <u>actually</u> on alert varied slightly from these figures, however. On 31 December 1954, 77 were reported on five minutes and 228 on one hour for a total of 305.[2] For 30 January these figures were 78 and 228, or a total of 298. On 31 March, they went down to 74 and 178 or 252 in all. These fluctuations were due to a number of causes. At all times, a

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* At the beginning of 1955, 27 bases had one squadron and 15 had two squadrons. By mid-year, this ratio had changed to 26 with one squadron and 16 with two squadrons.



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number of squadrons were training at one of ADC's weapons employment centers or were unable to meet the alert because of conversion or some other reason. In these cases, the five-minute requirement was handled by a detachment from a squadron at another base, but no aircraft were put on alert below five minutes. On rare occasions, the alert was waived entirely at a few bases for short periods. Also, the possibility of error existed in the totals reported at various times.

The number of aircraft on reserve status was another highly variable figure. This number was dependent upon those that could be put into commission at any one time. As reported, it equalled approximately the number available within one hour--300. For example, 294 were reported on three-hour availability on 30 December 1954, 332 on 30 January 1955, 330 on 28 February, and 419 on 31 March.[3]

Augmentation Interceptors. To the daytime pool of aircraft on five minute alert, the Air National Guard contributed 34 fighters. At 17 bases, the ANG had two aircraft on five minute alert from sunrise to sunset. None of the other augmentation forces maintained alert during this period. At San Diego, a detachment of the Fleet All-Weather Training Unit, Pacific Fleet, expected to begin standing a limited alert on 1 October and a full alert on 1 December 1955. This unit was equipped with F3D Sky Knight fighters.

INTERCEPT TACTICS

Standardized Tactics for Directors and Aircrews. The long-needed and long-awaited manual on lead-collision course intercept tactics was distributed by ADC in mid-1955.[4] In a simplified, illustrated text, ADC laid down in precise detail the procedures for directing and flying every phase of the intercept. Aiming at complete standardization, ADC made its manual directive and ordered that the tactics be used regardless of weather conditions. As ADC saw it, complete standardization would make it possible for the director and aircrew to know exactly what to expect of each other, and most effectively employ the weapons.

Months of research by the command had gone into the development of these tactics. In 1954, the Air Proving Ground Command ran Project WOLFPACK to find the best tactics. On the findings of this project, much of the manual was based. The tactics in the manual were, in ADC's words, "based on sound principles and proven procedures which insure the greatest kill probability."[5]

ADC built its tactics primarily around three points. The first was that each interceptor was to be scrambled according to a standard procedure that would result in the prescribed separation between aircraft within a flight (5 miles) and between flights (20 miles). This procedure was for each interceptor to take off in 30-second intervals to get a five-mile separation. The director was to space flights by using diverging vectors or ordering flights to turn in opposite directions after take-off. After take-off, the pilot was to determine the proper point to turn to the first heading for the climb-out. This turn was to be started at exactly the same location in space by each pilot so that after the turn all aircraft would be lined up in combat trail and spaced properly. To do this, a standard time to turn, starting from "release brakes," was to be established for each base. The pilot was to maintain his position in combat trail during climb-out, cruise, and recovery primarily by flying on a heading and altitude specified by the director.

The second point was that each director was to think of and direct his flight as a flight, coordinating with other directors for a symtematic attack. And the third was that interceptors were to be positioned according to the "Air Mass Theory"* and with a positioning aid.

ADC covered, besides take-off separation, combat-trail, flight maneuvers,

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* A theory which explains a method of computing a course for the interceptor to fly that results in a true beam intercept on an airborne target...

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the means of solving the lead-collision course intercept problem, use of the director's positioning aid, plans for attack and re-attack, attack break-away, recovery, and standard procedures for identification interception. In addition, informational charts on fuel consumption, speed conversion, angle-off, and climb, were included to provide for better understanding and accurate control.

<u>Rules of Engagement</u>. Instructions for engagement and interception for the Continental Air Defense Command (which would be applicable to all military forces engaged in air defense in the United States) had been approved by the JCS early in 1955 and sent to the Secretary of Defense.[6] Pending his approval, the rules of engagement in force remained those laid down by ADC's regulation issued in May 1954. However, USAF Headquarters objected to the provisions of this regulation.

USAF said that the regulation did not conform to a Presidential and a JCS ruling. Two points were in conflict: the markings on aircraft on which engagement was authorized; and the determination of their hostility as a condition of engagement. The regulation directed engagement of aircraft bearing the national, not specifically military, markings of potential aggressor nations found within the boundaries of the United States on which no notification of flight clearance had been received.[7] It listed Russia and its satellite nations as possible aggressors. USAF said that engagement could be authorized only on Soviet aircraft with <u>military</u> markings and the phrase "manifestly hostile in intent" had to be included.

CONAD reconsidered the ADC regulation and in May told USAF that it had new provisions that it believed would bring the regulation in line. CONAD proposed that aircraft entering a coastal ADIZ be considered as demonstrating hostile intentions when:[9]

They have not been properly cleared for entry, and

They are on a course, which, if continued, would carry them over the boundaries of the Continental U.S., and

They are not obviously in distress, and

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> They do not respond properly to interrogation where communications permit or immediately obey signals to change course or land.

CONAD said that when the JCS engagement instructions were approved it would authorize the joint air divisions to declare aircraft hostile under these conditions.

Air Force Headquarters replied that it would approve these proposals provided that definite safeguards were made to prevent engagement of friendly aircraft.[10] CONAD felt that sufficient safeguards were provided already and asked that approval be made.[11] Meanwhile, the Canadian ADC approved the CONAD changes.

<u>The Intercept Computer Program</u>. By March 1956, ADC expected to receive the first AN/GPA-37, its pre-SAGE, semi-automatic intercept system.[12] This was a package outfit called the Radar Course-Directing Group consisting of a computing-tracking group, AN/GPA-23; the ground-to-air data link, AN/GKA-1; and the data link coupler, AN/GPA-34. This system would enable one director to handle six interceptions simultaneously.[13] It was to be used in both the manual and the SAGE system. When SAGE came in, the AN/GPA-37 system would be used as a back-up.

ADC wanted the AN/GPA-37 at all AC&W sites except those that were to retain only a surveillance function.[14] This included AN/GPA-23 equipment at all control positions. In addition, one AN/GPA-37 and three AN/GPA-23 were required for each of the eight REP sites in Canada. Currently, 91 AN/GPA-37's were on contract.[15] Each of these included four AN/GPA-23 consoles.

<u>BROFICON</u>. The idea of using commercial broadcast frequencies for close control of interceptors during an emergency, in the event normal communications were jammed, was first conceived in late 1950. But not until at a meeting of ADC, USAF, and FCC representatives in October 1953, was a plan made. This was called BROFICON (BROadcast FIghter CONtrol). The plan was that if normal ground-to-air

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communications were rendered useless by enemy jamming, commercial broadcast transmitters of 50 KW power, modulated by ADC controllers, would take-over. Because of the high power and frequency band of commercial transmitters, an enemy would find it difficult to jam them.

The operational concept for this back-up communications system was submitted to the Secretary of Defense in December 1954, and approved on 7 March 1955. The air defense forces were assigned the responsibility of establishing the necessary contacts with commercial broadcasting stations, determining the engineering requirements, and operating the plan. ADC was to approve operational requirements and monitor the plan only.[16] By mid-1955, priority requirement for BROFICON had been submitted by the defense forces.[17]

THE CONTROLLER PROBLEM

ADC had too few skilled controllers. At mid-year, only 27% of the 1,015 controllers assigned were fully combat ready.[18] Almost half of ADC's controllers were at the entry level or below. However, this was an increase over the previous year, indicating that ADC's efforts to raise the skill level was paying off. Back in November 1954, only 19% were combat ready.

Numerous directives had been issued by ADC to standardize and promote controller training. To these, ADC added in March 1955 a standard proficiency directive. It established the annual requirements for evaluation of controller skill, the minimum training requirements for new controllers, and the progression controllers normally would follow.[19] All division commanders were charged with evaluating their controllers within three months after initial assignment and at least once each six months after, and for setting up a training program for correcting any deficiencies found. For entry-level controllers, a yearly total of 240 actual and 480 synthetic intercepts was re-

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quired. Others had to meet 120 actual and 240 synthetic intercepts annually.

In an effort to improve pilot-director cross training, ADC directed longer training periods, but did not increase the total time required. This was done at the complaint of EADF that ADC's previous requirement of one day each two months for directors to go to an interceptor squadron and pilots to go to an AC&W squadron did not give enough time.[20] ADC raised the requirement to three days each six months.[21]

ADC knew that the problem of too few skilled controllers would not be solved, however, until the great turnover of people in this field was stopped. Within the next two years, ADC stood to lose over 55% of its controllers.[22] The majority of controllers were reserve officers; regular officers were not attracted to the field. Checking at the ATRC controller school at Tyndall AFB, ADC found that during 1953, 1954, and the first six classes of 1955, only 34 regular officers had entered as compared to 2,462 reserve officers.[23]

To lower the turnover, regular officers had to be attracted to the field. This was no easy task. Most controllers did not like their job. To find out exactly why, ADC passed out questionnaires to a good cross-section of the command. Three questions were asked: how did you get into the field? would you get out of it if possible? and what would be your choice of field?[24] Only 65 of some 300 questioned had volunteered for the duty; the rest had been put there. Twenty-four liked the field, 203 did not, and the remainder were undecided. As to choice of fields, the majority wanted a flying assignment.

Criticisms of the field fell into four major categories: undesirability of working at isolated sites and lack of housing and medical facilities; lack of commissary and PX facilities; limited recreational facilities; and additional duties and shift work. Additional duties were particularly irksome. Their assignment was

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not uniform throughout the command--ranging all the way from none to 15 and everything from air installations to unit funds.

One of the more articulate, and perhaps disgruntled, officers had this to say:[25]

> This career of controlling is not only objectionable because of working hours and assignment location, but as a controller, you are a third-class officer rated beneath officers attached to flying units and all other non-controlling functions. Until the position and prestige of the AFSC is raised, controlling will continue to be a dirty, obnoxious job with no compensation or satisfaction that goes with a job well done, and certainly no promotions for an officer intent upon a career.[26]

Another made these remarks:

> The locations of sites in the controlling field does not offer a bright future. The around the clock hours, shift work, and duty hours are more than average for an Air Force officer. There is little reward for a good job with abundant complaints when something goes wrong.

ADC had taken action to overcome some of the dislikes expressed. Controllers could become AC&W squadron commanders and could advance from AFSC 1644 (Intercept Controller) to AFSC 1616 (Aircraft Control Staff Officer) which had a grade spread of major through colonel. Efforts were made to get more prestige to the field and recognition of the controller. An ADC-wide information program on the field was launched. Under a program started in June 1955, individual controllers were cited for unusual performance in emergency service leading to the saving of an aircraft.[27*]

A world-wide conference on controllers was held in March at Tyndall AFB at the suggestion of both ADC and ATRC. The purpose was to study the problems and attempt to find solutions. Among the recommendations made by the conferees was that a definite and more exacting screening program be set up to select

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* The first controller to receive this recognition was Lieutenant David A. Peavy of the 789th AC&W Squadron, Omaha, Nebraska.

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officers for the field and that a recruiting program similar to that for aviation cadets be started.[28]

They also recommended that the Officers Candidate School, surplus officers in related career fields, the AFROTC, and the recall of reserve officers in the controller and related fields, in that order, be used as sources for personnel; that the input to OCS include more airmen from the AC&W career fields; and that a study be made of the tasks being performed by controllers that could be performed by airmen. As to training, they recommended lengthening and making more realistic the ATRC course; placing more emphasis on controller-pilot team training; that interceptor and AC&W squadrons be made into training teams; and that the controller school be given a higher priority.

## STANDARDIZATION OF AIR DEFENSE PROCEDURES

A long-cherished goal of ADC had been to standardize its systems and procedures. Until mid-1954, standardization had been carried on in a gradual, evolutionary manner. Much in air defense was new and it took a long time to build up the knowledge and experience required for standardization. Also, lack of manpower had prevented an all-out effort.

But in June 1954, ADC's commander approved a recommendation for complete standardization made by a committee headed by the late Brigadier General Clinton D. Vincent. His committee had been organized to find the best means of putting into force a new flight safety policy and organization. As a result, the Deputy Chiefs of Staff for Operations, Materiel, and Personnel were directed to standardize all pertinent areas.

In a little more than a year, standardization of key systems and procedures was completed. By 1 September 1955, Operations had put out some 17 regulations, two manuals, and one unit training standard.[29] The directives issued by Operations covered the following: lead-collision course interceptor tactics; AC&W procedures; interceptor squadron and group training standards; aircrew skill qualification criteria; controller training requirements and skill evaluation; flying training program; vertical plotting and status board display; aircraft activity reporting criteria; and checkout and transition programs for ADC's interceptors and T-33 aircraft.

To insure the control and evaluation of standardized procedures recommended by the Vincent Committee, a directive on standardization was issued in November 1954, and revisions were made in April and August 1955. Each version established that ADC Headquarters was to prepare and issue all standardized directives.[30] Coordination with the defense forces was to be made prior to issuance of the directives, but recommendations for changes or additions had to be sent through channels to ADC Headquarters.

In other words, once issued, the directives were to be followed to the letter until changed by ADC Headquarters. To make certain that the command understood and was following the directives a thorough system of checks was set up.

To make these checks, standardization boards were to be established at all levels from the squadrons up to ADC Headquarters. The important point of the checks was the evaluation of the operational skill of personnel that would result. The board at ADC Headquarters was to make spot checks of subordinate boards, aircrews and controllers. The defense force boards were to check every six months each air division deputy for operations, wing commander, wing deputy commander, wing deputy for operations, group commander, group operations officer, squadron commander, squadron operations officer, and one flight commander and one pilot from each squadron assigned. At air division level checks were to be given to two members of each AC&W squadron and three members of each interceptor squadron each year. The divi-

BRIG. GEN. WOODBURY M. BURGESS
DEPUTY CHIEF OF STAFF, INTELLIGENCE

BRIG. GEN. EMMETT F. YOST
COMMAND INSPECTOR GENERAL

BRIG. GEN. ROBERT S. MACRUM
DEPUTY CHIEF OF STAFF, COMPTROLLER

BRIG. GEN. ALBERT H. SCHWICHTENBERG
COMMAND SURGEON

sion board was also to check members of the boards at the wings and groups. At the interceptor squadron level (there were also wing and group boards), each aircrew was to be checked every six months.

What the checks were to be for aircrews; aircrew members of interceptor, AEW&C, radar evaluation units, and support aircraft; and intercept controllers, was also detailed. If an aircrew member failed a check and a re-check given a month later, his immediate commander was to recommend to the air defense force commander "the disposition that should be made with subject personnel."[31]

Another area standardized was maintenance and supply. The Deputy Chief of Staff for Materiel had by mid-1955 put out five maintenance manuals and one consolidated supply manual.[32] Three of the maintenance manuals were on aircraft: "Fighter-Interceptor Squadron Materiel Organization"; "Field Maintenance Organization"; and "RC-121 Maintenance." The fourth manual covered ground radar-communications maintenance organization. The fifth was on vehicle and equipment maintenance. The consolidated supply manual covered unit supply policies and procedures, base supply operation, special supply procedures, and methods of evaluating supply operations.

Finally, important training manuals and regulations had been published by the Deputy Chief of Staff for Personnel. The first of these manuals established the standard procedures and controls to be used in the administration of on-the-job training programs held in all units of the command.[33*] A second manual established a standard method of evaluating the skill of airmen in certain career ladders and determining what additional training was needed.[34] A regulation issued in late 1954

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* This manual was very favorably received by other commands. Some used it for their own OJT programs with only minor changes and one, at least, the Alaskan Air Command, used it almost verbatim.

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directed establishment of a standardized OJT program for all specialities.[35] The policies and procedure for movement and use of mobile training detachments was set up by regulation.[36]

For the command OJT program, the training section of DCS/P had issued training needs tests for five career ladders; tests for five more career ladders were being published in September 1955; and tests for the communications-radar maintenance career fields were being developed.[37] A total of 134 USAF OJT programs had been distributed.

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# CHAPTER FIVE: SAGE

THE SAGE OPERATIONAL PLAN

SITING AND CONSTRUCTION

SAGE BOUNDARIES

TRAINING

COMPUTER PROGRAMMING

MAINTENANCE



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SAGE

THE SAGE OPERATIONAL PLAN

By mid-1954, preliminary thinking on the SAGE program had jelled sufficiently to warrant an attempt at a full-scale operational plan. In August, ADC's SAGE Project Group joined forces with Lincoln Laboratories, and shortly thereafter a draft plan was prepared. The draft was then coordinated with other interested agencies, such as the Western Electric Company, the International Business Machines Company, AMC, ARDC, and ATRC. By January 1955, their recommendations were incorporated into the plan and after further debate by the ADC staff, the finished plan was submitted to USAF on 20 April 1955.[1] In anticipation of USAF's concurrence, limited distribution was made to those agencies which required the information for immediate action.

As Major General Frederic H. Smith, Jr., stated in the foreword, "SAGE does not represent just another step forward; it represents complete departure from many of the tried, true, and somewhat archaic concepts of today's operation and equipment."[2] In considerable detail, the plan went on to spell out the philosophy and procedures whereby air defense was to be revolutionized.*

SITING AND CONSTRUCTION

Other than production-development work on the digital computer itself, the major implementation effort during 1954 had been the siting of SAGE facilities. Basi

* A restatement of the operational details of the plan can hardly be made within the narrow compass of the present history, and interested readers are urged, therefore, to consult the plan itself, which may be found in the supporting documents to this volume.



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siting criteria had been prepared by ADC and the task of selecting the final locations was delegated to its defense forces, working in conjunction with agencies of the American Telephone and Telegraph Company. ADC approved or disapproved the siting proposals, submitting final choices for approval by USAF. Siting was to have been completed by May 1955, but delays were experienced at a few sites where circumstances were not routine in nature, e.g., where joint service agreements were needed, or where sub-sector boundaries had been readjusted in planning.[4] ADC estimated that by 1 January 1956 all 40 locations in the program would be selected. In spite of the siting delays, however, no delay was experienced in the actual construction schedule.[5]

The Western Electric Company was awarded the prime contract for the construction of the SAGE facilities. In each area, sub-contracts were let by Western Electric for the actual construction of buildings. During the first six months of 1955, ground was broken at the following SAGE locations in Sector No. 1: McGuire AFB, Stewart AFB, Syracuse, and Fort Lee.

As was expected, it was discovered that certain modifications to the AC&W stations in the Permanent system would be needed. Designs were consequently prepared for additional buildings to house the SAGE data transmission equipment at the "P" sites.[6] Installation of the XD-1 computer also was accomplished in its new building at the Lincoln Laboratories in Lexington, Massachusetts; while construction of the XD-2 building was begun at Poughkeepsie, New York.[7]

SAGE BOUNDARIES

An important change in the number and boundaries of SAGE subsectors was replanned by ADC and approved by USAF early in 1955. This was caused by certain revisions in the criteria for SAGE sector and sub-sector boundaries. The primary cri-

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teria employed in the earlier estimates had been the radar deployment as outlined in ADC's "Air Defense Requirements Plan, 1954-60," and working agreements reached with the RCAF-ADC on an integrated command system.

The radar deployment upon which the earlier SAGE boundaries were predicated was based upon early 1954 estimates of required radar coverage. By the start of 1955, however, site surveys for the first three phases of the Mobile Program made it necessary to revise these estimates. Some radar sites were deleted entirely and others were scheduled to be replaced by gap-filler radars when SAGE became operative. The effect of these changes was to delete 20 heavy radar stations from consideration in the planning for SAGE boundaries.

As to Canada, no governmental agreements concerning an integrated command structure had been consummated by the beginning of 1955, although working agreements with the RCAF-ADC had been made. These working agreements were based on the assumption of an integrated command structure which discounted the Canadian-United States boundary. Rather than take the risk that an integration of commands might not be realized in time for SAGE, ADC determined to retain the international border in planning the SAGE boundaries.

Consideration of the new factors mentioned above revealed that the distribution of subsectors was out of balance with the radar inputs. Boundaries were consequently readjusted to meet the new needs. The realignment caused a reduction of eight subsectors (4 in Canada and 4 in the United States) and one sector. This resulted in a total of 34 subsectors (two of them manual) and eight sectors as compared to the original 42 subsectors (two of them manual) and nine sectors. The changes also made it possible to move the program completion date from August 1961 to October 1960. Installation priorities were also revised slightly.[8]

ADC's new proposals were submitted in January 1955, and approved by USAF

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in March, with minor changes.[9] The news that the reduction would save approximately 4,000 personnel and 200 million dollars was no doubt encouraging to higher headquarters.

There was much more to be done in shaping the organization of the command during the SAGE era. The organizational structure of the eight divisional areas, the nature of the new wings which were to supervise the operation of the subsectors, the command of weapons forces, were pressing issues which demanded speedy decision so that manning principles and documents could be prepared.[10] Opinions on the subject of an ideal organization were numerous within ADC Headquarters and among the defense forces, but intensive staff coordination promised a solution to this important problem in the near future.[11]

TRAINING

It had been decided that the prototype model of the AN/FPS-7 Direction Central (XD-1) at Lincoln Laboratories was to be used by ARDC to train instructor personnel for the Air Training Command. In turn, ATRC was to utilize the XD-1 to provide formal training for Direction Center and Combat Center operations personnel. XD-1 was to be used for this purpose until a low priority site could be made available. The Combat Center at Grandview AFB, Missouri, was chosen as the eventual training site. Proposals for training standards and procedures were made by Western Electric and were established by USAF as guides for the future training effort.[12]

In August 1955, ATRC was presented with ADC's requirements for SAGE training and the dates by which training in the several maintenance and operational fields was to be completed. The specific nomenclatures and description of the equipment on which ADC personnel was to train were uncertain at that time, but ADC believed that it would be valuable to alert ATRC as to the time requirements, and to

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## AIR DEFENSE BOUNDARIES (SAGE)

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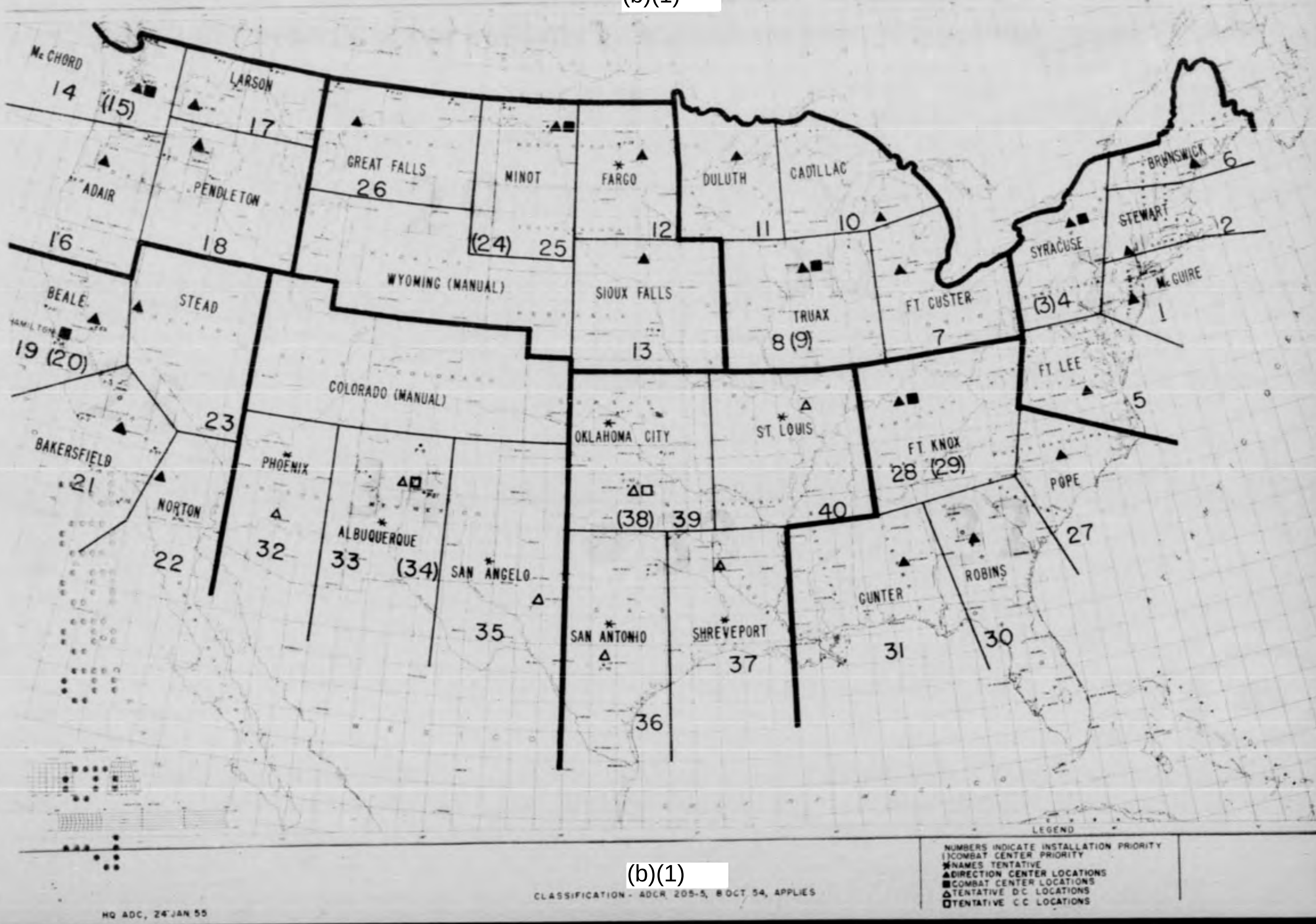


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HQ ADC, 24 JAN 55

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forward more detailed information when it was made available.[13]

COMPUTER PROGRAMMING

During the first half of 1955 an important matter which occupied the attention of ADC's Project Group was computer programming.[14] The computer program was a sequence of instructions, punched on IBM cards, which was read into the machir by means of an automatic IBM card reader. These instructions were, therefore, the machine's standing operating procedure by which an important part of the air defense process was carried out. The programs fell into two general categories: operational and support.

The operational computer program linked together the air defense functions of detection, tracking, height-finding, identification and weapons control; all incoming data were thereby controlled. Included, were features for automatic recording of data and for checking the operation of the duplex equipment so that transfer of the load to a standby computer could be made rapidly. In addition, programs for maintenance, operations analysis, synthetic training data, and program revision checks were required.

The sum total of these programs constituted a master program. Because there were two computer facilities, however, i.e. a Direction Center and a Combat Center, two such programs had to be drawn up. Each master program was to be applied to all computers in each of the two categories.

The master computer programs were to be prepared by Lincoln Laboratories with guidance by an ADC "Experimental Wing." Once the program was prepared, checkout and adaptation of the program at specified sites would be made to conform to the geography. Continuous revisions of programs would be made thereafter to incorporate improvements in procedures uncovered by operational experience. Finally,

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research was required on a continuing basis. Capabilities of air defense equipment would change with the development of air defense over the years, and these changes would have to be incorporated into the programming.

The magnitude of the computer programming effort caused ADC to establish the 4620th Air Defense Wing (Experimental - SAGE), effective 1 June 1955, at the Lincoln Laboratory in Lexington, Massachusetts.[15] The wing was to bear the military responsibility for computer programming, but the primary burden was to be given to the RAND Corporation of Santa Monica, California, which was to support the Wing contractually.

The 4620th was to have a large responsibility for SAGE in addition to computer programming. Its chief tasks were to provide operational guidance for the operation of the SAGE subsector and provide all ADC operational units with synthetic air defense problems and data. It was also to determine personnel requirements for SAGE operation and to devise on-the-job training programs and methods.

As each air defense wing and division for SAGE was created, advance cadres were to be trained by the 4620th, and after these took their position in the field, the wing was to provide them with the computer programming assistance they needed.

The RAND Corporation was to be the chief programming body. This organization, then engaged in developing the System Training Program for ADC, was considered to have a unique experience of synthetic training problems in air defense, and had the knowledge to perform computer programming satisfactorily. Supervision of the effort, however, was to rest with the 4620th Wing.[16]

The System Training Program, which had been developed for use in the manual system, also came under intensive study in this period to determine whether it needed modification for use in SAGE.

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MAINTENANCE

The complexity of the computers caused ADC to recommend that maintenance be provided on a contract basis, and concurrence was received from both USAF and AMC. ADC had programmed civil service personnel to operate and maintain power and air conditioning equipment, but it was uncertain whether these positions would be changed to military or contractor personnel by the time manning studies were completed. Internal communications were to be leased from commercial telephone firms and maintained by them. Teletype and cryptographic equipment however, was to be operated and maintained by the Air Force.[17]

Ownership of the computers them selves was also resolved in the period, in favor of government purchase. ADC strongly backed this decision, believing that it would result in considerable monetary savings.[18]

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# CHAPTER SIX: ORGANIZATION

AREA ORGANIZATION

COMMAND ORGANIZATION

COMMAND MANNING

CHANGE OF COMMANDERS

HEADQUARTERS CONAD

HEADQUARTERS ADC

REDESIGNATION OF ALTERNATE COMMAND POST



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## ORGANIZATION

Area Organization. To control and support adequately the increased number of tactical forces which would be in operation by 1956, ADC planned to activate four new air divisions. Three were to be assigned to EADF, and one to CADF.

Sector and region boundaries as they would exist following the establishment of the new divisions were drawn up by late 1954. Early in 1955, the command was ready to begin conversion to the 1956 organization.

The first action taken was the minor one of moving the southern portion of the WADF-CADF boundary slightly to the east. The change resulted in a small reduction of the 34th Division area and a small increase in the areas of the 27th and 28th Divisions.[1]

In the East, bigger changes took place. Two of the three new divisions scheduled for activation in the EADF region were to be located south of the 26th and 30th Divisions. The areas to be assigned to them included all of Tennessee and North Carolina and portions of Mississippi, Alabama, Georgia and South Carolina -- areas currently assigned to the 35th Air Division.

By September 1954, EADF, CADF, and Headquarters ADC were agreed that management of the reduced 35th Division could be handled as easily by EADF as by CADF. Consequently, the decision was made to reassign the 35th to EADF in the 1956 organization. It was believed the realignment would make for a better distribution of weapons; EADF would be responsible for the defense of the whole of the east coast, CADF for the hinterland, and WADF for the west coast.



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By early 1955, Headquarters ADC had further decided that there was no need to delay reassignment of the 35th until the new divisions were activated. If the changeover were made at once it would greatly assist both CADF and EADF "in their programming, development of plans, and engineering and installing of wire and radio communications for the 1956 organization."[3]

Consequently, on 10 April, the 35th Headquarters and its assigned forces were reassigned to EADF and the region boundary between the two defense forces changed as shown on the map on the next page. As the map also reveals, the southeastern portion of Louisiana, which formerly had come within the 33d Air Division's area of responsibility, was reassigned to the 35th area.[4]

<u>Command Organization</u>. Important changes in command organization during the period, other than the reassignment of the 35th Division to EADF, included the reassignment of the 8th Air Division (AEW&C) from Headquarters WADF to Headquarters ADC and the activation of the 4620th Air Defense Wing (Experimental, SAGE). Others were the activation of a second AEW&C wing at McClellan AFB, California; the organization of the 4756th Air Defense Group (Weapons) at the Moody Air Force Base weapons training center in Georgia;[5] the activation of the 518th Fighter Interceptor Squadron at George Air Force Base, California; and the activation of five additional AC&W squadrons for the operation of Mobile Radar Program stations.

The command organization as it appeared following these changes, and a roster of the units assigned, by type, is shown on the chart on the next page.

<u>Command Manning</u>. The command continued to grow in manpower strength during the first half of 1955. Authorized strength at the end of June was 88,131, as compared to 80,639 at the end of 1954. Assigned strength in June was 84,469, an increase of about 2100 during the period. Of the total persons assigned, 9,585 were officers, 64,834 were airmen, and 10,050 were civilians.[6]

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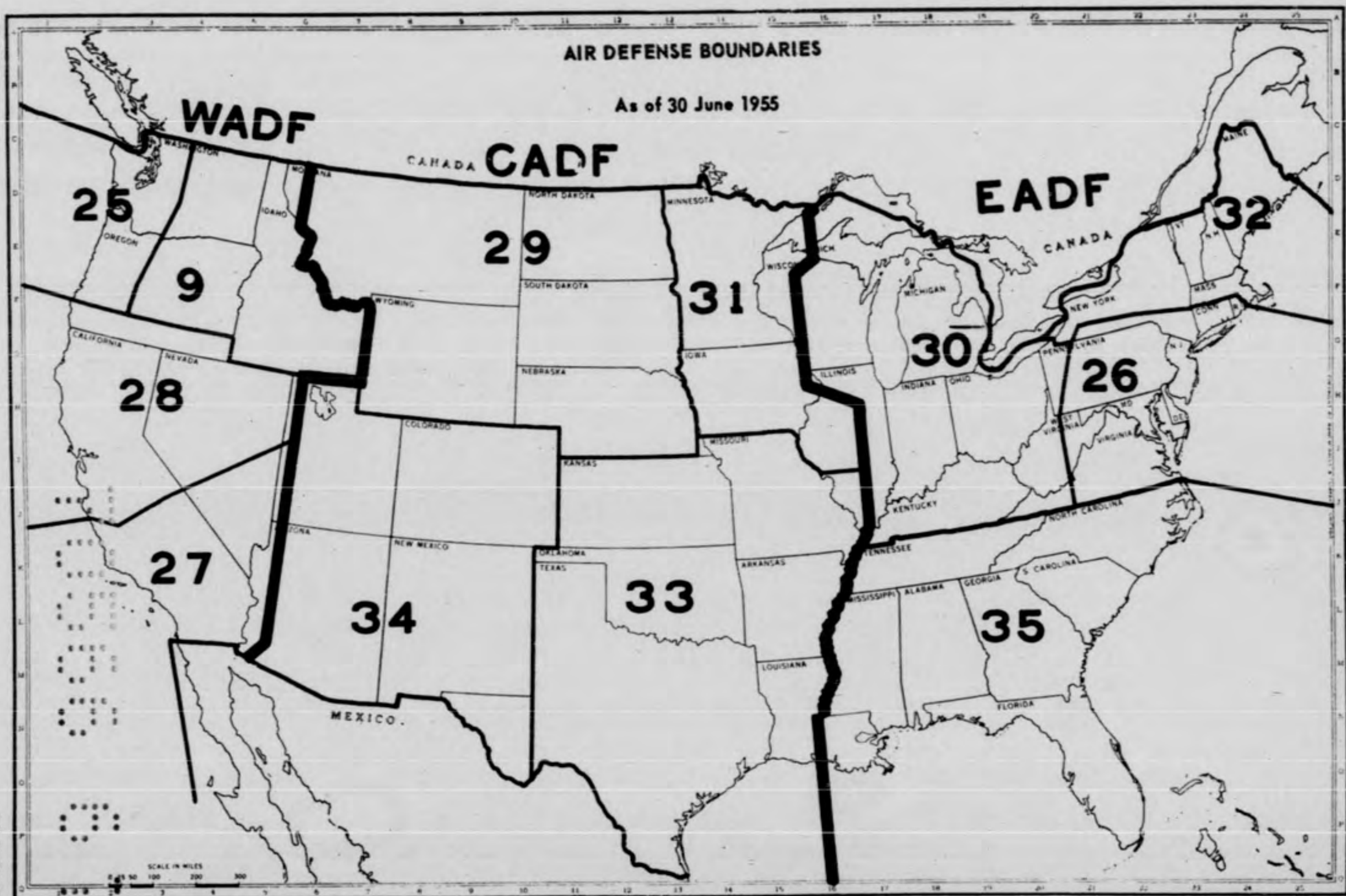

UNITED STATES

The drive to conserve manpower in the various headquarters functions at division level and above and, at the same time, provide sufficient staff allotments for commanders to perform their assigned duties continued throughout the period. In this connection, General Chidlaw reported to USAF that ADC had underestimated its headquarters' staff needs in its February 1954 evaluation of staff functions.[7] After operating for several months under the manning which had been recommended at that time, he said, it had become apparent that "the criterion of matching phased requirements with our expanding workloads was not sufficiently considered."[8]

As a result, General Chidlaw had reconvened the Headquarters ADC Function and Manning Review Board in 1954 for the purpose of reappraising headquarters' manning needs.[9] The findings of the Board called for an increase of approximately 9.7 for each division headquarters, 8.6% for each Air Defense Force headquarters, and 6.9% for Headquarters ADC.[10]

The final report on the situation, submitted to USAF Headquarters on 19 May 1955, listed in great detail the reasons why the increase was necessary and why requests for even further increases would most probably have to be submitted in the future. As summarized in the report, they were as follows:[11]

> The Air Defense Command program is in an expansion phase. The accelerated effort associated with this phase in both the staff and command elements will not abate until end FY 1959 according to present USAF plans and programs. The supervisory load associated with this expansion is a dual one, [resulting] both from quantitative increases in numbers of units and from qualitative problems in converting to new equipment.
>
> The growing national interest and emphasis on air defense has presented a major problem. A considerable volume of special studies, briefings, program changes, conferences, and test participation over and above normal requirements for such staff actions are the direct result. A constant stream of high ranking military personnel and civilian dignitaries arrives at this and subordinate

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headquarters. This is necessary in solving the air defense problem, and represents a workload reflected throughout the Air Defense Command and Defense Force staffs. Our current authorizations are proving inadequate even now to meet these accelerating demands.

Our mission requires continuous coordination with numerous civilian agencies -- nation, state and local, as well as other commands and services. This has been compounded by the creation of CONAD. The comparatively large staff workload resulting from this requirement is unique to this command.

Higher headquarters' approach to the problem was to consider each of the requests contained in the report separately in order to grant early approval of requested increases with which it had no argument. On the requests where USAF needed further information, ADC staff members were called to Washington to defend them.[12] It was a laborious process, but an essential one to making the most of the Air Force's manpower resources in the face of its steadily increasing responsibilities.

By the end of June, the authorized manning for Headquarters ADC had increased by 68 spares over the December 1954 allowance. Authorized strength of the Headquarters at the beginning and at the end of the period, by grade, was as follows:[13]

| Officers: | Dec | June | Airmen: | Dec | June | Civilians Dec | Civilians June |
|---|---|---|---|---|---|---|---|
| Gen..... | 12... | 13 | M/S.... | 130... | 138 | | |
| Col..... | 52... | 54 | T/S.... | 75... | 79 | | |
| Lt Col.. | 89... | 98 | S/S.... | 125... | 130 | | |
| Maj..... | 152... | 159 | A/1.... | 144... | 144 | | |
| Capt.... | 63... | 77 | A/2.... | 56... | 58 | | |
| Lt...... | 4... | 2 | A/3.... | 2... | 3 | | |
| WO...... | 4... | 7 | | | | | |
| TOTAL..... | 376... | 410 | | 532... | 552 | 363... | 377 |

GRAND TOTAL: 7 Dec 54 - 1271
21 Jun 55 - 1339

Change of Commanders. Retirement ceremonies for General Chidlaw, Com-

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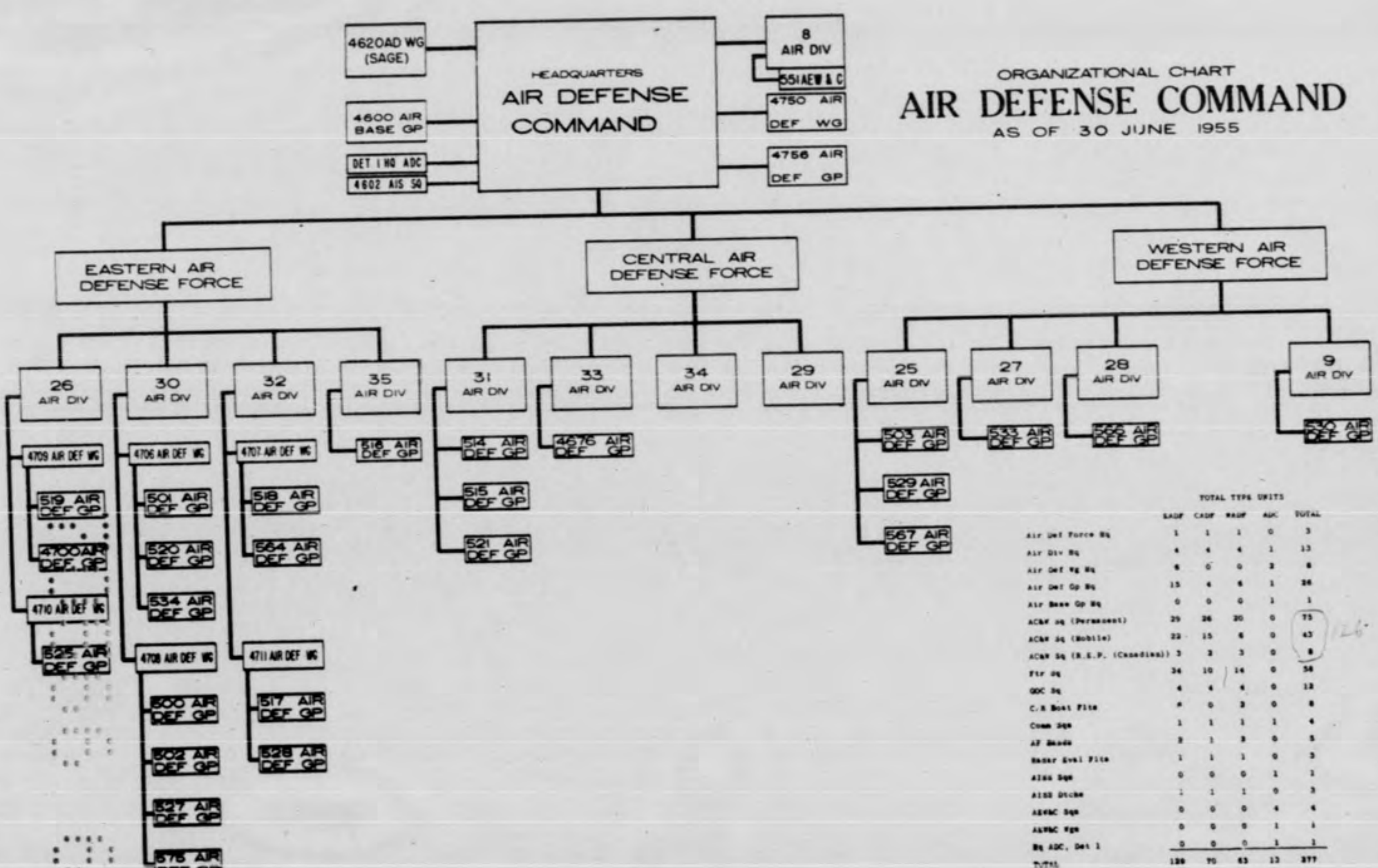
ORGANIZATIONAL CHART

# AIR DEFENSE COMMAND

AS OF 30 JUNE 1955




TOTAL TYPE UNITS

| | EADF | CADF | WADF | ADC | TOTAL |
|---|---|---|---|---|---|
| Air Def Force Hq | 1 | 1 | 1 | 0 | 3 |
| Air Div Hq | 4 | 4 | 4 | 1 | 13 |
| Air Def Wg Hq | 6 | 0 | 0 | 2 | 8 |
| Air Def Gp Hq | 15 | 4 | 6 | 1 | 26 |
| Air Base Gp Hq | 0 | 0 | 0 | 1 | 1 |
| AC&W Sq (Permanent) | 29 | 26 | 20 | 0 | 75 |
| AC&W Sq (Mobile) | 22 | 15 | 6 | 0 | 43 |
| AC&W Sq (R.C.P. (Canadian)) | 3 | 3 | 3 | 0 | 9 |
| Ftr Sq | 34 | 10 | 14 | 0 | 58 |
| GOC Sq | 4 | 4 | 4 | 0 | 12 |
| C.R Boat Flts | 6 | 0 | 2 | 0 | 8 |
| Comm Sqs | 1 | 1 | 1 | 1 | 4 |
| AF Bands | 2 | 1 | 2 | 0 | 5 |
| Radar Eval Flts | 1 | 1 | 1 | 0 | 3 |
| AISS Sqs | 0 | 0 | 0 | 1 | 1 |
| AISS Dtchs | 1 | 1 | 1 | 0 | 3 |
| AEW&C Sqs | 0 | 0 | 0 | 4 | 4 |
| AEW&C Wgs | 0 | 0 | 0 | 1 | 1 |
| Hq ADC, Det 1 | 0 | 0 | 0 | 1 | 1 |
| TOTAL | 128 | 70 | 63 | 13 | 277 |

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mander of the Air Defense Command since April 1951 and the first Commander-in-Chief of the Continental Air Defense Command, were held at Bolling Air Force Base on 31 May 1955.[14]

His 37 years of military service, "17 of them at full throttle," as he put it, had finally begun to have an "inevitable impact" on his health, he said.[15] Consequently, he felt that his application for retirement was in the best interests of the USAF.

"I am proud to have had the privilege of serving as your Commander, and shall remember you with respect and deep affection," he told the men and women of CONAD on the eve of his departure.[16] They, in turn, appreciative of what it was like to have held responsibility for defending the nation against air attack through four crucial years, would long remember him with equal respect.

General Earle E. Partridge, who had commanded the Fifth Air Force during the Korean War and was currently serving as Commander of the Far East Air Forces, was chosen as General Chidlaw's successor.[17] He officially assumed command of both the Continental Air Defense Command and the Air Defense Command on 20 July 1955.[18] In the period between General Chidlaw's retirement and General Partridge's arrival, Lieutenant General Stanley R. Mickelsen, ARAACOM's chief commanded the Continental Air Defense Command[19] and Major General Frederic H. Smith, Jr., the Air Defense Command.[20]

Headquarters CONAD. Two Navy officers, two Army officers, and one Marine Corps officer had joined with officers of Headquarters ADC to comprise the Headquarters CONAD staff by June 1955. Colonels Robert S. Dingle, Jr., USA, and Joseph N. Renner, USMC, were serving as assistants to the Headquarters CONAD Deputy for Operations; Commander James C. Huddleston, USN, and Lieutenant Colonel Marcus L. Parson, USA, were on the Directorate of Plans and Requirements staff; and Commander Ralph M. Thudium, USN, was assigned as assistant to the Director of Operational Intelligence.

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These officers, would not be assigned dual-responsibilities. That is to say, they would hold no duties on the Headquarters, Army Antiaircraft Command and the COMNAVFORCONAD staffs.

Headquarters ADC. Two directorates were eliminated from the Headquarters ADC staff structure during the period by a combining of staff functions.

On 3 January, the Directorate of Plans and Hospitalization and the Directorate of Medical Staff and Education under the Command Surgeon's Office were abolished and the Directorate of Medical Administration created to handle both functions. In early February, the functions of the Directorate of Personnel Plans and Research and those of the Directorate of Training were combined under a new Directorate of Personnel Requirements and Training. While the changes did not result in a savings of personnel, they did improve the efficiency with which the several functions were conducted.

Redesignation of Alternate Command Posts. On 15 May, previous instructions establishing the JEADF/EADF Headquarters at Stewart Air Force Base, New York, as the alternate command post for Headquarters CONAD and Headquarters ADC in the event of the severance of communications between Colorado Springs and the field organizations in an emergency were rescinded. On the same date, the JEADF/CADF Headquarters at Grandview Air Force Base, Missouri, was designated the alternate command post.[22]

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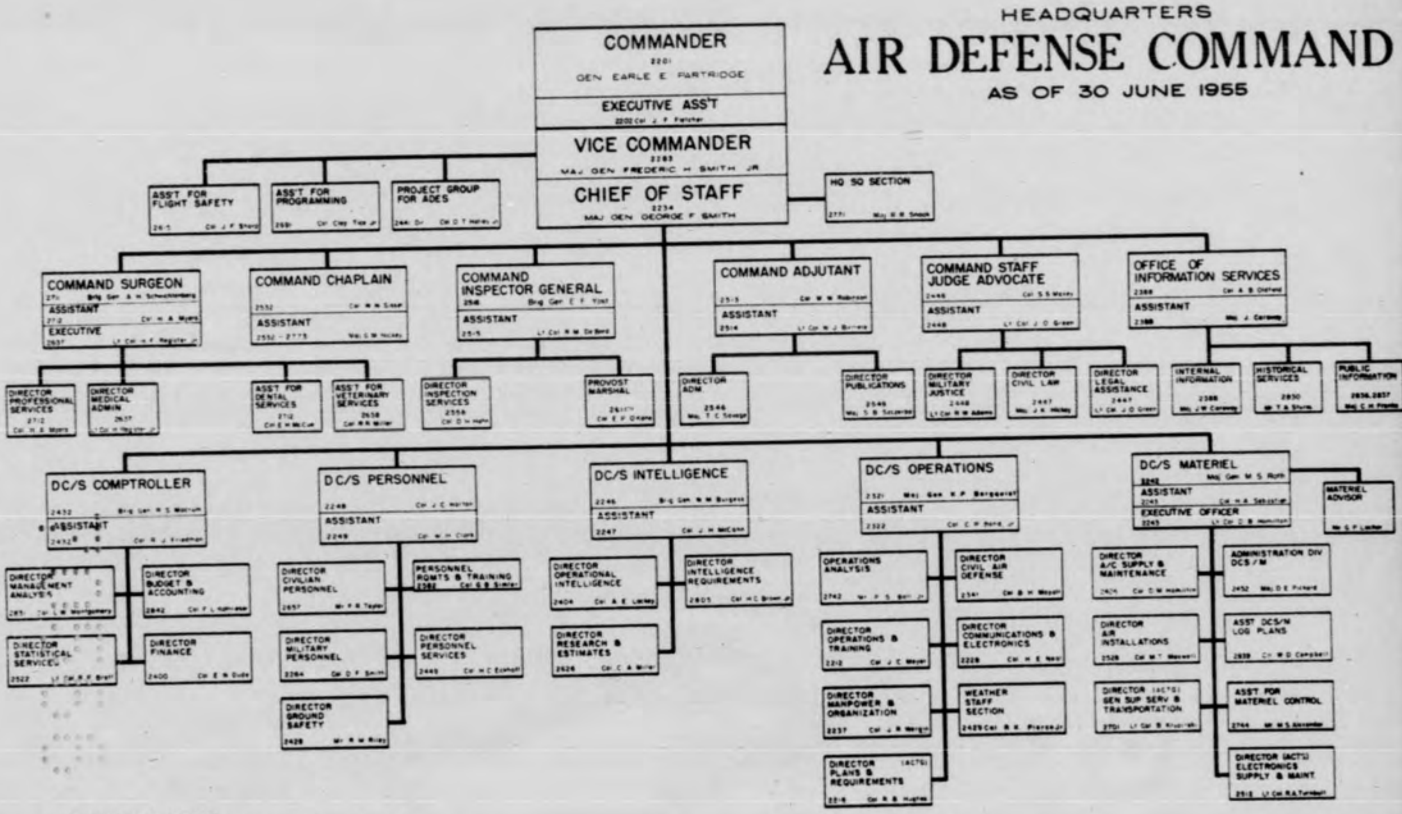
HEADQUARTERS

# AIR DEFENSE COMMAND

AS OF 30 JUNE 1955




NUMBERS ARE TELEPHONE EXTENSIONS

SOURCE: ROSTER OF COMMANDERS AND PRINCIPAL STAFF OFFICERS, RCS: AF-P4(ADC-3)

ADC-1.0

# REFERENCES

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## A NOTE ON THE REFERENCES

This history is accompanied by nine volumes of supporting documents which corroborate statements made in the text and supply additional detailed information on the subjects treated. The documents are indicated in the references by the abbreviation (DOC ) following the citation. A complete set of the supporting documents is available in the office of the Directorate of Historical Services and in the Historical Division of the Air University.

Where a cited document was not included in the supporting documents, the following abbreviations after the citation reveal its location:

(HRF) indicates that the document is either too bulky or of insufficient value to the subject in question to warrant reproduction. Such documents are preserved in the files of the Directorate for ultimate retirement to the Historical Division of the Air University.

(HRF-AU) indicates that the document has been forwarded separately to the Air University through routine inter-command distribution, and has not been attached to the present history. Copies of such documents have also been retained in the files of the Directorate.

(ADC Staff Section) indicates that the document was found in the files of the CONAD/ADC staff section whose name is included within the parentheses. Such documents were not reproduced because they were insufficiently important to warrant reproduction. No copies of such documents are on file in the Directorate.

In some instances, documents cited in the present history were included in the supporting documents to previous histories or studies. Where this was done, adequate reference was made to the work in which they originally appeared.

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## REFERENCES
to
Chapter I

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LIST OF
KEY PERSONNEL

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## KEY PERSONNEL

**30 June 1955**

## HEADQUARTERS CONTINENTAL AIR DEFENSE COMMAND/AIR DEFENSE COMMAND

**Commander-in-Chief (Commander)**
Gen. Earle E. Partridge
**Executive Assistant** Col. John F. Fletcher

**Deputy Commander-in-Chief (Vice Commander)**
Maj. Gen. Frederic H. Smith Jr.
**Assistant for Programming**
Col. Clay Tice Jr.
**Assistant for Flight Safety**
Col. John F. Sharp
**ADES Project Officer**
Col. Oscar T. Halley Jr.

**Chief of Staff**
Maj. Gen. George F. Smith

**Deputy Chief of Staff, Operations**
Maj. Gen. Kenneth P. Bergquist
**Assistant**
Col. Charles R. Bond Jr.
**Assistant**
Col. Robert S. Dingle, Jr., USA*
**Assistant**
Col. Joseph N. Renner, USMC*
**Director Operations and Training**
Col. John C. Meyer
**Director Plans and Requirements**
Col. Robert B. Hughes
**Director Manpower and Organization**
Col. James R. Wergin
**Director Communications and Electronics**
Col. Haskell E. Neal
**Chief Operations Analysis**
Mr. Philip S. Ball Jr.
**Director Civil Air Defense**
Col. Broun H. Mayall
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Col. Harry W. Shoup

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Part II

ORGANIZATION AND RESPONSIBILITY
FOR AIR DEFENSE

March 1946 - September 1955

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## FOREWORD

Within the past nine and one-half years the agency entrusted with the air defense of the continental United States has grown from a third or fourth priority Army Air Forces' organization to a top-priority command directly under the Joint Chiefs of Staff. The object of this study is to trace this growth in terms of the changes in mission, command organization, and area assignments for air defense over these years.

The study is designed to serve as an orientation and reference work. To meet this goal, it was necessary to omit many of the details which a researcher interested in a particular organizational change <u>per se</u> would find most helpful. These details are readily available, however, either in the appended documents or in the referenced semiannual histories. Copies of these may be obtained from the ADC Historical Office or the USAF Historical Division.

Isolating the organizational story from the history of the growth of the radar, fighter and antiaircraft forces was the most difficult problem encountered in preparing the study. To have ignored the influence on organization of the various expedients applied to the build-up of the forces would have been to treat the evolution of the organization in a vacuum. On the other hand, to have made more than the merest reference to the force developments would have led to an obscuring of the central theme.

The usual escape from such historiographical predicaments was attempted. Changes in the forces which resulted in either a reorganiza-

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tion or the formulation of new organizational concepts were briefly discussed. Reference notes were then inserted on where additional information on these particular developments and on the general history of the growth of the forces could be found.

Most of the factual information contained in the study was gleaned from Wing, Air Division, Numbered Air Force, Air Defense Force, and Command semiannual histories. Consequently, whatever merit the study possesses is due in large part to the work of the authors of those volumes.

Appreciation is due, also, to the many staff officers at all echelons without whose unflagging cooperation the preparation of the semiannual volumes and the study would have been impossible.

Notification of suspected or actual errors or misrepresentations in the study will be sincerely appreciated.

Thomas A. Sturm
Directorate of Historical Services

Colorado Springs, Colorado
1 December 1955

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CHAPTER I

# EMERGENCE OF THE MISSION
## 1946-1947

In the War Department changeover to a peacetime establishment in the spring of 1946, the Army Air Forces were organized along functional lines. Since the primary missions of the air arm during World War II had been strategic and tactical air operations and air defense, it seemed to follow that the combat organization of the peacetime air forces should be one which preserved and continued to develop a high capability in these particular and separate "arts".[1]

In keeping with this logic, the Strategic, Tactical and Air Defense Commands were formed in March 1946.[2] The Headquarters Air Defense Command was activated on the 27th at Mitchel Field, New York.[3] Lieutenant General George E. Stratemeyer, of India-Burma-China fame during World War II, assumed command two days later.* Major General Charles B. Stone III was appointed Deputy Commander.

To suffice until conditions permitted the formulation of a more detailed statement of responsibilities, General Spaatz had drawn up a so-called "Interim Mission" for the new organization. The Air Defense Command, it directed, would: "organize and administer the integrated air defense of the continental United States; ...exercise direct control of all active measures and coordinate all passive means of air

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* For a brief biography of General Stratemeyer, see Appendix B.

defense; ...maintain units of the Air National Guard and the Air Reserve in a highly trained and operational condition of readiness; ...[and] perform such special missions as the Commanding General, Army Air Forces may direct.[4]

To discharge these responsibilities, six numbered air forces were scheduled for assignment to the new organization. Two of them, the 1st and the 4th, with headquarters at Mitchel Field, New York, and Hamilton Field, California, respectively, were former members of the Continental Air Forces and were still manned and operational in March 1946. Consequently, they were reassigned immediately to the new Command. The others, however, had to be completely re-formed. Three -- the 10th, 11th and 14th -- were former overseas organizations and had been disbanded at the end of the war. The other, the 2d, had also been part of the Continental Air Forces, but its people had been transferred to the Strategic Air Command in the March reorganization.

Activation and manning of the 10th Air Force was completed in May at Brooks Field, Texas. The 14th was formed the same month at Orlando Army Air Base, Florida. And by the end of the following month, the other two were in operation -- the 2d at Fort Crook, Nebraska, and the 11th at Olmsted Field, Pennsylvania.

The establishment of the geographical areas within which the air force commanders would be responsible for the conduct of the responsibilities set down in the Interim Mission was an easy task. On the orders of higher headquarters, they were drawn to conform to those of the continental armies.[5]

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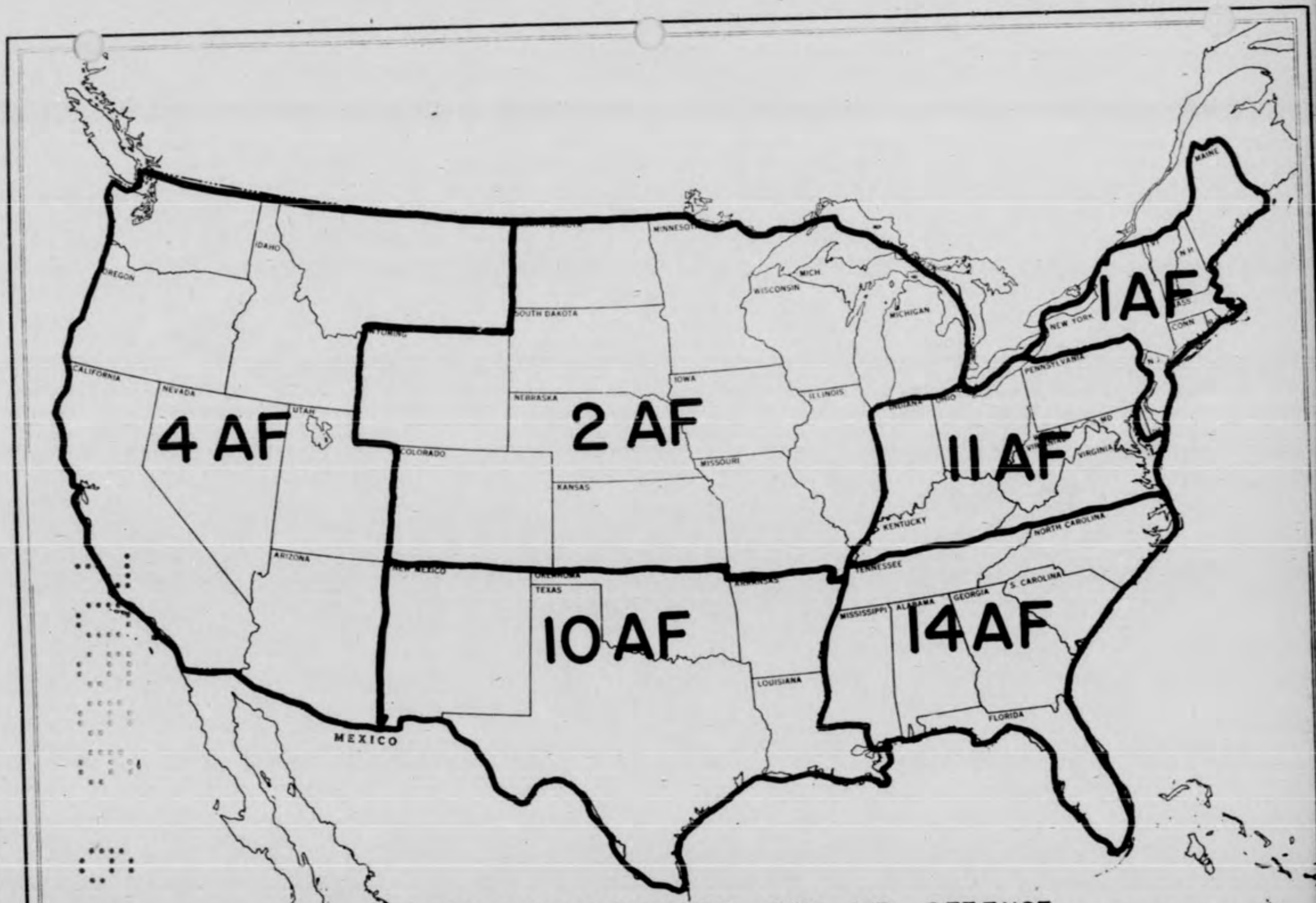


AREAS OF RESPONSIBILITY FOR AIR DEFENSE

APRIL 1946 — JULY 1948

The majority of the tactical forces had gone to the Strategic and Tactical Air Command in the March reorganization, ADC receiving only one fighter group, one night fighter squadron and three or four radar warning and control squadrons. Consequently, until additional forces were assigned, the numbered air forces would have little or nothing to do in the way of actual air defense operations and training.* Anticipating this delay in the air defense program, however, Headquarters AAF had planned from the start to establish ADC as its chief representative in the field on a host of administrative duties.

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* Having been given the responsibility for air defense but no weapons with which to perform his mission, General Stratemeyer early set out to draw plans whereby the Army's antiaircraft weapons and the considerable fighter and radar forces of the sister commands and the Navy might be employed for air defense in an emergency. But it was not clear in the Interim Mission directive just how far he should go in pushing for control of these forces. "Could more explicit information be issued on this score?" USAF Headquarters was queried in May 1946.[6]

"Clarification of responsibilities of Air, Army and Navy commanders as to coordination of defense efforts," that headquarters replied, "is at this time inseparable from the questions of unification of the armed forces and the missions of the land, naval and air forces."[7] In short, higher headquarters intended to pursue a general hands-off policy on the issue of interservice relations for air defense until the air arm became a separate service and could plead its case with a firm voice. So far as the use of the forces of the sister commands for emergency air defense was concerned, higher headquarters would leave such arrangements up to ADC, to be worked out at local level. As events proved, this was tantamount to saying: These organizations are too engrossed in their own manning and materiel problems at this time to devote much time to your problem.

Shortly after this interchange, General Eaker informed General Stratemeyer that until a doctrine for the employment of the forces of the three services for emergency air defense was settled on, ADC would take "immediate and independent action" in the event of air attack.[8] On 17 July 1946, General Stratemeyer delegated this independent action" authority to his numbered air force commanders. Within the confines of this policy, he and his field commanders were responsible for air defense of the nation in an emergency over the next year and one-half.[9]

On 5 June 1946, higher headquarters explained in further detail ADC's responsibilities toward the reserve forces, as stipulated in the Interim Mission directive. In the future, the new instruction stipulated, ADC would fulfill the Army Air Forces' obligations to the Air Reserve and Air National Guard regardless of the role particular reserve organizations were destined to fill on the outbreak of hostilities.[10] The magnitude of this assignment is best illustrated by the fact that some five years later it became the primary mission of a major Air Force command.

The following month, General Eaker verbally assigned General Stratemeyer the mission of serving as the administrative contact between Army Air Forces Headquarters and the Army, Naval Sea Frontier and Naval District commanders, and civilian agencies.[11] It was to facilitate the conduct of this mission that the numbered air force boundaries had been made identical to the continental Army boundaries. This assignment, too, was a large order, and, as the histories of the numbered air forces for these early years relate, engendered a great amount of administrative labor.

In succeeding months, ADC was given responsibility for the Air Reserve Officers Training and Air Scout Programs, the Aviation Cadet procurement program, liaison at ports of embarkation, the operation of overseas replacement depots for Army Air Forces personnel, administration of Army Air Force Extension Course Program, and a score of other such duties.[12] As a result, the title "Air Defense Command," as depictive of the various functions performed by the organization, had become a misnomer by late 1946.[13] In actuality, in terms of field organization and current duties,

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the command had evolved into a sort of administrative extension of Headquarters Army Air Forces.

In October 1946, higher headquarters replaced the interim mission orders of the Strategic and Tactical Air Commands with formal mission directives. But none appeared for the Air Defense Command. Anxious to obtain an equally firm and detailed statement of his responsibilities, General Stratemeyer, in early 1947, prepared what he felt was an adequate document of this sort and sent it forward for signature.[14] General Spaatz, however, refused to sign it. The Air Defense Command would have to continue to struggle along as best it could under interim orders until the air arm achieved independence. Not until this time could work begin in earnest to obtain a firm statement from the Joint Chiefs of Staff on the Air Force's right to begin actual construction of a peacetime air defense establishment.[15]

Consequently, through 1947, the main emphasis within ADC continued to be placed on supervision of the reserve forces programs and conduct of the humdrum housekeeping assignments. In what time remained, General Stratemeyer, his staff, and his field commanders explored the several avenues of approach to the creation of an active air defense system toward the day when the wraps would be taken off their combat mission.[16]

The waiting period for a clear statement on the Air Defense Command's reason for being began to draw to a close in mid-1947. Following the passage of the National Security Act in July, which established the Air Force on a co-equal basis with the Army and the Navy, ....

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complete restudy of the air defense problem was begun in Headquarters United States Air Force. Then, at a meeting in the Pentagon on 16 October, General Spaatz informed General Stratemeyer that beginning at once more emphasis would be placed on the air defense mission.[17] In evidence of this, the formal mission directive for which the command had been waiting since mid-1946 (Air Force Regulation 20-13) was issued on 19 December.[18] While specifying that the Air Defense Command would continue to discharge the reserve forces and other missions which it currently held, the directive further stipulated that air defense was to be the command's "chief mission."

Some two months later, at the Key West Conference of 11-14 March 1948, the other two services put their stamps of approval on the Air Force's air defense responsibilities as set down in the 19 December directive. Henceforth, it was agreed, air defense, to include the establishment of an operational peacetime system comprised of radars and interceptor aircraft and incorporating Army antiaircraft and Navy forces on a coordinated basis, would be a primary function of the United States Air Force.

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# CHAPTER II

## BIRTH OF THE ACTIVE AIR DEFENSE SYSTEM
## 1948

### The Requirement for an Operational Air Defense System

The elevation of the Air Force to equal status with the other services, and the clarification of the Air Force's mission with regard to air defense at Key West opened the door to the construction of a radar net and the creation of an operational air defense system within the United States. The Air Defense Command, however, remained practically destitute of tactical forces. Even with the receipt of its projected force increases it would still be unable to carry out its mission.* Clearly, before construction could start on the air defenses Air Force manpower and materiel authorizations had to be expanded. But Congress was slow to accept the justification for such action.

The long and the short of the situation in early 1948 was that Congress was not convinced of the need for a peacetime air defense establishment. Was not the United States the sole possessor of the atom bomb? Was not the Strategic Air Command powerful and capable enough to deliver the bomb at the least sign of hostile intent on the part of the

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* In a briefing on ADC organization and mission for the Assistant Secretary of the Defense Department in early 1948, General Stratemeyer pointed out that under current Air Force allocations four fighter groups and two aircraft control and warning groups were allotted ADC. This, he said, was "a hopelessly inadequate force to afford any acceptable degree of security."

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Soviets? And had not Dr. Vannevar Bush and other eminent scientists predicted that it would be about another six years before the Soviets developed their own bomb? Then why the commotion over an air defense system? The nation should be certain that one was needed before spending vast sums on it.

The major defect in this logic, in the eyes of General Stratemeyer, his staff, and those acquainted with air defense requirements in higher quarters, was that an air defense system was not something which could be thrown up overnight. The British experience in World War II had shown that air defense was an exceedingly complex operation and required large numbers of skilled radar operators, radar technicians, controllers, and pilots familiar with the hazards of night and inclement weather operations. These men had to be trained before the outbreak of hostilities. General Stratemeyer and his superiors in Washington reasoned, therefore, that an interim air defense system -- comprised of radars, aircraft, stations, and airbases at hand -- had to be erected immediately to train on and to provide a modicum of protection. At the same time, research and development and new construction had to begin immediately on the communications, electronics, weapons and bases which would be required to mount a defense of the nation when the Soviets had developed the A-bomb and the means to deliver it.

## Genesis of the Radar Warning and Control Net

Late in 1947, Headquarters USAF, in keeping with General Spaatz' promise to place greater emphasis on air defense, had drawn up plans for the construction of 223 radar stations in the United States and 37 stations

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Lieutenant General George E. Stratemeyer.
Commander, Air Defense Command: March 1946-November 1948
Commander, Continental Air Command: December 1948-April 1949

in Alaska. This ambitious program, fittingly labeled SUPREMACY, was submitted to Congress for approval and funding in April 1948. There, as a reflection of the general apathy toward air defense which marked the times, it eventually died on the vine.[1]

Meanwhile, General Stratemeyer had to decide how best to employ the few forces assigned him for carrying out the jobs set down in the 19 December 1947 mission directive. The only radar organization in the Command was the 505th Aircraft Control and Warning Group which had been activated in May 1947 and assigned command of the paltry radar resources in the Northwest.[2] Headquarters of this organization was at McChord Air Force Base. By early 1948 it had one radar station in operation for training purposes at Arlington, Washington, north of Seattle, and commanded a total of four undermanned squadrons. General Stratemeyer's plan was to move this unit to the New York area, the section of the nation which he and the Pentagon regarded as most sensitive to air attack, and there, by July of 1948, to set up an experimental air defense system.[3]

In March, the 505th was packed and ready to move to its new location when an order came down from Headquarters USAF to establish immediately an active air defense system in the Seattle-Pasco area. While there was no indication that the Soviets were actually mounting an attack against the United States, international relations were strained to the point where the outbreak of World War III seemed imminent.*

This, then, was an emergency, not a maneuver directive.[4]

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* See <u>Forrestal Diaries</u>.

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At once, General Stratemeyer ordered Major General John E. Upston, the 4th Air Force Commander and the officer charged with the air defense of the West Coast, to place the radar station at Arlington on twenty-four hour operations immediately. In addition, he was directed to locate radar stations about Spokane and Hanford on the western slope of the Cascades, and to integrate these stations into a twenty-four hour operational air defense system. To provide fighter strength, the Tactical Air Command's 27th Fighter Wing was flown into McChord from Kearney, Nebraska. By 12 April, the Northwest Air Defense Wing, under the 27th Wing's commander, had been set up to assume control over the radar and fighter forces in the area.[5]

Similar emergency action was taken on the East Coast. On 9 April, Major General Robert M. Webster, Commander of the 1st Air Force and responsible for the air defense of the Northeast, was directed to take immediate action to prepare to reoccupy World War II radar sites at Roslyn and Montauk, on Long Island, and Palermo and Twin Lights, in New Jersey.[6] This was an even more difficult order to execute than the one given General Upston; no radar forces at all were assigned the 1st Air Force and General Webster's instructions were to create them from within his currently assigned resources.

By mid-April, the crisis had blown over and the pitiful display of strength evidenced by the Air Defense Command during the course of it was soon forgotten by political Washington (if, indeed, it had ever been noticed). Consequently, when Colonel Hobart Yeager, the Air Defense Command's communication chief was told in Washington that the "heat was off," there was nothing to do but dismantle the Northwest Air

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Defense Wing and return the Tactical Air Command forces to their home bases.

Until it received instructions to do so, however, ADC was not going to close out the radar stations which had been so painfully maintained during the affair. The 505th was now operational with several stations on the West Coast. And the 1st Air Force was forming the 503d Aircraft Control and Warning Group to assume command over the radar stations set up on the East Coast during the emergency.[7*] Why not keep both nets in operation, so far as current manpower resources permitted, until orders came down to tear them out? Accordingly, Generals Upston and Webster were permitted to relax their twenty-four hour schedules, but directed to keep the radar stations in operation to the best of their capacities.[8]

On 23 April, higher headquarters confirmed this decision. Lieutenant General Lauris Norstad, Deputy for Operations of Headquarters USAF, instructed General Stratemeyer to establish aircraft control and warning systems in the Northwest, the Northeast, and the Albuquerque, New Mexico areas, in that priority.[9]

Thus, as the result of the agreements reached at Key West the preceding month, USAF Headquarters finally could issue General Stratemeyer specific orders on when, where, and how the active air defenses were to be initially constructed. This was a turning point of no small consequence in the history of the Air Defense Command. While funds were not available for the build-up of the stations already in operation and for

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* The 503d was officially activated on 30 April 1948.

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the construction of additional stations right away, General Norstad was optimistic that the Pentagon would soon be able to raise them. It was a small start, certainly, but the creation of a radar warning and control network, the first ingredient of an air defense system, had begun at last.

## Reorganizing for Active Air Defense

By the time this authority was received to begin construction of active air defense systems, General Stratemeyer had readied a plan for reorganizing ADC along lines better fitted for air defense. The breakdown of the command into six numbered air forces, whose boundaries coincided with those of the six continental armies, was a suitable arrangement so long as the conduct of the "single contact" and other housekeeping missions had been the command's major preoccupations. However, the 19 December 1947 regulation had definitely established air defense as the chief mission of the command and the present organization did not lend itself to the adequate conduct of that duty. The numbered air force boundaries, General Stratemeyer believed, should be arranged so that one commander was responsible for the air defense of the whole of a particular target complex, regardless of whether the air defense boundary coincided with an Army boundary or not.

Following the issuance of the formal mission directive in late 1947, General Spaatz gave General Stratemeyer permission to organize his command in the manner which he believed to be best suited for carrying out the functions set down in that regulation.[10] Accordingly, in early 1948, General Stratemeyer requested permission to reduce the numbered air

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forces from six to four and realign the air force boundaries according to his principle of concentrating the whole of a target area under the responsibility of a single Air Force commander. "Four air forces, each controlling a specific geographical area of related strategic importance, [would] prove more effective than the six air forces maintained previously," he believed.[11]

He also asked for the transfer of Headquarters ADC as soon as possible "to a locality that is suitable and acceptable as the site of the headquarters of the commander charged with the overall defense of the United States." The locations where he would have moved it, in order of priority, were St. Lous, Kansas City, Indianapolis and Louisville.[12]

In early June 1948, General Norstad wrote General Stratemeyer that Headquarters USAF had approved both requests and asked him to pick the new site for the Headquarters. However, General Norstad added, actual movement of the Headquarters would have to be postponed until additional funds were obtained.[13]

The reorganization went into effect on 1 July 1948.[14] The 11th and 2d Air Forces were inactivated and their personnel reassigned to the remaining Air Forces. The 10th Air Force then moved up to take over the area formerly watched over by the 2d. The 1st and 14th Air Forces moved into the area vacated by the 11th and 10th.*

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* During the preliminaries to the reorganization the Department of the Army had successfully swung Headquarters USAF over to its belief that the Continental Army-Numbered Air Force boundaries should and could still coincide even with the reduction in the total number of Air Forces. The Army's point was that if each of its commanders had to do business with more than one Air Force commander, an unnecessary number of administrative problems would arise. General Stratemeyer acceded to the Army's wishes.

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## Organization for Air Defense Below Numbered Air Force

The stringent manpower ceiling under which the Air Force had been forced to operate and the conviction on the part of many officers that the commander responsible for the air defense of an area should be as free as possible of detailed, administrative and logistic worries appear to have been the prime motivating factors for the form of organization which evolved below numbered air force level around mid-1948.

Upon the termination of the March 1948 "crisis", the Northwest Air Defense Wing was disbanded. From that time until late 1948, responsibility for the defense of the areas in which the radars and fighters were deployed did not extend below the 1st and 4th Air Force commanders. The reason for this was quite simple: there was no one to whom it could be delegated. The radar stations were assigned to the aircraft control and warning groups and the fighter squadrons to the fighter wings,* with both the groups and wings assigned on the same line

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(con't from previous page) except in the case of Michigan. He regarded that State as part of the general Northeast defense complex and had recommended that it be assigned to the 1st Air Force. The Army, for the reasons given above, wanted it to be assigned to the 10th Air Force. USAF Headquarters sided with the Army and the reorganization which went into effect on 1 July saw Michigan assigned to the 10th Air Force. At this point, General Stratemeyer drew up a strongly worded defense of his original position. Administrative convenience, he said, should be subordinated to the "dictates of efficient air defense."[15] In August following, USAF Headquarters reversed its position and Michigan went over to the 1st Air Force.

* The Wing-Base organization was instituted Air Force-wide in July 1948 (AFR 20-15). Prior to this date, in the Air Defense Command, the basic unit for the fighters had been the group. Following this change, the Wing became the basic unit. It was comprised of a tactical group, to which the tactical squadrons were assigned, and three support organizations -- a maintenance and supply group, an air base group and a medical group.

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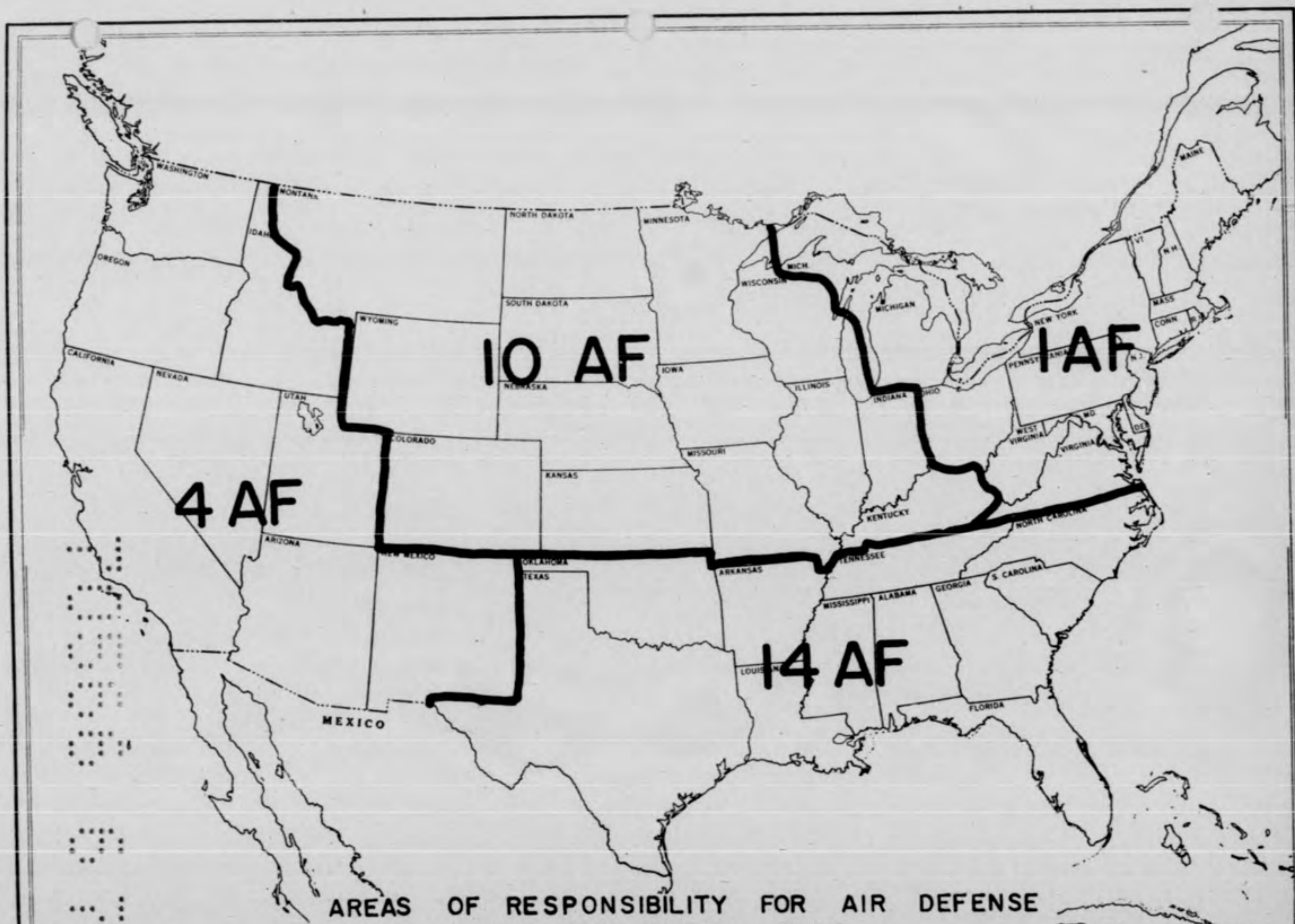


AREAS OF RESPONSIBILITY FOR AIR DEFENSE
JULY 1948 — MARCH 1949

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of command to the numbered air forces.

To remedy this situation, it was decided in late April or May 1948 to activate small, operational-type headquarters under the numbered air forces and make them responsible for the air defense of sub-areas* within the numbered air force areas. Assignment of the tactical forces would remain with the radar groups and fighter wings, who would oversee their administration, supply, and proficiency training needs. Training of the tactical forces in air defense operational procedures, however, would pass to the new units. All three organizations -- radar groups, fighter wings and the new organizations -- would be assigned on the same level of command to the numbered air forces.

The name given to these small, operational headquarters was Air Division (Defense).** No indication as to the thinking in mid-1948 concerning how many of these organizations would be required appeared in the available documents. Since the Air Defense Command was already reconciled to the fact that the SUPREMACY plan for additional radar forces would be rejected, it is probable that no specific plans were made in this regard.

In the "Department of the Air Force Troop Program," issued on 1 June 1948, two air divisions were programmed for activation and

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* As is told in the next chapter, these areas eventually came to be termed air defense "sectors."

** The organizations were initially designated Air Defense Divisions. The change to Air Division (Defense) was made on 20 June 1949 to conform more to common Air Force organizational terminology. Throughout the study they will also be referred to either as Air Divisions or, simply, Divisions.[16]

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assignment to the Air Defense Command. One was to be activated in the Northwest in late September 1948,[17] the other in the Northeast in late 1949. In keeping with this schedule, the 25th Air Division was formed at Silver Lake (Everett), Washington, on 25 October 1948 and assigned to the 4th Air Force.[18] Because the radar net in the Northeast grew faster than originally expected as the result of an increase in construction funds in late 1948, ADC sought and received permission from higher headquarters to activate the division in that area a year ahead of schedule.[19] Thus, the 26th Air Division was born at Mitchel Air Force Base on 16 November 1948, assigned to the 1st Air Force, and moved to Roslyn, on Long Island, soon after.[20]

## Expansion of the Radar Warning and Control Net

The 80th Congress adjourned in 1948 without acting on the SUPREMACY proposal. To USAF Headquarters, it seemed unlikely, in mid-1948, that the next session of Congress would be any more amenable to the plan than its predecessor was. While the troubles with Soviet Russia in early 1948 had convinced the legislators of the need for some air defense, they still did not believe that the situation demanded an all-out and exceedingly expensive program such as SUPREMACY called for. In short, Congress' objection seemed not to be that the Air Force had asked for funds with which to create a radar net but that it had asked for too much.

Accordingly, the Air Force lowered its sights in the fall of 1948. Major General Gordon P. Saville -- probably the foremost expert on air defense on the Headquarters USAF staff due to his extensive World

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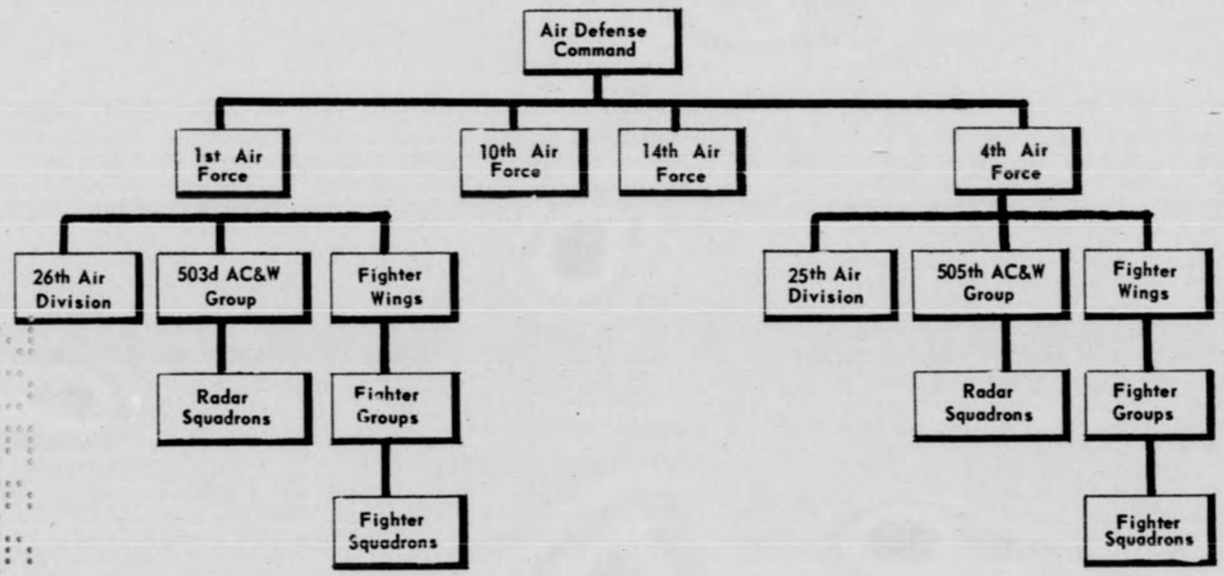
## ORGANIZATION FOR AIR DEFENSE

November 1948



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War II experience with the subject, and, in the postwar years, a leading figure in the drive for an operational, peacetime air defense system -- briefed Secretary Forrestal on the Air Force's revised approach in September.

General Saville called the new plan the Interim Program. The Air Force was asking the Defense Department to submit it to Congress for approval and funding, he said, because "immediate and positive action is required to start at once on the establishment of a limited air defense in being...." In brief, the Interim Program, was "designed to constitute the initial phase of Project SUPREMACY or of any other over-all air defense plan for the Continental U. S. and Alaska which may be finally approved."[21]

The plan, "to avoid any possible objection...on the grounds of magnitude, cost or possible interference with important development or research to produce better equipment," called simply for the deployment of radars currently on hand or under procurement from funds already appropriated. All told, the Air Force had 61 search radars which fell into one or the other of these two categories. There were five obsolescent but usable radars presently on site in the Northwest and Northeast and 19 other radars of this type in storage. In addition, the Air Force had under procurement 12 CPS-6s and 25 FPS-3s, the latest design in search radars, which would be completed and ready for use in 1949 and 1950.

Thus, the Air Force already had the radars with which to build an air defense system. It also had the troops and the ancillary communications equipment. The hold-up was, and had been, in authorization and funds for the construction of facilities.

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Under the Interim Program, the Air Force was asking for $45 million in FY 1949 to begin construction on 61 stations for the radars and for ten control centers from which area (Division) commanders could direct operations. To obtain these funds, the Air Force recommended that $706,000 be diverted immediately from lesser and already funded Air Force projects and that a supplemental appropriation of $44,300,000 be submitted as soon as Congress convened.

When completed, General Saville pointed out, the Interim Program would still not afford even a minimum defense. Consequently, the Air Force, in its FY 1950 estimates, had included a request for funds to procure additional radars of the CPS-6 type, build stations for their operational employment, and procure modern height-finders. This program was called the "First Augmentation."

Congress approved both the Interim Program and the First Augmentation in March 1949 and the necessary funds for their implementation were received later in the year. Soon after the passage of this legislation, the name Permanent Radar System (P-system) was affixed to the facilities authorized for construction by the terms of these programs, which, as finally approved, totaled 75 radar stations and ten control centers. Originally scheduled to be finished by July 1951, the P-system was not fully in operation until early 1953, due primarily to delays in the procurement of the radar equipment.

Meanwhile, USAF Headquarters had decided that while the P-system was being built a temporary aircraft control and warning system, consisting of World War II radars sited on government-owned land, would be

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erected. Action toward this end had already begun in the Northwest and Northeast. The additional radars required to expand the net were already on hand. All that was needed now were funds for construction. On 20 October 1948, General Stratemeyer was informed that $561,000 had been pulled off other projects for initiating construction of the emergency net and that he was to proceed immediately on the selection of sites.[22]

The location of the stations of the temporary net had been decided on and many of the stations already placed in operation by early 1949. To differentiate the stations and equipment of this system from those of the P-system, it was termed the Lashup radar net. By July 1950, 44 Lashup stations were in operation. While a few minor changes in location and equipment took place within the network afterwards, the Lashup system was regarded as completed as of that date. When stations of the P-system began to come into operation in late 1950, the stations of the Lashup net were gradually disbanded.



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## CHAPTER III

## POOLING THE RESOURCES
## 1949

<u>Creation of the Continental Air Command</u>

The Air Defense Command was barely settled under the 1 July 1948 reorganization when higher headquarters announced its intentions to merge the resources and functions of the Air Defense and Tactical Air Commands under a new major Air Force organization -- the Continental Air Command (ConAC).[1] The new command was created on 1 December 1948, with Headquarters at Mitchel Air Force Base.[2] At this time, the Air Defense and Tactical Air Command Headquarters were shorn of their subordinate units, reduced in stature to so-called "Operational Air Commands," and placed on equal command line with the six numbered air forces.* The tactical forces were then assigned to the numbered air forces.

The decision to form the new organization was a sudden one and derived its stimulus from the Presidential Directive of 15 October 1948 which ordered that a strong impetus be given to the organization and training of the Civilian Components. In the reorganization, the offices at Command and numbered air force level whose duties were to

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* In the reorganization, the two former Tactical Air Command air forces, the 9th and the 12th, were relieved of their former missions and assigned the same geographical functions as the four former Air Defense Command air forces.



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supervise Air Reserve and Air National Guard activities were increased in size and importance to bring greater attention to bear on reserve affairs in line with the President's instructions.[3]

An equally important rationale for the reorganization, however, was to strengthen the air defenses by pooling practically all of the fighter resources in the Zone of the Interior in the hands of the air defense commander.[*] By the same token, this same force would be prepared to assume a tactical air role immediately after the air defense battle was won. In short, the goal was the development of a multi-purpose fighter force.[4]

The staff of the headquarters of the new command was formed almost wholly from the staff of the former Headquarters Air Defense Command. General Stratemeyer assumed command on 1 December 1948. General Saville, who had spearheaded the drive for the P-system, was appointed commander of the Air Defense Command on the same date.[**] Major General Robert M. Lee assumed command of the Tactical Air Command.

## The Plan for Air Defense Under the Continental Air Command

The mission directive for the Continental Air Command was issued on 11 January 1949.[5] The new organization was to conduct the active air defense of the United States, cooperate with land and amphi-

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* A number of the Strategic Air Command fighter squadrons were also transferred to the Continental Air Command in the reorganization.

** For a brief biography of General Saville, see Appendix B.

(b)(1) [redacted]

Major General Gordon P. Saville
Commander, Air Defense Command: December 1948-September 1949

bious forces, supervise the Air Force reserve programs, and ready all forces under its jurisdiction for combat. The numbered air forces would be responsible for the administration, training and logistic support of the tactical forces. The Air Defense and Tactical Air Commands would "act as operational command headquarters for their respective tactical functions, within the framework of the Continental Air Command, and [would] also act as the staff of the Commanding General, Continental Air Command, for their respective tactical functions."

Thus, General Stratemeyer, in his new capacity as the Continental Air Command commander, would remain in supreme command of the air defenses. However, instead of delegating this authority to the numbered air force commanders, as before, he would invest it in an operational hierarchy to be established under General Saville's Air Defense Command. The concept of separating administrative and logistic responsibilities from operational responsibilities for air defense was not a new one, having received practical application months earlier when the plan for establishing the air divisions was drawn up. Under the new scheme of things, the concept was merely to be extended up the chain of command.*

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* The mission directive for the Air Defense Command (ConACR 25-1) was issued on 31 Dec 49. By its provisions, the Air Defense Command was responsible for the following: (1) Continue to plan in preparation for the conduct of active air defense of the United States; (2) Conduct the active air defense of the continental United States with the means made available by the Commanding General, Continental Air Command; (3) Prepare for the employment of such units of the Army and Navy as may be made available for direct defense of the United States against air attack; (4) Prepare and conduct USAF operational participation in civilian defense in connection with an air attack on the conti-

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The plan for air defense under ConAC retained that aspect of earlier air defense planning which called for splitting the nation into a number of air division or "sector" areas of responsibility.* The duties of the division commander and his small operational-type staff would be to assist in planning the defenses of the sector; coordinate with the Army, Navy, and other Air Force organizations in the area for the employment of their forces in an emergency; exercise "operational control" of the radar and fighter forces assigned to the ConAC numbered air forces in their sectors for the purpose of training these forces in air defense tactics and techniques; and, in the event of attack, conduct the air defense of the sector.

To enable the division commander to oversee the air situation in his area, he was to be provided an operations building housing a

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(con't from previous page) nental United States; (5) Recommend policies, plans, doctrine, organization, systems, materiel, tactics, techniques, and procedures applicable to the air defense of the United States; (6) Conduct systematic training of available forces in active air defense; (7) Carry out joint air defense exercises and maneuvers, in accordance with approved plans, utilizing such units of other components of the National Military Establishment as may be made available; (8) Recommend to the Commanding General, Continental Air Command, the allocation and deployment of available force in preparation for and the conduct of the active air defense of the United States; (9) Establish and maintain liaison with Naval sea frontier commanders and numbered Army commanders in joint matters pertaining to the air defense of the continental United States; and (10) Recommend to the Commanding General, Continental Air Command, the proficiency standards and desired capabilities of units to be employed in air defense operations.[6]

* Actually, the terms "sector" and "region" (the latter is used later in the chapter) were not officially incorporated into air defense terminology until mid-1950. However, they were in common usage throughout 1949 and early 1950.

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control center. Battle information from the outlying radar stations would be sent into this center. There it would be displayed for battle control purposes and also forwarded to adjacent control centers and to higher headquarters.

As discussed previously, ten control centers were authorized under the Permanent Radar System. However, under the projected troop program the command would be able to man only eight divisions. Consequently, the Plan was to construct all ten control centers but to subdivide the nation into only eight air division/sector areas for peacetime operations. Upon the outbreak of war, the remaining two centers would be manned by Air National Guardsmen recalled to active duty. Also at that time, an additional ten control centers, manned by Air National Guard personnel, would go into operation. In short, in wartime the nation would be divided into twenty air division/sector areas for air defense.[7]

Between the air divisions and ADC Headquarters, two additional operational headquarters, called the Eastern and Western Air Defense Forces, were to be created. The commanders of these organizations would be responsible for the air defense of a "region," each of which would encompass several division/sector areas, and be provided some sort of facility into which information from the control centers would flow for command purposes.

Atop the whole structure would be Headquarters, Air Defense Command. General Saville, too, would eventually be provided a facility through which he and General Stratemeyer could keep abreast of the state of the air situation in the regions and sectors.

## Transfer of the Air Defense Mission to the Air Defense Command

As previously mentioned, two air divisions -- the 25th at Silver Lake and the 26th at Roslyn -- were activated before ConAC was formed. Both, however, were still little more than paper organizations in late 1948. The plan was to bring these organizations up to operating strength by early 1949 and to assign them to the Headquarters, Air Defense Command.

Also by that time, two interim organizations, called the Eastern and Western Liaison Groups, were to be organized. These would be non-operational agencies, their primary mission being to relieve the numbered air forces of air defense planning responsibilities and to provide an experienced cadre on which the Headquarters, Eastern and Western Air Defense Forces could be formed later in the year when additional personnel were authorized.[8] The commanders of the 25th and 26th Air Divisions would also command the liaison groups during this interim period. These actions completed, the numbered air force commanders were to be relieved of the responsibility for air defense which they had held since 1946. It would then be reinvested in General Saville to be exercised through the air division/liaison group commanders.[9]

The changeover began on 1 March 1949. On that date, the liaison groups were formed by transferring to them the persons who had been assigned to the Directorates of Air Defense in the Headquarters of the 1st and 4th Air Forces. Also on that date, the numbered air forces were completely absolved of further responsibility for air defense.[10] On 1 April, the transition to the new order was completed with the transfer of the two air divisions to Headquarters, Air Defense Command.[11]

Demise of the Headquarters, Air Defense Command

The first step which had to be taken following these changes was to explain how the air defense system would function under the new arrangement. This was done on 24 May in a Continental Air Command regulation defining "operational control" as:[12]

> those functions of command involving the assignment of tasks, the designation of objectives, and the authoritative direction necessary to accomplish the mission. It shall be exercised by the use of the assigned normal organizational units, through responsible commanders. It does not include such matters as administration, discipline, internal organization, logistic support, and individual training, except in such matters as the subordinate commander may request assistance.

The next step was to redraw the areas of responsibility for air defense. This was done on 8 June. The 25th Air Division area of responsibility included everything west of the line running south from the northeast corner of the State of Washington a point mid-way on the eastern border of Oregon, east to Scottsbluff, Nebraska, and south to the Mexican border.[13] The 26th Air Division's area of responsibility encompassed everything north and east of the line extending from Cape Fear in North Carolina, east to Memphis, Tennessee, and north to Houghton, Michigan, on Lake Superior.[14]

The next step was to allocate specific units of the numbered air forces to the operational control of the divisions. At this juncture the original plans for air defense under the Continental Air Command began to fall apart. In late June, General Saville went to Lieutenant General Ennis C. Whitehead,* who had recently replaced General Stratemeyer as the ConAC commander, for permission to grant the 25th Air Division operational control over the 505th Aircraft Control and Warning Group and its radar squadrons. General Whitehead, to whom the very complex organizational structure was still an unfamiliar object, turned to General Upston, to whose Fourth Air Force the 505th was assigned, for his opinion on the request. "It has been our intention to give permanent operational control of the AC&W network to ADC when the network became sufficiently operational and when the ADC was properly organized and sufficiently manned," General Whitehead said. "If such action were taken now, what effect would it have on the Fourth Air Force's ability to train, administer and logistically support existing radar installations and to conduct new stations?"[15]

General Upston replied that operational control of the forces could be given to the 25th without interfering with the 4th's presently assigned mission. However, he felt that the overall arrangement for air defense as recommended by General Saville was not the best answer to the problem of defending the West Coast with the weapons and manpower currently assigned. He believed that he, not the 25th Air Division commander, should be responsible for West Coast defenses, and that the 25th should be attached to the 4th Air Force to execute this responsibility. He would then attach the 505th Group to the 25th and give the Division operational control over the 505th and its squadrons. He would,

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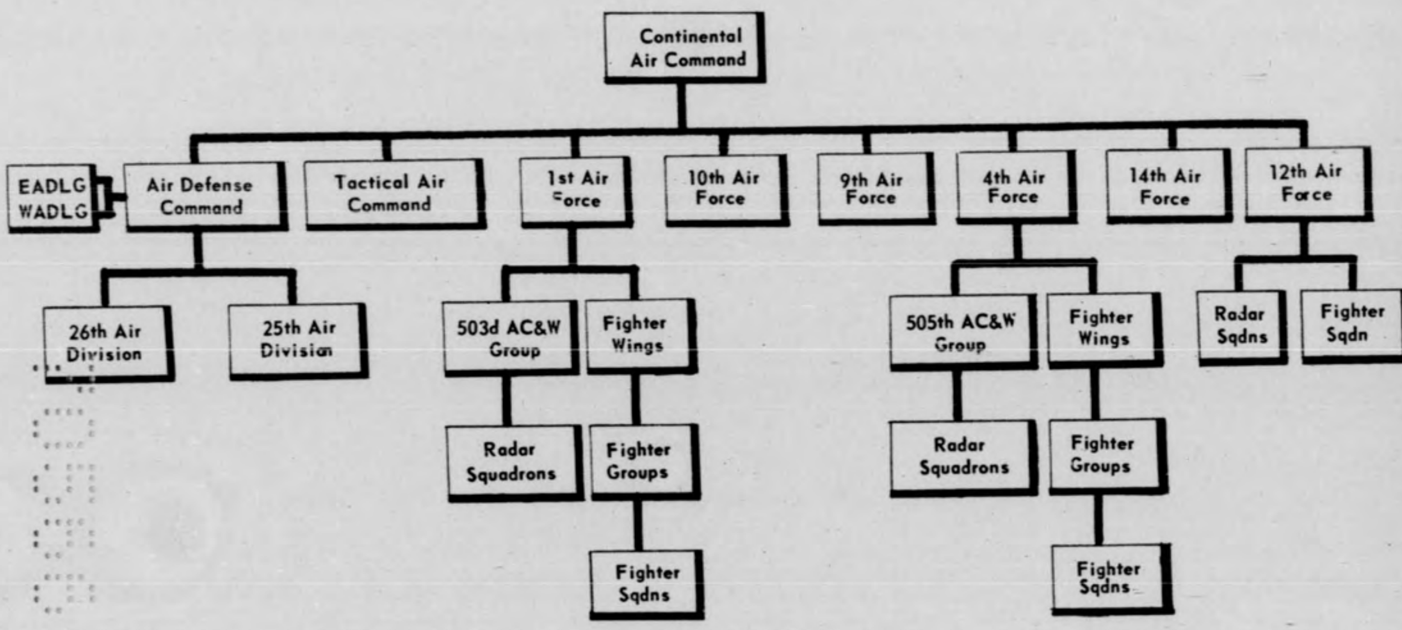
* See Appendix B for a brief biography of General Whitehead.

**ORGANIZATION FOR AIR DEFENSE**

April 1949



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additionally, place a flight of fighter aircraft on continuous alert and under the immediate operational control of the Division.[16]

Caught in the middle of these conflicting views, Colonel Clinton D. Vincent, the 25th Air Division Commander, threw additional fuel on the flames. The letter of 8 June establishing the 25th's area of responsibility made him responsible for the air defense of practically everything in the western half of the United States, he wired General Saville in July. But, he still did not have control over any forces. "Thus," he said, "I have the responsibility but not the tools ...either assign me operational control of necessary units...or relieve me of responsibility for air defense and assign it to appropriate air forces."[17]

This was too confusing a state of things for General Whitehead.[18] After obtaining General Saville's recommendations on the matter, he reassigned the 25th Air Division back to the 4th Air Force on 14 July[19] and made General Upston responsible for the air defense of the California and Northwest areas. At the same time, he made the 12th Air Force commander, Major General Glen O. Barcus, responsible for the air defense of the Albuquerque area. This arrangement, he said, would remain in effect until the Western Air Defense Force was formed "to obviate any misunderstanding as to who is responsible to me for the air defense in the West...."[20]

In the east, the Eastern Air Defense Liaison Group was disbanded and its personnel reassigned to a new organization called the Eastern Defense Division, which was assigned directly to Head-

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quarters, Continental Air Command. Major General Webster, Commander of the 1st Air Force, was appointed commander of the new organization as an additional duty and made responsible for the air defense of the East Coast until the Eastern Air Defense Force could be activated.[21]

The above actions sounded the death-knell to General Saville's Air Defense Command. By them, General Whitehead eliminated the need for an agency between himself and the field commanders charged with the air defense of the specific areas. Consequently, in September, the Headquarters Air Defense Command was reduced to record status. It remained in this state of limbo until 1 July 1950 when, in consonance with the sweeping reorganization of the command which took place at that time, it was completely dissolved.

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* General Saville moved into the Director of Requirements job on the Headquarters USAF staff on 1 September.

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CHAPTER IV

RISE OF THE AIR DEFENSE FORCES
1950

Activation of the Defense Forces

On 1 September 1949, simultaneously with the disappearance of the Air Defense Command from the scene, the two regional commands were activated.[1] The Headquarters of the Eastern Air Defense Force was activated at Mitchel Air Force Base and that of the western command at Hamilton Air Force Base. They were then placed on the same command level as the numbered air forces and the Tactical Air Command, directly under Headquarters, Continental Air Command.

The Headquarters Eastern Air Defense Force was manned by transferring to it the persons formerly assigned to the Headquarters ADC Deputate for Air Defense and the Eastern Defense Division.[2] On the same day it was formed, Major General Webster was relieved of his previous duties as commander of the 1st Air Force and the Eastern Defense Division and appointed commander of the Eastern Air Defense Force as a sole duty. By mid-September, the new command was ready to assume charge of the eastern defenses.

Readying of the Headquarters Western Air Defense Force was a more difficult task. The only immediate source of experienced persons here was the small number of officers formerly comprising the Western Air Defense Liaison Group. As a result, for the first few months following the activation of the new organization General Upston and his

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4th Air Force staff doubled as the staff of the new organization.[3] Finally, by late November, the initial manning problems were overcome, Major General Hugo P. Rush was appointed commander, and the new command was ready to assume responsibility for the western defenses.

## Mission and Area Organization

Tentative instructions were sent to the Air Defense Forces shortly after their activation. The Western Air Defense Force was to be responsible for the area west of the 103° meridian and the Eastern Air Defense Force of the area east of that line. On 2 November, the formal mission directives were issued, confirming the area responsibilities previously delineated and stipulating that the Headquarters Air Defense Forces would discharge their air defense responsibilities by exercising "operational control... of such ...units as may be allocated by the Commanding General, Continental Air Command."[4]

Meanwhile, actions were underway for realigning unit assignments and increasing the number of air division/sector defense areas.

When the Air Defense Forces were activated, the 25th and 26th* Air Divisions, the 505th and 503d Aircraft Control and Warning Groups, and the fighter wings were assigned to the numbered air forces on the same level of command. On 16 November, on the recommendations of General Upston and Colonel Vincent,[6] the radar groups, which were situated on the same stations as the divisions, were assigned to the divisions. At that time, the staffs of the group headquarters and their control

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* When responsibility for air defense reverted to the 4th AF and Eastern Defense Command in mid-1949, the 26th Air Division remained assigned to Hq ADC and was not officially reassigned to the 1st AF until 16 November.[5]

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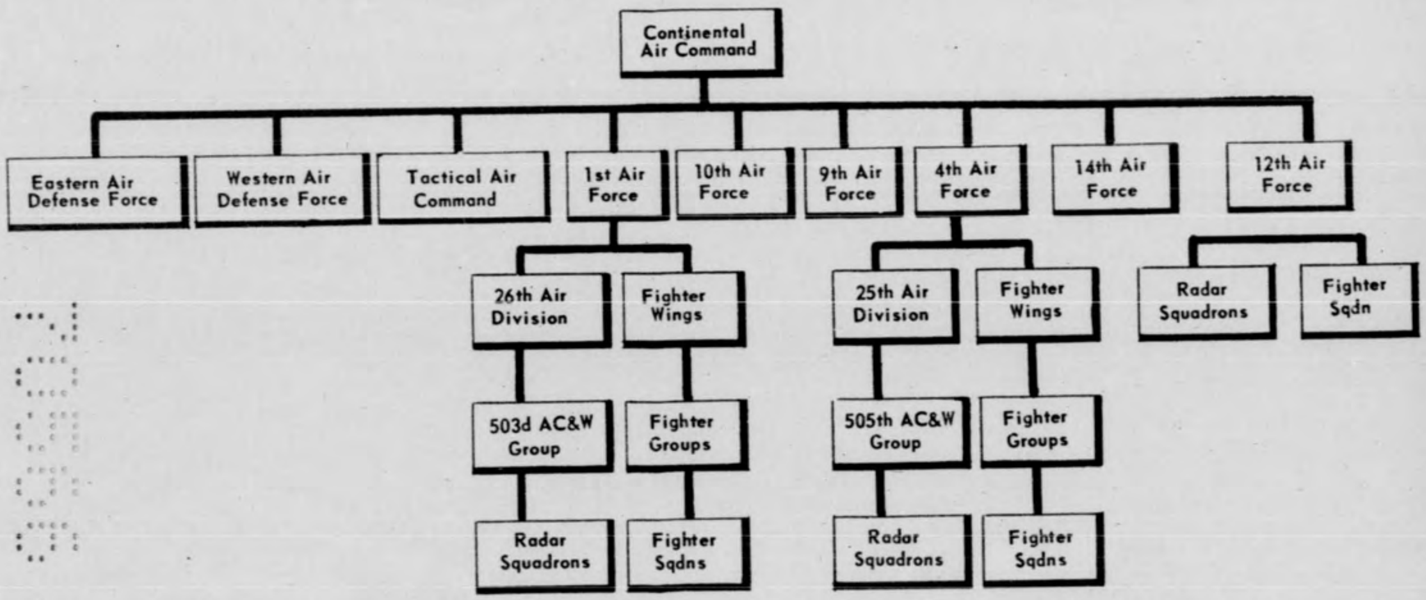
ORGANIZATION FOR AIR DEFENSE

November 1949



squadrons were combined with those of the air divisions to the extent that certain officers carried on the rolls of the groups were assigned key air division staff duties. To all intents and purposes, the three organizations, in the changeover, came to function as one. The result was a greater efficiency of operation plus closer contact between the division commander and the persons responsible for the support of the radar squadrons.[7] A few years later, the groups were disbanded completely. Such action was not considered feasible at this time, however, in view of the uncertainty of future operational requirements.*

By this time, construction of the Lashup radar system had reached a point where the activation of three additional air divisions was deemed necessary under the eight-division peacetime plan for air defense. Consequently, the 32d and 28th Divisions were activated on 8 December at Stewart Air Force Base, New York, and Hamilton Air Force Base, California, respectively. The 30th was activated at Selfridge Air Force Base, Michigan, eight days later.[8]**

The new divisions became operational in early 1950, at which time sector area responsibilities for all five divisions then in exis-

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* The possibility existed that as new radar stations came into being groups would have to be activated on installations separate from the air division installations to provide a proper span of control between the divisions and the stations.

** At the same time these divisions were activated, AC&W groups were activated on the same installations, assigned to the divisions, and the consolidated staff method of operation placed into effect. This system prevailed until the groups were inactivated in early 1952.

tence were established as shown on the following map.[9*]

## The Problem of Divided Control

While the assignment of the groups to the divisions eased the situation in part, the organizational structure at the time responsibility for air defense passed to the Air Defense Forces still remained confusingly complex. The 2 November Air Defense Force mission directives had said that the Defense Forces would exercise operational control over the tactical units assigned the numbered air forces. The questions posed by both the Air Defense Force and the numbered air force commanders in late 1949 were: precisely, what was meant by the term "operational control"? Was it a permanent sort of thing, or was it to be exercised only during maneuvers or an emergency?

ConAC Regulation 25-2, issued in May 1949 while Headquarters Air Defense Command was still in charge of the air defenses, remained the outstanding authority on this subject.[10] As defined in that directive,

> Operational control of units for air defense purposes may be prescribed for a definite or indefinite period of time. Thus, for a training exercise, certain fighter groups, squadrons, or flights, and certain AC&W groups may be placed under the operational control of the Air Defense Command between specific dates, upon termination of which they will revert to normal status wherein complete command and control jurisdiction is exercised by the parent air force; or during emergencies, these units might be placed under Air Defense Command operational control for a period of time not having a prescribed termination date. Normally, all AC&W units will be under Air Defense Command operational control continuously inasmuch as they man and operate the air control

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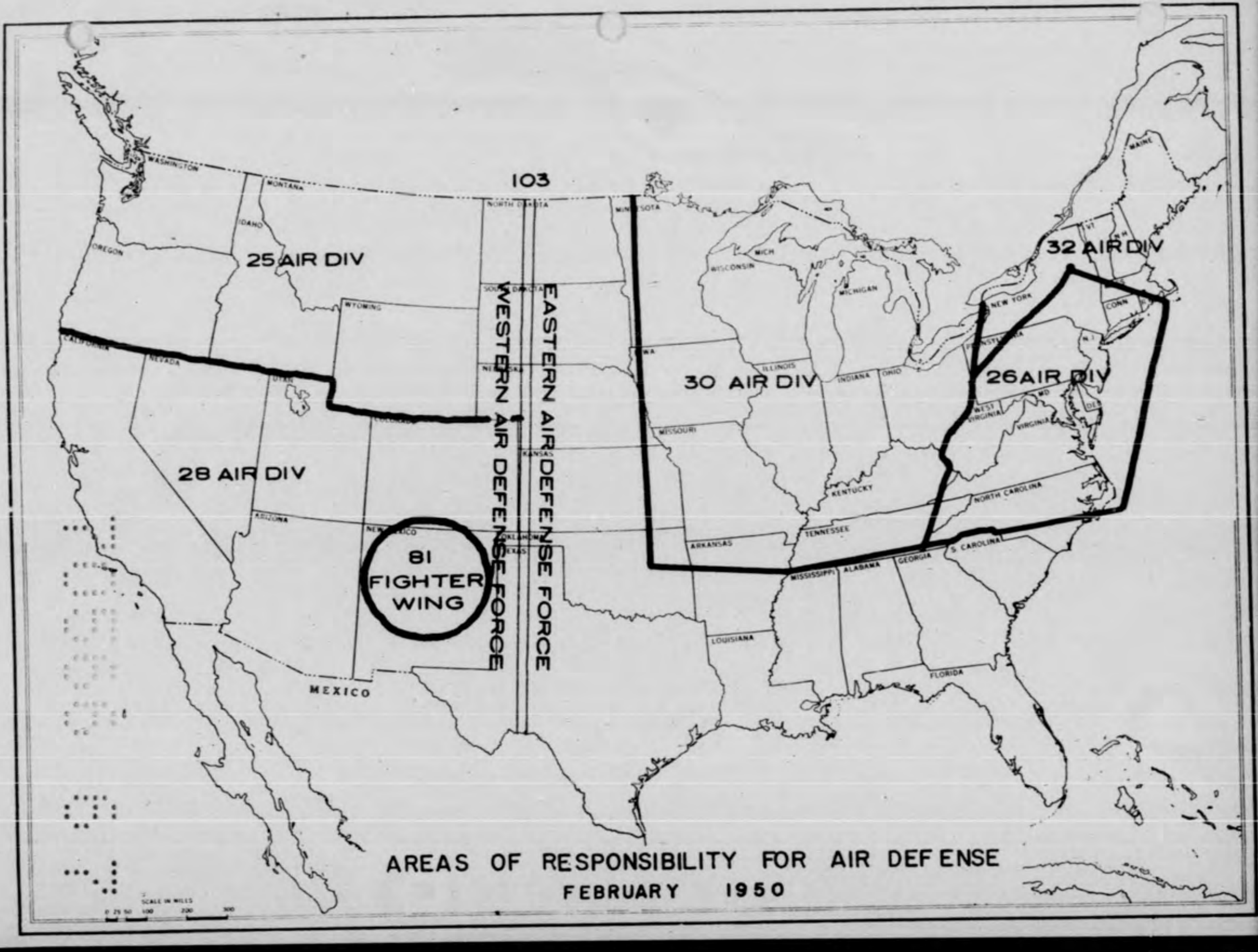
* The radar and fighter defenses in the Albuquerque area at this time were under the operational control of the 81st Fighter Wing Commander, at Kirtland AFB, whose area of defense encompassed roughly the area within a 150 mile radius centered on Albuquerque.


103
25 AIR DIV
28 AIR DIV
30 AIR DIV
32 AIR DIV
26 AIR DIV
81
FIGHTER
WING
WESTERN AIR DEFENSE FORCE
EASTERN AIR DEFENSE FORCE
MEXICO
AREAS OF RESPONSIBILITY FOR AIR DEFENSE
FEBRUARY 1950

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> and warning net system which must provide a continuous service to command agencies charged with active defense against possible air attack.

Clearly, there was too much room in this definition for individual interpretation.

Major General Charles T. Myers, ConAC's Vice Commander, clarified the issue before any serious conflicts arose. On 9 November he informed the field commanders that the Air Defense Forces would have <u>continuous</u> operational control over the fighter and radar forces for "systems" training -- i.e., training in ground controlled interception tactics and procedures. The numbered air forces would be charged with their unit and individual training.[11] In short, the tactical forces, practically speaking, would answer to two masters.

On 10 November, a ConAC General Order threw further light on the subject by specifically allocating tactical units to one or the other of the Air Defense Forces for continuous operational control.[12] By the terms of this order, all of the radar and fighter forces (excluding those few whose primary mission was tactical air) were to be under the control of the Defense Force commander for "systems" training at all times. This soon proved too ambitious a program, however; the fighter forces found themselves getting ample training in ground controlled interception procedures but falling far behind the numbered air force' unit and individual training schedules. Consequently, in late November, the instructions were modified so that no more than one-third of the fighter force in the particular Air Defense Force area was under the operational control of the Air Defense Force at any one time.[13]

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In late December, a new regulation on operational control, defining the subject in terms of "systems" versus "unit and individual training", was issued.[14] On the basis of the instructions contained in this regulation and under "the one-third of the available fighter force" proviso, the Air Defense Forces and air divisions operated until mid-1950.[15]

Assignment of the Tactical Units to the Air Defense Forces

Shortly after the activation of the Air Defense Forces, President Truman announced to the nation that signs of an atomic explosion within the Soviet Union had been detected. The Russians had succeeded in developing the bomb some four to six years ahead of prediction.

Within the Air Force, attention was immediately focused on strengthening the air defenses, so far as current resources permitted. In early January 1950, manning of the fighter and radar squadrons was raised to a number one priority, a privilege formerly enjoyed only by the Strategic Air Command and the overseas commands. The completion date for the Permanent Radar System was moved up. And plans for a wider dispersal of the interceptor force were given favorable reception. Within the Continental Air Command, General Whitehead and his staff dropped practically all else to attack the problems standing in the way of twenty-four hour operations

In keeping with this overall effort, General Whitehead protested the division of control over the tactical forces. The assignment of forces to one commander for unit and individual training, and to

Lieutenant General Ennis C. Whitehead
Commander, Continental Air Command: April 1949-December 1950
Commander, Air Defense Command: January 1951-August 1951

another for combat training and operations, simply ran contrary to proved methods of efficient operation. Thanks principally to an unusually cooperative group of field commanders, he had been able to make some headway under the current organization toward an operational defense system. But if the defenses were to catch up with the new threat, they had to be more directly aligned.

Higher headquarters showed full agreement with this view. The "marriage of convenience," that was the Continental Air Command, was fine so long as the balance of offensive power rested overwhelmingly in the hands of the United States. Now, however, things had changed and the decision had to be made whether to continue the conduct of air defense, tactical air and reserve forces affairs in equal balance or, through a reorganization, assign the weight of the available resources to air defense. What were General Whitehead's views on the matter? higher headquarters asked in early 1950.

His recommendation was that a new command, which he tentatively labeled the "Combat Command," be created which would become responsible for the tactical air and air defense missions. The Eastern and Western Air Defense Forces and the Tactical Air Command would be reassigned to this organization and be raised to full command status. All of the tactical forces would then be reassigned from the numbered air forces to the operational commands. ConAC and the numbered air forces would remain in existence for the conduct of the reserve forces and the several minor missions. At the same time, to provide the additional personnel required to elevate the Air Defense Forces and Tactical

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Air Command to full command status, the 12th and 9th Air Forces would be eliminated.[16]

Higher headquarters disapproved the recommendation, presumably because it disagreed with General Whitehead's belief that there were enough personnel available in the present organization to adequately man two separate organizations. The Air Force still had more tasks than it had men to perform them with; consequently, Headquarters Continental Air Command would have to remain as presently constituted. General Whitehead was then asked to devise a new plan for reorganizing within the confines of that ruling.

The new plan was forwarded on 2 May. Under it, General Whitehead proposed that the Air Defense Forces and the Tactical Air Command be raised to full command status and the tactical units be reassigned from five of the numbered air forces to the regional commands. The 9th Air Force would be assigned to the Tactical Air Command and share in the command of the forces assigned a tactical air role. The 12th Air Force would be inactivated and its people reassigned throughout the command as necessary, leaving four numbered air forces for the conduct of the reserve forces and other functions.[17]

This plan was immediately accepted, and on 1 August Headquarters Western Air Defense Force assumed command of all the forces west of the $103^\circ$ meridian.[18] On the first day of the following month, all of the forces east of that line were assigned to Headquarters Eastern Air Defense Force.[19] To afford roomier and more centrally located quarters for its expanded function, the Eastern Headquarters moved north at this time

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from Mitchel Air Force Base to Stewart Air Force Base at Newburgh, New York.[20] The Western Headquarters remained at Hamilton.[21*]

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* Mission directives for the Defense Forces following this change, as amended and revised through September 1955, may be found in the supporting documents to the study (See, Reference Notes, Chapter V, note 21).

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CHAPTER V

## THE AIR DEFENSE COMMAND COMES OF AGE
## 1951

### The Problem of Excessive Responsibilities

Both Generals Stratemeyer and Whitehead had tried repeatedly without success during the years 1946-1950 to disentangle the air defense mission from the reserve forces and housekeeping missions. They were convinced, through experience, that the responsibility for conducting the other missions was so great a load that they were unable to give proper attention to air defense matters.

General Stratemeyer called the problem to the attention of his superiors on every possible occasion during 1946 and 1947. He knew that he was battling windmills, for nothing could be done about the matter until the air defense mission was more clearly defined, the Air Force had gained its freedom from the Army, and additional forces for air defense were allocated. His orders, however, were to plan an air defense system and this he felt was a basic principle in any such plan: that the command charged with air defense had to be free of all duties which might detract from its ability to establish and operate such a system.

Following unification, General Spaatz informed General Stratemeyer, at an October 1947 meeting of the two in the Pentagon, that as part of the program to place more emphasis on the air defense mission "all miscellaneous tasks now assigned to the Air Defense Command and



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which interfere with the air defense mission would be transferred to other commands."[1] At that time General Spaatz asked General Stratemeyer to list the other missions held by the Air Defense Command which served to drag down his ability to attend properly to the air defenses and to recommend the agencies within the Air Force to which these missions could be reassigned.

A group of USAF officers who had been working on Air Force organizational problems helped General Stratemeyer prepare the study,* which was completed in late October 1947.[2] If the recommendations contained in it had been adopted, virtually every major and minor mission then held by the Air Defense Command other than air defense would have been turned over to another Air Force organization. However, the study was never accepted, in whole or in part, for the additional missions remained with the Air Defense Command and its successor the Continental Air Command through 1950.

Making the best of the situation, the Air Defense Command then drew up the plan for an operational hierarchy for air defense at sector level in mid-1948. When the Continental Air Command was formed in December 1948, this plan was expanded on and accepted as the answer to the excessive responsibilities problem. Soon, however, the concept of investing air defense responsibility in an operational headquarters under Headquarters, Continental Air Command proved unworkable and General Whitehead was back in the same position that General Stratemeyer had been in throughout 1946-1948.

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* This was the Hood Committee, comprised of Generals Hood, Lindsay, Burns and Ankenbrandt, Colonels Shuck and Hilger, and assisted by General McConnell.

Late in 1949, General Whitehead recommended to higher headquarters that he be relieved of a host of the smaller missions assigned him.[3*] But, early in 1950, before a reply had been received to this suggestion, he submitted the proposal that higher headquarters split the Continental Air Command down the middle, leaving all the missions except air defense and tactical air with the Continental Air Command, and creating a "Combat Command" to carry out air defense and tactical air responsibilities.

In view of the fact that the Russians had found the A-bomb, General Whitehead's recommendation for strengthening the organization for air defense was very much in order. Higher headquarters, however, was forced to disapprove the proposal. The Air Force simply did not have enough people to man the two separate commands. It was at this point that the compromise solution of reassigning the tactical forces from the numbered air forces to the Air Defense Forces and the Tactical Air Command was adopted. This cleared up the problem of divided authority at regional level but still left the Continental Air Command Headquarters staff immersed in so many duties that it could not properly attend to air defense affairs.

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* These were: 1) The AF ROTC Program; 2) The Air Scout Program; 3) The single Air Force contact mission; 4) The Air Force liaison at water POEs mission; 5) The Apprehension of Air Force Absentees Program; 6) The custody of Air Force prisoners; 7) The Aviation Cadet and Officer Candidate procurement programs; 8) The administration of procurement program; 9) The Air Force Extension Course Program; 10) The Return of WWII dead program; 11) The Armed Forces disciplinary control boards. Subsequently, the Command was relieved of three of them (4, 5, and 8) but the rest remained with ConAC throughout 1950.

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Reestablishment of the Air Defense Command

Meanwhile, the Korean War had broken out. Fearful that this was the prelude to World War III, Congress took a new look at the nation's fighting strength. One result of the survey was the granting of large manpower and materiel increases to the Air Force.

This opened the door to a reconsideration of the possibility of separating air defense affairs from the reserve and housekeeping functions and General Whitehead was prompt to resubmit his case to higher headquarters. His proposal this time was far more drastic than his previous ones. "In order to cope with the growing Air Defense system and its problems," he told General Vandenberg in October, "I think that it is a matter of utmost urgency to separate the headquarters of the Air Defense Command from Continental Air Command."[4] In short, he wanted a major Air Force command established whose sole business would be air defense. Furthermore, he wanted it set up on or before 1 January 1951 with headquarters somewhere in the mid-west. His justification for prompt action on the reorganization was as follows:[5]

> Beginning the first of the year, 1951, some of our permanent radar sites will become operative. During the course of the year, many additional sites will come into being. Over the same period of time, twelve additional Air Defense fighter squadrons are programmed for activation. To be sure that these activities receive adequate, undivided attention and supervision, the Hq Air Defense Command should be organized immediately and a permanent site designated for its headquarters.

Evidently, there had been some private discussion of the matter between General Whitehead and his superiors before he submitted his recommendation, for the request was immediately approved. On

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17 November, Major General William F. McKee, Assistant Vice Chief of Staff, Headquarters USAF, informed General Whitehead that orders were being cut for the establishment of the new command with Headquarters at Ent Air Force Base in Colorado Springs, Colorado.[6]

Breakup of the Continental Air Command began on 1 December 1950. The Tactical Air Command, as well as the Air Defense Command, was to gain its freedom, and on 1 December it was elevated to major command status, taking with it the forces whose primary mission under the Continental Air Command had been tactical air.

The Air Defense Command was "reestablished as a major air command of the United States Air Force" on 1 January 1951.[7] The two Air Defense Forces, the air divisions, the fighter wings, groups, and squadrons, the AC&W groups and the radar squadrons, plus all of the other organizations whose primary duty under ConAC had been air defense were, on that date, reassigned from the Continental Air Command to the Air Defense Command. General Whitehead, who was selected to command the new organization, and the officers, airmen and civilians whom he chose to man the Headquarters, began the move from Mitchel Air Force Base to Colorado in December. On 1 January 1951 the Command was in operation.

The mission directive for the new organization had been issued shortly before its activation. "The Air Defense Command," it read, "is organized primarily for the air defense of the United States."[8]

Thus, for the first time since 1946, there existed a major Air Force organization whose only reason for being was to develop and

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operate the air defenses of the continental United States. Later, on 19 September 1951, the new organization was written into public law. In PL 150, "An Act to provide for the organization of the Air Force and the Department of the Air Force..." the 82d Congress directed,[9]

> (a) There shall be within the Air Force-
> (1) the following major air commands:
> (i) an air defense command;
> (ii) a strategic air command; and
> (iii) a tactical air command;
> (2) such other commands and organizations as may from time to time be established by the Secretary of the Air Force in the interest of efficiency and economy of operation.

There was no longer any question as to the relative importance of the air defense mission among the other missions of the Air Force. And there were to be no more compromise solutions as to the best way to organize for the conduct of that mission; at least, not without the consent of Congress.

## Changes in Division/Sector Area Organization

The plan for air defense area organization below Air Defense Force level as conceived at the time ConAC was activated had undergone considerable revision by the time the new Air Defense Command was formed. Under the Permanent Radar Program, it will be recalled,* the construction of ten division operational buildings or control centers was authorized. Shortly after this program was approved in late 1948, the requirement for a center in the Southeast was eliminated, reducing the total number of centers programmed for construction under the P-program to nine.[10] They

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* See Chapter II, pp. 16-19.

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were to be built at: Syracuse, New York; Silver Lake, Washington; Great Falls, Montana; Bismarck, North Dakota; Detroit, Michigan; St. Paul, Minnesota; Oakland, California; Roslyn, New York and Albuquerque, New Mexico.[11]

By early 1949, the division/sector peacetime, organizational plan was as follows. At eight of the nine centers, air division headquarters manned by regular Air Force personnel were to be activated. The ninth center, at Bismarck, North Dakota, would lie dormant except for training purposes until the outbreak of war. At this time, it would be manned and operated by Air National Guard personnel who would also form a division headquarters and assume sector responsibilities. The defense of the Southeast area was to be conducted in an emergency by men and facilities of a radar training school to be established at Orlando AFB, Florida.

On the outbreak of war, ten more ANG manned division control centers were to go into operation, making a 20 sector wartime organization.[12]

Meanwhile, as a matter of economy, the decision had been made to construct the nine control centers on government-owned or already leased property. Thus, the permanent stations of the five divisions already in operation in early 1950 had been relocated as necessary to comply with the terms of this policy. The 25th's control center was built on McChord Air Force Base, requiring the Division to move eventually from Silver Lake to that installation.* The 26th remained at

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* The move was finally completed in September 1951.

Roslyn. The other three were located as close to the originally programmed stations as possible -- the 28th at Hamilton, the 30th at Willow Run Airport outside Detroit, and the 32d at Hancock Field on the outskirts of Syracuse, New York.

This left four control centers to be constructed and three divisions to be activated. By this time, however, the efficacy of phasing from an eight division/sector peacetime organization (plus the Orlando defense area) to a 20 division/sector breakdown upon the outbreak of war had been questioned. In evidence of ConAC's dissatisfaction with this plan, General Whitehead recommended in January 1950 that the control center scheduled for construction at Albuquerque be located instead in the Los Angeles area where an Air National Guard defense sector was scheduled to go into operation in wartime. This was too critical an area to be defended by the reservists, he believed. At the same time, he recommended that the control center at Bismarck, which was to be Air National Guard manned, be eliminated, presumably to expedite construction of the Regular Air Force-manned control centers.[13]

These recommendations, coupled with the overall reappraisal of air defense which took place in higher quarters following the discovery of the Soviet atomic explosion, resulted in the formulation of a firmer concept of division/sector organization. The plan for the use of Air National Guardsmen in sector control operations was abandoned. Henceforth, air division headquarters, manned with Regular Air Force personnel, would be activated at each control center. This peacetime sector organization would be the one under which the air defense of the nation would be performed in wartime.

The question now was: how many division/control centers were required in support of the new concept and where should they be located? The decision reached around mid-1950 was that eleven of them were required initially. If additional forces were later assigned, new division/control centers would be formed as necessary.

As it worked out, the five division/control centers already in operation remained as currently located. Also, the plans for placing division/control centers on Great Falls Air Force Base, Fort Snelling (St. Paul), and Kirtland Air Force Base at Albuquerque were retained. The control center originally scheduled for construction at Bismarck, however, was reprogrammed for the Los Angeles area -- at Norton Air Force Base near San Bernadino.[14] Additionally, a new control center was programmed for Tinker Air Force Base. The eleventh division/control center was programmed for Dobbins Air Force Base at Marietta, Georgia. Since funds existed under the P-program for only nine control centers, construction on the Dobbins and Albuquerque centers was held up until additional funds became available.[15]

Action on the establishment of the six additional divisions began in May 1950 with the creation of a small Headquarters, Albuquerque Air Defense Sector (Provisional) at Kirtland.[16*] Pending the activation of a Division headquarters here, this organization would exercise opera-

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* This organization was designated the Headquarters, Albuquerque Air Defense Area (Provisional) from 1 May to 7 August 1950, at which time the designation given in the narrative was adopted.

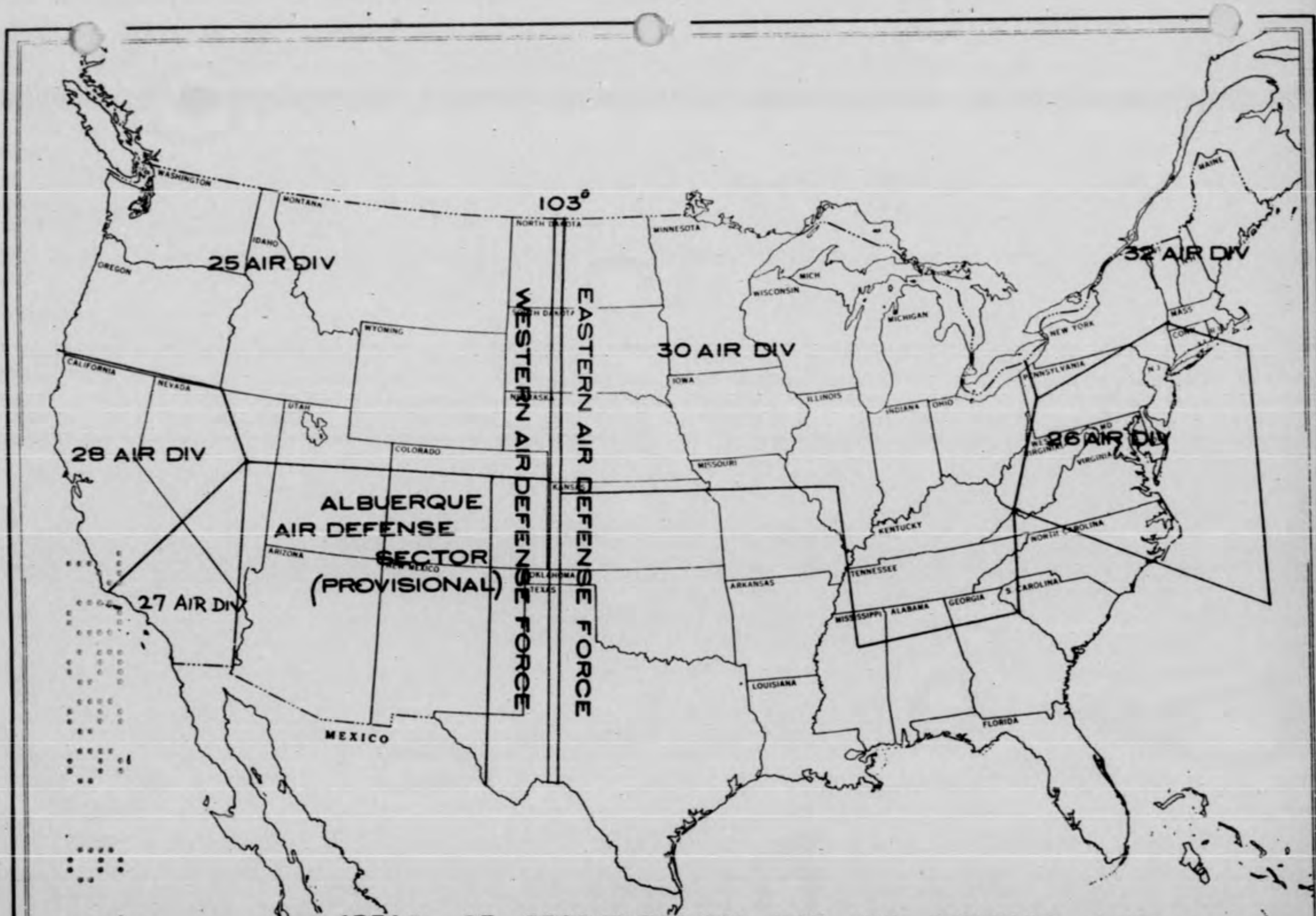
tional control over the radar and fighter forces deployed for the defense of the critical Los Alamos and Sandia areas. On 7 August, the Southern California Air Defense Sector (Provisional) was activated at Fort MacArthur, San Pedro, California, and given operational control over the radar and fighter forces in the area.[17] On 20 September 1950, the 27th Air Division was activated at Norton, at which time the provisional organization was disbanded and its personnel transferred to the new Division headquarters.[18] Thanks to the preparatory actions taken by the provisional headquarters, the 27th became operational on the same day it was activated.

Thus, when the Air Defense Command was reactivated as a major Air Force command on 1 January 1951, defense of the nation was split among six divisions and the provisional organization at Albuquerque.[19] The seventh division, the 31st, programmed for location on Fort Snelling, had been activated on 8 October 1950, but was not yet sufficiently manned or equipped to assume area responsibilities.[20]

The remaining four divisions were activated during the next six months. On 5 January 1951, the 34th was formed at Kirtland, at which time the provisional organization was discontinued.[21] The 29th was activated at Great Falls on 1 March[22] and the 33d at Tinker on the 19th of that month.[23] The eleventh division, the 35th, was activated on 1 July.[24]

## Creation of the Central Air Defense Force

Regional organization plans drawn up at the time ConAC was formed had also been changed by the time the Air Defense Command was

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reactivated. In late July 1950, General Whitehead had asked General Vandenberg for the wherewithal to establish a third Air Defense Force. "I feel that a three way division is necessary," he said, "in order that the troops may be properly handled, their morale maintained, and efficient administration and operational command exercised." Specifically, he believed that the air defense of the area east of the $103^\circ$ parallel was too much of a job for one Air Defense Force, containing as it did the majority of the vital targets of the nation. His plan was to create a Central Air Defense Force, which would take over the western and southeastern portion of the Eastern Air Defense Force's region.

Two months passed before an answer was received on the proposal. Then Lieutenant General Lauris Norstad, Acting Vice Chief of Staff, Headquarters USAF, stated that the overall plan for the air defense of the United States had just been completed and submitted for the approval of the other services. The plan had been based on splitting the nation at the $103^\circ$ parallel into two parts for air defense and to change that concept now would be to invite further delay in coordinating the plan. Further, General Norstad said, talk of the creation of a Unified Command for air defense was going the rounds.* It would be best to hold up on any drastic revisions in the current organization for air defense until that issue was settled.[26]

General Whitehead immediately protested the decision. "Urgently request reconsideration be given to my original proposal," he wrote. "Problems associated with the air defense of the United States, regard-

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* See below, p. 84.

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less of the command status of the Air Defense Command, are of such proportions as to dictate a further breakdown of the Air Defense Forces to include a Central Air Defense Force."[27] Despite this plea, higher headquarters pigeonholed the recommendation for the remainder of the time the air defense mission was under the Continental Air Command.

In early December 1950, the Unified Command discussions had died down and General Nathan F. Twining, who had since replaced General Norstad as Vice Chief of Staff, informed General Whitehead that his proposal for a third Air Defense Force was a valid one and had been approved in principle by the Air Staff. General Twining said, however, that his headquarters did not believe that conditions warranted the creation of the new organization immediately. "It is appreciated that when the air defense force and facilities approach more closely [its programmed strength] ... the Eastern Air Defense Force may be faced with such logistical and administrative burdens as to impair its air defense mission."[28]

Following the reestablishment of the Air Defense Command on major Air Force command level, General Whitehead reopened his case for the new Air Defense Force, asking that it be established on 1 March following.[29] Either higher headquarters had had a change of heart as to the urgency of the matter or General Whitehead's persistence had worn it out, for it promptly concurred in the recommendation. Grandview Air Force Base, Missouri, just outside Kansas City was chosen as the site for the headquarters.[30]

The negotiations for manning the new organization were quickly completed and on 1 March 1951, as planned, the Central Air Defense Force

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was activated with Major General George R. Acheson as Commander.[31] Pending the completion of its permanent quarters at Grandview Air Force Base, the Headquarters moved into temporary offices in downtown Kansas City, where it was to stay for the next three years.*

Arrangements for the reassignment of divisions and tactical forces within the area of responsibility set aside for the new Air Defense Force from Eastern Air Defense Force were completed within the next couple of months and the changeover became official on 20 May 1951.[32]

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* Hq CADF moved onto Grandview AFB in March 1954.



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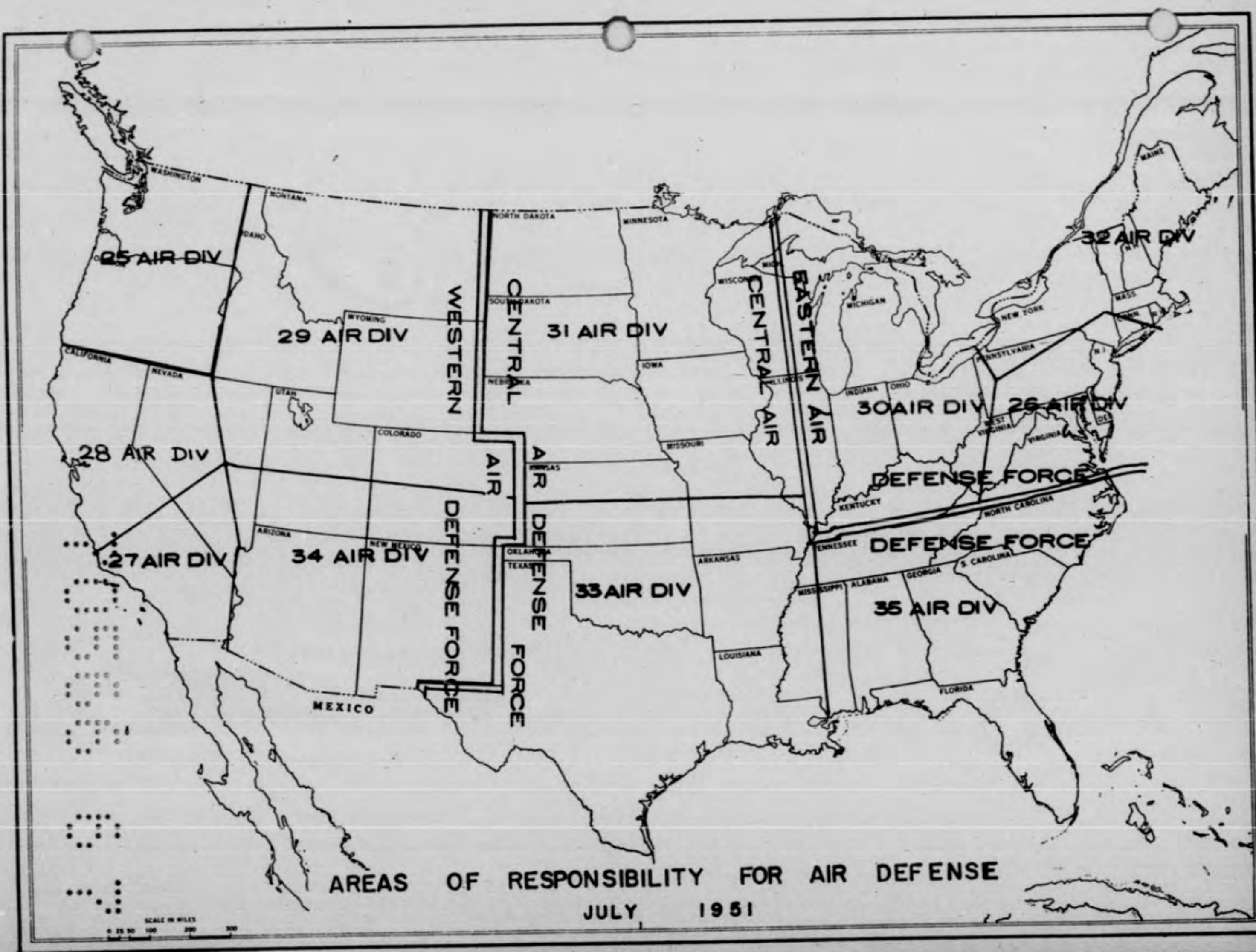


AREAS OF RESPONSIBILITY FOR AIR DEFENSE

JULY 1951

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CHAPTER VI

FORMULATION OF A PHILOSOPHY OF AIR DEFENSE ORGANIZATION
1952-1953

Inadequacies in Sector Organization

The assignment of the tactical units to the Air Defense Forces in the reorganization of mid-1950 had resolved the problem of divided control at regional level. The 1 January 1951 reorganization had eliminated the problem of excessive responsibilities by freeing the nation's air defense commander of all duties except that of creating and operating an air defense system. The time had now arrived to attack certain conspicuous organizational problems which had developed within the sectors during the past year.

There were two major trouble-spots in sector organization in early 1951. These were, (1) a split in command over the fighter squadrons, and (2) an overabundance of personnel in the higher echelons of the fighter organization with a dire shortage at base level. The first problem resulted from the fact that the fighter wings (to which the fighter squadrons were assigned) occupied the same level of command under the Air Defense Forces as the divisions, with the division commanders responsible for the "systems" training of the fighter squadrons and the wing commanders for their unit and individual training and logistic and administrative support. The second was caused by the conflict between ADC's requirement to deploy by squadron and Headquarters USAF's dictum that all fighter organizations would be organized on the wing-

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base plan.[1]

Even before it was completely settled in the new quarters at Colorado Springs, the Headquarters ADC staff, with the help of the Defense Force staffs, was busy seeking ways to eliminate the problems. The obvious solution was to assign the fighter wings to the divisions and "tailor" the fighter organization at each base to fit the particular situation.

It was not as simple as that, however. First of all, Headquarters USAF was adamant that the wing-base structure be retained. Korea was still very active and at any moment ADC's fighter units might be called into action in the Far East, in which event, they could most efficiently deploy by wing. Also, in spite of the manpower increases of late 1950, the Air Force still labored under an overall shortage of personnel. To assign the fighter forces to the air divisions would require raising the division headquarters from strictly operational-type organizations to full command status. There were simply not enough people available to make this change at this time. Finally, a large number of officers still held to the belief that the division commanders should not be loaded down with tedious squadron and airbase chores which would result from the direct assignment of the fighter forces to the divisions.

In February 1951, General Whitehead called his staff and key Air Defense Force officers together at Colorado Springs to discuss the problems. At the meeting everyone had an answer. The trouble was that no two of the profferred remedies were alike or else the solutions offered were academic in the light of current manning and organization restrictions. Con-

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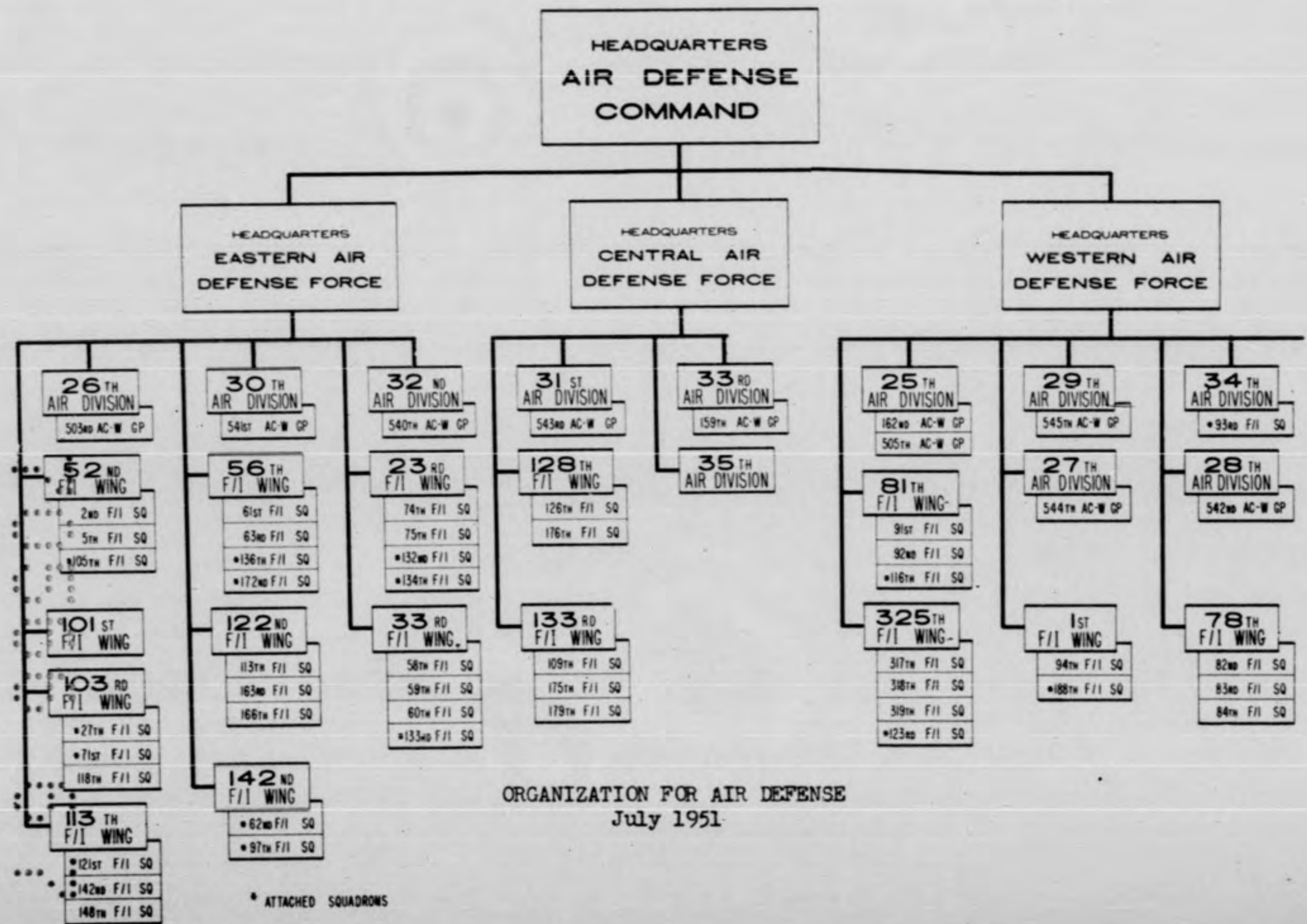


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sequently, the Defense Force officers returned home with instructions to "rearrange and/or reorganize units, on a temporary basis, to isolate problems or develop more suitable structures....in order that ideas which might only be proven by trial and error" could be tested.[2]

By mid-1951, about as many different ideas on bettering sector organization as there were division and Air Defense Force headquarters had been forwarded to Command Headquarters. By no process of legerdemain were the manpower and organization staff officers there able to reconcile fully these many views one with the other and with the USAF dictates on the wing-base structure and manpower ceilings. Then came a break in the impasse. At a conference of top Air Force commanders on 30 August 1951, General Vandenberg said that to make the most of available forces, standardized organizational arrangements such as the wing-base were to be abandoned and major commands permitted to organize as befitted their particular missions.[3] This pronouncement at once freed ADC to remove one of the major defects from sector organization -- the inefficient alignment of the fighter force.

On 2 October following, General Benjamin W. Chidlaw, who had assumed command of the Air Defense Command in August upon General Whitehead's retirement,* told higher headquarters that he was ready to start cleaning house in the sectors. His plan, he stated, was in consonance with USAF's program for extracting the most firepower from available resources. And while it was not the final answer to his sector problems, it would provide a springboard to the eventual resolution of them all.[4]

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* See Appendix B for a brief biography of General Chidlaw.

The plan was as follows. The wing-base structure would be scrapped in favor of a fighter organization tailored to meet ADC's particular needs. The aircraft control and warning groups, with their control squadrons, would be inactivated and their duties and responsibilities taken over by the divisions. Finally, the divisions would be changed from table of organization to table of distribution headquarters.

USAF approved the plan on 12 October.[5] While General Chidlaw had hoped to make the changeover before the end of the year, higher headquarters was not able to complete the detailed paperwork on the matter until early in January 1952.[6] Final arrangements were completed by the end of that month and the reorganization, as planned, went into effect on 1 February.[7]

## Abolition of the Wing-Base Plan

An underlying motive for the institution of the wing-base plan throughout the Air Force in 1948 was to invest command of the base in the officer who commanded the tactical forces stationed there. In many instances during World War II where one officer had commanded the base and another the tactical unit on the base a sort of personal war on the side had taken place between them. Under the wing-base plan, this situation could never occur. Another advantage of the plan was that it featured a high degree of mobility, since the wings were administratively, logistically and operationally self sufficient.[8]

The plan was unsuited to air defense because the centralization of three squadrons on one base resulted in an inadequate dispersal of the fighter interceptor force. When, in mid-1950, General Whitehead,

General Benjamin W. Chidlaw
Commander, Air Defense Command: August 1951-May 1955
Commander-in-Chief, Continental Air Defense Command: September 1954-May 1955

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requested permission to deploy the twenty-three squadrons then assigned him for air defense over fourteen bases,[9] USAF granted the request, but stipulated that it and subsequent single squadron deployments be performed within the framework of the wing-base plan. In other words, one or two squadrons might be separated from the parent wing and group headquarters, but those headquarters were still to be maintained intact. As mentioned previously, USAF's reason for this was to preserve the mobility of the fighter forces which the wing-base system afforded in the event those forces were needed for duty in Korea.

One result of this conflict between ADC's requirement to deploy by squadron and USAF's insistence that the wing-base organization still be kept, was a wastage of manpower in wing and group headquarters with a concomitant shortage of support personnel on the deployed squadron bases. One investigation showed that a separately deployed squadron required approximately 630 people, but a wing with one squadron at a base of comparable size required more than twice as many people.

Another problem was the great burden it placed on commanders of squadrons deployed on ADC-owned bases. They had to cope with the minutia of base problems and still operate their squadrons in competition with squadron commanders situated on bases where wing and group commanders attended to the housekeeping affairs.[10]

Thus, while wide variations in opinion still existed within the Air Defense Command in mid-1951 as to the best way to reorganize the sectors, there was full agreement that the wing-base had to go. And go it did on 1 February 1952. The new arrangement looked a bit weird to the old pilots in Washington, but they were willing to gamble with General Chidlaw that

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it was the best solution in sight to a tough problem.

In the reorganization, all of the wing, tactical group, air base group, maintenance and supply group and medical group headquarters of the wing-base were inactivated. Further, all of the deployed squadrons were stripped of their augmentation spaces and reduced to their basic manning allowances. In short, the fighter force was pared down to the pilots, mechanics, and aircraft.

In the rebuilding, two new types of support units were activated on the bases over which the command had jurisdiction.* On the six large bases, (Hamilton, McGuire, McChord, Otis, Larson and Selfridge), eight-squadron air base groups were activated. On the five smaller bases and 12 municipal airports air base squadrons were formed.

Under the new organization, the air base group and the air base squadron commanders were placed on the same level of command as the tactical squadron commanders. In the future, one man would run the base and the other the fighter squadron with neither having jurisdiction over the other's activities. This was in line with ADC's experience that it was too much of a load on the tactical commander to run both the base and the squadron. Of course, this meant a return to the split in responsibility at base level which had caused so much trouble during World War II.

However, ADC did not anticipate similar troubles. In contrast

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* On the bases where a fighter squadron was a tenant (there were ten of these in February 1952) the command which owned the base was hence forth charged with the full support of the squadron. Formerly, the tenant squadrons had been manned to perform part of their support and the owning command had furnished a part.

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with the situation during the War, both commanders were members of the same organization. Too, as Major General Kenneth P. Bergquist, the Air Defense Command's Deputy for Operations, put it, it was to be made clear to base commanders that "...this Service Unit's mission in life will be to give service to that Tactical Unit."[12]

USAF was not as optimistic as ADC that this aspect of the organization was workable. The split in responsibility, that Headquarters warned, would make it difficult to fix responsibility in the event a squadron failed to perform its mission. However, because it promised a great savings in personnel, by making unnecessary the superimposing of a third commander and staff over base and tactical squadron activities, it was worth a trial. Consequently, ADC was given five months in which to test its workability, at the end of which time it was to submit a full report on its experiences to the Pentagon.[13]

## Activation of the Air Defense Wings

To insure a proper span of control over air base and fighter squadron activities, still another type of fighter organization was created in the February 1952 reorganization. This was the Air Defense Wing.* Its mission was to exercise administrative and logistic supervision over the fighter elements assigned them.

In contrast to the wing headquarters of the old wing-base plan, the new wings were designed as area rather than mobile headquarters. While the old wings were responsible for administering one base, the

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* From February 1952 until September 1954, these organizations were designated simply Defense Wings.

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air defense wings were responsible for administering all of the ADC-owned fighter bases in their areas. Also, there was no enduring relationship between wing and fighter squadron as there had been under the wing-base. If a squadron moved from one geographical area to another it simply changed its assignment from one air defense wing to another. Thus, the complex and confusing web of assigned and attached squadrons scattered over the nation, which had existed under the wing-base, was dispensed with.

Finally, the old wings had been table of organization units. The new wings were organized according to more flexible tables of distribution. This made it simpler to vary the size of the staff of each wing headquarters to meet variations in requirements at different locations.[13]

Eight air defense wings were activated, two in each of the Eastern Air Defense Force division areas and one in the 25th and the 28th Division areas.[14*] In these sectors, the fighter squadrons and the air base organizations were assigned to the wings and the wings directly to the Air Defense Forces. In four of the remaining five air divisions -- the 29th, 33d, 34th and 35th -- the few fighter squadrons

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* Actually, ten defense wings were initially established but two (the 4703d in the 25th Division and the 4705th in the 27th) were discontinued soon afterwards in compliance with the ever-increasing pressure from Washington to economize in manpower. Later, the wing activated in the 28th Division was transferred to Geiger Field, Washington where it remained in operation until the activation of the 9th Air Division in September 1954. At that time, both of the 25th Division wings were inactivated as unnecessary, dropping the number of wings in-being in September 1955 to six, all of which were located in the Eastern region.

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stationed there presented no span of control problem and were assigned directly to air division headquarters. In the fifth division, the 31st, there were enough fighter squadrons to warrant the establishment of a defense wing. Here, however, the efficacy of assigning all of the forces in an area directly to the division commander was to be tested.

## Changes in Division Headquarters

While the emphasis in the February 1952 reorganization was on the elimination of the logistic and administrative problems in the fighter forces, two changes of note also took place in the function and character of the air division headquarters. The aircraft control and warning groups were abolished and full command of the radar squadrons invested in the air division commander. Also, the tables of organization, under which the air division headquarters had been manned for the past three years, were replaced by more flexible tables of distribution.[15] This last change was designed to enable ADC to better apportion manpower in the future according to the particular needs of each division.[16]

The elimination of the groups was long overdue. While the concept of the division headquarters as a strictly operational body had been workable if not satisfactory so far as the fighter force was concerned, it had proved untenable for radar affairs. The division headquarters was too intimately a part of the radar warning and control system for it to delegate matters of any consequence to the groups. In recognition of this fact, the staffs of those divisions and group headquarters which were located on the same installations had been combined in late 1949.* By 1951,

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* See Chapter IV, p. 33.

this process of amalgamation had advanced to the point where division commanders were also commanding the groups.[17]

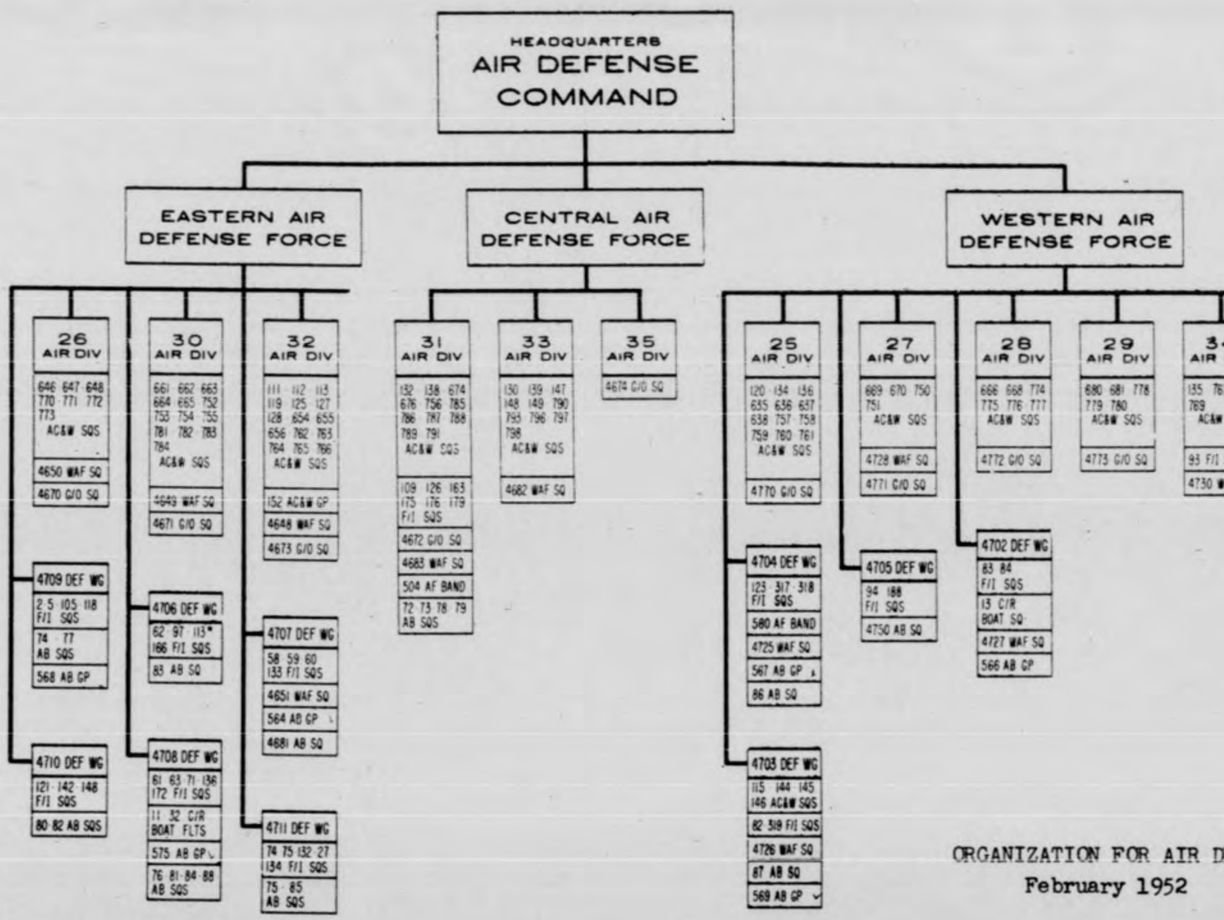
Thus, the aircraft control and warning group had become an anachronism by mid-1950 and its elimination in early 1952 merely served to clear the books of extraneous unit designations. The most noticeable effect of the change was a large increase in the number of personnel assigned the division headquarters. This was an illusory growth, however; actually, the same number of people were on hand in the division blockhouses after the reorganization as before. The only difference was that where before they were carried on the rolls of three organizations, they now appeared on the single roster.

The chart on the next page shows the organization after the February 1952 changes. In the sectors where defense wings were created, the fighter units were assigned to the wings and the radar units to the divisions, with the divisions and wings reporting to Air Defense Force headquarters. In the two sectors where there were few or no fighters, both the radars and fighters were assigned to the divisions.

The 31st Division was the exception to both cases. Here, under Brigadier General Thomas C. Darcy, the possibility of assigning a large number of fighter as well as radar units in the sectors directly to the division was to be tested. The thought was that by expanding the administrative and logistic offices of the division staffs perhaps the defense wings could be eliminated with an overall savings of manpower.[18]

## Straightening the Command Line

By late 1952, ADC had acquired a further understanding of organi-

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* TO BE REASSIGNED TO CADF WHEN CONTROL CAPABILITY EXISTS
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zational requirements in the sectors and was ready, once again, to make drastic revisions at that level of operation.

One problem requiring settlement was the unsatisfactory situation that had developed at airbase level since the February 1952 changes. First of all, ADC's experiment in split-authority on the bases had failed. "The presence of two commanders on a station in an equal status," the Command confessed, "tended to create some friction in lack of proper administration of base responsibilities as it placed reliance on cooperation and good will, rather than on command control."[19] In short, higher headquarters' pessimism on the policy of investing command of the base in one officer and command of the tactical squadron in another had been borne out. In a surprisingly large number of cases, the arrangement had worked. But when personalities came into conflict, it broke down. The only solution was to place one man in charge at each base.

The other aspect of the base problem concerned the support of operations at the medium sized bases. The air base squadrons had proved adequate to run a small base, and the six air base groups had adequately supported operations on the six large bases, but neither of the tables of organization under which these units were formed fitted conditions at the medium sized bases.

Trouble on the medium sized bases came as no surprise to the Command. Even before the February 1952 reorganization it had asked that all of the air base units be initially formed on a non-table of organization basis. This would give the command time to learn of its needs at the particular bases. After that, appropriate tables of organization

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could be drawn up in accordance with actual operating experience. But higher headquarters would not grant the delay, "forcing us /prematurely/," as Major General Frederic H. Smith, Jr. said at the time, "into a T/O&E for an Air Base Squadron."[20]

The result was that needs at the medium sized bases were met by augmenting the strength of the air base squadrons with non-table of organization personnel, oftentimes swelling them to almost twice their basic sizes. Experience had proved that approximately four hundred persons was the largest number which a squadron commander could adequately supervise but on some of the bases this figure had run upwards to a thousand men. Only an officer with exceptional ability could dig himself out from under the administrative burden engendered by this situation to pay attention to the needs of the tactical squadron. Even then chances were good that the services which he could provide would be inadequate.[21*]

Steps to settle this problem were taken almost before the ink dried on the February 1952 reorganization. By mid-1952, a table of organization for air base groups to be formed on the medium sized bases was drawn up. Then, as the split in command responsibility on the bases grew increasingly more troublesome the whole concept of the support organization at base level was revised. By late 1952, the decision was made to establish "Air Defense Groups" on <u>each</u> ADC-owned base. One table

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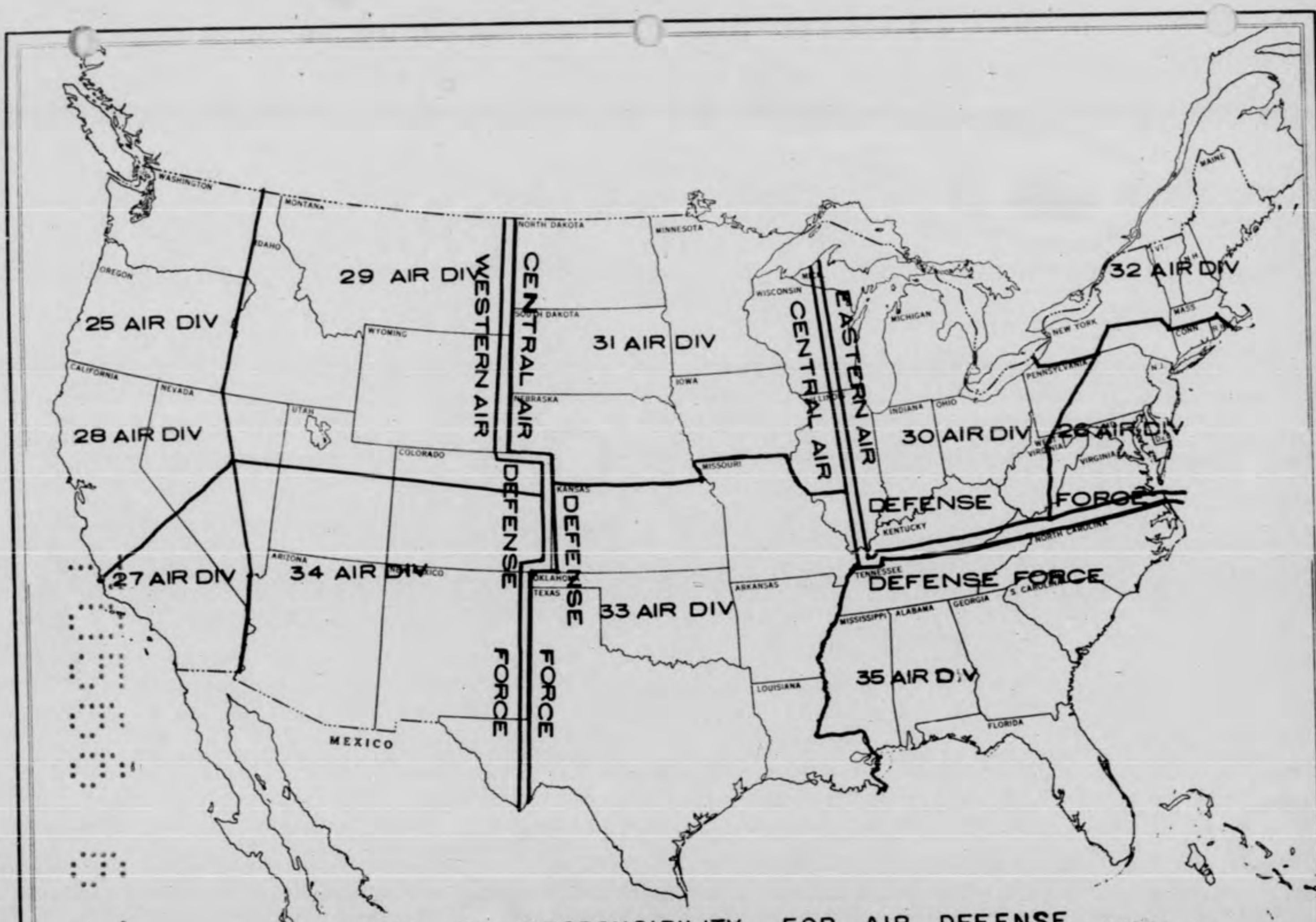
* After a visit to Presque Isle AFB, one of the medium sized bases, in the summer of 1952, Colonel Carl Elver of the Hq USAF manpower office reported to ADC as follows: "I came to the very definite conclusion that so far as that /Air Base/ squadron was concerned it was running after a fashion because of the fact you had a damn bright young Lt. Col. running it."




AREAS OF RESPONSIBILITY FOR AIR DEFENSE
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of organization was drawn up for the groups which would occupy the six large bases and another for those to be established on the smaller bases. Unlike the six air base groups presently in existence, the new air defense groups would command both the tactical and support squadrons on the bases. Thus, in effect the plan called for the institution of a group-base plan throughout the command.[22]

Meanwhile, evidence was piling up in favor of assigning all forces in the sectors directly to the air divisions. Upon the conclusion of the organizational experiment in the 31st Division, General Darcy enthusiastically endorsed the alignment of all forces under the division commander. "The outstanding fallacy of the previous organization," he wrote in his final report, "was the divided responsibility for operational command and for administrative and logistical command.... This abnormal and unhealthy situation has been eliminated /in the test organization/ with a resultant increase in overall effectiveness in operational, administrative and logistical matters and in a considerable savings of personnel."[23] General Chidlaw and his staff, after studying the results and discussing the matter at great length with all three Air Defense Force commanders and their staffs, concluded that the air defense groups and their fighter and support squadrons should be assigned to the divisions.

All that remained now was to figure out a solution to the span of control problem. In the 31st Division test, all of the radar and fighter organizations, totaling 24 units, had been assigned directly to division. General Darcy believed that his headquarters had been successful in exercising direct control over them, but observers at Headquarters ADC did not agree. The conclusion reached was summed up by General Chidlaw

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in a briefing for General Vandenberg in August 1952: "I picked out the 31st to try this service test because I believed at that time we could eliminate some headquarters. Now I have found out that we overshot entirely on that."[24] In short, while unified control over operations, administration, training and logistics at division level was now known to be feasible, it was also evident that the divisions would not be able to exercise direct command over all of the operating units in their areas, no matter how desirable this was from manpower and funding points of view. Agencies which could perform close administrative and logistic supervision over the tactical units had to be interjected into the chain of command. In other words, the traditional military concepts of concentration of authority and responsibility and limitation of span of control had to be observed.

While the establishment of air defense groups on each base would serve to reduce the span of control which had obtained within the 31st Division during the period of the test, the gap was still too wide. Consequently, the decision was made to retain air defense wings between air defense group and division in those sectors where the bulk of the forces were deployed but to change the function of the wings to include administrative and logistical support of the radar squadrons as well as the air defense groups. In the sectors in the Central and Western regions where few forces were located, the air defense groups and the individual radar squadrons would report directly to division headquarters.

Higher headquarters' approval to establish an air defense group on each base, change the mission of the defense wings to include

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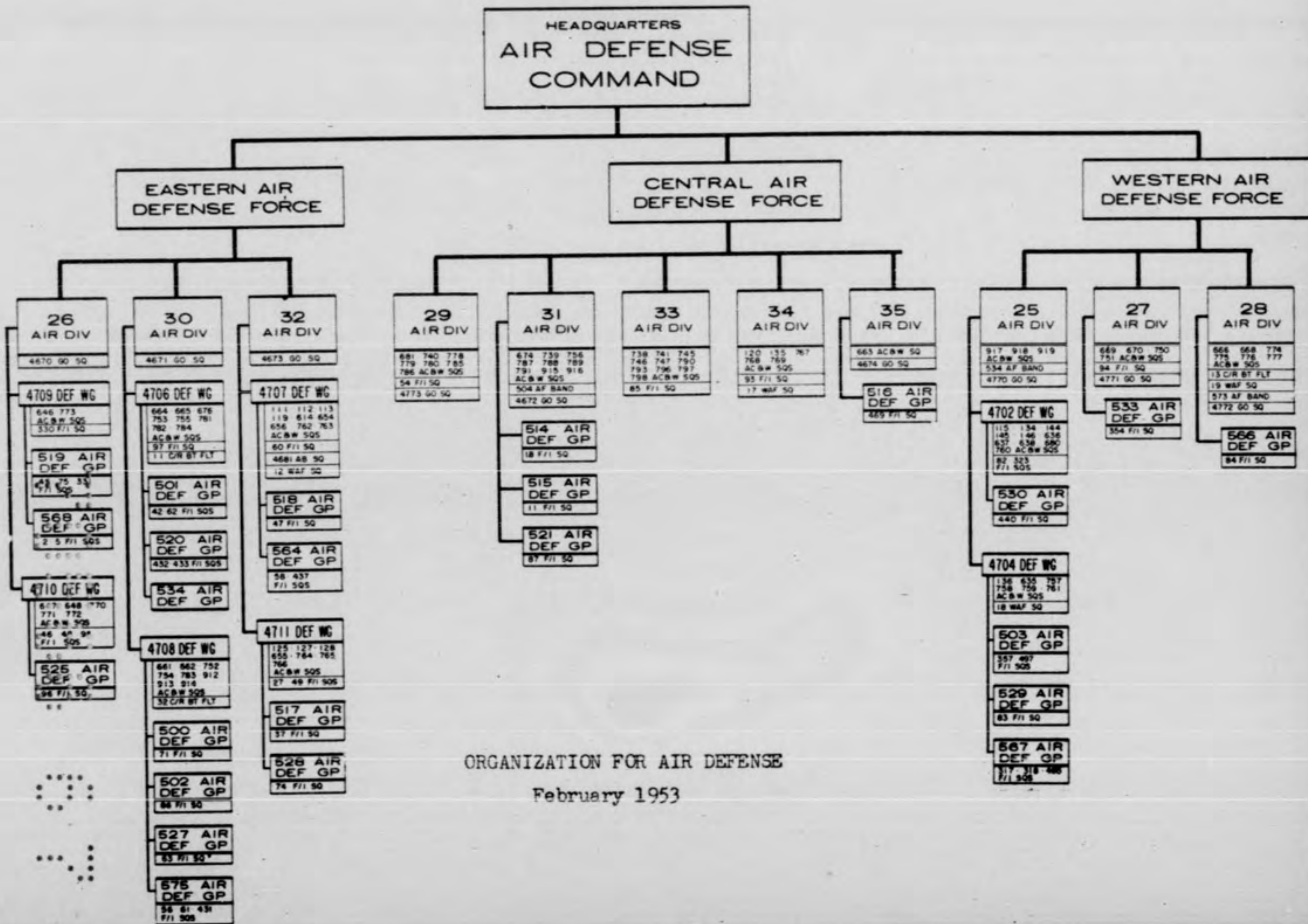
administrative and logistic support of the radar as well as the fighter elements, and assign all of the forces within the sectors to the divisions was received in late October.[25] Three months later on 16 February 1953, the new organization went into effect.[26*] Evidently, the new organization was the one for which the Command had been searching, for the system continued to operate within that framework two and one-half years later.

## The Philosophy of Air Defense Organization

Thus, the struggle for understanding had been a long and tedious one, but by early 1953 ADC believed that it had isolated the basic tenets of air defense organization. As later enunciated by Colonel James R. Wergin, the Command's manpower and organization chief, these were:[27]

> Air Division Commanders should have control of all air defense tools in his area which are necessary for the active air defense.
>
> With minor exceptions, one man on each ADC operated base should have command of all ADC units located thereon.
>
> Wings should be injected between the Air Divisions and operating units when a reasonable span of control is exceeded. Because of the homogeneity of ADC units, a maximum of sixteen units is considered satisfactory in some cases.
>
> ADC owned and operated bases [should] be operated by an Air Defense Group.
>
> Austere manning standards preclude authorization of full staffs at all levels of command.

Throughout the organizational planning which took place during the following years, these principles, which in total comprised a sort of philosophy of air defense organization, were scrupulously attended.




ORGANIZATION FOR AIR DEFENSE

February 1953

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## CHAPTER VII

## AIR DEFENSE ORGANIZATION IN MID-PASSAGE
## 1954-1955

### Developments in the Warning and Control System

The air defense system remained sub-divided into three Air Defense Force regions and 11 Air Division sectors until late 1954. Then, a new division was activated in the Northwest. By the end of the following year, four additional divisions had been formed. To explain adequately these changes and the organizational plans beyond the 1955 time-period, it is necessary to discuss briefly certain developments which took place within the radar system during 1951-1953.

The Permanent Radar Program, it will be recalled,* had been regarded as only the first link in the radar warning and control system. Additional ground radar stations (both manned and unmanned), picket vessels, airborne early warning and control aircraft, and other facilities would be required to fill the gaps in P-system coverage and extend coverage to the North and seaward.

The first increase in the system was authorized in July 1951, at which time higher headquarters approved the construction of 44 additional, manned radar stations (under the terms of the Mobile Radar Program).[1] By early 1952, ADC had decided to deploy the new stations to form or begin to form, double perimeter radar fences around the Northeast,

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* See Chapter II, p. 17.



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Northwest, and California target areas. The rationale of the plan, as explained by General Bergquist, was as follows: "initial detection of an enemy...should be accomplished approximately 250 miles from the target area. To achieve this detection capability for altitudes down to 5,000 feet, a double perimeter of radar surveillance should be established around the target area with the radar sited on the inner perimeter... 70 miles out from the edge of the target area and the outer perimeter established...120 miles outside the inner perimeter."[2]

USAF approved the deployment plan in March 1952.[3] Thereafter, future additions to the radar warning and control system were justified and located in conformance with this double perimeter concept of operations.

Concurrent with the action being taken to complete and extend the radar system, research and development on an improved means for displaying and transmitting tactical data within the system was underway. The slowness with which data on the air situation was compiled and displayed in the radar stations where interceptor guidance took place and forwarded to adjacent stations and control centers at division had long been a critical defect in the system. The problem had been first pointed out by General Myer's, ConAC's Vice Commander, in July 1950. "Methods now employed in transmission and display of information in our Aircraft Control and Warning nets are inadequate to use the full capabilities of our defensive radar and aircraft," he had said. "The manual observing, telling and plotting procedures in current use introduce errors, omissions and delays into the operation of our AC&W net which seriously degrade the effectiveness of our defense system."[4] He had then asked higher head-

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quarters to initiate a crash program for the development of an electronic means for the automatic performance of these functions.

In response, USAF began to explore the possibility of adapting a version of the British Comprehensive Display System for use within the radar net. The heart of this system was a World War II developed digital computer, an electronic "store" into which information on aircraft tracks could be placed and retained until summoned for presentation on display boards. Or, as General Bergquist more graphically described it, a device into which "...you [throw] a bucket full of blips... somebody sorts [them] out... puts them in slots, and [you] put in a nickle for whatever kind of blip you want."[5]

While the British had not brought their system to the point where data stored in one computer was transferable to another, the United States scientists believed that such a development was possible. If so, it would solve the Air Defense Command's problem. Consequently, the Air Force in 1951 authorized the Laboratory for Electronics of Boston, Massachusetts, to study the British system and to develop a plan for producing the equipment using American radar and American parts.

The device conceived by this firm was designated the ACDS, the "American Comprehensive Display System." By the spring of 1952, the Pentagon had decided that the ACDS promised a significant enough improvement in data processing efficiency and track handling capacity to warrant procurement and directed ADC to develop a plan for incorporating it into the double perimeter concept of operations.[6]

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## The 1955 Organization Plan

The plan drawn in Air Defense Command Headquarters was titled the 1955 Organizational Plan, on the assumption that the ACDS would be ready for operational use by that time.

As explained by General Smith, ADC's Vice Commander, the nation under the 1955 plan would be divided into electronic areas, in which the ACDS equipment would be used, and non-electronic areas. The electronic areas would be located in the areas of heavy air traffic within the double perimeters of the Northeast, Northwest, and California. The areas outside the double perimeters, where air traffic was lighter and where there were fewer important targets, would be the non-electronic areas.[7]

Division/sector boundaries in the electronic areas would be located according to the number and character of probable targets in each sector and the forces which would be assigned and deployed under the double perimeter concept of operations by 1955. The ACDS equipment had the capacity to handle one hundred simultaneous tracks. Consequently, to reduce the size of the sectors to this probable track penetration level, seven new divisions would have to be created in the electronic areas.

In the non-electronic areas, the radar stations would be furnished equipments then under development (Target Position Indicators) to increase their display capability. Data transmission would continue to be performed manually. No new divisions would be required in these areas.

Thus, the 1955 plan called for an increase in the total number of air divisions from eleven to eighteen. Because it was desirable to

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have the area of each double perimeter completely within one Air Defense Force region, the 1955 plan also included a provision to alter the boundaries of the Defense Forces to fit both the double perimeter and the ACDS scheme of things.

<u>Area Boundary Changes of February 1953</u>

The 1955 plan was approved in principle by USAF on 22 August 1952[8] and in late October, the specific requirement for the seven additional Air Divisions was confirmed.

To facilitate the transition from the existing system to the 1955 system, ADC asked permission in November 1952 to realign region and sector boundaries in the forthcoming reorganization of the Command to correspond, insofar as possible, to the boundaries which would be in force in 1955. The request was approved in late December.[9]

Accordingly, on 1 February 1953, at the same time the defense wings were assigned to the divisions and the air defense groups formed, region boundaries were changed to correspond to the 1955 double perimeter and ACDS concept of operations. This required an extension of the Eastern Air Defense Force boundary westward to encompass territory and units formerly assigned the Central Air Defense Force. It also meant moving Central's western boundary farther west by reassigning the 29th and 34th Air Divisions, whose areas of coverage were outside the Northwest and California double perimeters, from Western Air Defense Force to Central. The changes would leave an adequate span of control in each air division during the remainder of the period before the new radar facilities and the ACDS equipment came into being except in the case of the

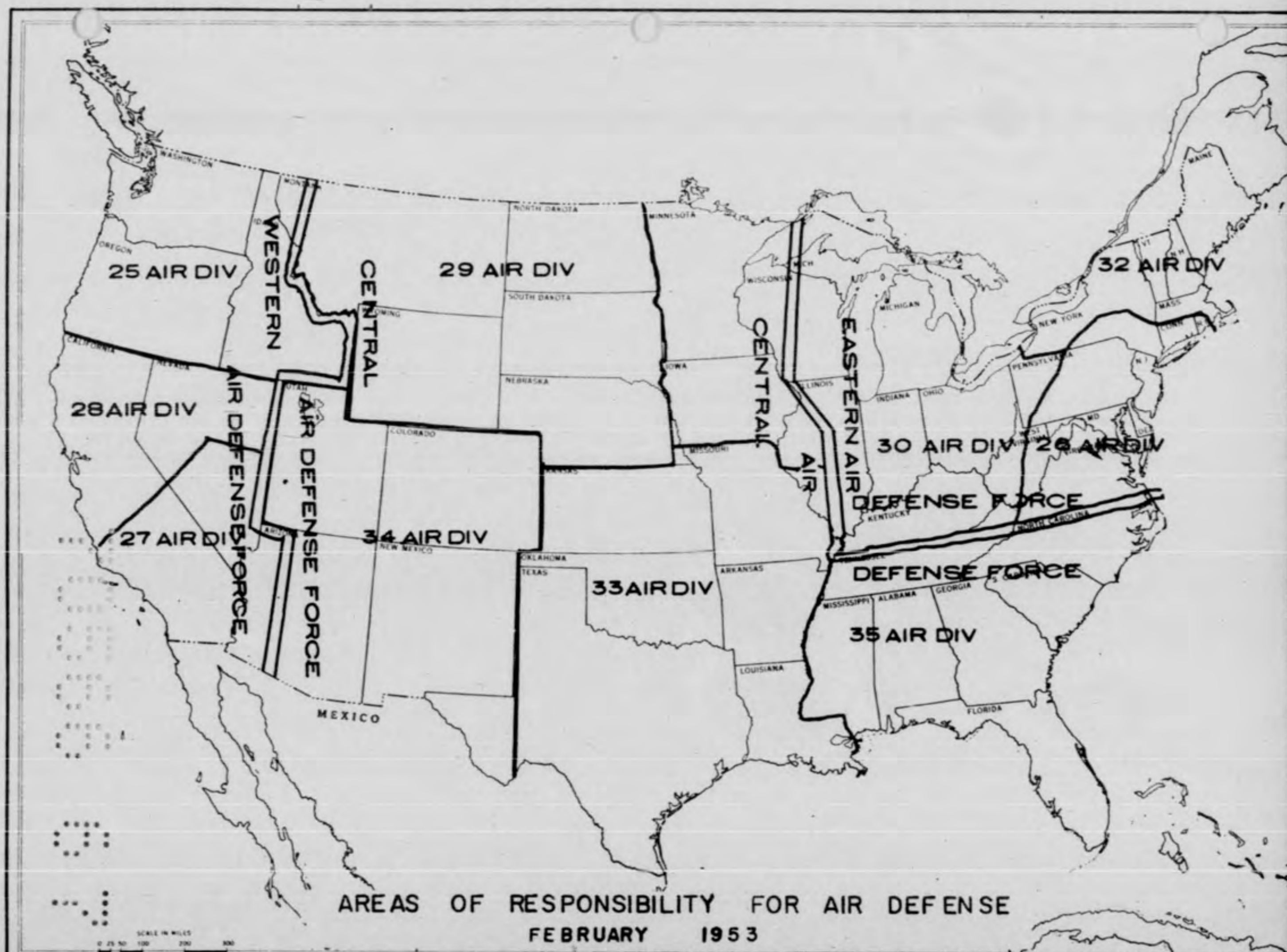
31st Air Division. Here, it will be recalled, no intermediary organizations existed between division headquarters and the operating forces. To resolve this span of control problem, the 29th Air Division boundary was extended eastward to encompass some of the 31st's units, thus obviating the need to activate defense wings in this area.[10]

## Advent of the SAGE System

To overcome the problem of transmitting data from one ACDS computer to another, the Air Force turned to the University of Michigan's Willow Run Research Center. In September 1952 that organization proposed to build an electronic system which would completely integrate the ground and air electronic environment using the ACDS as the basic component with digital magnetic drum storage. This system came to be called the Air Defense Integrated System (ADIS). In mid-October higher headquarters instructed ADC to work closely with the Willow Run Research Center on its development.[11]

Meanwhile, since mid-1951, the Massachusetts Institute of Technology, was working on another version of an electronic display and transmission system in its Lincoln Laboratory. Called the "Lincoln Transition System," it was being designed to perform "all the functions of data processing, threat evaluation, weapon assignment and weapon control centralized at the Air Defense Control Center [in the Air Division headquarters]."[12] Through 1952, there was little information available on the status of this project and ADC had presumed that its completion was a much longer way off than that of the ADIS.

Early in 1953, General Earle E. Partridge, then commanding the

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FEBRUARY 1953

Air Research and Development Command, said that USAF Headquarters, in order to "produce in the shortest possible time the most effective Air Defense Electronic Environment," was going to support fully the projects underway in both the University of Michigan and MIT. The Air Defense Command, for its part, was requested to extend "similar support...to the development of the Transition system that you accorded the ADIS program."[13]

But, in May 1953, this instruction was suddenly withdrawn and the startling announcement made that work on the ADIS system would cease. "The Air Force has found it necessary," General Partridge said, "to initiate a unilateral approach to the solution of its research and development problems in the field of Air Defense Electronic Environments. This single approach will be oriented toward the Lincoln Laboratory Transition Air Defense System and the ADIS program at RADC will be phased out completely...."[14]

The decision to cancel the ADIS project and devote full effort to the Semi Automatic Ground Environment (SAGE) system, as the Lincoln system came to be called, made it necessary to reevaluate future organizational plans. While the SAGE system was not due to become operational until the 1957-1960 time period, the double perimeter defenses would be well along to completion by late 1955 and early 1956. The problem, then, was how to mesh the organization which would be required in 1956 with the organization which would be placed into effect once the SAGE system came into being.

On 18 January 1954, an initial study of the organization which would be required under the SAGE system was completed in Headquarters, Air Defense Command. Under this plan, the nation was divided into 16 air divisions. This corresponded exactly with the numbers of air divisions which the command had by then decided would be needed for adequate span of control purposes once the double perimeters were completed and for the remainder of the manual operation period.[15] Thus, the path which ADC believed it could follow seemed a simple one at this time: build-up from 11 to 16 divisions as the additional radar forces came into being, keeping area boundaries during the remainder of the manual period as closely aligned with future SAGE boundary plans as possible and, then, simply phase-over when the SAGE equipment arrived.

This plan soon proved invalid. A salient feature of the SAGE system was that it would permit further decentralization of control of the air battle from division where it had reposed since 1948, to so-called "subsectors." In the January study, the system had been broken down into 46 such subsectors, but certain features of that alignment had been highly unsatisfactory. For one thing, the target areas of Chicago and Washington were positioned in such a manner that specific subsector responsibilities for their defense were unclear. For another, the Detroit-Cleveland target complex fell into two subsectors. Also, the small size of certain subsectors threatened to complicate the weapons handover and radar overlap functions. Finally, the existence of a great number of irregularly formed subsectors promised to create a technical problem insofar as their display on the cathode ray tubes was concerned. What better type of organization would result, ADC asked itself, if (1) the number of radar inputs

## AIR DEFENS BOUNDARIES (SAGE)

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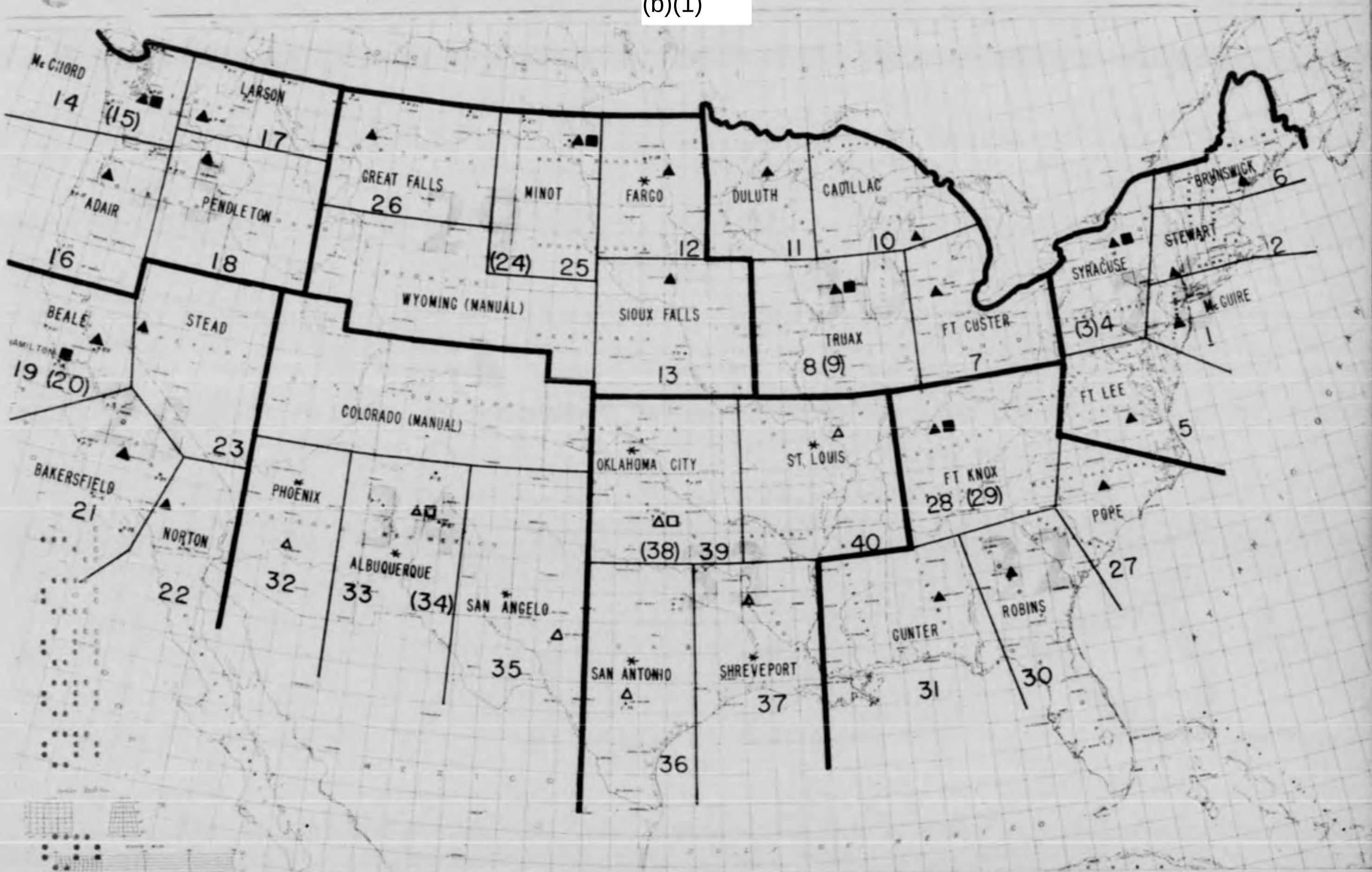


LEGEND

NUMBERS INDICATE INSTALLATION PRIORITY
( ) COMBAT CENTER PRIORITY
✱ NAMES TENTATIVE
▲ DIRECTION CENTER LOCATIONS
■ COMBAT CENTER LOCATIONS
△ TENTATIVE D.C. LOCATIONS
□ TENTATIVE C.C. LOCATIONS

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CLASSIFICATION - ADCR 205-5, 8 OCT 54, APPLIES

HQ ADC, 24 JAN 55

into a computer was increased 10 to 15 percent, and (2) no attempts were made to retain the same number of air divisions needed under the manual system after the SAGE system came into operation?[16]

As the result of a study made on the basis of these criteria, the planned number of subsectors under SAGE was reduced from 46 to 42 in March 1954. Of these, the two located in the Colorado-Wyoming-Utah area would remain on manual operations. The new plan would place each target well within one subsector area, improve weapons handover by enlarging on the size of the subsectors, and improve the display function. Further, the reduction from 46 to 40 SAGE equipped subsectors would save tremendously in manpower and money.

Finally, the new study called for a reduction in division headquarters and sectors after SAGE came in from 16 to 9. "This arrangement," the Air Defense Command stated, "provides adequate span of control and defines the area of supervision for a sector commander as one in which weapons can be allocated for the successful conduct of any given air battle in his area."

By September 1955, one further revision of note had been made in SAGE area organization planning. The number of planned subsectors was again reduced from 42 to 34, and the division/sectors from nine to eight.[17] The map on the preceding page shows the area boundary alignment as it was to exist after the advent of the SAGE system, as planned in September 1955.

Area Organization: 8 October 1955

The expense of building up to 16 divisions during the remainder

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of the manual period and, then, dropping to eight following the arrival of the SAGE equipment was questioned by higher headquarters.[18] Consequently, in July and August 1954, ADC carefully restudied the problem to see if there was some other and cheaper means of meeting it. In the end, however, the Command stood fast on its original plan. As General F. H. Smith pointed out, "...the increase in numbers and complexity of radar and fighter organizations requires the build-up...to provide adequate control under the Manual Air Defense System."[19]

In the alignment of the boundaries of the 16 divisions nothing would be gained, it was figured, by attempting to make them conform to sector boundaries as they would exist under the SAGE system. Consequently, they were drawn as best fitted double perimeter dictates. On the other hand, it was quite feasible to realign the regions so that the areas which probably would be assigned the Defense Force commanders following the conversion to the SAGE system could be under their control during the remainder of the manual period.[20] Accordingly, on 10 April 1955, the 35th Air Division was reassigned from the Central to the Eastern Air Defense Force.[21]

Activation of the five new divisions began on 8 October 1954 with the forming of the 9th at Geiger Field, Washington.[22] It was another year, however, before conditions warranted the activation of the remaining four. Then, on 8 September 1955, the 85th was established at Andrews Air Force Base, Maryland, and the 58th at Wright-Patterson Air Force Base, Ohio. On the same date, the 37th was formed at Truax

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Field, Wisconsin. The 20th was activated at Grandview on the 8th of the following month.[23*]

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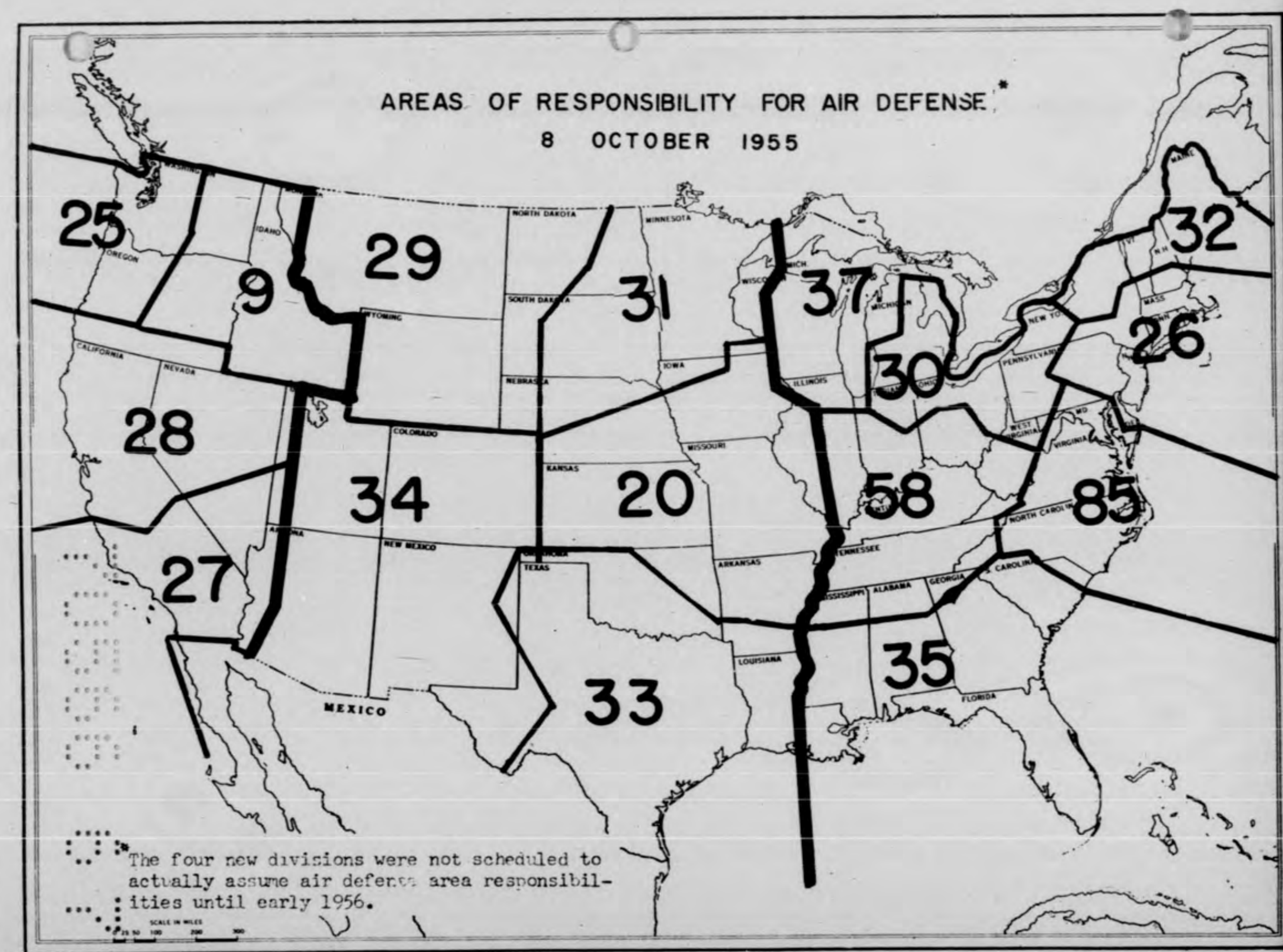
* See Appendix D for organizational chart of the Air Defense Command as of 8 October 1955.

AREAS OF RESPONSIBILITY FOR AIR DEFENSE*
8 OCTOBER 1955




*The four new divisions were not scheduled to actually assume air defense area responsibilities until early 1956.

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CHAPTER VIII

ESTABLISHMENT OF THE CONTINENTAL AIR DEFENSE COMMAND

From the first it was clear that defense of the Continental United States against air attack was not something which the Air Force could handle alone. Army antiaircraft weapons and Navy picket vessels were required as integral parts of the air defense system. And Navy fighters would be needed to augment the Air Force's interceptor resources. The big questions facing the early planners were who would command these forces in an emergency and how might they be readied for their air defense roles before the outbreak of hostilities?

In reply to ADC's queries on this score in early 1946, the Army Air Forces had stated that a theater organization would be established as soon after the initial stages of an attack as possible to take charge of the total defense effort.* In the time between the initial attack and the establishment of the theater command, control of the forces would <u>probably</u> be invested in the Air Defense Command.

This pronouncement failed to come to grips with the basic problem, General Stratemeyer believed. What he wanted was a written instruction from the Joint Chiefs to all services stating that control of the forces <u>would</u> pass to him when war broke out and remain with him until the theater command came into being. On the basis of that ruling he could then begin immediately to negotiate with Army Ground Forces

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* See Chapter I, p. 3, fn.

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and Navy commanders on their wartime air defense responsibilities.[1]

Further action on the matter was postponed until after Unification in 1947. Then, at Key West in early 1948 General Stratemeyer's views were for the most part confirmed and written into official doctrine. It was agreed that the Air Force (through the Air Defense Command) would command the forces of all services in an emergency until subsequent orders were issued by the Joint Chiefs. By the same token, this coordinated defense system would be operated on the basis of previously executed mutual agreements.

In the five years following the Key West meeting, the Joint Chiefs periodically considered going a step beyond the Key West agreement by broadening the peacetime air defense organization to include members of the other services on its staffs. One indication of this showed up in General Norstad's answer in mid-1950 to General Whitehead's recommendation that a third Air Defense Force be established. At this time, it will be recalled, General Norstad said that the creation of a "Unified Command" for air defense was under consideration.* Presumably, like the unified command headquarters which operated during World War II, this was to be a separate staff composed of members of all three services placed over Air Force, Army, and Navy commands assigned an air defense mission. Whatever these proposals were, nothing came of them and matters remained as established at Key West until 1954.

Meanwhile, the Air Force and the other services were forging out a workable means of interservice cooperation for air defense under

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* See Chapter V, p. 51.

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the "mutual agreement" clause of the Key West document.* In mid-1950, the Army established the Army Antiaircraft Command, under Major General Willard W. Irvine, to assume command of the antiaircraft batteries allocated to the air defense mission. Later in the year, the Headquarters of the new organization was located at Mitchel Field where it could work in close harmony with General Whitehead and his staff. By this time, too, sub-commands had been created alongside the Air Force headquarters at the several echelons within the air defense system. When the Air Defense Command was formed and moved to Colorado Springs in early 1951, General Irvine and his staff moved with it. By late 1954, the Air Defense Command's radars and fighters and the Army Antiaircraft Command's forces were operating as one system.

Relations with the Navy, too, had come a long way since Key West by late 1954. Agreements for the emergency employment of naval fighters and radars had been drawn up between the Air Defense Force and Sea Frontier commanders, and picket vessels were in operation off the East Coast. Here, however, there still remained one major impediment to efficient coordination -- the absence of actual naval representation at Command, Air Defense Force and division levels.

Early in 1954, the Joint Chiefs of Staff once again began an examination of the possibility of broadening the organization for air defense. In January, the Joint Strategic Plans Committee was

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* This subject is discussed in detail in ADC Historical Study #4, _Army Antiaircraft in Air Defense, 1946-1954_; and ADC Historical Study #5, _Emergency Air Defense Forces, 1946-1954_.

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directed to prepare and submit for approval the Terms of Reference for a joint command. This report, completed in March, recommended that the views of the Army, Navy and the Air Defense Command be obtained on the matter.[2]

General Chidlaw completed his reply in early May. He proposed that a joint command (which he tentatively labeled the United States Air Defense Command) be formed directly under the Joint Chiefs with the Air Force to serve as the executive agency. Joint headquarters would then be established at each echelon of the existing Air Defense Command structure through air division. The staffs of the joint headquarters would be comprised of the staffs of the present Air Defense Command headquarters, plus a small number of Army, Navy and Marine Corps personnel, and be commanded by the ADC commanders. Sub-commands would be the Air Defense Command, the Army Antiaircraft Command, and a Navy command yet to be formed. Overall responsibility for air defense would then be reinvested from the Air Defense Command in the new organization, which, in an emergency, would exercise operational control over the forces assigned to the sub-commands of the three services.[3]

The joint organization proposed by General Chidlaw had no precedent in the organizational history of the armed forces. It was a unique organization intended to solve the problems which had arisen as a result of the requirement to defend the United States against air attack with every resource available to the nation. The broad principles on which it was based, in his own words, were as follows:[4]

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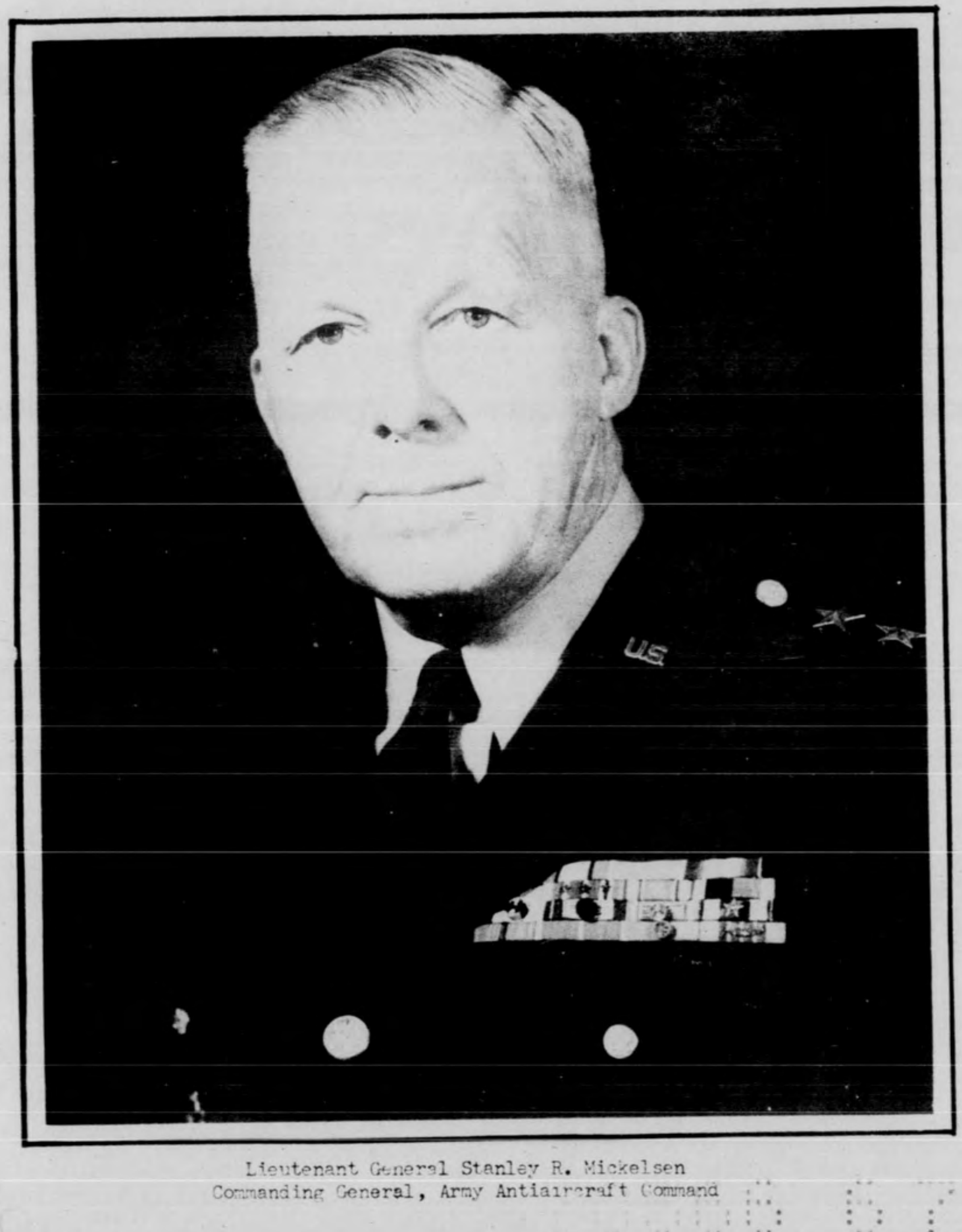



Lieutenant General Stanley R. Mickelsen
Commanding General, Army Antiaircraft Command

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Air Defense of the Continental United States is recognized as a prime mission of the United States military establishment. Since all U.S. military services possess Air Defense capabilities to some degree, the greatest effectiveness is gained for 'home' defense by employing all of them jointly. However, joint operations do not, themselves, tend toward simplicity -- in Air Defense the required combined operation of forces of the several Services is in itself a complication. Therefore, when a joint command is established for Air Defense, it is essential that unity of command and simplicity of operation be overriding considerations. Additional important considerations are: A clear analysis of the threat; a command structure which is simple, clear, and direct; and a sound plan, directive upon all Services.

Defense of the United States against air attack is a functional mission, limited geographically only by international agreement and the practical range of air defense weapons. The statement of mission is simple -- its implementation extremely complex. Successful accomplishment requires a force, in being, capable of maximum combative effort on extremely short notice at any unknown time. The operating command for air defense must be organized on a geographical basis, with sub-commands, all having the same mission -- that of air defense of a geographical area. For example, Eastern Air Defense Force is responsible for air defense of the vital Eastern "region" of the United States; and the 26th Air Division, a sub-command of EADF, is responsible for air defense of the New York-Washington 'sector.' It is imperative that all Air Defense Forces in these areas be under the operational control of the Air Defense Commander of the particular region or sectors concerned.

Because air defense of the U.S. is a functional mission carried out on a geographical basis, no other existing joint command can be used directly for organizational comparison. The Strategic Air Command, a JCS Specified Command, is closest perhaps to the proposed United States Air Defense Command in type mission; but, because it is primarily unilateral in structure cannot be used as a model. As a result, the organization and command arrangements herein proposed may not appear too familiar to anyone not intimate with air defense requirements and operations.

The functions of command required by Commander-in-Chief, United States Air Defense Command, are those involving the composition of subordinate forces, the assign-

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> ment of tasks, the designation of objectives, and the authoritative direction necessary to accomplish the mission.
>
> The peculiarities of the various existing Service and Command arrangements from an administrative and logistics standpoint are such that major changes in existing procedures would inevitably result in confusion. I therefore recommend, at this time, no fundamental changes in present administrative or logistics support procedures.

In conclusion, he stated that his proposed organization was the most efficient one, in terms of manpower and other support costs, which he could devise. It would, he believed, "promote intimate staff relations, mutual trust, respect, and understanding, at the same time making possible ...minimum joint staff responsibilities."

In early August, the Joint Chiefs directed the establishment of the joint command substantially as proposed by General Chidlaw. In JCS SM-688-54, dated 2 August, establishment of the Continental Air Defense Command (CONAD) "as a joint command of the United States," with Headquarters at Ent Air Force Base was ordered. The Department of the Air Force was designated the executive agency.[5]

The Terms of Reference, the mission of the joint organization, and the responsibilities of the Army Antiaircraft Command, the Naval component (which would soon be formed), and the Air Defense Command were issued on 27 August.[6] As prescribed in these directives,*

> The existing organization of the USAF Air Defense Command, with its air defense system for surveillance, warning and control, and combat is the basic structure which will be utilized for the Joint Command. Each USAF Headquarters from command down to air division level will be additionally designated as a joint headquarters commanded by an Air Force officer and with appropriate repre-

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* These are included verbatim in Appendix C.

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Rear Admiral Albert K. Morehouse
Commander, Naval Forces
Continental Air Defense Command

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sentation from each Service.

The Army Antiaircraft Command and the Naval Command will parallel this organization through the regional level and with a Component Commander or staff representation below regional level as experience dictates. The numbers of personnel who will represent each component commander at the Joint Regional Air Defense Force level will be a matter for agreement between him and the Commander, Joint Regional Air Defense Force.

The Service component commanders at regional or lower levels, in addition to their uni-service functions, shall be Army Deputy and Navy Deputy, respectively, to the joint commanders for matters of concern to their Services.

The Component Commanders will be responsible for the military command of their components in accordance with directives and procedures of their Services. Logistic and administrative support of the Service components will be provided as directed by the Service concerned.

The Joint manning of the staff of the Commander-in-Chief, due to the proximity of the headquarters of the component commands should be kept to a minimum.

The Continental Air Defense Command, in accordance with these instructions, was established on 1 September 1954 with General Chidlaw as its first Commander-in-Chief.[7] Lieutenant General Stanley R. Mickelsen,* Commander of the Army Antiaircraft Command, became his advisor on antiaircraft matters, in accordance with the Terms of Reference, and Rear Admiral Albert K. Morehouse,** who was appointed to the command of the Naval forces for CONAD upon the establishment of the Headquarters of

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* Lieutenant General John T. Lewis had replaced General Irvine as the ARAACOM Commander in May 52. Upon his retirement in September 1954, he was succeeded by General Mickelsen, who officially assumed command on 1 October. See Appendix B for a brief biography of General Mickelsen.

** See Appendix B for brief biography.

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that command at Ent Air Force Base in late 1954, his advisor on the employment of naval forces in air defense.

Effective the same date, overall responsibility for the air defense of the nation passed from the Air Defense Command to the new organization.*

Joint Air Defense Force and Joint Air Division headquarters, as depicted on the following chart, were formed throughout the organization on the same date.[9] By early 1955, naval components had been created under Admiral Morehouse alongside the Army and the Air Force commands at the several echelons of the organization through air division.

In mid-1955, command of the new organization passed from General Chidlaw, upon his retirement, to General Earle E. Partridge.** By the end of its first year, the new command had made considerable progress in the revision of operating procedures to fit the new situation and in working out the minor kinks which cropped up in inter-staff relations. That the new organization was a tremendous forward stride was an irrefutable fact; that it was the final answer to the efficient and operationally effective conduct of the tri-service mission of continental air defense only time would tell.

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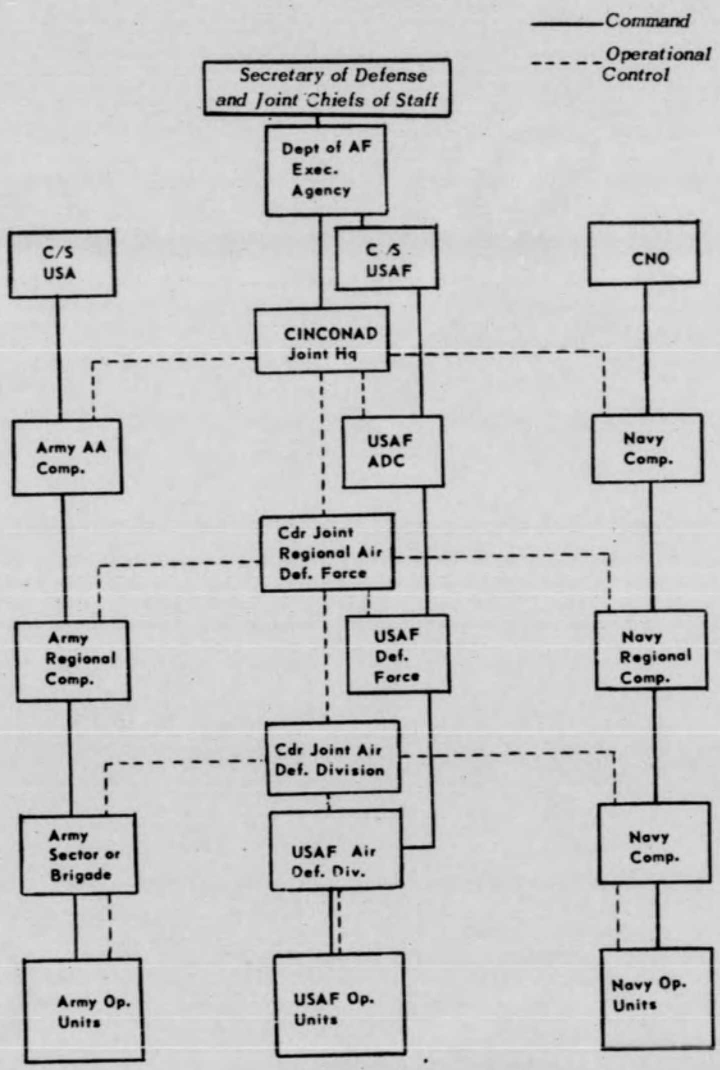
* Actual revision of the Air Force mission regulation for the Air Defense Command (AFR 23-9) was not made until 24 August 1955. Whereas the former editions of this directive had stated "The Air Defense Command is organized primarily <u>to provide for and conduct the air defense</u> of the United States," the new one read: "...is organized primarily <u>to discharge Air Force responsibilities for</u> the air defense of the United States."[8] (Italics, the author's)

** See Appendix B for a brief biography.

ORGANIZATION

CONTINENTAL AIR DEFENSE COMMAND

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# A P P E N D I C E S







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# APPENDIX A

## COMMANDER'S ROSTER

| | Date of Office |
|---|---|
| **I. AIR DEFENSE COMMAND (Mar 1946-Nov 1948)** | |
| **A. Commander:** | |
| Lt Gen George E. Stratemeyer | Mar 46-Nov 48 |
| **B. Vice Commander:** | |
| Maj Gen Charles B. Stone III | Mar 46-Oct 47 |
| Maj Gen Howard M. Turner | Jan 48-Nov 48 |
| **C. Deputy for Operations:** | |
| Col James H. Wallace | Apr 46-Aug 46 |
| Col Keith K. Compton | Aug 46-Jul 47 |
| Col Bruce K. Holloway | Jul 47-Apr 48 |
| Col Jacob E. Smart | May 48-Nov 48 |
| **II. CONTINENTAL AIR COMMAND (Dec 1948-Dec 1950)** | |
| **A. Commander:** | |
| Lt Gen George E. Stratemeyer | Dec 48-Apr 49 |
| Lt Gen Ennis C. Whitehead | Apr 49-Dec 50 |
| **B. Vice Commander:** | |
| Maj Gen Howard M. Turner | Dec 48-May 49 |
| Maj Gen Charles T. Myers | May 49-Dec 50 |
| **C. Deputy for Operations:** | |
| Col Jacob E. Smart | Dec 48-Jul 49 |
| Brig Gen Herbert B. Thatcher | Aug 49-Dec 50 |





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| | Date of Office |
|---|---|
| **III. AIR DEFENSE COMMAND (Jan 1951-Sep 1955)** | |
| A. Commander: | |
| Lt Gen Ennis C. Whitehead | Jan 51-Aug 51 |
| Gen Benjamin W. Chidlaw | Aug 51-May 55 |
| Gen Earle E. Partridge | Jul 55-To date |
| B. Vice Commander: | |
| Maj Gen Charles T. Myers | Jan 51-Mar 52 |
| Maj Gen Frederic H. Smith, Jr | Mar 52-To date |
| C. Chief of Staff: | |
| Office non-existent | Jan 51-Feb 52 |
| Maj Gen Jarred V. Crabb | Feb 52-Jul 54 |
| Maj Gen George F. Smith | Aug 54-To date |
| D. Deputy for Operations: | |
| Brig Gen Herbert B. Thatcher | Jan 51-Aug 51 |
| Maj Gen Kenneth P. Bergquist | Aug 51-May 55 |
| Brig Gen Clinton D. Vincent | May 55-(Deceased) |
| Maj Gen Hugh A. Parker | Sep 55-To date |
| **IV. COMMANDERS, NUMBERED AIR FORCES (Mar 1946-Sep 1950)** | |
| A. 1st Air Force | |
| Maj Gen Robert W. Douglass, Jr | Mar 46-Jul 47 |
| Maj Gen Robert M. Webster | Jul 47-Aug 49 |
| Maj Gen Glenn O. Barcus | Sep 49-Jul 50 |
| Maj Gen Willis H. Hale | Jul 50-thru Sep 50 |
| B. 2d Air Force (inactivated, Jun 1948) | |
| Maj Gen Frederick W. Evans | Jun 46-Jun 47 |
| Brig Gen Walter R. Peck | Jun 47-Sep 47 |
| Maj Gen Paul L. Williams | Sep 47-Jun 48 |
| C. 4th Air Force | |
| Maj Gen Willis H. Hale | Jul 54-Oct 47 |
| Brig Gen Ned Schramm | Nov 47-Jan 48 |
| Maj Gen John E. Upston | Jan 48-thru Sep 50 |

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| | Date of Office |
|---|---|
| **D. 9th Air Force** (Assigned from TAC to ConAC Dec 48 - Reassigned TAC Sep 50) | |
| Maj Gen William D. Old........................ | Dec 48-Oct 49 |
| Maj Gen Willis H. Hale........................ | Oct 49-Jul 50 |
| Maj Gen Willard R. Wolfinbarger............... | Jul 50-thru Sep 50 |
| **E. 10th Air Force** | |
| Maj Gen Howard M. Turner...................... | Jun 46-Dec 47 |
| Brig Gen Harry A. Johnson..................... | Jan 48-Jun 48 |
| Maj Gen Paul L. Williams...................... | Jul 48-Apr 50 |
| Maj Gen Harry A. Johnson...................... | Apr 50-thru Sep 50 |
| **F. 11th Air Force** (inactivated, Jun 1948) | |
| Maj Gen Thomas J. Hanley, Jr.................. | Jun 46-Jan 48 |
| Brig Gen Ralph A. Snavely..................... | Jan 48-Jun 48 |
| **G. 12th Air Force** (Assigned from TAC to ConAC Dec 48 - discontinued July 1950) | |
| Maj Gen Glenn O. Barcus....................... | Dec 48-Sep 49 |
| Maj Gen Alden R. Crawford..................... | Sep 49-Jun 50 |

V. AIR DEFENSE FORCES

A. EASTERN AIR DEFENSE FORCE (Sep 49-Sep 55)

| | |
|---|---|
| **1. Commander:** | |
| Maj Gen Robert M. Webster................. | Sep 49-Jun 50 |
| Maj Gen Frederic H. Smith, Jr............. | Aug 50-Feb 52 |
| Brig Gen Russell J. Minty................. | Feb 52-Jun 52 |
| Maj Gen Morris R. Nelson.................. | Jun 52-To date |
| **2. Vice Commander:** | |
| Brig Gen George R. Acheson................ | Nov 49-Mar 51 |
| Brig Gen Jacob E. Smart................... | Mar 51-Nov 51 |
| Brig Gen George F. Smith.................. | Nov 51-Aug 54 |
| Brig Gen Donald F. Smith.................. | Aug 54-Sep 55 |

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| | Date of Office |
|---|---|
| **3. Deputy for Operations:** | |
| Col Joseph A. Cunningham........................ | Nov 49-Aug 50 |
| Col Edwin L. Tucker........................ | Aug 50-Nov 50 |
| Col Henry Vicellio........................ | Nov 50-May 51 |
| Brig Gen George F. Smith........................ | May 51-Nov 51 |
| Col Ernest H. Beverly........................ | Dec 51-Jul 52 |
| Col Carroll W. McColpin........................ | Jul 52-Jul 54 |
| Col Arthur C. Agan, Jr........................ | Aug 54-To date |

B. WESTERN AIR DEFENSE FORCE (Sep 1949-Sep 1950)

| | |
|---|---|
| **1. Commander:** | |
| Maj Gen John E. Upston........................ | Sep 49-Nov 49 |
| Maj Gen Hugo P. Rush........................ | Nov 49-Sep 51 |
| Maj Gen Herbert B. Thatcher........................ | Sep 51-Jan 52 |
| Maj Gen Walter E. Todd........................ | Feb 52-Sep 55 |
| Maj Gen Roy H. Lynn........................ | Sep 55-To date |
| **2. Vice Commander:** | |
| Col Robert S. Israel........................ | Sep 49-Dec 49 |
| Brig Gen William O. Morgan........................ | Dec 49-Jul 51 |
| Brig Gen Hugh A. Parker........................ | Jul 51-Jul 53 |
| Brig Gen Clinton D. Vincent........................ | Aug 53-Jun 55 |
| Brig Gen Edwin L. Tucker........................ | Jun 55-To date |
| **3. Deputy for Operations:** | |
| Col Robert S. Israel........................ | Dec 49- |
| Col Hugh A. Parker........................ | Aug 50-Jul 51 |
| Col Loring F. Stetson, Jr........................ | Jul 51-Sep 51 |
| Col William H. Wise........................ | Sep 51-Sep 52 |
| Col Loring E. Stetson, Jr........................ | Sep 52-Dec 52 |
| Col Harrison R. Thyng........................ | Dec 52-Aug 54 |
| Col Clayton B. Claassen........................ | Aug 54-To date |

C. CENTRAL AIR DEFENSE FORCE (Mar 1951-Sep 1955)

| | |
|---|---|
| **1. Commander:** | |
| Maj Gen George R. Acheson........................ | Mar 51-Feb 53 |
| Maj Gen Delmar T. Spivey........................ | Feb 53-Jul 54 |
| Maj Gen Jarred V. Crabb........................ | Jul 54-To date |

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2. Vice Commander:

| | Date of Office |
|---|---|
| Brig Gen Frank H. Robinson | Mar 51-Jan 54 |
| Brig Gen Edward W. Suarez | Feb 54-To date |

3. Deputy for Operations:

| | |
|---|---|
| Col George F. McGuire | Apr 51-Nov 51 |
| Col Charles B. Overacker | Dec 51-Sep 54 |
| Col Clifford H. Rees | Oct 54-To date |

VI. COMMANDERS, AIR DIVISIONS (DEFENSE)

A. 25th Air Division (Oct 1948-Sep 1955)

| | |
|---|---|
| Brig Gen Ned Schramm | Oct 48-Nov 48 |
| Maj John C. Burnett | Nov 48-Apr 49 |
| Col Clinton D. Vincent | Apr 49-Mar 52 |
| Brig Gen T. Alan Bennett | Sep 54-To date |
| Brig Gen Romulus W. Puryear | Sep 54-To date |

B. 26th Air Division (Nov 1948-Sep 1955)

| | |
|---|---|
| Brig Gen Russell J. Minty | Nov 49-Apr 53 |
| Brig Gen James W. McCauley | May 53-To date |

C. 28th Air Division (Dec 1949-Sep 1955)

| | |
|---|---|
| Col William A. Matheny | Dec 49-Feb 51 |
| Col Hobart R. Yeager | Feb 51-Apr 52 |
| Brig Gen James W. Andrew | Jun 52-Apr 54 |
| Brig Gen Monro MacCloskey | Apr 54-To date |

D. 30th Air Division (Dec 1949-Sep 1955)

| | |
|---|---|
| Col James B. Burwell | Dec 49-Dec 50 |
| Brig Gen Edwin L. Tucker | Dec 50-Aug 55 |
| Brig Gen Benjamin J. Webster | Sep 55-To date |

E. 32d Air Division (Dec 1949-Sep 1955)

| | |
|---|---|
| Lt Col John A. H. Miller | Dec 49-Jan 50 |
| Lt Col Otto G. Quanrud | Jan 50-Feb 50 |
| Col Fred T. Crimmins | Feb 50-Jun 50 |
| Brig Gen Jacob E. Smart | Jul 50-Feb 51 |
| Col Fred T. Crimmins, Jr | Feb 51-Apr 51 |

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| | Date of Office |
|---|---|
| Col Arthur C. Agan, Jr | Apr 51-Aug 51 |
| Col Grover C. Wilcox, Jr | Aug 51-Nov 51 |
| Brig Gen James W. McCauley | Nov 51-Apr 53 |
| Brig Gen Robert S. Israel | May 53-To date |

F. 27th Air Division (Sep 1950-Sep 1955)

| | |
|---|---|
| Brig Gen Donald R. Hutchinson | Sep 50-Apr 54 |
| Brig Gen James W. Andrew | Apr 54-To date |

G. 31st Air Division (Oct 1950-Sep 1955)

| | |
|---|---|
| Col Harold W. Grant | Jan 51-Jun 51 |
| Brig Gen Thomas C. Darcy | Jul 51-Jun 53 |
| Brig Gen William A. Matheny | Jun 53-To date |

H. 34th Air Division (Jan 1951-Sep 1955)

| | |
|---|---|
| Brig Gen William A. Matheny | Mar 51-Jun 53 |
| Brig Gen Wendell W. Bowman | Jul 53-To date |

I. 29th Air Division (Mar 1951-Sep 1955)

| | |
|---|---|
| Col Paul E. Greiner | Mar 51-Aug 52 |
| Col Edward N. Backus | Aug 52-Aug 53 |
| Brig Gen James O. Guthrie | Aug 53-To date |

J. 33d Air Division (Mar 1951-Sep 1955)

| | |
|---|---|
| Brig Gen Victor H. Strahm | Mar 51-May 52 |
| Brig Gen Romulus W. Puryear | Jun 52-Sep 54 |
| Brig Gen William P. Nuckols | Sep 54-To date |

K. 35th Air Division (Jul 1951-Sep 1955)

| | |
|---|---|
| Col M. C. Woodbury | Aug 51-Jan 54 |
| Brig Gen John B. Cary | Feb 54-To date |

L. 9th Air Division (Sep 1954-Sep 1955)

| | |
|---|---|
| Col Harrison R. Thyng | Oct 54-Jan 55 |
| Brig Gen Sam W. Agee | Jan 55-To date |

VII. COMMANDERS, ARMY ANTIAIRCRAFT COMMAND (Jul 1950-Sep 1955)

| | |
|---|---|
| Maj Gen Willard W. Irvine | Jul 50-May 52 |
| Lt Gen John T. Lewis | May 52-Sep 54 |
| Lt Gen Stanley R. Mickelsen | Oct 54-To date |

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Date of Office

VIII. COMMANDERS, NAVY FORCES FOR CONAD (Sep 1954-Sep 1955)

Rear Admiral Albert K. Morehouse.................. Sep 54-To date



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# APPENDIX B

## B I O G R A P H I C A L   S K E T C H E S

### Lieutenant General George Edward Stratemeyer*

George E. Stratemeyer was born in Cincinnati, Ohio, November 24, 1890. He spent most of his early life in Peru, Indiana, graduating from high school there in 1909. He was graduated from the U. S. Military Academy at West Point, New York, and commissioned a second lieutenant of Infantry June 12, 1915.

He first was assigned to the Seventh Infantry at Galveston, Texas, and served with the Seventh and 34th Infantry at Galveston and El Paso, Texas, and Douglas and Nogales, Arizona, until September, 1916, when he was detailed to the Aviation Section at Rockwell Air Force Base, San Diego, California. Upon completion of flying training, he was assigned to the First Aero Squadron at Columbus, New Mexico.

In 1917, he was ordered to organize and command the School of Military Aeronautics at Ohio State University. This assignment lasted until January, 1918, when he was assigned to Kelly AFB, Texas, first as chief test pilot and later as commanding officer of the Air Service Mechanical School. From Kelly AFB he moved the Air Service Mechanics School at Chanute AFB, Illinois, where he remained as its commanding officer during the summer of 1921.

Meanwhile, on July 1, 1920, he transferred from the Infantry to the Air Service.

In the fall of 1921, he was transferred to Luke AFB, Hawaii, to command the 10th Air Park. In December of that year he moved to Schofield Barracks, Hawaii, to organize and command the Division Air Service. From April, 1922, until August 1924, he commanded Luke AFB and also served as department air officer.

His next assignment was instructor in tactics at the U. S. Military Academy, and in 1929 he entered the Air Corps Tactical School at Langley AFB, Virginia. After graduating in June, 1930, he entered the Command and General Staff School at Fort Leavenworth, Kansas. Upon graduation in 1932, he was assigned to remain at the school as an instructor, which position he held for four years.

In July, 1936, he became commanding officer of the Seventh Bombardment Group at Hamilton AFB, California. He kept the seventh group until he was enrolled in the Army War College at Washington, D. C., in September, 1938. Following graduation in 1939, he was assigned to the office of the

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* As of November 1948.

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Chief of Air Corps, as chief of the Training and Operations Division. He became executive officer to the Chief of Air Corps in April, 1941. In January, 1942, he was assigned to command the Southeast Air Corps Training Center at Maxwell AFB, Alabama, and in June of that year was called back to Washington to become Chief of the Air Staff at Air Force Headquarters.

On August 5, 1943, he became commanding general of the India-Burma Sector and air advisor to the commanding general of the China-Burma-India theater. On December 15, 1943, he was appointed air commander of the Eastern Air Command. In the reorganization of that theater in November, 1944, he became commanding general of the Army Air Forces in the India-Burma theater, and in July, 1945, was appointed commander of the AAF in the China theater, with headquarters at Chungking, and later at Shanghai.

In February, 1946, he was recalled from overseas to assume command of the Air Defense Command, with headquarters at Mitchel AFB, New York. Plans for this organization were formulated during the latter part of February and early March, with General Stratemeyer assuming command on March 29, 1946.

In November, 1948, he was appointed commanding general of the newly-organized Continental Air Command, with headquarters at Mitchel AFB, a Command designed to strengthen the Air National Guard and Air Reserve programs and to provide for Air Force command areas identical with those of the Department of the Army.

The Command includes the units and functions formerly assigned to Air Defense Command and Tactical Air Command, which continue as operational headquarters at Mitchel AFB and Langley AFB, Virginia, respectively.

It has direct control over six regional Air Forces, which are responsible for Air Force matters within the identical limits served by each of the six Department of the Army areas. The six regional Air Forces, with their headquarters, are: First Air Force, Fort Slocum, New York; Fourth Air Force, Hamilton AFB, California; Ninth Air Force, Greenville, South Carolina; 10th Air Force, Ft. Benjamin Harrison, Indiana; 12th Air Force, Brooks AFB, Texas, and 14th Air Force, Langley AFB, Virginia.

General Stratemeyer has been awarded the Distinguished Service Medal with two Clusters, Distinguished Flying Cross, and Air Medal.

His foreign decorations include the British Order of Companion of the Bath; the Chinese Special Tashou Cloud Banner and the Ho Tu Medal of the Chinese Air Force; the Polish Order of Polonia Restituta, Commander's Cross; the Yugoslavian pilot's badge, with honorary membership in the respective Air Forces.

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He is rated a Command Pilot, Combat Observer, Aircraft Observer, and Technical Observer.

PROMOTIONS: He was promoted to first lieutenant (permanent) on July 1, 1916; to captain (permanent) on May 15, 1917, and to major (temporary) on August 20, 1920. He reverted to the rank of captain on November 2, 1922, and was promoted to major (permanent) on August 28, 1925; to lieutenant colonel (temporary) on June 16, 1936; to lieutenant colonel (permanent) on January 1, 1937; to colonel (temporary) on March 1, 1940; to brigadier general (temporary) on August 4, 1941; to major general (temporary) on February 16, 1942; to colonel (permanent) on May 31, 1944; to lieutenant general (temporary) on May 28, 1945; to brigadier general (permanent) on June 28, 1946; to major general (permanent) on August 1, 1947.

## Major General Gordon Philip Saville*

Gordon P. Saville was born at Macon, Georgia, September 14, 1902. He attended the University of Washington, Antioch College, and then University of California and was commissioned a second lieutenant in the Infantry Reserve November 5, 1923.

He became a flying cadet in March 1926 and entered the primary flying school at Brooks Field, Texas. In September of that year he was transferred to the advanced flying school at Kelly Field, Texas, from which he was graduated in February 1927. That same date he was commissioned a second lieutenant in the Air Reserve and assigned to the Fifth Observation Squadron at Mitchel Field, New York. In June 1927, he was appointed a second lieutenant in the Air Corps of the Regular Army.

He became adjutant of Crissy Field, California, in December 1928, and two years later transferred to Mather Field, California, where he was appointed adjutant of the field, and the 20th Pursuit Group. In 1932, he went to Barksdale Field, Louisiana, with the 20th Pursuit Group. He entered the Air Corps Tactical School at Maxwell Field, Alabama. In August 1933, and after graduating in May 1934 remained at the school as an instructor. In July 1935, he was named recorder of the Air Corps Board at Maxwell Field, in addition to his duties as fighter aviation instructor.

He entered the Command and General Staff School at Fort Leavenworth, Kansas, in September 1938, and was graduated the following June. He then was assigned to Washington, D. C. as assistant to the chief of the Plans Division in the office of the Chief of Air Corps. He became assistant intelligence and operations officer of the Air Defense Command at Mitchel Field, New York, in March 1940.

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* As of February 1950.

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In October of that year he went to London, England, for temporary duty as a military air observer, and returned to Mitchel Field the following December to become executive officer of the First Interceptor Command. In August 1941, he returned to London and served there until December 1941, when he was assigned to AAF headquarters in Washington as Director of Air Defense. In March 1943, he became Director of Tactical Development at the AAF School of Applied Tactics at Orlando, Florida.

The following July he was ordered to the North African theater where he became chief of staff of the Mediterranean Air Command. In October 1943, he was appointed commander of the 12th Fighter Command and in January 1944 was named deputy commander of the 12th Air Support Command in the Mediterranean. This unit was later redesignated the 12th Tactical Air Command. He assumed command of the First Tactical Air Force in January 1945.

The following month he returned to the United States for temporary assignment to AAF headquarters, and in March 1945 became commander of the Third Tactical Air Command at Barksdale Field. Two months later he was appointed deputy commander of Air Transport Command at Washington.

In January 1947, he became chief of the Air Section of the Joint Brazil-United States Military Commission, with station at the American Embassy at Rio de Janeiro.

He returned to the United States in July 1948 for assignment to Air Defense Command headquarters at Mitchel AFB, New York, and the following November was named commanding general of ADC.

He was appointed head of the newly-established Directorate of Requirements in the Office of the Deputy Chief of Staff for Operations at USAF headquarters in September 1949. The following January he became Deputy Chief of Staff for Development, a new staff section at USAF headquarters.

General Saville has been awarded the Distinguished Service Medal with one Oak Leaf Cluster, the Legion of Merit, the Distinguished Flying Cross, the Bronze Star Medal, and the Air Medal.

He is rated a Command Pilot, Combat Observer, Aircraft Observer, and Technical Observer.

PROMOTIONS: He was promoted to first lieutenant (permanent) on October 17, 1933, and to captain (temporary) on March 11, 1935. He reverted to his permanent rank of first lieutenant on June 16, 1936 and was promoted to captain (permanent) on June 30, 1937; to major (temporary) on January 5, 1942; to colonel (temporary) on March 1, 1942; to brigadier general (temporary) on November 2, 1942; to major (permanent) on June 30, 1944;

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to brigadier general (permanent) on February 19, 1948, with date of rank from November 2, 1942; to major general (temporary) on February 19, 1948; with date of rank from October 8, 1947; to major general (permanent) on January 27, 1950, with date of rank from June 7, 1944.

## Lieutenant General Ennis C. Whitehead*

Lieutenant General Ennis C. Whitehead was born at Westphalia, Kansas, on September 3, 1895. He attended the University of Kansas and entered the Army as a flying cadet on August 16, 1917. From June 1917 until November 1917, he was stationed at Chanute Field, Illinois where he was commissioned a first lieutenant in the Aviation Section of the Signal Officers Reserve Corps on November 20, 1917.

During World War I, General Whitehead served in France from November 1917 until the Armistice at the 3rd Aviation Instruction Center, Issoudun, France, successively as an instructor and a test pilot. In June 1918 he was named Assistant Chief Test Pilot and served in that capacity until November 1918, when he was returned to the United States.

General Whitehead was honorably discharged on January 9, 1919, at which time he returned to the University of Kansas to complete his college education. On graduation in 1920 he received the degree of Bachelor of Arts and was shortly thereafter commissioned a first lieutenant in the Air Service of the Regular Army, July 1, 1920.

General Whitehead's first peacetime assignment immediately following his commissioning was at Camp Funston, Kansas, as Assistant Supply Officer of the 55th Infantry. In October of the same year he went to March Field, California, as an instructor.

In February 1921 he went to Kelly Field, Texas, as an Engineering Officer of the 94th Squadron, and in July 1921 he was transferred to Langley Field, Virginia. In October 1921 he went to Ellington Field, Texas, and in July 1922 was transferred to Selfridge Field, Michigan, where he had charge of aeronautical repair units.

He entered the Air Service Engineering School at McCook Field, Ohio, in July 1925, and was graduated in June 1926. On graduation, he was assigned as Assistant Chief of Maintenance at the Fairfield Air Intermediate Depot in Ohio. In December 1926 he was designated Assistant Engineering Officer and Pilot for the Pan-American Flight from Miami, Florida, to Panama under the command of the late Major General Herbert A. Dargue.

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* As of February 1950.

APPENDIX B - 106 (b)(1) [redacted]

In May 1927 General Whitehead went to Wright Field, Ohio, as Assistant Chief of the Maintenance Engineering Branch in the Air Corps Materiel Division. In July 1928 he became Chief of the Aircraft Engine and Spare Parts Branch there, and in August 1930, he entered the Air Corps Tactical School at Langley Field, Virginia. He was graduated in June 1931 and assigned to Selfridge Field, Michigan, as Commanding Officer of the famed 36th Pursuit Squadron.

General Whitehead went to Albrook Field, Panama Canal Zone, in November 1932, as Operations Officer and Intelligence Officer. He returned to the United States in December 1934, and was stationed at Barksdale Field, Louisiana, as Assistant Operations Officer. In March 1935 he went to Langley Field, Virginia, as Assistant to the Plans and Training Officer, G-3, of the General Headquarters Air Force. In July 1935 he became Inspector of the General Headquarters Air Force with station at Langley Field, Virginia, and in August 1937, he entered the Command and General Staff School, Fort Leavenworth, Kansas, from which he was graduated in June 1938.

Upon graduation from the Command and General Staff School, General Whitehead was appointed Chief of the Field Service Section of the Supply Division, Office of the Chief of Air Corps, Washington D. C. In September of that year he was transferred to the Military Intelligence Division, G-2, of the War Department General Staff for duty in the Balkans and Near East Section of that office. Two years later he was made Chief of the Aviation Section, Military Intelligence Division. In February 1941, he was assigned as Commanding Officer of the Air Corps Advanced Flying School at Phoenix, Arizona, until July 1942 when he was appointed Deputy Commander, Fifth Air Force in the Southwest Pacific.

General Whitehead became Commanding General of the Fifth Air Force in June 1944, serving in this position throughout the remainder of World War II and until March 1946 when he was made Commanding General of the Far East Air Forces.

After nearly seven years of continuous duty overseas, General Whitehead returned to the United States to become Commanding General of the Continental Air Command at Mitchel Air Force Base, New York, on April 15, 1949. He served as Commanding General of ConAC until he was appointed Commanding General of the Air Defense Command on 8 January 1951.

General Whitehead is rated a Command Pilot, Combat Observer, and Technical Observer. He was promoted to Lieutenant General on June 5, 1945.

He has been awarded the Distinguished Service Cross; the Distinguished Service Medal with Oak Leaf Cluster; the Silver Star; the Distinguished Flying Cross; and foreign decorations from the governments of Chile, Peru, Venezuela, and Bolivia.

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General Benjamin Wiley Chidlaw*

Benjamin W. Chidlaw was born at Cleves, Ohio, near Cincinnati, on December 18, 1900.

Soon after graduation from Woodward High School in Cincinnati, he entered the U. S. Military Academy at West Point, New York. He was graduated from the Academy and appointed a second lieutenant of Air Service on June 13, 1922.

From September, 1922, until January, 1924, he took primary flight training at Brooks Air Force Base, Texas, and advanced training at Kelly AFB, Texas, specializing in "Fighter" aviation.

He remained on duty at Kelly AFB as a flying instructor until June 1924 when he was ordered to the Philippine Islands for duty with the 3d Pursuit (Fighter) Squadron at Clark Field. After two years duty in the Philippines, he returned to Brooks AFB, San Antonio, Texas, for duty in the air training establishment. In October 1928, he was named assistant stage commander and final check pilot at that station.

He entered the Air Corps Engineering School at Wright-Paterson AFB, Ohio, in July 1930, and was graduated the following June.

The following four years he served as project officer of the Aircraft Branch, Air Corps Materiel Division, at Wright-Patterson AFB, where he was concerned with aircraft design, development, and testing. In early 1934, he spent three months helping the Air Corps inaugurate its flying of the air mail.

In August 1935, he entered the Air Corps Tactical School at Maxwell AFB, Alabama, and following graduation in June 1936, entered the Command and General Staff School at Fort Leavenworth, Kansas. He completed the course in June 1937, and went to Langley AFB, Virginia to join the Second Bombardment Group, which was then engaged in the initial service testing of the original B-17 bombardment aircraft. He became Operations Officer of the group in May 1938, and the following January was named Technical Assistant for Materiel at General Headquarters Air Force at Langley AFB.

Following a short period of temporary duty at Wright-Patterson AFB, he went to Washington, D. C., in March 1939, for duty in the Supply Division of the office of the Chief of Air Corps. Three months later he became Chief of the Engineering Section of that Division. His duties at this time were principally concerned with Research and Development. It was during this period that General Chidlaw was assigned by General Arnold the task of monitoring and directing the development and tests of the original American jet engine and jet airplane. He was among the first to "flight test" the original jet fighter which wrote the foreword

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*As of March 1952.

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for a new chapter of American aviation history.

In March 1943, he was designated as Chief of the Materiel Division. During this time he represented the Army Air Forces on several joint RAF-AAF technical missions held in London.

In April 1944, General Chidlaw began his second overseas tour of duty as Deputy Commanding General of the 12th Tactical Air Command in the Mediterranean theater. Following the invasion of Southern France, in which the 12th TAC participated, he returned to the Mediterranean theater to organize and command the 22d Tactical Air Command which blasted the way up the Italian Peninsula for General Mark Clark's Fifth Army early in 1945, promoted to Major General, he assumed command of the Mediterranean Allied Tactical Air Forces, composed of the American 12th Air Force, the British Desert Air Force, and numerous other Allied air units.

Upon successful conclusion of hostilities and the surrender of the German forces in the Mediterranean theater, he returned to the United States for duty as Deputy Commanding General for Operations of the Air Technical Service Command (later redesignated Air Materiel Command) at Wright-Patterson Air Force Base at Dayton, Ohio. In this capacity, he handled the engineering and maintenance phases of the Command's operations.

In October 1947, he was promoted to Lieutenant General, and transferred from his specialized research, development, and engineering duties to the position of Deputy Commanding General of Air Materiel Command.

He became Commanding General of the Air Materiel Command in September 1949, serving in that capacity nearly two years.

In August 1951, Lieutenant General Chidlaw was assigned to command the Air Defense Command and shortly thereafter, in October 1951, was promoted to four-star rank.

General Chidlaw has been awarded the Distinguished Service Medal, Legion of Merit, Air Medal, and Bronze Star Medal. His foreign decorations include the French Croix de Guerre with Palm and Legion of Honor; the Brazilian Commander, Order of the Southern Cross, and Aeronautical Medal of Merit; the Polish Cross of Valor, the British Commander, Order of the British Empire. He also wears the American Defense ribbon, American theater ribbon, European-African-Middle East ribbon with five Bronze Stars and Victory Medals for both World Wars.

He is rated a Command Pilot and Combat Observer with nearly 7,000 flying hours, including numerous combat missions over Europe in World War II.

A husky six-footer, General Chidlaw enjoys golf, generally touring the course in the high 70's. His main interest centers around

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the Air Force, for which he speaks often at various civilian and military meetings.

He and his wife, the former Miss Lillian Marie Braun, of Cincinnati, Ohio, have one son, Ben Evan Chidlaw, who served with the Air Force during World War II and is a graduate of Harvard University, Class of 1950. He is now on duty as a Second Lieutenant with the Air Force at Langley Field, Virginia.

PROMOTIONS: He was promoted to first lieutenant (permanent) on April 26, 1927; to captain (permanent) on August 1, 1935; to major (temporary) on March 1, 1940; to major (permanent) on September 8, 1941, to lieutenant colonel (temporary) on September 8, 1941, to lieutenant colonel (permanent) on June 13, 1945; to colonel (temporary) on March 1, 1942; to brigadier general (temporary) on November 2, 1942; to major general (temporary) on April 9, 1945; to lieutenant general (temporary) on October 1, 1947; to major general (permanent) on February 19, 1948, with date of rank from December 22, 1942; to general (temporary) October 29, 1951.

## General Earle E. Partridge*

Earle Everard Partridge was born at Winchendon, Massachusetts, on July 7, 1900. He enlisted in the Army July 10, 1918, at Fort Slocum, New York, and was assigned to the Fifth Engineer Training Regiment at Camp Humphries, Virginia. General Partridge went to France in August 1918, and served in the Argonne offensive with the 79th Division. When the division returned to Camp Dix, New Jersey, in June 1919, he was honorably discharged.

Following a year at Norwich University, General Partridge reenlisted in June 1920. A year later he was appointed to the U. S. Military Academy, was graduated June 12, 1924, and commissioned a second lieutenant of Air Service in the Regular Army. Entering Primary Flying School at Brooks Field, Texas, he was graduated from Advanced Flying School at Kelly Field, Texas. After serving ten months in the Third Attack Group there he was appointed as Instructor at the Advanced Flying School there in July 1926. He became an instructor in mathematics at the Military Academy in September 1929.

Going to the Panama Canal Zone in October 1930, he was assigned to the Seventh Observation Squadron at France Field, and was later transferred to the Sixth Composite Group there.

In December 1932, General Partridge was assigned to Selfridge Field, Michigan, and in July 1936, went to Wright Field, Ohio, as a test pilot. Entering the Air Corps Tactical School at Maxwell Field, Alabama, in September of that year, he was graduated the following June, and was

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* As of 1 June 1955.

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assigned to the Command and General Staff School at Fort Leavenworth, Kansas. He then returned to Maxwell Field as an instructor in the Pursuit Section of the tactical school. Transferring to the Southeast Air Corps training command in June 1940, he took a major part in establishing flying schools in the Southeast. On October 1, 1940, he was sent to Barksdale Field at Shreveport, Louisiana, to start an advanced single-engine flying school. He went to Dothan, Alabama, in May 1941, to supervise construction of the single-engine advanced flying school there.

Five months later he was assigned to Air Force headquarters as a member of the Air War Plans Division, and in March 1942, was made a member of the War Department General Staff to serve on the Joint Strategic Committee, Joint Chiefs of Staff. He assumed command of the New York Air Defense Wing in January 1943.

The following Spring he joined the Northwest African Air Force as operations officer and chief of staff of the 12th Bomber Command and later became chief of staff and deputy commander of the 15th Air Force. In January 1944, General Partridge moved to England and became deputy commander of the Eighth Air Force, and the following June assumed command of the Third Bombardment Division. At the close of hostilities in the European theater, General Partridge became deputy commander, and later assumed command, of the Eighth Air Force and assisted in its reorganization and movement to Okinawa in August 1945.

Returning to Air Force headquarters in January 1946, he became Assistant Chief of Staff for Operations. In October of the following year he was appointed Director of Training and Requirements in the office of the Deputy Chief of Staff, Operations, there. Assigned to the Fifth Air Force at Nagoya, Japan, in August 1948, he assumed command the following October, and took the Fifth to Korea in July 1950.

General Partridge was named acting commanding general of the Air Research and Development Command at Wright-Patterson Air Force Base, Ohio, in June 1951, and on July 28, 1951, was designated commanding general of that Command, which had moved to Baltimore, Maryland. He became Deputy Chief of Staff, Operations, at Air Force headquarters, on June 30, 1953.

On April 1, 1954, General Partridge assumed command of the Far East Air Forces, at Tokyo, Japan.

On June 1, 1955 the General assumed command of the Continental Air Defense Command at Colorado Springs, Colorado, at that time the only truly unified all-services organization operating within the limits of the United States.

His decorations include the Distinguished Service Medal, Legion of Merit, Distinguished Flying Cross, Bronze Star Medal, and the Air Medal with three Oak Leaf Clusters. For his service in the Korean campaign he was also awarded the Distinguished Service Cross, Silver Star, two Oak

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Leaf Clusters to the DFC, and seven Oak Leaf Clusters to the Air Medal. His foreign decorations include the French Legion of Honor and Croix de Guerre with two Palms; the Polish Order of Polonia Restituta, Chevaler, with Commander's Cross with star; the British Companion of the Order of the Bath; and the Belgian Croix de Guerre with Palm. General Partridge won the Distinguished Aerial Gunner's Medal in 1926, 1927, and 1928. He is rated a command pilot, combat observer, and aircraft observer.

General Partridge married Miss Katherine L. Holder on January 27, 1928. They have two daughters, Patricia Earle and Kay Blythe.

<u>PROMOTIONS</u>: He was promoted to first lieutenant December 15, 1928, to captain (temporary) April 20, 1935; to captain (permanent) August 1, 1935; to major (temporary) March 11, 1940; to major (permanent) June 12, 1940; to lieutenant colonel (temporary) November 15, 1941; to colonel (temporary) March 1, 1942; to brigadier general (temporary) December 9, 1942; to major general (temporary) May 31, 1944; to brigadier general (permanent) February 19, 1948; to major general (permanent) June 11, 1948; to lieutenant general (temporary) April 11, 1951; to general (temporary) April 1, 1954.

## Lieutenant General Stanley Raymond Mickelsen*

Stanley R. Mickelsen was born at St. Paul, Minnesota, October 8, 1895. After attending the University of Minnesota, he was commissioned a second lieutenant in the Coast Artillery Corps Reserve August 15, 1917. He received his regular commission as a second lieutenant of Coast Artillery October 26, 1917.

His first assignment was with the Anti-Aircraft Artillery Board at Fort Monroe, Virginia. In June 1918, he was transferred to Fort Hamilton, New York, and a month later was ordered to Fort Amador, Panama Canal Zone, for duty with the Panama Coast Artillery District. He remained at Fort Amador in various duties in connection with antiaircraft artillery batteries and submarine mines, and as Post and Department Adjutants until his return to the United States.

In November 1921, he returned to the United States for duty at Fort Terry, New York; and in January 1923, he became an instructor with the Connecticut National Guard at Bridgeport. He entered the Coast Artillery School at Fort Monroe, Virginia, in September 1927, and upon graduation the following June took the Advanced Engineering course at that school, which he completed a year later. He then remained at Fort Monroe as an instructor.

He went to Fort Mills, Philippine Islands, in July 1933 to join

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* As of November 1954.

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the 59th Coast Artillery, and returned to the United States two years later to enter the Command and General Staff School at Fort Leavenworth, Kansas. Upon graduation in June 1936, he was appointed a member of the Coast Artillery Board, with station at Fort Monroe, Virginia.

In August 1937, he entered the Army War College at Washington, D.C.; and after graduating the following June, he became assistant secretary of the War Department General Staff in Washington. He assumed command of the 74th Coast Artillery at Camp Pendleton, Virginia, in October 1941.

The following March he became commander of the 47th Artillery Brigade at Camp Davis, North Carolina, and a month later took it to Iceland.

He returned to the United States in November 1943, to assume command of the Antiaircraft Artillery Training Center at Fort Bliss, Texas.

A year later he went to Europe to join the Supreme Headquarters Allied Expeditionary Forces where he served as Chief of Displaced Persons Branch. In January 1947, he was named Director of the Civil Affairs Division of the European Command with station at Frankfurt, Germany.

In September 1947, General Mickelsen became Assistant Commandant of the Artillery School at Fort Sill, Oklahoma. He was appointed Chief of the Guided Missiles Group, Department of the Army General Staff, and member of the Military Liaison Committee to the Atomic Energy Commission in October 1949. Upon the reorganization of Army headquarters March 1950, he was designated Deputy Assistant Chief of Staff for Operations (Guided Missiles). General Mickelsen was given additional duty as Deputy for Special Weapons to the Assistant Chief of Staff for Logistics at Department of the Army headquarters in January 1951. These positions he held until assuming command of the AA and GM Center at Fort Bliss, Texas, on July 19, 1952.

He was named Commanding General, Army Antiaircraft Command, Colorado Springs, Colorado, on October 1, 1954 and, on the same day, was nominated for promotion to lieutenant general.

General Mickelsen has been awarded the Distinguished Service Medal and the Legion of Merit.

PROMOTIONS: He was promoted to captain (temporary) June 24, 1918; to captain (permanent) July 1, 1920; to major (permanent) August 1, 1935; to lieutenant colonel (permanent) August 18, 1940; to colonel (temporary) December 24, 1941; to brigadier general (temporary) March 15, 1942. He reverted to the temporary rank of colonel March 5, 1946, and was promoted to colonel (permanent) October 1, 1946; to brigadier general (temporary) June 17, 1949, with date of rank from May 22, 1949; to brigadier general

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(permanent) February 3, 1950, with date of rank from June 18, 1949; to major general (temporary) May 1, 1952, with date of rank from May 4, 1944; to major general (permanent) January 26, 1954, with date of rank May 5, 1953; and to lieutenant general (temporary) October 1, 1954.

## Rear Admiral Albert K. Morehouse

Rear Admiral Morehouse was born in Brooklyn, N. Y., on April 29, 1900. He was appointed to the U.S. Naval Academy in 1918 and graduated as Ensign with the class of 1922.

After graduation he served aboard the battleship USS Maryland before reporting to Naval Air Station, Pensacola, Florida for flight training. He received his wings on March 16, 1925.

Between 1925 and the outbreak of World War II Admiral Morehouse served with various aviation units throughout the Naval establishment. December 7, 1941 found him serving as a special naval observer at the American Embassy, London, England.

He commanded the seaplane tender USS Chandeleur and in 1943 was transferred to the staff of Commander Aircraft, South Pacific Force. Admiral Morehouse was awarded the Bronze Star Medal for "meritorious service" in this assignment.

In 1944, he left the South Pacific Force and ultimately took command of the escort carrier Natoma Bay. During the Battle of Samar Island in late 1944 he was awarded the Navy's second highest award, the Navy Cross. Admiral Morehouse also received the Legion of Merit with Combat "V" for his service aboard the Natoma Bay.

After duty as chief of staff to Commander Carrier Division FOUR, he took command of NAS, Miami, Fla., and in 1946 was assigned to the staff of the Chief of Naval Air Advanced Training, Jacksonville, Fla.

In 1947, he took command of the USS Midway and in 1948 became chief of staff to Commander, Naval Air Forces, Atlantic Fleet. With the outbreak of Korean hostilities he was assigned to duty as chief of staff for Naval Forces Far East.

In 1951 Admiral Morehouse was designated as Chief of Naval Air Advanced Training at Naval Air Station, Corpus Christi, Texas. Two years later he assumed command of Carrier Division FOUR.

He was ordered to his present post in August 1954.

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## APPENDIX C

### ORGANIZATION AND MISSION
### CONTINENTAL AIR DEFENSE COMMAND*

Terms of Reference and Mission

1. The Continental Air Defense Command (CONAD) is established as a joint command for the defense of the continental United States against air attack. The Department of the Air Force has been designated as the executive agency therefor. Headquarters USAF Air Defense Command is additionally designated as Headquarters, CONAD, the staff of which will be augmented by appropriate representation from all Services.

2. The Commander-in-Chief (CINC) CONAD will exercise operational control over all forces assigned or otherwise made available by the Joint Chiefs of Staff or other proper authority, for defense of the continental United States against air attack. The command will be established in accordance with the appropriate provisions of Joint Action Armed Forces (JAAF), and the directives contained herein. The command shall consist initially of the U. S. Air Force Air Defense Command, the U. S. Army Antiaircraft Command, and a Naval Command composed of the naval forces of the contiguous radar coverage system. During the periods that augmentation forces of the Army, Navy/Marine Corps, and Air Force are employed in air defense of the continental United States, operational control of such forces shall be temporarily vested in CINCONAD.

3. The CINCONAD will be a U. S. Air Force general officer who will be designated Commander, U. S. Air Force Air Defense Command. The Commanding General, Antiaircraft Command, will be the principal advisor to CINCONAD on Army matters pertaining to the CONAD. An appropriate Naval Command, under a flag officer, will be established with Headquarters at ENT Air Force Base and the Commander will also be the principal advisor to CINCONAD on Navy matters pertaining to the CONAD. An appropriate Marine Corps representative will be assigned to the Staff of CINCONAD as principal advisor on Marine Corps matters pertaining to the CONAD. In the absence of the Joint Commander, the Senior Component Commander will assume temporary command.

4. Forces and operations of the seaward extensions of the early warning system will continue under the Commander in Chief, Atlantic (CINCLANT), and the Commander-in-Chief, Pacific (CINCPAC), and early warning installations in Alaska and the Northeast Command under the Commander-in-Chief, Alaska (CINCAL) and the Commander-in-Chief, Northeast

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* As appended to Ltr, USAF to ADC, "Continental Air Defense Command (CONAD)," 27 Aug 1954 (document 204, in supporting documents).



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Command (CINCNE). However, the above commanders will support CINCONAD in accordance with plans approved by the Joint Chiefs of Staff and mutual agreements by the Commanders concerned, to insure that plans for, and the operations of, these elements of the early warning system will be responsive to the needs of CINCONAD.

5. The mission of the CINCONAD will be to:

a. Defend the continental United States against air attack.

b. Support CINCPAC, CINCLANT, CINCARIB, COMSAC, CINCAL and CINCNE in their missions to the maximum extent consistent with the primary mission outlined in subparagraph 2. above.

6. In carrying out his mission, CINCONAD will:

a. Conduct operations to the limit of the capabilities of available forces in the defense of the continental United States against air attack.

b. Prepare joint plans and requirements for the defense of the continental United States against air attack and submit these plans and requirements to the Joint Chiefs of Staff for approval.

c. Implement JCS approved plans, through the appropriate component commands; and exercise such emergency powers as may be delegated to him by proper authority.

d. Coordinate plans, operations and exercises with appropriate United States Commanders and with Canadian and Mexican Commanders in accordance with agreed Canada-United States and Mexico-United States defense policies.

e. In coordination with* appropriate U. S. and Allied commanders, plan for early warning systems and procedures which will provide early warning of air attack for the defense of the continental United States to insure that there systems are designed and operated in a manner responsive to continental air defense requirements and in consonance with national policy.

f. In coordination with commanders concerned, establish procedures and methods of operation for all forces allocated, attached or otherwise made available for the air defense of the continental United States.

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* "In coordination with" whenever used in this paper is as defined in the "Dictionary of U.S. Military Terms for Joint Usage (Second Revision)."

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g. In coordination with commanders concerned, prepare and submit to the Joint Chiefs of Staff for approval, plans for the full utilization of all military forces, including reserve forces, which have an air defense capability and which can temporarily augment the air defense forces in event of emergency.

h. When there exists an imminent threat of air attack upon the continental United States, or in case such an attack develops, assume operational control of those forces specifically having been made temporarily available from other commands (augmentation forces). Such operational control over forces having been made temporarily available from other commands, will be relinquished when the imminence of the threat has dissipated or when the attack is ended. In the event that the Commander who made the forces available should consider that his primary mission requires their return to their permanent command assignments, he should first make appropriate requests to the Air Defense commander; if such request is not granted his next recourse is to the Joint Chiefs of Staff.

i. Plan for and conduct air defense exercises, including participation by augmentation forces, coordinating plans as appropriate with other U. S. commands and military agencies of Canada and Mexico.

j. Plan for, train, exercise and operate in coordination with appropriate authorities a Ground Observer Corps of necessary military personnel, and civilian volunteers.

k. Coordinate with appropriate military governmental and non-governmental agencies in the development of plans, policies and procedures for the security control of air traffic, the control of electromagnetic radiations, and the control of illumination and, when appropriate, initiate implementing actions therefor in the defense of continental United States against air attack.

l. Coordinate with the Federal Civil Defense Administration, State Civil Defense agencies, and other non-military agencies on matters of participation in air defense.

7. Based on missions or tasks assigned by CINCONAD in consonance with JCS approved plans, detailed planning as to forces and their deployments will be accomplished by component commanders coordinated as necessary with other commanders of their Services.

8. In matters not covered by JCS approved joint plans, doctrines or procedures, interim directives, promulgated by CINCONAD will govern all Air Defense operations. These will be formulated in consonance with existing inter-Service and inter-Command agreements and decisions of the Joint Chiefs of Staff.

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## Responsibilities of the Commanding General Army Antiaircraft Command

1. Serve as the Commander of the Army Component of the CONAD.

2. Command all Army forces assigned or otherwise made available for air defense of the continental United States.

3. Provide above forces for operational control by the CINCONAD, in accordance with Incl 4, on the basis of JCS approved plans, doctrines and procedures pertaining to the air defense of the continental United States.

4. Develop detailed plans for Army forces and their deployments allocated for the air defense of the United States based on missions or tasks assigned by the CINCONAD in consonance with approved JCS plans.

5. Organize and establish a suitable Headquarters and subordinate Headquarters and commands as deemed necessary to accomplish the assigned missions or tasks.

6. Participate in ground defense, harbor defense, disaster relief, and other domestic emergencies when such participation will not interfere with the air defense mission.

7. Coordinate with the Department of the Army and other Army agencies on matters pertaining to the support, administration, organization, and equipping of Army units assigned or otherwise made available for the air defense mission.

8. Prepare combat Army air defense units for overseas deployment as required, to include organizing, training, and equipping.

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<u>Responsibilities of the Commander,</u>
<u>Naval Forces... /CONAD/</u>

1. Organize a suitable command under a flag officer with appropriate headquarters necessary to meet the requirements set forth by higher authority.

2. Serve as the Commander of the Naval component command of the CONAD.

3. Coordinate with the other Service component commanders on matters of mutual interest.

4. Command all Naval forces assigned or otherwise allocated for employment in the contiguous radar coverage of the continental United States air defense system.

5. Coordinate with appropriate fleet and training command for provision of naval augmentation forces for continental air defense.

6. Provide above forces for operational control by the CINCONAD in accordance with Incl 4, on the basis of JCS approved plans, doctrines and procedures pertaining to the air defense of the United States.

7. Provide appropriate Air Defense Commanders with required information relative to the status and operating characteristics of all Naval forces allocated for the air defense of the continental United States, and Naval augmentation forces and facilities capable of emergency employment in air defense of the United States.

8. Provide for the control of fire of the Antiaircraft batteries of vessels in port by the Air Defense Commander through the local Army, Antiaircraft Control Center, if one is established, otherwise through a Navy AA Control Center.

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APPENDIX C - 119

## Command Arrangements

### SECTION I

### Operational Control

1. The operational control exercised by CINCONAD over all forces assigned or otherwise made available, will consist of the following:

a. Direct the conduct of the tactical air battle including the engagement and disengagement of air defense weapons.

b. Control of fighters.

c. Specify the conditions of alert.

d. Station the early warning elements of the command and their control elements.

e. Locate and deploy the combat elements of the command in accordance with plans approved by the Joint Chiefs of Staff.

### SECTION II

### Implementation of Operational Control

2. Operational control as defined above will be implemented in accordance with the chart, shown in Incl 5, in the following manner:

a. When reporting on station, naval forces in contiguous radar coverage system come under operational control of the appropriate regional headquarters through the appropriate naval regional component channel.

b. Naval surface forces made available in case of emergency will report for operational control to the Commander-in-Chief through the appropriate Naval Regional Component Commander. Limitations on the deployments of these surface forces may be prescribed by the fleet commander making the forces available.

c. Naval aviation augmentation forces, provided in case of emergency, will report for operational control to the appropriate Air Division Command. The Fleet or Naval Air Training Command Commander making the forces available will prescribe whether such forces may be deployed to other than home bases.

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d. Operational control, as defined in paragraph 1 Section I, above, will be exercised by the joint air defense commanders in accordance with the chart in Incl 5.

e. Operational control will be exercised over all forces assigned or otherwise made available in a geographical area by the appropriate joint regional or sector air defense commander thereof.

f. Army antiaircraft units will pass to the operational control of the appropriate air defense commander upon deployment to tactical air defense positions.

## SECTION III

### Organization and Command Arrangements

1. The mission of air defense is a functional mission carried out on a geographical basis. Since time of reaction to the threat is all-important, successful Air Defense must be predicated upon decentralization of control. The United States is now divided into three Air Defense regions which are further subdivided into sectors; each region having an Air Defense Force Commander responsible for the defense of his area against air attack and utilizing all available forces of the military establishment which have an air defense capability.

2. The existing organization of the USAF Air Defense Command, with its air defense system for surveillance, warning and control, and combat is the basic struction which will be utilized for the Joint Command. Each USAF Headquarters from command down to air division level will be additionally designated as a joint headquarters commanded by an Air Force officer and with appropriate representation from each Service. The Army Antiaircraft Command and the Naval Command will parallel this organization through the regional level and with a Component Commander or staff representation below regional level as experience dictates. The numbers of personnel who will represent each component commander at the Joint Regional Air Defense Force level will be a matter for agreement between him and the Commander, Joint Regional Air Defense Force.

3. The Chart, Incl 5, shows the lines of operational control and command as set forth in Incl 4.

4. The Service component commanders at regional or lower levels, in addition to their uni-service functions, shall be Army Deputy and Navy Deputy, respectively, to the joint commanders for matters of concern to their Services.

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5. The Component Commanders will be responsible for the military command of their components in accordance with directives and procedures of their Services. Logistic and administrative support of the Service components will be provided as directed by the Service concerned.

6. The Joint manning of the staff of the Commander-in-Chief, due to the proximity of the headquarters of the component commands should be kept to a minimum. Thus, augmentation of the Command will be approximately as follows:

| | ARMY | NAVY | MARINE |
|---|---|---|---|
| Operations and Training | 1 | 1 | - |
| Operations Analysis | 1 | 1 | - |
| Communication and Electronics | 1 | 1 | - |
| Plans and Requirements | 1 | 2 | - |
| Assistant to the DCS/O | 1 | 1 | 1 |
| Intelligence | 1 | 1 | - |
| Materiel | - | 1 | - |
| Comptroller | - | 1 | - |
| Information Services | 1 | 1 | - |
| | 7 | 10 | 1 |

7. The command of naval forces in the contiguous radar coverage system will be exercised at the regional (second echelon) level for the east and west coasts.



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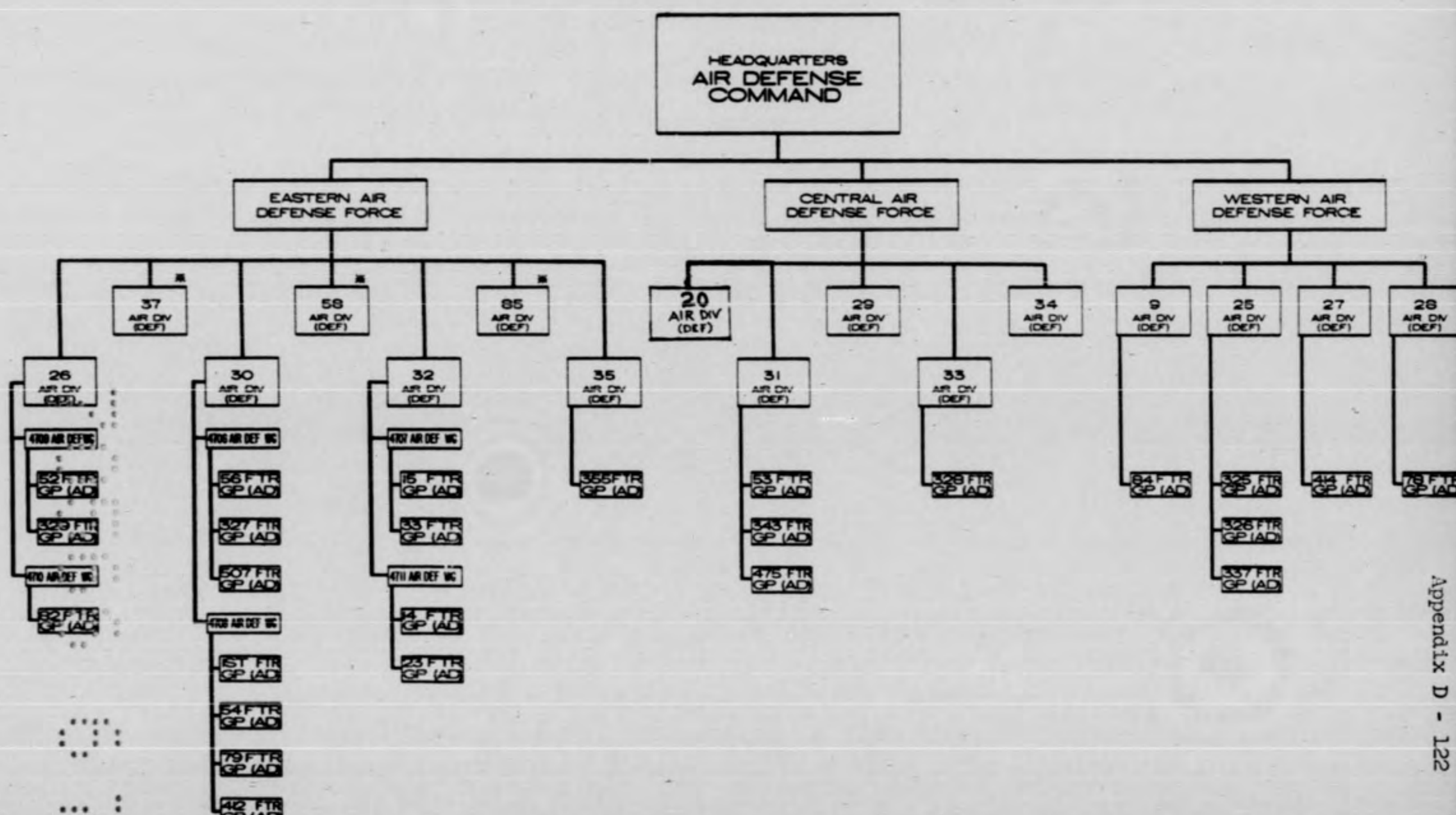
ORGANIZATIONAL CHART

# AIR DEFENSE COMMAND

8 OCTOBER 1955

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REFERENCE NOTES

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## NOTES
## to
## Chapter I

1. For a detailed and very readable account of the evolution of Air Force organization principles during World War II and their application in the postwar reorganizations, see History of the Air Defense Command, Vol. I, "Evolution of the Mission, March 1946-June 1947," Chapter I. This study was issued on 15 June 1947. For general information on the Air Defense Command for the period March 1946-June 1947 the reader is referred to this work and the volume bearing the same title completed in November 1948.

2. Ltr, War Dept to CG Army Air Forces, "Establishment of Air Defence /Sic/ Strategic Air, and Tactical Air Commands....," 21 Mar 46 (DOC 1).

3. Hq ADC General Orders No. 1, 27 Mar 46 (DOC 2).

4. Ltr, Gen Carl Spaatz to CG ADC, "Interim Mission," 12 Mar 46 (DOC 3).

5. Hq ADC Operational Directive No. 1, 5 Apr 46, with amendment, 3 May 46 (DOC 4).

6. Ltr, Col R. E. Beebe, AC/S A-5 Hq ADC to Maj Gen Lauris Norstad, AC/S A-5 Hq AAF, "Air Defense of the United States," 3 May 46 (DOC 5).

7. Ltr, Gen Norstad to Col Beebe, "Air Defense of the United States," 13 Jun 46 (DOC 6).

8. Ltr, Lt Gen I. C. Eaker, Deputy Commander AAF, to CG ADC, "Investment of Command Responsibilities of the Land, Sea and Air Forces in Event of an Air Invasion," 10 Jun 46 (DOC 7).

9. Ltr, Maj Gen Charles B. Stone III, C/S Hq ADC, to CGs 1st and 4th AFs, "Air Defense of Continental United States," 17 Jun 46 (DOC 8). See also, Ltr, ADC to CGs Numbered AFs, "Air Defense of the Continental United States," 12 Aug 46 (DOC 9).

10. Ltr, Maj Gen C. C. Chauncey, Deputy Chief of Air Staff Hq AAF, to CG ADC, "Interim Mission," 5 Jun 46 (DOC 10). See also, Ltr, Gen Stratemeyer to CGs Numbered AFs, "Mission of the Air Defense Command," 11 Jun 46 (DOC 11).

11. Ltr, ADC to CG AAF, "Mission of the Air Defense Command," 31 Jul 46, with 1 Incl, ADC Regulation 20-7, "Relationship of Air Defense Command with Military and Civilian Agencies," 31 Jul 46 (DOC 12). See also, Ltr, ADC to CGs Numbered AFs, "Air Defense Command Regulation 20-7," 12 Aug 46 (DOC 13); Ltr, ADC to Other Major Air Force Commands, "Mission of Air Defense Command," 12 Aug 46 (DOC 14); Ltr, Gen Stratemeyer to CG AAF, "Relationship of Air Defense Command with Military and Civilian Agencies," 18 Aug 47 (DOC 15); and Ltr, Gen Stratemeyer to Gen Eaker, 13 Nov 46 (DOC 16).

## NOTES
## to
## Chapter II

1. For a more detailed account of Plan SUPREMACY see History of Air Defense Command, Jan-Jun 1951, Chapter Three.

2. Hq ADC General Orders No. 53, 14 May 47 (DOC 24).

3. See Hq ADC Historical Study No. 1, The Air Defense of Atomic Energy Installations, Mar 1946-Dec 1951, p. 1.

4. Ibid.

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5. Ibid., p. 2.

6. Ibid.

7. Ltr, USAF to ADC, "Constitution and Activation of the Hq 503d Aircraft Control and Warning Group...," 19 May 48 (DOC 25).

8. Msg, ADC to 4AF, 22 Apr 48 (DOC 26).

9. Ltr, USAF to ADC, "Air Defense of the Continental United States," 23 Apr 48 (DOC 27).

10. Ltr, USAF to ADC, "Reorganization of the Air Defense Command," 17 Dec 47 (DOC 28).

11. Ltr, Gen Stratemeyer to Gen Thomas T. Handy, CG Fourth Army, and other Army commanders, 18 Jun 48 (DOC 29).

12. Ltr, ADC to C/S USAF, "Plan for Reorganization of the Air Defense Command," 29 Jan 48 (DOC 30); also, Ltr, ADC to Numbered AFs, "Reorganization of the Air Defense Command," 18 Dec 47 (DOC 31).

13. Ltr, USAF to ADC, "Plan for Reorganization of the Air Defense Command," 10 Jun 48 (DOC 32). See also: Ltr, ADC to Numbered AFs, "Reorganization of the Air Defense Command," 18 Jun 48 (DOC 33); and Ltr, ADC to Numbered AFs, "Reorganization of Air Defense Command," 25 Jun 48 (DOC 34).

14. Hq ADC General Orders No. 51, 24 Jun 48 (DOC 35). See also: Ltr, USAF to ADC, "Inactivation of the Headquarters of the Second and Eleventh Air Forces," 21 Jul 48 (DOC 36); and Msg, ADC to Numbered AFs, 15 Jun 48 (DOC 37).

15. Ltr, Gen Stratemeyer to C/S USAF, "Plan for Reorganization of Air Defense Command," 30 Jun 48 (DOC 38).

## NOTES
## to
## Chapter III

1. Hq USAF Press Release, 18 Nov 48 (DOC 49).

2. Ltr, Hq USAF to ConAC, ADC, TAC, "Establishment of the Continental Air Command and Designation of Air Defense Command and Tactical Air Command as Operational Air Commands," 19 Nov 48, with amendment dtd 14 Dec 48 (DOC 50). See also: Hq ConAC General Orders No. 1, 1 Dec 48 (DOC 51); and Hq ConAC General Orders No. 2, 1Dec 48 (DOC 52).

3. For more detailed information on the reorganization of 1 December 1948, see History of the Continental Air Command, 1949, Vol I.

4. For a more detailed accounting of the increase in fighter strength for air defense resulting from the reorganization of 1 December 1948, see History of the Air Defense Command, Jan-Jun 1951, Part III.

5. AF Regulation 23-1, 11 Jan 49, with amendment dtd 25 May 49 (DOC 53).

6. ConAC Regulation 21-1, 31 Jan 49 (DOC 54).

7. Transcript of Speech by Lt Col John B. Cary, Hq ADC, at War College, 25 Mar 49 (DOC 55).

8. Ltr, ConAC to Chief, WADLG, "Mission and Responsibility of the Western Air Defense Liaison Group," 23 Mar 49 (DOC 56), and Ltr, ConAC to Chief, EADLG, "Mission and Responsibility of the Eastern Air Defense Liaison Group," 23 Mar 49 (DOC 57).

9. Ltr, Gen Stratemeyer to 10AF, "Air Defense Responsibilities," 1 Feb 49 (DOC 58).

10. Ltr, ConAC to 4AF, "Air Defense Responsibilities," 9 Mar 49 (DOC 59); and Ltr, ConAC to 1AF, "Air Defense Responsibilities," 29 Mar 49 (DOC 60). See also, Ltr, ConAC to 9AF, "Air Defense Responsibilities," 1 Feb 49 (DOC 61).



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11. Hq ConAC General Orders No. 34, 24 Mar 49 (DOC 62).

12. ConAC Regulation 25-2, 24 Mar 49 (DOC 63).

13. Ltr, ConAC to 25ADiv, "Air Defense Area of Responsibility," 8 Jun 49 (DOC 64).

14. Ltr, ConAC to CG 26ADiv, "Air Defense Area of Responsibility," 8 Jun 49 (DOC 65).

## NOTES
to
Chapter IV

1. Hq ConAC General Orders No. 94, 31 Aug 49 (DOC 74), and Hq ConAC General Orders No. 99, 21 Sep 49 (DOC 75).

2. Memo, Hq ConAC Deputy for Air Defense to AG, 6 Sep 49 (DOC 76). See also, History of Eastern Air Defense Force, Sep-Dec 1949.

3. Ltr, ConAC to 4AF, "Organization of Hq and Hq Squadron, Western Air Defense Force," 14 Sep 49, with attached Hq ConAC Memo KDOC 77). See also: Ltr, Gen C. T. Myers, VC ConAC, to Gen Upston, 3 Nov 49 (DOC 78).

4. ConAC Regulation 25-1, 2 Nov 49 (DOC 79), and ConAC Regulation 25-2, 2 Nov 49 (DOC 80).

5. Hq IAF General Orders No. 116, 16 Nov 49 (DOC 81).

6. Ltr, Gen Upston to ConAC, "Organization and Mission, Western Air Defense Force," 5 Nov 49 (DOC 82).

7. See Histories of IAF and 4AF, Jul-Dec 1949.

8. For activation orders on the 30th and 32d Divisions, see: 10AF General Orders No. 131, 13 Dec 49 (DOC 83); and IAF General Orders No. 125, 5 Dec 49 (DOC 84). See History of 4AF, Jul-Dec 49, for the activation authority for the 28th Division.

9. Hq EADF General Orders No. 3, 17 Feb 50 (DOC 85) and 3d Ind, EADF to ConAC 4 Oct 49, to Ltr, ADC to EADF, "Air Defense Training," 1 Sep 49 (DOC 86). See also, WADF General Orders No. 1, 1 Jan 50 (DOC 87); WADF General Orders No. 2, 16 Jan 50 (DOC 88); WADF General Orders No. 4, 1 Feb 50 (DOC 89); and WADF General Orders No. 7, 1 Mar 50 (DOC 90).

10. See (DOC 63), previously cited.

11. Ltr, Gen Myers to EADF, "Operational Control in the Conduct of Air Defense and Air Defense Systems Training," 9 Nov 49 (DOC 91).

12. Hq ConAC General Orders No. 122, 10 Nov 49 (DOC 92). See also, Msg, EADF to 26ADiv, 18 Nov 49 (DOC 93).

13. 1st Ind, ConAC to EADF, 30 Nov 49, to Ltr, EADF to ConAC, "ConAC Fighter Forces Committed to Eastern Air Defense Force for Emergency Air Defense Operations," 21 Oct 49 (DOC 94)

14. ConAC Regulation 25-4, 16 Dec 49 (DOC 95).

15. See Ltr, ConAC to 1, 4, and 10AFs, "Commitment of Fighter-Interceptor Forces to EADF," 2 May 50 (DOC 96); and Ltr, ConAC to EADF, "ConAC Fighter Forces Committed to EADF for Emergency Operations," 19 May 50, with 1 Ind (DOC 97).

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# NOTES
## to
## Chapter V

1. Hq ADC, Memo for the Record, Col. John B. Cary, 20 Oct 47 (DOC 112).

2. Ibid.

3. Ltr, Gen Whitehead to AG USAF, "Deletion of Continental Air Command Responsibilities," 28 Dec 50, with attached memo (DOC 113).

4. Ltr, Gen Whitehead to C/S USAF, "Separation of the Hq Air Defense Command from Hq Continental Air Command," 24 Oct 50 (DOC 114).

5. Ibid.

6. Ibid., 1st Ind, USAF to ADC, 17 Nov 50.

7. Ltr, USAF to ConAC, "Designation of Tactical Air Command and Air Defense Command as Major Air Command ...," 10 Nov 50, with amendment, Ltr, USAF to ConAC, same title, 4 Dec 50 (DOC 115). See also: Ltr, USAF to ConAC, "Movement Directive, Hq & Hq Sq, Air Defense Command," Dec 50 (DOC 116); and Hq ADC General Orders No. 2, 1 Jan 51 (DOC 117).

8. AF Regulation 23-9, 15 Nov 50 with amendment, AFR 23-9A, 8 May 51 (DOC 118). For later revisions of this regulation see AFR 23-9, 13 Mar 53 (DOC 119); AFR 23-9, 5 Apr 54 (DOC 120); and AFR 23-9, 10 Sep 1954 (DOC 121).

9. AF Bulletin No. 39, 24 Sep 51 (DOC 122).

10. Ltr, USAF to ConAC, "Air Defense Control Center Conference," 24 Apr 50, with minutes of meeting attached (DOC 123).

11. Ltr, USAF to ConAC, "Detailed Cost Data on Programmed Aircraft Control and Warning Systems in Continental United States and Alaska," 23 Dec 48 (See DOC 70 in History of Air Defense Command, Jan-Jun 1951).

12. Transcript of Speech by Lt Col John B. Cary, Hq ADC, at War College, 25 Mar 49 (DOC 55). See also, Ltr, ConAC to 14th AF, "Air Defense Organization in Continental United States," 17 Jun 49 (DOC 124).

13. Ltr, ConAC to USAF, "Construction Priorities, Permanent Air Control and Warning System" 4 Jan 50 (See DOC 78, History of Air Defense Command, Jan-Jun 1951).

14. Ltr, USAF to Chief of Engineers, USA, "Authorization - Z. I. Aircraft Control and Warning System No. ZI-le-50," 25 Apr 50 (DOC 125).

15. Ibid. See also: Ltr, ConAC to EADF, "Air Defense Control Center Areas of Responsibility," 11 May 50 (DOC 126); and Memo, Hq ConAC, "Air Defense Control Center Areas of Responsibility," 7 Jul 50 (DOC 127).

16. Ltr, ConAC to 4AF, "Designation and Organization of Headquarters, Albuquerque, Air Defense Area, Provisional," 1 May 50 (DOC 128). See also, 4AF General Orders No. 53, 3 May 50 (DOC 129).

17. WADF General Orders No. 28, 15 Aug 50 (DOC 130).

18. WADF General Orders No. 36, 20 Sep 50 (DOC 131). Originally the 27th Division was scheduled for activation at Kirtland. For the reasons why it was formed at Norton instead, see: Ltr, ConAC to USAF, "Relocation of Aircraft Control and Warning Units in Support of ConAC SREWP 1-49 and Permanent Aircraft Control and Warning System," Jan 50 (DOC 132).



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19. WADF General Orders No. 38, 13 Oct 50 (DOC 133), and EADF General Orders No. 36, 5 Dec 50 (DOC 134).

20. EADF General Orders No. 16, 7 Oct 50 (DOC 135).

21. WADF General Orders No. 1, 3 Jan 51 (DOC 136).

22. WADF General Orders No. 19, 23 Feb 51 (DOC 137).

23. EADF General Orders No. 34, 13 Mar 51 (DOC 138).

24. CADF General Orders No. 22, 26 Jun 51 (DOC 139).

25. Ltr, Lt Gen Whitehead to C/S USAF, "Establishment of a Central Air Defense Force," 27 Jul 50 (DOC 140). See also, Ltr, Gen Whitehead to Gen Vandenburg, 12 Sep 50 (DOC 141).

26. Ltr, Lt Gen Norstad to CG ConAC, "Establishment of a Central Air Defense Force," 5 Oct 50 (DOC 142).

27. Ibid., 1st Ind, Gen Whitehead to C/S USAF, 11 Oct 50.

28. Ltr, Gen N. F. Twining, Vice Chief of Staff, USAF, to CG ConAC, "Establishment of a Central Air Defense Force," 13 Dec 50 (DOC 143).

29. Msg, ADC to USAF, 26 Jan 51 (DOC 144).

30. Ltr, Gen Whitehead to C/S USAF, "Location of Headquarters of Proposed Central Air Defense Force," 6 Sep 50 (DOC 145).

31. ADC General Orders No. 17, 10 Feb 51 (DOC 146).

32. ADC General Orders No. 35, 9 May 51 (DOC 147).

## NOTES
## to
## Chapter VI

1. For detailed information on these problems, see the semiannual histories of Headquarters Air Defense Command, the Defense Forces, and the Air Divisions from January 1951 through June 1952.

2. Ltr, ADC to Defense Forces, "Organization for Air Defense," 27 Apr 51 (DOC 84, History of Air Defense Command, Jul-Dec 1952).

3. Ltr, Gen Chidlaw to C/S USAF, "Reorganization of Air Defense Command," 24 Sep 51 (DOC 148).

4. Ltr, ADC to USAF, "Reorganization of Air Defense Command...," 2 Oct 51 (DOC 149).

5. Ltr, Brig Gen R. J. Browne, Deputy Director M&O, Hq USAF to CG ADC, "Reorganization of Air Defense Command," 12 Oct 51 (DOC 150).

6. Msg, Gen Chidlaw to DCS/Operations, Hq USAF, 8 Dec 51 (DOC 151); and Msg, USAF to CG ADC, 17 Dec 51 (DOC 152).

7. Ltr, USAF to ADC, "Reorganization of Air Defense Command," Nov 51 (DOC 153); Ltr, USAF to ADC, "Reorganization of Air Defense Command," 20 Dec 51 (DOC 154); Ltr, ADC to WADF, "Reorganization of Air Defense Command," 4 Jan 52 (DOC 155); Ltr, USAF to ADC, "Reconstitution, Redesignation, and Activation of ... Air Force Units," 3 Jan 52 (DOC 156); ADC General Orders No. w, 11 Jan 52 (DOC 157); ADC General Orders No. 3, 11 Jan 52 (DOC 158); and ADC General Orders No. 4 (DOC 159).



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8. For a fuller account of the inadequacies of the Wing-Base Plan for continental air defense, its abolishment in 1952, and the fighter organization which was substituted in its stead see History of the Air Defense Command, Jan-Jun 1952, Chapter Four, pp. 141-193.

9. See History of the Air Defense Command, Jan-Jun 1951, Chapter Six for an account of the squadron deployment requirement.

10. As in fn 8, above.

11. See (DOC 149), previously cited.

12. As in fn 8 above, p. 178. See also, Ltr, ADC to USAF, "Reorganization of the Air Defense Command," 8 Nov 51 (DOC 160).

13. As in fn 8, above.

14. See (DOCS 157, 158, and 159), previously cited.

15. Ibid.

16. See (DOC 149), previously cited.

17. Ltr, 25th ADiv to WADF, "Organization of 25th Air Division (Defense)," 11 Dec 50 (DOC 161); and 505th AC&W Gp General Orders No. 7, 16 Dec (DOC 162).

18. As in fn 8, above. See also, Ltr, ADC to CADF, "Organizational Test, 31st Air Division," 27 Feb 52 (DOC 163).

19. See Hq ADC's final report on 31st ADiv test, /ca./ Aug (DOC 164).

20. History of Air Defense Command, Jun-Dec 1952, p. 107. See Chapter Four of this work for a more detailed discussion of organizational problems encountered during 1952.

21. Ltr, ADC to USAF, "Proposed Air Base Group T/O's, " 28 Aug 52 (DOC 165), see also, Ltr, ADC to EADF, "Proposed Air Base Group T/O's," 29 Feb 52 (DOC 166).

22. Ltr, ADC to USAF, "Air Defense Command Organization," 11 Sep 52 (DOC 167). See also, Ltr, ADC to WADF, "Reorganization of Air Defense Command," 12 Nov 52 (DOC 168); Ltr, ADC to USAF, "Air Defense Command Reorganization," 14 Nov 52 (DOC 169); and Memo, Hq ADC 21 Nov 52 (DOC 170).

23. Ltr, Brig Gen T. C. Darcy, CG, 31st ADiv to CG CADF, "Organization Progress Report," 3 May 52, with 1 Ind, CADF to ADC, 22 May 52 (DOC 171).

24. Transcript of ADC Briefing for Gen Vandenberg, 11 Aug 52, p. 49. Cited in History of Air Defense Command, Jun-Dec 1952, p 103.

25. Ltr, USAF to ADC "Air Defense Command Organization," 30 Oct 52 (DOC 172).

26. Ltr, USAF to ADC, "Reconstitution, Redesignation and Activation of ... USAF Units," 21 Jan 53 (DOC 173); ADC General Orders No. 11, 10 Feb 53 (DOC 174). ADC General Orders No. 12, 10 Feb 53 (DOC 175); ADC General Orders No. 13, 10 Feb 53 (DOC 176).

27. Ltr (prepared by Col J. R. Wergin), ADC to WADF, "Air Defense Command Organization," 26 May 54 (DOC 177).

## NOTES
## to
## Chapter VII

1. For information on the Mobile Radar Program, see semiannual Histories of the Air Defense Command, Jan 1951-June 1955.



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3. Ibid, 1st Ind, Maj Gen R. M. Ramey, Dir of Ops, USAF, 21 Mar 52.

4. Ltr, Gen Myers to USAF, "Improvement of Means for Handling AC&W Informations," 22 Jul 50 (DOC 178).

5. History of Air Defense Command, Jun-Dec 1952, p 120. See Chapter Five, this study, for additional information on the ACDS.

6. Ltr, USAF to ADC, "Employment of An Americanized Version of the Comprehensive Display System (ACDS)," 12 Jun 52 (DOC 179).

7. Ltr, Gen Smith to Dir of Req, USAF, "Plan for Employment of the Americanized Version of the Comprehensive Display System," 21 Jul 52 (DOC 180).

8. Ibid., 1st Ind, USAF to ADC, 22 Aug 52.

9. Ltr, ADC to USAF, "Air Defense Boundaries," 5Nov 52, with 1 Incl (DOC 181).

10. ADC General Orders No. 10, 9 Feb 53 (DOC 182), and ADC General Orders No. 14, 10 Feb 53 (DOC 183).

11. As in fn 5, above, pp. 126-7.

12. Written record of a verbal briefing to Gen Chidlaw by Lt Col O. T. Haley, Chief of the Hq ADC SAGE Project Group, on 23 Jan 53 (in &q ADC Historical Reference Files 104.2).

13. Ltr, Gen Partridge to Gen Chidlaw, 11 Feb 53 (Document 7 in History of Air Defense Command, Jan-Jun 1953).

14. Ltr, Gen Partridge to Gen Chidlaw, 11 Feb 53 (Document 9 in History of Air Defense Command, Jan-Jun 1953).

15. Hq ADC Publication, "Transition System Program," 18 Jan 54 (Document I, Appendix VII, History of Air Defense Command, Jan-Jun 1954).

16. Ltr, ADC to EADF, "Readjustment of Transition System Boundaries," 13 Mar 54 (DOC 184). See also: Hq ADC Staff Study, "Activation of Additional Air Divisions," 23 Nov 53 (DOC 185). Memo, Hq ADC, "Revised Boundaries for Transition System," 17 Apr 54 (DOC 186); Ltr, Gen F. H. Smith, Jr. to C/S USAF, "Selection of Transition System Direction Center Location," 30 Apr 54 (DOC 187); and Memo, Hq ADC " AC&W Program," 3 May 54 (DOC 188).

17. Ltr, Gen F. H. Smith, Jr., to Dir of Ops, "Readjustment of SAGE Boundaries and Reduction of Sectors and Subsectors," 29 Jan 55 (DOC 189); and Ltr, USAF to ADC, "Readjustment of SAGE Boundaries and Reduction of Sectors and Sub Sectors," 3 Mar 55 (DOC 190).

18. Ltr, USAF to ADC "Selection of Transition System Direction Center Locations," 17 May 54 (DOC 191).

19. Ibid., 1st Ind, Gen F. H. Smith, Jr. to Dir of Ops, USAF, 11 Aug 54. See also, Msg, ADC to USAF, 11 Jun 54 (DOC 192).

20. Ltr, ADC to EADF, "Proposed 1956 Air Defense Force and Air Division (Defense) Boundaries," 17 Sep 54 with 1 Incl, EADF to ADC, 11 Oct 54 (DOC 193); and Ltr, Gen Bergquist to CG EADF, "Proposed 1956 Air Defense Force and Air Division (Defense) Boundaries," 29 Nov 54 (DOC 194).

21. Hq ADC General Orders No. 8, 29 Mar 55 (DOC 195).

22. Hq ADC General Orders No. 25, 26 Jul 54 (DOC 196).

23. Hq ADC General Orders No. 20, 25 May 55 (DOC 197), and Hq ADC General Orders No. 31, 25 Jun 55 (DOC 198).

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24. Hq ADC General Orders No. 35, 18 Jul 55, as amended by GOs No. 37, 19 Jul 55, and No. 41, 2 Aug 55 (DOC 199); Hq ADC General Orders No. 36, 19 Jul 55 (DOC 200); and Hq ADC General Orders No. 38, 20 Jul 55 (DOC 201).

## NOTES
### to
### Chapter VIII

1. Ltr, Gen Stratemeyer to CG AAF, "Responsibility of the Air Defense Command," 13 Sep 46; and copy of lecture, Gen Stratemeyer before faculty and students of Air University, 15 Oct 46 (appended as documents 9 and 18, respectively, to History of Air Defense Command, Jan-Jun 1951).

2. Ltr, USAF to ADC, "Command Arrangements for the Air Defense of the United States," 7 Apr 54 (DOC 202).

3. Ltr, Gen Chidlaw to C/S USAF. "Command Arrangements for the Air Defense of the United States," 11 May 54 (DOC 203).

4. Ibid.

5. Ltr, USAF to ADC, "Continental Air Defense Command (CONAD)," 27 Aug 54 (DOC 204).

6. Ibid.

7. Hq CONAD General Orders No. 1 1 Sep 1954 (DOC 205).

8. AF Regulation 23-9, 24 Aug 1955 (DOC 206).

9. As in fn 7, above.

10. Hq CONAD General Orders No. 7. 20 Jul 1955 (DOC 207); and Hq ADC General Orders No. 39, 20 Jul 1955 (DOC 208).



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CORRECTION SHEET - Reference Notes

Chapter I (con't)

12. See ADC Regulation 20-1, 29 Jul 1946, and amendment, 28 Jul 1946 (DOC 17). See also, ADC Staff Memo 20-23B, 30 Jun 1946 (DOC 18); and Ltr, Gen Stratemeyer to CG AAF, "Mission of the Air Defense Command," 5 Aug 1946 (DOC 21).

13. Presentation, Col R. C. Candee, DC/S Hq ADC, to Advisory Board of the Chief of Staff of the Army, 25 Oct 1946 (DOC 19).

14. AAF Regulation 20- (Draft), written II Feb 1947 (DOC 20).

15. Ibid., see note at bottom of draft.

16. As in note 1, above.

17. See note 1, Chap V.

18. AF Regulation 20-13, 19 Dec 1947 (DOC).

Chapter II (con't)

16. Hq ConAC General Orders No. 69, 1 Jun 1949 (DOC 39).

17. Ltr, ADC to C/S USAF, "Preliminary Action for Activating Air Defense Division Headquarters," 25 Aug 1948, with 1 Ind (DOC 40).

18. Ltr, USAF to ADC, "Establishment of the 25th Air Defense Division; etc," 27 Sep 1948 (DOC 41). See also: Hq ADC General Orders, 6 Oct 1948 (DOC 42); and 25th ADiv General Orders No. 1, 25 Oct 1948 (DOC 43).

19. Ltr, ADC to C/S USAF, "Request for the Activation of an Air Defense Division," 28 Sep 1948, with 1 Ind (DOC 44).

20. Ltr, USAF to ADC, "Establishment of the 26th Air Defense Division; etc," 21 Oct 1948 (DOC 45). See also: Hq ADC General Orders No. 111, 4 Nov 1948 (DOC 46); and Hq IAF General Orders No. 90, 16 Nov 1948 (DOC 47).

21. Presentation, Gen Saville to Secretary of Defense, 9 Sep 1948, appended as document 18 to History of ADC, Jan-Jun 1951. See Chapter V of this study for a more complete account of Plan SUPREMACY.

22. Ltr, USAF to ADC, "Interim Program for Employment of Aircraft Control and Warning Radar," 20 Oct 1948 (DOC 48).

Chapter III (con't)

15. Msg, ConAC to 4AF, 22 Jun 1949 (DOC 66).

16. Msg, 4AF to ConAC, 28 Jun 1949 (DOC 67).

17. Msg, 25 ADiv to ADC, 8 Jul 1949 (DOC 68).

18. Memo, Gen Saville to Gen Whitehead, 5 Jul 1949 (DOC 69).

19. Hq ConAC General Orders No. 80, 14 Jul 1949 (DOC 70).

20. Msg, Gen Whitehead to Gen Upston, 8 Jul 1949 (DOC 72).

21. Hq ConAC Office Memo No. 5, "DAD Organization," 9 Aug 1949 (DOC 73).

Chapter IV (con't)

16. Ltr, Gen Myers to CG TAC, "Long Range Planning in Headquarters Continental Air Command," 6 Apr 1950 (DOC 98).

17. Ltr, Gen Whitehead to C/S USAF, "Proposed Internal Reorganization of the Continental Air Command," 2 May 1950 (DOC 99).

18. Hq ConAC General Orders No. 38, 23 Jun 1950 (DOC 100). See also: Msg, ConAC to WADF, 4AF, and 12AF, May 1950 (DOC 102); Hq ConAC Memo, "ConAC Reorganization Plans," 23 May 1950 (DOC 103); and Hq ConAC General Orders No. 60, 5 Aug 1950 (DOC 104).

19. Hq ConAC General Orders No. 51, 20 Jul 1950 (DOC 101).

20. History of EADF, January-December 1950, p. 11.

21. See: ADC Regulation 23-1, 18 Jul 1951 (DOC 105); ADCR 23-1, 17 Sep 1951 (DOC 106); ADCR 23-1, 6 Mar 1952 (DOC 107); ADCR 23-1, 18 Sep 1952 (DOC 108); ADCR 23-2, 18 Sep 1952 (DOC 109); ADCR 23-3, 18 Sep 1952 (DOC 110); and ADCR 23-1, 20 May 1954 (DOC 111).

**Part III**

**SEAWARD EXTENSION OF RADAR**

**1946 - 1956**

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# foreword

It is a truism that while offensive action begins at the moment enemy aircraft or missiles become airborne, defensive action can not begin until knowledge is gained of the enemy attack. Thus, the problem is to find a means of learning of the attack as soon as possible.

In the immediate post-World War II days, air defense planners saw a need for lines of radar placed far beyond the nation's borders. But the warning system had to be started from scratch and built as the money and resources became available. The Air Force started by placing a few radars around a small number of vital targets inside the country. Gradually, the warning lines were expanded outwards from the vital targets to the nation's borders. Only by 1956, the tenth year of post-war air defense, were warning lines north of our borders and off-shore going into place. This study tells of one segment of this ten-growth -- the effort to put radar off shore.

This study is organized into five sections. The first is introductory and covers the early planning for airborne early warning aircraft and picket ships. The second tells the story of the airborne early warning and control force. The third covers the picket ship history. The story of Texas Towers is told in the fourth section. The last section contained in chapter seven, gives a picture of the off-shore forces at the end of 1955 and of the shape of things to come.

The study was drawn from a wide variety of sources -- official

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correspondence and publications from the Joint Chiefs of Staff down to and including ADC squadrons, interviews with CONAD staff officers, official histories of ADC units (and in one case of a Navy unit), personal observation at an AEW&C unit and aboard a Navy ship, and secondary sources such as published articles and books. As in any historical study, however, only a relatively small part of the vast amount of information on the subject could be told. Readers desiring more information are invited to use any of the documents cited in the reference notes. These documents are available at the CONAD/ADC Directorate of Historical Services and in the USAF Historical Division.

Notification of any errors found by readers will be greatly appreciated.

L.H.B.

Colorado Springs, Colorado
31 December 1955

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# Illustrations





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Chapter One

# EARLY PLANNING

## Plans In The Immediate Post-War Period

In designing the post-war air defense system, military planners knew that the earlier the warning of the approach of hostile bombers the better. They saw a need for placing radar beyond the northern borders. And because some fifty percent of the nation's vitally important targets were concentrated within 150 miles of the coasts, they saw a need for extending radar seaward.[1]

But advance warning was not the only consideration; the ability to engage approaching raiders before they reached our shores was also needed. The combat radius of the interceptor aircraft was about twice that of the range of the shore-based radar. To make it possible to control interceptors at the limits of their range, radar had to be placed off shore.

As early as the spring of 1947, air defense planners began thinking of possible locations for radars outside the country. In April of that year, a newly formed joint Canadian-United States planning agency, which was directly under the respective chiefs of staff, issued a plan on early warning.[2] This group proposed the building of an early warning line across Alaska, Canada, Greenland, Newfoundland, and off both coasts. Their plan was to have both radar-equipped ships and planes patrolling off shore. The





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plan was never acted on, however.

The following year, the Air Defense Command proposed establishment of early warning lines.* ADC's suggestion was made following USAF's approval of an aircraft control and warning plan for the continental United States, called Plan SUPREMACY. But this plan, a rather ambitious scheme for the time, did not get through Congress. A smaller program which became the so-called "Permanent System," was passed later. However, after USAF approved SUPREMACY, ADC planners stated their view that "coverage along the coasts must be extended by radar picket boats or airborne early warning stations in order to provide adequate early warning for interception before bomb release line is reached by high speed hostile flights."[3] As ADC saw it in 1948, an early warning belt was needed from Hawaii to Alaska and across the northern border of Canada, down through Greenland and Newfoundland, and off the eastern shore to Puerto Rico. The following map, which was reproduced from the original made at the time, illustrates the area where ADC wanted early warning lines.

USAF was thinking along similar lines. An Air Defense Policy Board in Washington concluded in early 1948 that "seaward surveillance and control is necessary to effective air defense."[4] To provide this, the board recom-

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* This was the first of two post-war Air Defense Commands. The first command was activated in March 1946 and abolished in July 1950. Before its abolition, from 1 December 1948, this ADC served as an operational command under the Continental Air Command. The second postwar ADC was activated in January 1951. Lieutenant General George E. Stratemeyer commanded the first ADC until it went under ConAC, at which time Major General Gordon P. Saville took over. General Stratemeyer headed ConAC until April 1949 when he was succeeded by Lieutenant General Ennis C. Whitehead. General Whitehead went on to command the second ADC. For an account of air defense organization from 1946 on, see CONAD/ADC Historical Study #9, <u>Organization and Responsibility for Air Defense, March 1946 - September 1955</u>.

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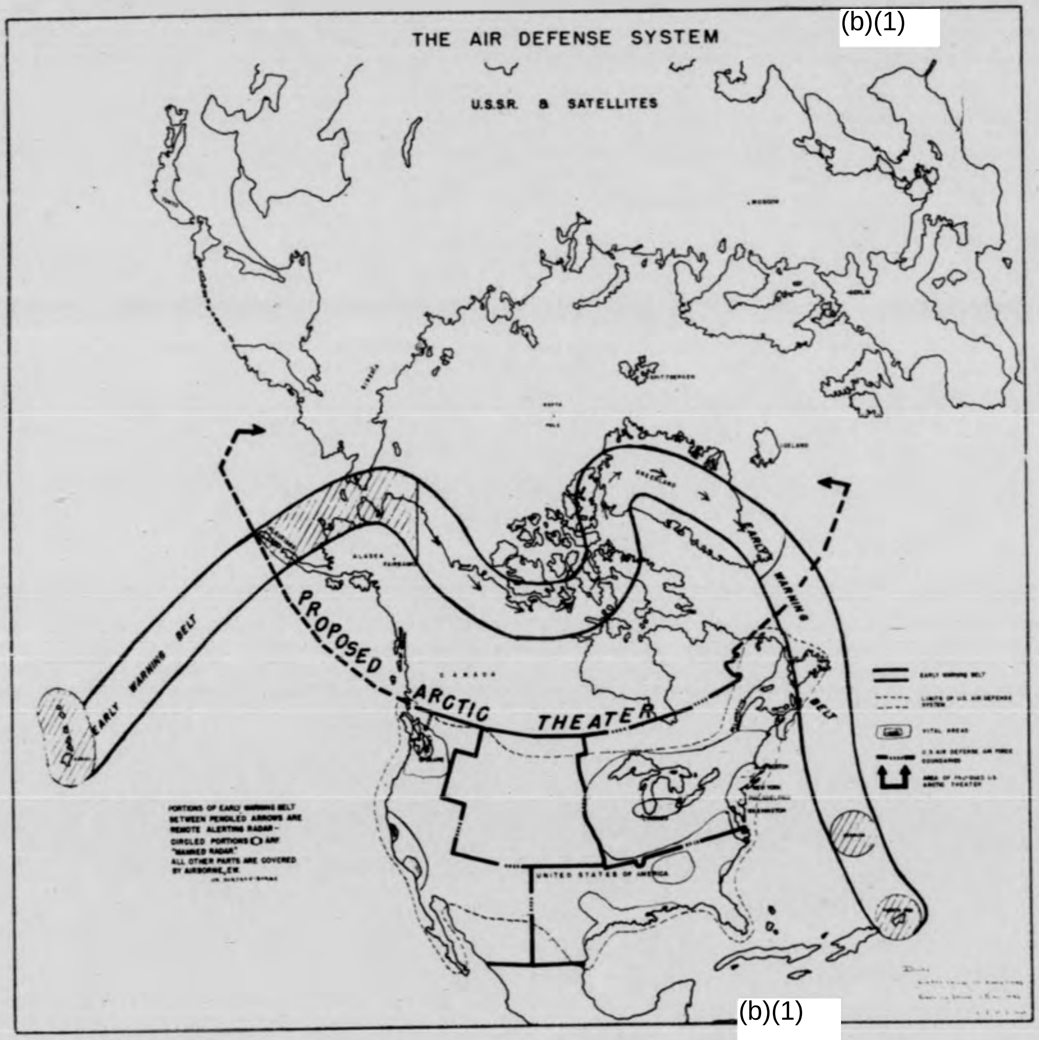
THE AIR DEFENSE SYSTEM
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U.S.S.R. & SATELLITES
EARLY WARNING BELT
PROPOSED ARCTIC THEATER
EARLY WARNING BELT
CANADA
UNITED STATES OF AMERICA
EARLY WARNING BELT
LIMITS OF U.S. AIR DEFENSE SYSTEM
VITAL AREAS
AREA OF PROPOSED U.S. ARCTIC THEATER
PORTIONS OF EARLY WARNING BELT
BETWEEN PENCILED ARROWS ARE
REMOTE ALERTING RADAR -
CIRCLED PORTIONS ARE
"MANNED RADAR"
ALL OTHER PARTS ARE COVERED
BY AIRBORNE EW

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mended that the Air Force investigate the use of airborne early warning planes and Navy picket ships.

The Air Force had to turn to the Navy for picket ships and for advice on AEW aircraft. By 1948, they Navy had had several years experience in using both. Radar-equipped picket ships had been used with the fleets during World War II and AEW aircraft had been developed in the closing days of the war.

The AEW aircraft was developed as a result of the low-level suicide attacks made on the Pacific fleets by Japanese planes. These attacks were meeting with some success in late 1943 and the Navy sought a means to extend the range at which the Japanese planes could be detected. They came in too low for shipboard radar to detect until they were within 20 to 25 miles.[5]

One answer was to station picket ships at some distance from a task force to give early warning. A disadvantage in this was that the pickets themselves became casualties at a rapid rate.

Another answer was to place a powerful long-range search radar in a carrier-based type aircraft. Various agencies went to work on the problem, and by 1944 an operating model of the radar, later designated the AN/APS-20, was built.[6] The only carrier-type plane that could accommodate the equipment and the crew needed was the Grumman torpedo-bomber, the TBM. By war's end, 27 of them, designated TBM-3W after modification, had been assigned to carriers. None reached the combat zones, however, before the end of the war with Japan.

Following this initial work, the Navy went on to modify a number of B-17's for airborne early warning operations.[7] To the basic parts of the system in the TBM's, they added an indicator system, the AN/APA-53, which

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consisted of four 12 inch position indicators. This made possible the evaluation of radar data and thus constituted the first airborne combat information center. Fighter direction, in addition to early warning, could be achieved. Fighter control capability was limited, however, for there was no height finder. The modified B-27's were termed PB-1W's.

The Navy's next step was to get a larger aircraft and to install additional and improved equipment. They chose the Lockheed standard Constellation (not to be confused with the Super Constellation, a later development). In this plane, the Navy placed a height finder, the AN/APS-45. A greatly improved search radar, the AN/APS-20B, which had greater range, and an improved indicator, the AN/APS-56, were installed. This indicator had five 12 inch PPI scopes. The modified Constellation was termed the PO-1W. This was later changed to the WV-1.

Meanwhile, in 1945, the Air Force had begun studying the possibilities of an airborne control center, primarily for strategic use.[8] But because of duplication of effort and the fact that the Navy had two years head start, the Air Force stopped its general research the following year. It agreed to use the basic Navy radar and to concentrate on the problem of airborne moving target indicators and height finding. Even this was stopped, however. In the fall of 1948, the Air Force suspended all work because of lack of funds, with the understanding that the Navy would continue research.

## Navy Responsibility In Air Defense

Thus, it was well-nigh impossible for the Air Force to get a radar screen off shore without Navy help. The basis of inter-service cooperation

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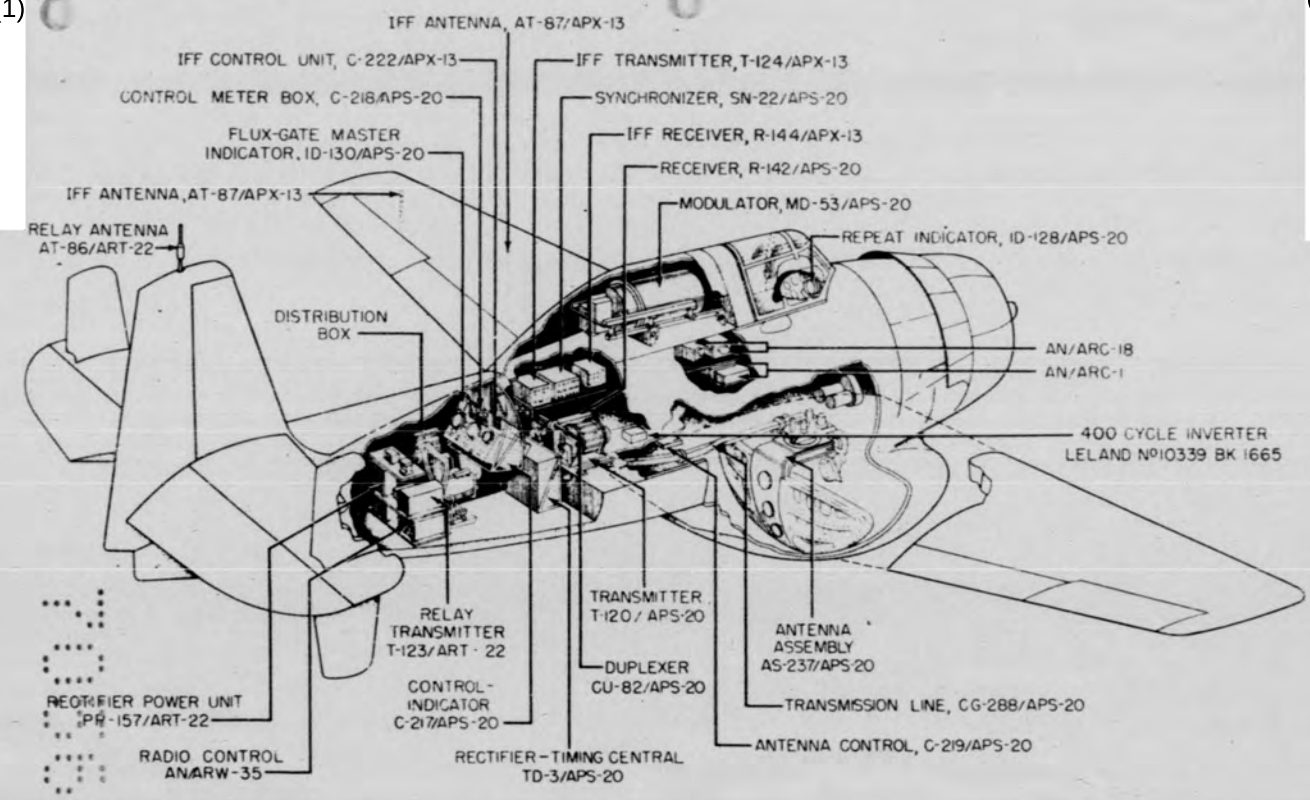


**The First AEW Aircraft - The Navy TBM-3W**

SOURCE: VC-11, U.S. Pacific Fleet Air Force, Basic Concepts of Air-Borne Early Warning System, 7 December 1949.

in the post-war period was laid at Key West, Florida, in the spring of 1948. At this small resort city in the Florida Keys, the Joint Chiefs of Staff agreed on the functions of the armed forces. In regard to air defense, the Chief of Naval Operations agreed for the Navy:[9]

> To provide sea-based air defense and the sea-based means for coordinating control for defense against air attack, coordinating with the other Services in matters of joint concern.
>
> To provide naval (including naval air) forces as required for the defense of the United States against air attack, in accordance with joint doctrines and procedures approved by the Joint Chiefs of Staff.

Not until the creation of the Continental Air Defense Command in late 1954, however, were any jointly approved doctrines or procedures issued by the JCS. In the meantime, the Navy took part in air defense on the basis of interim policies set down by the Chiefs of Naval Operations.

In the first such policy statement issued following the Key West conference, the Chief of Naval Operations drew up a number of basic principles which, for lack of a combined JCS policy, were to serve for many years. He decreed that the guiding principle for naval participation in air defense was that "naval forces having important air defense capabilities will be trained and prepared for emergency employment to reinforce and augment forces regularly assigned to this function."[10] But, he stressed, except for naval forces specifically allocated by the JCS, "a routine and continuing peacetime commitment of naval forces to continental air defense is not intended."[11]

As for picket ships, the CNO stated that availability of ships regularly assigned to the operating forces of the fleets for air defense was to be decided by the fleet commanders. When picket ships were employed in an emer-

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gency or for joint training, operational control was to be in the hands of the air defense commanders concerned.

The CNO's statement, it should be noted, was made prior to any formal requirement given to him by the Air Force for picket ships. Thinking had not yet crystallized on picket ship needs at this time. Thus, it is not surprising that the only specific statement about picket ships was on availability in an emergency.

He did point out, however, that the Commanders of the Atlantic and Pacific Fleets had been made responsible for defense of the nation against attack through the Atlantic and Pacific oceans. He interpreted this to include responsibility for air defense in these areas beyond the area responsibility of the Air Force. He considered the Air Force area of responsibility to extend to the seaward limits of the fighter aircraft control system. He did not, however, give any indication of how this air defense part of the fleet commanders job was to be met.

In order to set up interim procedures for training and emergency employment, the CNO directed that agreements be made between appropriate Navy and Air Force commands. Agreements for the Navy were to be made by the sea frontiers.

The first agreement between a sea frontier and an air defense force, which was the nearest Air Force equivalent to the sea frontiers, was reached in December 1949 between the Eastern Sea Frontier (ESF) and the Eastern Air Defense Force (EADF).

The ESF commander agreed to allocate Navy forces under his jurisdiction, which were not more urgently needed by the Navy, to the operational control

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of the EADF commander in an emergency.[12] Included in these forces were airborne early warning aircraft and picket ships. Local Navy commanders were directed by the agreement to see that their crews were familiar with air defense operating procedures.

The two eastern commands followed this agreement with another in late 1950 on specific procedures for joint training. But only two types of training were provided -- fighter and airborne early warning.[13] Picket ship training procedures were not specifically enumerated until the next year when a new agreement was made.[14] However, picket ships took part in joint training exercises much earlier.

At the same time (1951) that this training agreement was negotiated, EADF made a new agreement with ESF on responsibilities and procedures for emergency employment. No significant changes in concept or procedures were made; the purpose being to bring the agreement up to date by including the latest command and boundary changes.[15] The new Central Air Defense Force, which had been activated in March 1951, joined EADF in negotiating this new agreement and the territory and responsibilities of both were covered.

On the west coast, the Western Air Defense Force made similar arrangements with the Western Sea Frontier. In an agreement signed in May 1950, the WSF commander pledged the training of his forces and their allocation in an emergency if possible.[16] As did EADF, WADF rewrote its agreement in 1951 to incorporate the latest boundary and organizational changes.[17]

Airborne Early Warning For Air Defense

The first concrete action for extending the lines of warning seaward was taken at the end of 1949. The Chief of Naval Operations, apparently on his own initiative, suggested the possibility of using airborne early warning planes for both anti-submarine warfare and air defense.[18] He recommended that tests be held to determine the feasibility of such operations. If they proved successful, a joint policy was to be issued. The Air Force endorsed his proposal enthusiastically, directing the Continental Air Command to set up a testing program for the air defense part.[19*]

ConAC handed WADF the assignment because the Navy had been using AEW aircraft primarily on the west coast. During 1950, Navy AEW planes -- converted B-17's -- took part in exercises and other joint training.[20**] Later, tests were extended to the EADF and its stations worked with Navy aircraft in the fall of 1950.

Early in 1951, the Air Defense Command asked WADF and EADF for their thinking on AEW in air defense to include their requirements, if any.[21] Both felt that operation of AEW aircraft was too costly for continuous over-water radar extension, but EADF liked the idea better than WADF.

EADF recommended that two squadrons of 24 aircraft each be provided for the defense of the eastern United States.[22] EADF's plan was to base one squadron at Limestone, Maine, and the other in the Duluth, Minnesota, area; the idea being to protect the seaward and polar approaches.

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* In order to keep the record of changing commands straight, a note of explanation is appropriate. On 1 December 1948, the Continental Air Command was established and the Air Defense Command and the Tactical Air Command were assigned to it. ConAC was given the missions and resources of both organizations. On 1 July 1950, the Air Defense Command was abolished but was re-established as a major command on 1 January 1951.

** Navy AEW planes had participated in west coast exercises earlier. In Exercise BLACKJACK, held in June 1949 in the northwest, Navy AEW aircraft operated on a limited basis.

WADF said that about 19 aircraft could be used on the west coast, deployed in no fixed locations, but used as mobile auxilliaries to the AC&W system. But WADF had doubts about the wisdom of using AEW aircraft at all. Picket ships might be better:[23]

> In the development of a program to extend early warning over the sea approaches to target areas within the United States, the capability of picket ships should be seriously compared to the capability of the early warning aircraft in view of the cheaper cost of operation of the picket ships.

Both defense forces agreed that the PB-1W (the modified B-17) and its equipment was not satisfactory for air defense. They felt that possibly the Constellation, which the Navy was equipping for AEW work, might do the job.

This was also the thinking of the plans people at ADC Headquarters. They wanted the dependability of a four-engine aircraft, one with exceptional range, provisions for minimizing crew fatigue, and ready availability from an active production line. The latter factor was particularly important in order to get some extension of coverage off shore as soon as possible. The Lockheed Constellation seemed to fit the bill. In March 1951, the Plans and Requirements Director, Colonel Kenneth P. Bergquist, told the staff that:[24]

> Since the Navy has adopted the Constellation as the vehicle for the airborne equipment, it is considered that it would be uneconomical in both time and money, particularly time, to attempt to use any other type aircraft. Basic Constellations are now being produced for the airlines. With the Navy having already contracted for four additional PO-1Ws to be available by 1 January 1952 it would appear reasonable that if the contract were increased and if no major changes were made in the specifications, an additional 15 or 20 could be available by about 1 April 1952.

The following month, Lieutenant General Ennis C. Whitehead, ADC's Commander, submitted a formal requirement for AEW equipment.[25] He requested that initially ADC be given five squadrons. One was to be placed along the northern

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border and two each on the northwest and northeast coast.

USAF agreed with the requirement, having already given consideration to the need for AEW planes in other commands as well as ADC. It decided, however, to get a larger model of the Lockheed Constellation (some 18 feet longer), called the Super-Constellation by the manufacturer. The Navy had already contracted for some of these for its AEW force. It termed them PO-2W's at first, but later called them WV-II's.

A tentative requirement for 48 of these aircraft in the Navy configuration was established by July 1951 for the entire Air Force, of which ADC was to receive the largest share.[26] This figure was soon increased as ADC's needs became apparent. By the end of the year, the command's quota was raised to 56.[27]

Production schedules at the end of 1951 called for delivery to ADC of the first plane in May 1953 and ten, or enough for one squadron, by the following November.[28] All 56 were to be delivered by late 1955.

By September 1951, ADC had chosen tentative locations for three of the squadrons: McChord AFB, Washington; Otis AFB, Massachusetts; and Presque Isle AFB, Maine.[29] ADC substituted Larson AFB for McChord AFB a little later. Early in 1952, it selected McClellan AFB, California, and Newcastle AFB, Delaware, for the other two squadrons.[30]

Thus, ADC's aircraft, which the Air Force termed the EC-121,* were to be procured by the Navy and produced primarily according to Navy specifications.

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* This aircraft was originally designated the RC-121, the "R" meaning reconnaisance. An Air Materiel Command Technical Order, 1-1-81, dated 15 August 1955, established an early warning designation, "E," and the aircraft was re-designated the EC-121. It will be referred to by the latter designation in this study.

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Its basic equipment was to be the Navy-developed "S" band search radar AN/APS-20B (later modified to AN/APS-20E by increasing transmitter reliability) and the "X" band AN/APS-45 height finder.

ADC was to accept the aircraft and equipment before it was tested by the Air Force. Tests were to be made concurrently with operations and with squadron-assigned aircraft. The reasons were to save money; the fact that this plane was already in production; and, probably most important, the necessity to extend the shore coverage as soon as possible.*

In outward appearance the EC-121 looked awkward, having the large (17 foot) search radar antenna slung under the fuselage in a radome and the height finder antenna mounted in a radome on top of the body. The aircraft interior was divided into four main work compartments: the flight deck, forward crew compartment, air operations center, and aft crew compartment. The air operations center (AOC) contained eight operating positions.

## Establishing A Requirement For Picket Ships

While attempts were being made to secure airborne early warning aircraft for air defense, efforts were also being made to obtain the use of Navy picket ships. The reasons for wanting both were many. In early 1950, air defense officials felt an urgent need to extend warning time to northern and coastal targets (Russia had set off an atomic explosion the preceding August). They thought that picket ships could be obtained and put into operation much before the Air Force could get and operate a sufficient number of AEW planes. As told above, the schedule at the end of 1951 provided for only ten aircraft by the end of 1953.

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* See Chapter III.

But picket ships were wanted even after AEW planes arrived in large numbers. AEW aircraft, it was believed, could not completely fulfill the early warning requirement; both ships and planes were required to do the job and to give an all-altitude coverage. AEW aircraft, because of their design and limitations, would be used to provide low altitude coverage. Picket ships would provide high altitude coverage. ConAC said that picket ships could be used to solve two major problems: identification of inbound over-water flights, and radar defense in depth around coastal targets.[31]

In January 1950, ConAC proposed establishing eight picket ship stations.[32] Air Force Headquarters agreed to the requirement and suggested raising the number to ten stations, six for the east and four for the west coast.[33] Two ships would be placed off New York, Philadelphia, Norfolk, San Francisco, and Seattle. ConAC agreed and higher headquarters presented the requirement to the Joint Chiefs of Staff in March. No immediate results were obtained, however.

While waiting for high level action, ConAC went ahead on its own to see what could be done. In October, ConAC directed its defense forces to find out what ships the Navy had and whether any could be furnished for air defense.[34]

The defense forces soon found that permanent allocation of picket ships could not be made. The Navy, through its sea frontiers, said that it simply did not have enough picket ships to meet both its and air defense needs.[35]

The Navy was in the position of being asked to do an extra job without being given additional resources. The best that the Navy could offer at this time was temporary allocation in an emergency. On 22 December 1950, the Chief of Naval Operations, Admiral Forrest P. Sherman, directed his Atlantic Fleet Commander to arrange his schedules so that two destroyer-type pickets would always be available on 24-hours notice for duty off the east coast.[36] The Navy was going to convert some smaller ships, destroyer-escorts, to radar pickets in 1951 and Admiral Sherman said that he intended to make these available to EADF for emergency use. Two destroyer-escorts radar (DER), USS Harveson and USS Joyce, were scheduled for completion and assignment to the Atlantic Fleet in mid-1951, and four others later in the year.

EADF was not satisfied with this arrangement, however:[37] It said that

> the requirement of this headquarters for a continuous offshore warning, identification and reporting screen is not met by the commitment of two vessels available only in the event of imminent attack.

WADF, which did not have ships allocated even for emergencies, joined EADF in recommending that vigorous action be taken to push the requirement on the Air Force-Navy Department level.[38]

At the end of 1950, ConAC again asked USAF to see what could be done about getting picket ships allocated on full-time duty. The requirement for a minimum of ten stations still existed, ConAC told Washington, "for an acceptable air defense of coastal target areas."[39] The defense forces had found that neither the Eastern nor Western Sea Frontiers had the resources for meeting the requirement. Therefore, action had to be taken at a higher level.

This was done, but to little avail. In January 1951, the Air Force Chief of Staff, General Hoyt S. Vandenberg, told Admiral Sherman that ships for ten stations were needed at the earliest date possible.[40] Admiral Sherman said that ships were not available and that they probably could not be provided before 1954. In return, General Vandenberg replied that they were needed by

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mid-1952 and asked him to re-examine his capability to provide the ships.

While the question was being discussed in Washington, EADF and ESF representatives got together to find the best means of employing the two ships allocated for emergency use. The conferees decided that the capability of picket ships had not been adequately tested in exercises. As a result there was not enough information to develop operating procedures.[41] They decided that a comprehensive test should be made at one location. A Civil Aeronautics Administration reporting point for inbound flights called "Tuna," approximately 130 miles off the coast of New Jersey, was selected.

Operation TUNA, as the test was termed, was held from 20 February through 19 March 1951. One ship was on station at all times during this month. Three ships -- USS Benner, USS Dyess, and USS Bordelon -- were used, each for about ten days. The ships reported to one station, the direction center at Santini, New York, operated by the 685th AC&W Squadron.

The radar on USS Benner, an SC-5, proved unsatisfactory for continental air defense work because of limited range. The SPS-6B on the other two ships was more adequate, having an average range of about seventy miles.[42]

The test was very worthwhile, both because it proved the value of picket ships in air defense and because it uncovered many areas that needed correcting. It showed that warning from the ship made it possible to intercept at greater distances.[43] An increase in numbers of aircraft identified through correlation of flight plans was another result. The ships were able to furnish navigational aid to aircraft and to detect airborne electronic emissions. The 26th Air Division, which ran the test, concluded that:[44]

> During periods when communications were adequate, the picket ship

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> at Point Tuna provided... an average early warning of approaching aircraft when such aircraft were approximately 200 miles from the New York area. This warning is more than twice the average provided by shore stations when a picket ship is not on station.

Poor ship-to-shore communications was the main problem area uncovered. Neither radio-telegraph nor voice contact could be maintained for more than 28 hours without a complete breakdown. Intervals of over three hours occurred during which no contact could be made. Among the causes for the difficulties were a shortage of usable frequencies, shortage of transmitters and receivers on the ships, and heavy interference. The commander of USS Dyess commented that "communications are likely to provide the weakest link in the early warning system."[45]

Periodic operations with Navy ships continued during 1951. Much effort was placed on finding a workable communications system. ADC asked its defense forces to investigate the possibilities of using radio-teletype circuits currently in existence between picket ships and Navy shore stations for passing aircraft plots.[46] These plots could be re-transmitted to nearby direction centers, ADC suggested, by use of a tape relay.

EADF reported that it found in a test held in July for this purpose that the use of radio-teletype was feasible and had merit.[47] WADF did not hold a test just for radio-teletype, but during the last half of the year held a series of over-all comminications tests.[48]

In addition to these special tests, both defense forces had the participation of picket ships in their exercises. In the WADF exercise of February, three ships operated, but with negligible results. The one general comment was, "Communications were very poor."[49] EADF held an exercise in June in which two ships operated in the general vicinity of Point Tuna.

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Communications were improved over the TUNA test; one reason being that the ships communicated with three direction centers rather than one as in TUNA.[50] EADF concluded that proper and sufficient frequencies had to be assigned to picket ship operations.

At the close of 1951 another request was sent to Washington for allocation of picket ships. Writing this time was the Air Defense Command which had taken over the air defense job at the first of the year. ADC said the need to extend coverage was urgent and picket ships were the only means of meeting it in the immediate future, for there would not be enough AEW aircraft until 1954.[51] USAF had advised earlier that General Vandenberg had inquired about the Navy's "plans and progress to meet our requirements for radar picket ships."[52] The new Chief of Naval Operations, Admiral William M. Fechteler (he succeeded the late Admiral Forrest Sherman on 1 August), had replied that he would make a survey of his ability to meet the air defense requirement with a type of vessel that would be available sooner than destroyer-escorts. ADC now suggested that if the Navy could not furnish the ships soon that the possibility of civilian concerns or the Coast Guard supplying them be investigated. USAF said it would.[53]

Whether it did or not and what the CNO's survey disclosed is not known by the author. Apparently, the CNO found his resources inadequate. The upshot was that no ships other than those of the Navy were made available and that no more than one or two stations were manned until 1955. It will be recalled that Admiral Sherman had said that this would be the time period when the Navy would have enough ships to meet air defense needs.

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## Chapter Two

# THE START OF THE AEW&C FORCE

### The First ADC Plan For AEW&C Aircraft

ADC had its first comprehensive plan for employment of AEW&C aircraft ready for USAF consideration in February 1952. The plan proposed the establishment of two barriers approximately 800 miles long some 200 miles off both coasts.[1] Each barrier was to be manned by four AEW&C planes orbiting on station with about 200 miles between planes. At this spacing, ADC estimating the probability of detection at between 80 and 90 per cent for low altitudes.

The eastern barrier was to start about 125 miles southeast of Nova Scotia and run to about 250 miles northeast of Norfolk, Virginia. The western line was to run from about 250 miles west of Seattle, Washington, to about 200 miles west of San Francisco.

Originally, ADC intended to operate its AEW force from five bases. ADC now dropped this idea as uneconomical and inefficient. One base on each coast was now proposed, tentatively selected as Hamilton AFB, California, and Mitchel AFB, New York. However, the runways could not be expanded to the length necessary for AEW operations at these bases. ADC next considered Otis AFB, Massachusetts, and McClellan, Mather, and Castle AFB's in California. The first 30 of the 56 aircraft programmed at this time were to go on the east coast because of the priority of the eastern target area.



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ADC planned that each mission would average from 11 to 13 hours, with eight hours on station. The additional time was allotted for going to and from station. Five aircraft were to be ready for each eight hour shift on each coast, or 15 per day. On each shift four would actually fly; the other would remain on back-up. At this rate of flying, each plane would be flown approximately 2,065 hours per year or 172 hours per month.

The plan proposed that the planes fly at around 2,500 feet altitude. Greater ranges could be obtained at higher altitudes; but ADC had learned from the Navy that the higher the altitude the greater the sea clutter on the radar scope. The Navy's experience was that range had to be sacrificed to good tracking and control capability. ADC said it would change its method if the problem of sea clutter was solved or experience proved the low altitude unnecessary.

Knowing that crew fatigue would be one of the most important deterents to efficient operation, ADC planned to follow Navy findings for duty rotation. It was known that the efficiency of a radar scope operator lagged markedly after about 40 minutes in the air. After this time, it was necessary to rotate personnel to plotting, tracking, or telling and then to provide a rest. With this rotation scheme, an operator would not be on a scope more than two hours during the eight hours on station. ADC felt that aircrews should fly only two days in succession.

Because of the complexity of the aircraft and its equipment, this first plan called for all maintenance to be handled by the Lockheed Aircraft Corporation. But a little later ADC decided that it could be done by Air Force maintenance personnel.[2]

In developing a T/O&E for the AEW&C force, ADC followed the organization

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of a typical B-36 wing. At each of the two bases there were to be a group headquarters, three tactical squadrons of ten planes each, one electronic maintenance squadron, and one periodic maintenance squadron.[3]

The tactical squadrons were to have no maintenance personnel, all organizational maintenance being performed by the periodic maintenance squadron. Field maintenance of the aircraft was to be done by the base maintenance squadron. The electronic maintenance squadron was to do both organizational and field maintenance of the radar and radio equipment. An around-the-clock maintenance schedule was to be set up in order to meet the 172 hours needed per aircraft monthly. In all, some 2,500 people would be needed at each of the two bases.

## Proposed Use Of B-29's As Interim Aircraft

While ADC's plan was being considered by higher headquarters, a proposal was made by USAF to modify 30 B-29's for AEW operations until the EC-121 was received.[4] The first EC-121 would not be available until mid-1953 and only ten by the end of that year. USAF said it could make five modified B-29's available by late 1952 and all 30 by mid-1953. The B-29's could be used until sufficient EC-121's arrived and then turned over to another command.

ADC opposed the idea because it thought that the B-29's would be coming at about the same time as the EC-121's.[5] Operation of both would be extremely difficult, ADC felt, and might harm the development of the EC-121 program. Also, the B-29's would have only limited value since they would not be equipped with height finders.

After discussing it for some months, USAF finally agreed to ADC's point of view and in August cancelled the B-29 project.[6] ADC was willing to wait for the

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EC-121.

## Approval of ADC's Two-Base Plan

USAF differed with ADC's plan on two points: the use of two bases rather than five and the operation of the aircraft at the high rate of 172 hours per month. On the first point, USAF asked for a comparative cost study of five versus two bases.[7] On the second point, USAF sent an alternate plan that reduced the flying hour and personnel requirements.[8] Its plan was for a flying hour rate of 100 hours and total troop allocation of 2,750 spaces instead of the 4,582 spaces in the ADC plan.

Before ADC sent a cost study on bases and justification for operation at 172 hours monthly, it surveyed bases on both coasts. As a result of this survey, ADC selected Otis AFB and McClellan AFB. Its choice was made on the basis of location, climatic conditions, runway strength and length, air traffic congestion, and planned future use.

In its cost study, ADC figured the facility requirement cost for five coastal bases suited to AEW operation at well over $31,000,000.[9] For Otis AFB and McClellan AFB, this cost was set at about $25,000,000, or over six million less. The annual operating cost for the five selected bases was reckoned by ADC at $45,439,500; for the two bases at about $39,000,000. This was a saving of an additional six million. Finally, five bases would have required over 5,500 people, while two bases needed only 4,500 -- a saving of 1,000.

ADC's plan for two bases was the one finally accepted. On 16 September 1952, the Air Force Council gave its approval and on 6 October formal approval was granted by USAF Headquarters.[10] Two AEW&C groups were to be organized, one at Otis AFB and one at McClellan AFB. Each was to have 30 aircraft. USAF in-

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creased the aircraft authorization sufficiently for this. Manpower spaces were to be allocated during FY 1954 and 1955 to match aircraft deliveries.

USAF also went along with ADC's contention that it could maintain the 172-hour flying rate and that it was cheaper to fly more hours than to buy more planes. However, during the build-up of facilities and personnel, operations were to be on a reduced scale. The aircraft were to be flown no more than 100 hours per month. Also, the crew was to be limited to 12 members and a ratio of 1.2 crews per aircraft.[11] ADC's ultimate manning requirement was 18 crew members and a ratio of 2.5 crews per plane. The 18-man crew was to consist of seven officers and eleven airmen.[12]

ADC wanted to place the first AEW&C squadron at Otis AFB because of the high priority of the important northeast target complex, but it could not.[13] ADC thought at this time that the first ten planes would be delivered by the fall of 1953 and therefore support facilities would have to be ready by that time. This required immediate funding, but funds for Otis AFB building were not provided.[14] Thus, ADC decided that, however desirable, the first squadron could not be put at Otis. Both lack of facilities and severe weather stood in the way. McClellan, on the other hand, had at least some facilities and enjoyed mild weather as well.[15]

ADC set 1 July 1953 as the date for activation of the first squadron. As soon as facilities were ready at Otis this unit was to move there. This was expected by about April 1954. The second and third squadrons were to be activated at Otis in July and October.

EADF objected to this decision, emphasizing that it had "an urgent requirement for AEW&C capability along the Eastern Seaboard due to extreme vulnerability of the vital target complex to sea penetration routes."[16] EADF did not agree with

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ADC's reasoning in placing the first unit at McClellan and then moving it some ten months later. It said that Otis facilities would not be ready for the first or second squadrons and possibly not for the third. Support limitations, with the possible exception of fuel storage and warehousing, would still exist when these units came.

ADC realized that all facilities would not be available by April 1954. However, ADC felt that by this time the weather would be better and the lack of facilities would not be such a severe handicap. Maintenance could be performed on the parking ramp, for example.[17] This could not be done during the preceding winter. In California's mild weather, however, temporary facilities would suffice. ADC hoped that by the following winter, Otis would have adequate facilities.

## Communications Plans

In other operations plans issued in 1953 and 1954, ADC covered communications and control. ADC planned that high frequencies in the two to twelve megacycle band would be used to provide communications between the AEW&C aircraft and ground stations.[18] All data gathered by the AEW&C plane was to be "told" to a ground communications point. Cross-telling of this data was then to become the responsibility of the station in whose area the aircraft was operating. Initially at least, identification was to be performed by the ADDC in whose subsector the AEW&C station was located. Weapon control was to be passed from the central communications point to the aircraft. Voice communications were planned for speed, but it was expected that under some conditions radio-telegraph would have to be used.

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On the west coast, central communications points were to be set up at McChord AFB, Washington, and Norton and Hamilton AFB's, California. On the east coast, the ground stations named were: P-13, Brunswick NAS, Maine; P-10, North Truro, Massachusetts; P-45, Montauk Point, New York; P-54, Palermo, New Jersey; and P-56, Cape Charles, Virginia. Each ground station was to be equipped with AN/FRT-15 transmitters and adequate receiving equipment.

Activation of the First AEW&C Squadron

By the beginning of 1953, the original EC-121 delivery schedule proved to be very optimistic. The original schedule had called for the delivery of the first aircraft by mid-1953 and a total of ten by the fall. At the start of 1953, however, delivery of the first plane was re-scheduled for November 1953 and a total of ten by April 1954.[19] By the fall of 1953, delivery of the first complete aircraft had been moved up to January 1954 and a total of ten by June. Actually, the first complete aircraft did not arrive until May 1954 and the first ten not until October 1954.

USAF had by this time programmed for 64 aircraft, the first ten planes of which were to be EC-121C's, the remainder EC-121D's.[20]* The adequacy of only four planes for attrition was questioned by ADC. USAF said that the 64 aircraft were actually only the number programmed for the original force of

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* The basic aircraft used in the "C" and "D" models were almost identical. The "D" model had two 600 gallon wing tip tanks, two more windows and changes in the number and location of some antennas. Internally, the "D" had a change in the video distribution system with the installation of the AN/APA-56 which added video mapping and other refinements to the scope presentation; the APN-70 Loran was substituted for the APN-9, and among other small changes, the APN-22 Radar Altimeter was substituted for the APN-1 and the SCR-718C.

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five squadrons and that more planes would be provided in the FY 1955 production program for the sixth squadron.[21] USAF later approved a seventh squadron and programmed a total of 82 EC-121's.

The lag in delivery of the aircraft resulted in delay in the activation dates of the squadrons. ADC's policy was to phase the program in accordance with aircraft delivery.

A reason for the aircraft delay was a lag in delivery of radar equipment to the Lockheed Plant. About mid-1953, Lockheed officials asked the Air Force to accept two planes that were ready except for the radar. ADC and USAF decided to take them in order to begin flying and maintenance training.[22] Lockheed said it could make the first one available for factory training at its plant on 15 October, the second on 15 November.[23] They could be delivered to McClellan AFB by December. ADC planned to use them until complete aircraft were on hand and then send them back to Lockheed for the radar.

ADC now decided to activate its first squadron on 1 October 1953.[24] This was the 4701st, activated as a T/D unit to serve as a training and test organization. The 4701st was to be overmanned to provide personnel for schools and to provide a trained cadre for the second squadron. Later, when other squadrons were activated and the two groups formed, it was to be reorganized as a T/O unit under another number. ADC planned to activate its second squadron at Otis AFB about mid-1954, also as a T/D unit. As the first squadron, it was to be reorganized later.

The two EC-121C's without radar arrived as scheduled.[25] One was lost the following February in a crash near Hamilton AFB leaving the squadron only one aircraft until May 1954 when the first complete plane was delivered.[26] Three

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more fully equipped aircraft came in June. The 4701st got its remaining six planes by October. In July, the radar-less plane was sent back to Lockheed for its equipment.

## Providing Trained Personnel

Thr EC-121 and its radar equipment, in fact the whole AEW operation, was new to the Air Force. There were no experienced personnel to man the first squadron. The Air Force could provide men with basic training and experience, such as four-engine pilots and radar technicians. But it had no EC-121 pilots or AN/APS-20 and AN/APS-45 radar technicians. Nor were there any Air Force schools or equipment to set up schools. To give an EC-121 to the Air Training Command at this time would have meant taking it from the tactical squadron. ADC had to turn to outside sources for help.

To form a nucleus for the first squadron, ADC Headquarters sent its own men to McClellan AFB.[27] The chief of this group, and thus the first commander of an Air Force AEW&C unit, was Lieutenant Colonel Russell E. Cheever.

Responsibility for manning the first squadron was taken by ADC Headquarters for the first month. After that, WADF took over. Initially, the 4701st was authorized 74 officers and 382 airmen.[28] USAF authorized overmanning to provide for schools and for the second squadron of 33 officers and 208 airmen.

For the specialized training, arrangements were made with Lockheed and the Navy. The initial training program was for a small number of people only. How many would have to be trained at these outside sources was not known at this time. Eventually, ATRC and ADC would have courses set up to provide the specialized training. But ADC wanted to get a core of highly skilled people.

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as soon as possible to begin unit training. Classes at Lockheed and the Navy's school were started in 1953. Most of this initial training was completed the following year.

At the aircraft plant in Burbank, California, training was given to pilots, flight engineers, and key aircraft maintenance personnel.[29] Forty pilots went through this course by February 1954. Lockheed and the Navy sent instructors to the AEW&C squadron for a short period.

Training for AEW radar specialists was provided by the Navy at its Fleet Airborne Electronics Training Unit, Pacific Fleet, at San Diego. From November 1953 to August 1954, 43 airmen were trained there.[30] Graduates of this school went to a short course on radar installation at the Burbank factory.

The squadron started its flying training and ground training upon receipt of the first aircraft and men. In January 1954, for example, the aircraft were scheduled for six hours a day, six days each week.[31] Controllers were sent to the Yuma, Arizona, proficiency course.

Familiarization flights were made by all crews starting in May 1954.[32] By June, routine radar training missions were being flown on a station about 150 miles off the coast. The squadron practiced and evaluated its operating procedures. Since permanent facilities for communications were not ready when the 4701st began training, interim facilities were set up at Mill Valley AFS (P-38) in the 28th Air Division.

## Plans For Otis AFB Changed

As we have seen, ADC chose to put its first squadron at McClellan because of inadequate facilities at Otis, with the idea of moving this squadron to the

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east coast about April 1954. ADC planned to put a second squadron at Otis in July and a third in October.

As it turned out, none of these dates could be met. The whole program had to be changed. In 1954 there were no maintenance, housing, or any of the other required facilities at Otis. Not until 1955 could ADC move its first squadron there, and even then facilities were not entirely adequate.[33]

The permanent facilities for Otis were placed in the FY 1954 and 1955 (and later FY 1956) Military Construction Programs, but building could not be started as planned. USAF could not approve the master plan until ownership of the land was settled.[34] The Army and the state of Massachusetts both controlled much of the land. This also held up construction of interim facilities as had been done at McClellan.

At any rate, these questions dragged on for months. It was not until late in 1954 that work on interim facilities and rehabilitation of existing facilities got started, and then it was slowed by bad weather. The interim facilities for three squadrons was completed in late 1955 and permanent facilities were scheduled for completion by August 1956.[35]

Because of the year's delay in building at Otis, ADC decided to keep all AEW&C activities on the west coast until about March 1955.[36] The 4701st was to move at that time.

In the meantime, ADC had gone ahead and activated its second squadron, the 4712th, at Otis AFB on 1 March 1954.[37] On 25 May, the 4712th, less its personnel, was moved to McClellan, which made it simply a record transfer.[38] It was then manned with a cadre from the 4701st.[39]



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### Activation Of The 8th Air Division

Headquarters ADC decided by March 1954 that neither it nor the defense force headquarters could give as close or as continuous supervision to the AEW&C program as needed. "Preliminary operations of the AEW&C program and further study of forthcoming requirements in this area have indicated a need for quality 'top level' supervision, if the program is to be successful," explained ADC to USAF.[40]

To supervise the program, an organization on the division level with a general officer in command was needed, ADC said. It had to be at least a division because of "the multitudinous operational problems to be faced in a new and unknown type operation, the development and testing of training methods and of tactics and techniques, the complexity of the aircraft, and the fact that each aircraft is a mobile direction center...."[41]

ADC wanted two divisions. The first should be activated at McClellan as soon as arrangements could be made. This division would run the program from there until March 1955 when it would be moved to the east along with the 4701st Squadron. At that time, a second division would be activated at McClellan.

USAF agreed with the need for a change in organization, but had a different solution. It authorized one division temporarily to get the program underway and two wings to take over when the division was inactivated.[42]

USAF said that the responsibility and functions which ADC planned to give to the AEW&C group were too much for a unit of that size. A similar force of tactical and maintenance squadrons in the Strategic Air Command was organized into a wing. ADC's groups would be raised to wing level and con-

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sidered as operational units. These wings were not to be activated until July 1955, however. To provide an organization to plan, supervise, and coordinate the program in the formative stage before the wings came into being, USAF authorized a division. It was to be activated on 1 May 1954 and inactivated "not later than July 1955."[43] USAF explained that, "At this point in time, the requirement for developing tactics, techniques and procedures should have been fulfilled, and with both Wing Hqs in-being, the required operational headquarters will have been provided so that the Air Division can be inactivated."[44]

USAF approved setting the division up as a T/D unit and ADC's manning proposal. ADC had proposed 27 officers and 52 airmen.[45] The 8th Air Division (AEW&Con) was activated as planned on 1 May and Colonel Kenneth H. Gibson (he was raised to Brigadier General rank in July 1954) assumed command on 19 May.[46]

Although at first ADC Headquarters planned to take direct charge of the division, the ADC Command Council decided on 28 April to assign it to WADF.[47] As will be seen later, the original plan was reverted to the following year.

The mission of the division, to which all AEW&C units were assigned, was simply stated: "to provide airborne early warning and control in the air defense combat zone."[48] The 8th Air Division was also given authority to command, organize, train, and equip all personnel assigned; to develop AEW&C techniques and intercept control procedures; to conduct AEW&C unit training; coordinate operations with appropriate divisions; and to take part in air defense exercises.

### Activation Plans

By April 1954, a new AEW&C program had been worked out based on delays

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at Otis and the expected aircraft delivery schedule.[49] ADC planned to have all six tactical squadrons of the original program activated by August 1955. By this time also, a wing and two support squadrons were to be in operation on each base.

The first tactical squadron to be activated at Otis was to be the 961st, scheduled for December 1954. Also in December, Otis was to get the 551st Wing and the 551st maintenance squadrons. A month earlier, the 4701st was to be reorganized under a T/O, and renamed the 960th, and to move to Otis with ten planes. The third eastern squadron, the 962d, was to be activated in July 1955.

At McClellan AFB, the 4712th was to be reorganized to a T/O unit, the 963d, in March 1955. In this month, the second squadron slated for McClellan, the 964th, was to be activated. The third McClellan squadron was the last of the original six. In August 1955, this one, the 965th, was to be activated. McClellan's wing, the 552d, was to be activated in July 1955. Its two maintenance squadrons were to be activated at the same time as those at Otis - December 1954.

ADC expected the maintenance facilities at Otis to be inadequate when the first squadron arrived there. Until maintenance capability was built up, ADC planned to get much of the work done by the Lockheed Aircraft Service at Idlewild Airport, New York.[50] Lockheed would provide periodic inspections and 400-hour cycle reconditioning. Pre-flight and post-flight inspections as well as unscheduled maintenance were to be done at Otis.

In an operations plan issued in March 1954, ADC set the operationally ready dates for the two wings. The Otis AFB Wing, the 551st, was to be capa-

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ble of operating on four stations, 24 hours per day by 1 March 1956; the McClellan AFB wing, the 552d, by 1 January 1957.[51] This would allow nearly three years from the date of activation of the first squadron (October 1953).

By the end of 1953, ADC had added a seventh AEW&C squadron to its program. USAF originally programmed it for McClellan AFB.[52] But ADC wanted it located more strategically and asked that it be placed on the east coast.

ADC wanted this squadron in the east as a part of an overall plan it was shaping at this time for the ultimate AEW&C force and for defense for the next few years. ADC was putting together a requirements plan (which will be discussed more fully later) for the period to 1960. In it, ADC planned to ask that coverage be provided seaward to about 475 miles from Nova Scotia to Savannah, Georgia.[53] ADC planned that two lines of AEW&C stations (nine stations in all) would be used to provide this coverage. The outside line was to be operated continuously, while the aircraft for the inside line were to be on stand-by alert. For this east coast coverage, two wings of 30 aircraft each would be needed.

One wing was already planned for Otis AFB. ADC wanted the second wing in the Norfolk, Virginia, area. Langley AFB was suitably located, but it could not be expanded enough to handle the wing. Seymour-Johnson AFB, Goldsboro, North Carolina, was the second choice.

Thus, ADC wanted to put the seventh squadron at Seymour-Johnson as the beginning of the build-up there. USAF approved this request on 8 February 1954 and the squadron was programmed in the FY 1955 public works program.[54] This unit, the 966th Squadron, was scheduled for activation in November 1955.

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## AEW&C Force Status

By the end of June 1954, the 8th Division Headquarters had over 30 per cent of its officers and 20 per cent of its airmen (T/D authorization 27 officers and 52 airmen). The 4701st Squadron was completely manned (T/D authorization 74 officers and 382 airmen). The 4712th Squadron had 26 per cent of its officers and over 40 per cent of its airmen (T/D authorization 109 officers and 572 airmen).[55]

Five aircraft were assigned, one of which had no radar. Twelve crews were on hand.[56] Colonel Gibson reported that about 85 per cent of the authorized equipment was on hand for the 4701st Squadron. Aircraft spares were generally in good supply, but electronic spares were very scarce.

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# Chapter Three

# BUILDING THE AEW&C SYSTEM

## Radar Extension Plans

By 1954, ADC had crystallized its plans for the over-all extension of radar northward and seaward. At mid-year, ADC sent Air Force Headquarters its requirements plan for the years 1954 to 1960. ADC had conceived a two-zone system of defense for the North American continent: a combat zone and an early warning zone.

ADC defined the combat zone as an area "encompassed by a line representing the maximum limit of contiguous radar cover around the United States and certain parts of Canada and Mexico."[1] The early warning zone was to be north of this area and consist of two lines -- a mid-Canada early warning line and a northern Canada distant early warning line.

In the combat zone ADC wanted to extend coverage out to sea about 475 miles on the east coast and 250 miles on the west coast. The degree of extension was determined by such factors as vulnerability to attack from seaward, importance of likely targets, expected number of enemy planes attacking particular areas and number of defense weapons. The AEW&C force together with picket ships of the Navy and platforms anchored in shoals off the east coast called "Texas Towers" (see Chapter Six) would provide this extension.

For the AEW&C force, ADC asked for five more tactical squadrons, or a total of twelve by the end of FY 1959.[2] In September 1954, command



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planners drew up a tentative deployment for the five additional squadrons.[3] They planned to put two on the west coast - one at Norton AFB in southern California and the other at McChord AFB in Washington, making a total of five there. Norton was later dropped, however, and both squadrons scheduled for McChord. They scheduled two for Seymour-Johnson AFB in order to complete the three-squadron deployment wanted in that area. The fifth squadron was to be placed at Brookley AFB, Alabama, to provide cover for the southeast coast. This location was changed later to Hunter AFB, Savannah, Georgia.

USAF advised in December 1954 that it would not approve the requirements plan as a whole because it was not "appropriate in view of the fact that certain parts of the document have been overtaken by events since publication."[4] It approved certain requirements in it, however. One of these was the expansion to 12 AEW&C squadrons, given early in 1955.[5] Later in the year, USAF approved a thirteenth squadron to be placed at Dover AFB, Delaware.

In June 1955, a deployment and operational plan for all elements of the combat zone seaward extension force was issued by a newly-created organization for air defense, the Continental Air Defense Command (CONAD).* CONAD was a joint command created the previous September by the Joint Chiefs of Staff, with headquarters at Colorado Springs.[6] This did not put ADC out of business. But its jobs of general air defense planning, coordinating, and control of the Air Force, Army, and Navy forces taking part in air defense in an emergency were taken over by this super, JCS-directed agency. ADC was to con-

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* For additional details on the creation of CONAD, see CONAD/ADC Historical Study #9, Organization and Responsibility for Air Defense.

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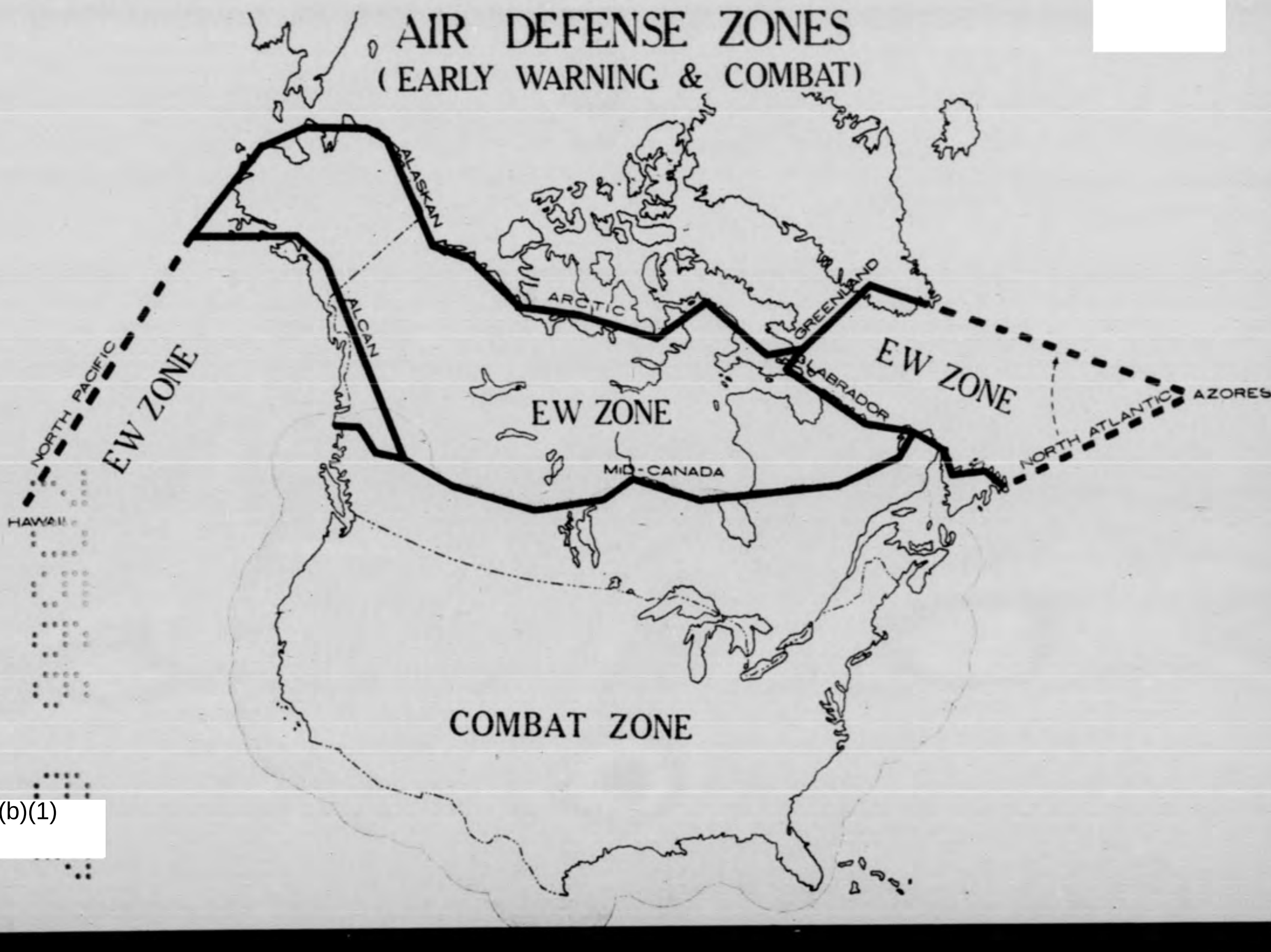
# AIR DEFENSE ZONES
## ( EARLY WARNING & COMBAT)

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centrate on running the Air Force air defense forces. ADC was allocated to CONAD along with the Army's Antiaircraft Command, and a Navy component established at this time (see Chapter Five). The JCS made the Air Force the executive agency for CONAD and named ADC's commander, General Benjamin W. Chidlaw,* as CONAD's commander also.

The CONAD plan for extension of the combat zone radar cover projected deployment and operation in two stages.[7] The first was based on the quantity of forces expected to be available by around 1958; the second when enough additional forces had been built up - possibly around 1960.

In the first stage, CONAD wanted to have five AEW&C stations off the west coast and six off the east coast. In addition, the west coast was to have five picket ship stations; the east coast five picket ship stations and five Texas Towers (see map following).

In the second stage, CONAD wanted 12 AEW&C stations off the east coast, but no increase in the other forces. In the Pacific, it wanted eight AEW&C stations and seven picket ship stations.

Thus, CONAD planned to build up to 11 AEW&C stations in the first phase, six off the east coast and five off the west coast; and to 20 stations in the second phase, 12 off the east coast and eight off the west coast. The eastern area, with its preponderance of targets and where a greater percentage of the enemy's attack was expected, was to have the most forces.[8]

This deployment took into account the fact that the AEW&C aircraft would

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* General Chidlaw became commander of ADC in August 1951, succeeding Lieutenant General Ennis C. Whitehead who retired.

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provide low-altitude coverage; picket ships high-altitude coverage. The over-all deployment was to give an all-altitude coverage so far as possible. CONAD planned to place AEW&C planes and picket ships in a single row in its first phase, with the AEW&C aircraft between the shore and the picket ship line.* Generally speaking, the east coast deployment placed Texas Towers about 100 miles out, AEW&C stations about 200 miles out, and picket ships about 300 miles out. Off the west coast, the AEW&C and picket ship stations were a little closer in. CONAD's plan for deployment was to provide high altitude (65,000 feet) coverage of about 550 nautical miles and low altitude (surface) coverage of about 320 nautical miles off the east coast; and high altitude coverage of about 460 nautical miles and low altitude coverage of about 280 nautical miles off the west coast.[9]

When the build-up was sufficient to reach the second stage, CONAD planned to add a second row of AEW&C stations on the outside beyond the picket ship stations in the Atlantic. This was to increase low altitude coverage to about 500 nautical miles. The single row deployment plan was to remain the same in the Pacific in this phase. Coverage would be extended to cover the complete length of both coast, however, in this stage (see map, Chapter Seven).

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* The geographical coordinates for the AEW&C stations in Phase I were as follows (see Chapter Five for Picket Ship and Chapter Six for Texas Tower locations):

| EAST COAST | | WEST COAST | |
|---|---|---|---|
| 33"20'N | 74"45'W | 48"00'N | 128"25'W |
| 36"25'N | 72"45'W | 45"50'N | 127'00'W |
| 38"43'N | 70"50'W | 38"20'N | 126"30'W |
| 40"00'N | 66"45'W | 36"40'N | 125"05'W |
| 42"18'N | 67"10'W | 34'10'N | 123"20'W |
| 42"10'N | 63"32'W | | |

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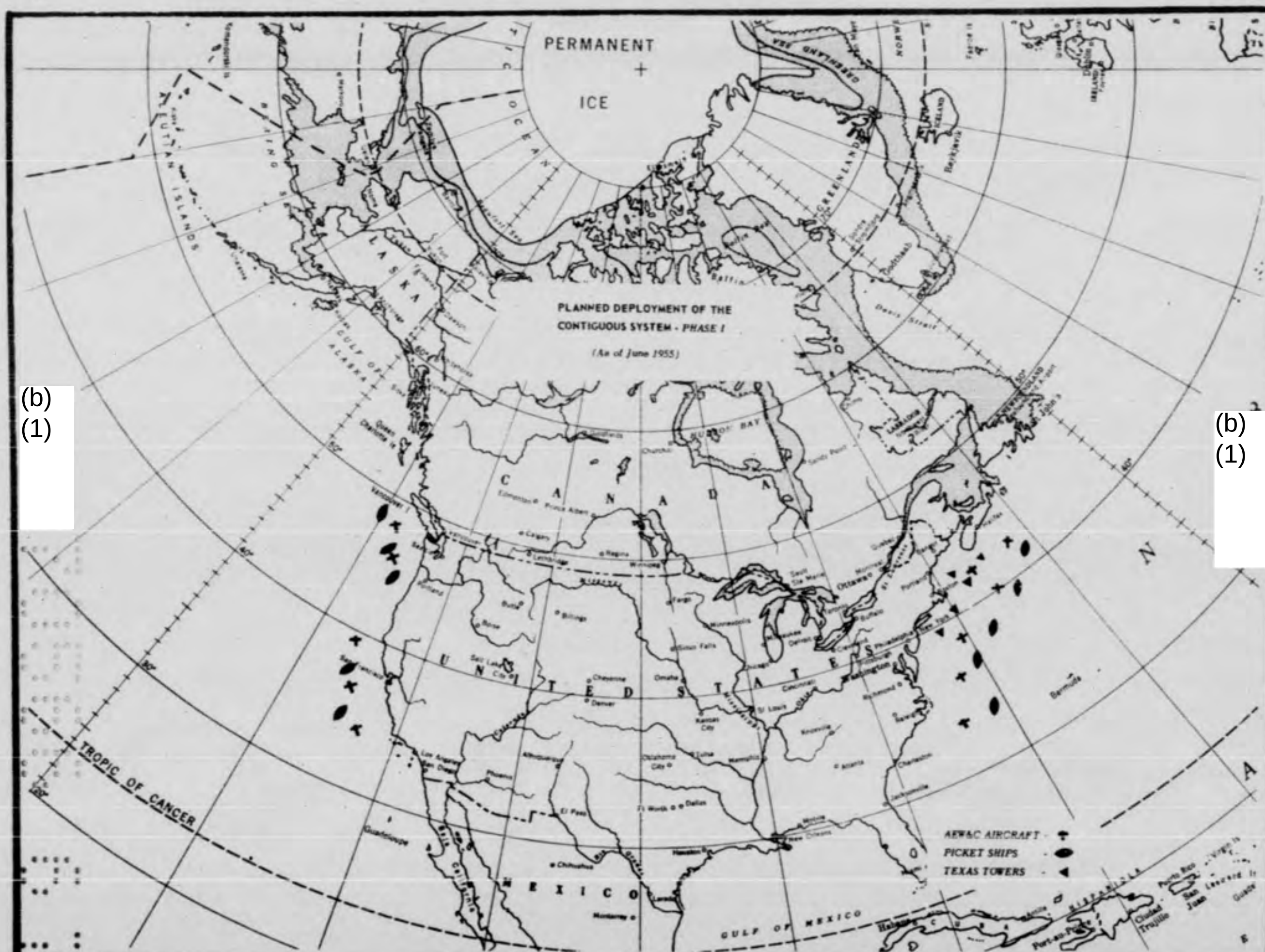
PERMANENT ICE
PLANNED DEPLOYMENT OF THE CONTIGUOUS SYSTEM - PHASE I
(As of June 1955)
ALEUTIAN ISLANDS
ALASKA
GREENLAND
CANADA
UNITED STATES
MEXICO
TROPIC OF CANCER
GULF OF MEXICO
AEW&C AIRCRAFT
PICKET SHIPS
TEXAS TOWERS

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CONAD did not think it would have enough aircraft to man these twenty stations continuously. Therefore, it planned to man only part of the stations around the clock and cover the rest with aircraft on alert.[10] Advance warning from the Distant Early Warning line would make this possible. On the east coast, CONAD planners proposed manning only the outer row and the northern stations of the inner row continuously. On the west coast, they planned to man only the two northern stations continuously. They noted in this plan that in actual practice this scheme might not work and that enough aircraft to man all stations continuously would be requested in the 1955 to 1965 plan.

### Activations and Organization

As planned by ADC in 1954, the six tactical squadrons, the two wing headquarters, and the maintenance squadrons of the original program were activated by August 1955 (see chart following). Two tactical squadrons had been activated at McClellan - one in October 1953 and the other in March 1954 - and the 8th Air Division had been activated there in May 1954. The first squadron, the 4701st, was moved to Otis AFB in March 1955. In this same month, the second squadron, the 4712th, was reorganized under a T/O and redesignated the 963d, and another squadron, the 964th, was activated under a T/O.[11] The third McClellan tactical squadron, the 965th, was activated in August.[12] The McClellan wing, the 552d, had been activated a month earlier.[13] A provisional wing had been operating there since the first of January, however, to relieve the division of day-to-day operational chores, leaving it free to concentrate on overall planning and supervision of the two-coast buildup.[14]

The first unit to be placed at Otis AFB was a provisional wing, activated

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on 1 October 1954, as an advance party.[15] This was discontinued and a regular T/O wing, the 551st, was activated in December 1954.[16] At the same time, the first tactical squadron was activated at Otis, the 961st.[17] In March 1955, the 4701st, now reorganized as the 960th Squadron, arrived from McClellan.[18] The Otis organization was completed with the activation of the third tactical squadron, the 962d, in July 1955.[19]

All of the Otis units were organized on a T/O except the 551st Periodic and Electronic Maintenance Squadrons. Because part of the maintenance was to be done by the Lockheed Aircraft Service, these units were organized on a T/D and their personnel reduced some 40 per cent. By the time that the Lockheed contract expired in September 1956, they would be reorganized under a T/O and fully manned.

This was the extent of the force activated by the end of 1955. As shown above, seven more tactical squadrons had been approved by USAF. Their activation dates, geared to anticipated base building and to availability of aircraft, were spread over the next three and one-half years.

A seventh squadron, the 966th, had been scheduled for activation in November 1955 at Seymour-Johnson AFB. However, by mid-1955, it became obvious to ADC that facilities, primarily family housing, would not be ready in time. USAF suggested that the activation be delayed until June 1956 when it was thought that housing would be available.[20] General Gibson protested this proposal. He did not want to interrupt the scheduled flow of personnel or the training planned at ATRC and other agencies' schools.[21] He feared that the delay would result in loss of the personnel authorizations. Instead he suggested that the 966th be activated as scheduled, but placed at McClellan AFB.

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**STATUS OF AEW&C UNITS - 31 DECEMBER 1955**

| Unit | Base | Assignment | Date of Activation |
|---|---|---|---|
| Hq 8th ADiv | McClellan AFB | ADC | 1 May 1954 |
| Hq 552d Wg | " | 8th ADiv | 8 Jul 1955 |
| 552d E/M Sq | " | 552d Wg | 18 Dec 1954 |
| 552d P/M Sq | " | 552d Wg | 18 Dec 1954 |
| 963d AEW&C Sq | " | 552d Wg | 8 Mar 1955 |
| 964th AEW&C Sq | " | 552d Wg | 8 Mar 1955 |
| 965th AEW&C Sq | " | 552d Wg | 8 Aug 1955 |
| Hq 551st Wg | Otis AFB | 8th ADiv | 18 Dec 1954 |
| 551st E/M Sq | " | 551st Wg | 18 Dec 1954 |
| 551st P/M Sq | " | 551st Wg | 18 Dec 1954 |
| 960th AEW&C Sq | " | 551st Wg | 8 Mar 1955 |
| 961st AEW&C Sq | " | 551st Wg | 18 Dec 1954 |
| 962d AEW&C Sq | " | 551st Wg | 8 Jul 1955 |

**AEW&C PROGRAM**

| Unit | Base | Approximate Activation Date (by Qtr FY) |
|---|---|---|
| Hq 553d Wg | Seymour-Johnson AFB | 2/58 |
| 955th AEW&C Sq | " | 2/58 |
| 956th AEW&C Sq | " | 3/58 |
| 966th AEW&C Sq | " | 1/58 |
| 957th AEW&C Sq | McChord AFB | 4/58 |
| 958th AEW&C Sq | " | 1/59 |
| 959th AEW&C Sq | Hunter AFB | 2/59 |
| 967th AEW&C Sq | Dover AFB | 1/60 |

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Both ADC and USAF agreed to this.[22] However, new problems cropped up. ADC saw that it would not have enough aircraft for the 966th if it were activated in 1955. There were three reasons for this.[23] By this time, numerous deficiencies had been found in the EC-121. One modification program had been started and others were soon to start. These would take aircraft out of the command. Secondly, ADC had found that more than the originally-planned 30 aircraft per wing were needed for operations. And, third, aircraft delivery slipped in late 1955. In view of these problems, ADC decided to postpone activation of the 966th for about two years.

Another important change in plans was in regard to the 8th Air Division. Back in early 1954, ADC had asked for two divisions to manage the AEW&C program. USAF agreed to the need for a stronger organization, but authorized wings instead of divisions. But until the wings were set up and could take over operations, USAF authorized a division to oversee the buildup. It gave authority for the 8th Air Division to be activated in May 1954 and to be inactivated in July 1955.

As the inactivation date drew near, ADC asked to keep the division for at least another year.[24] The wings could not take over yet, ADC told USAF. There were still problems of tactics and procedures, aircraft deficiencies, and training that were beyond the resources and authority of a wing organization. A central division was still needed to supervise and control the program. To further this central control, the division was to be placed directly under ADC Headquarters. ADC had not come to any conclusions about the final organization, but still thought that a division was needed for both coasts. USAF agreed, authorizing retention of the 8th for another year - to June 1956.[25]

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ADC wanted to take direct control of the 8th because the buildup of the program had not moved along as rapidly as had been expected. According to General Gibson there were great lags in the assignment of personnel and supply of materiel, particularly of electronic parts.[26] These deficiencies were causing the program to lag. He did not blame the defense force. Rather, he said that the "existing personnel and materiel situations represent a 'best effort' in light of other air defense and Air Force-wide requirements...."[27] But direct supervision by ADC Headquarters was needed.

Another reason for assigning the division to ADC Headquarters was that an awkward command arrangement had arisen with the beginning of activity on the east coast. The 8th Air Division under WADF was in charge of units stationed in EADF territory.

Just a year after its activation, on 1 May 1955, the 8th Air Division was reassigned to ADC Headquarters.[28]

### Manning and Individual Training

Because the EC-121 was new to the Air Force, ADC had to turn to Lockheed and to the Navy for help in training its people. Pilots, flight engineers, and aircraft maintenance personnel were sent to a Lockheed school. Search and height finder radar technicians were sent to a Navy school.

Manning of each unit activated during the long build-up period frequently lagged in certain important fields -- a typical problem in setting up any new organization. It was difficult to provide the exact number of people needed in all career fields exactly in accordance with the scheduled build-up. Small school output and competition for the people available with other units ADC-

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wide and Air Force-wide were among the causes of the shortages.*

The two most critical shortages were of radar operators and technicians and of controllers. ADC had been suffering for a long time from a shortage of skilled controllers. Without enough controllers as it was, the defense forces were hard put to meet the quotas asked of them. The result was that ADC had to lower its standard for those controllers assigned to the AEW&C force in order to man it. Initially, ADC required that controllers have one year's experience as AC&W directors.[31] It lowered this to permit assignment of radar observers who had not completed a year as a controller. USAF promised to help out by increasing the number of radar observers sent to controller's school.

General Gibson proposed in the fall of 1954 that a centralized training program be started at McClellan AFB to step up the training of people in all important specialities. A small training program was already in existence at McClellan for a number of fields. But General Gibson wanted a large scale program for the units on both coasts. He proposed that one squadron be set aside solely for AEW&C training to run through March 1956.[32] Considerable other equipment and personnel would also be needed, plus extensive cross-country travel for the people at Otis AFB. General Gibson felt that his plan would so increase the training that full operations could be started at Otis

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* The AEW&C units were no worse off than any other ADC units. AEW&C units had an Air Force precedence rating of II, the same as about half of ADC tactical units. However, the AEW&C squadrons had a unit precedence of 177 and 178 out of a possible 178 in category II. This meant that according to unit rating they should not have had as high a manning status as other ADC tactical units. But Headquarters ADC reported in late 1954 that the AEW had been manned at least equal to, and in most cases better than, other tactical units. For source, see reference notes 29 and 30.

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by October 1955, six months earlier than scheduled.

ADC Headquarters rejected his proposal, however.[33] Enough training equipment and personnel to establish such a program were not available. ADC programmed equipment had been allocated several months earlier to the Air Training Command to start a formal training program. General Gibson was told that no more for training purposes could be procured and "it is next to impossible to change the flow of this equipment within the time period allocated for the establishment of the training plan submitted."[34] Individual training would continue to be conducted by outside sources and by the ATRC once it got its program underway. Aircrew training would be conducted by the squadrons on each coast.

ADC arranged for a second series of classes in certain specialities at the Navy's San Diego school and at the Lockheed plant. For AEW radar technicians, new classes were started at San Diego on 28 February 1955.[35] At Burbank, radar maintenance courses were started in March 1955. These classes were to continue into 1957 when over 200 men were to be trained. Classes for maintenance personnel in other fields were also started at Lockheed in 1954 and 1955.

ATRC's Technical Training Air Force began basic and specialized courses on AEW radar in April 1955 at Keesler AFB.[36] These courses had been scheduled to start in January, but delay in getting the Navy-procured radar equipment held it up. Eventually, this school would be graduating trained radar technicians in fairly large numbers.

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Unit Training and Operations

Build up to around-the-clock AEW&C operations was to be accomplished by starting limited operations on one station and then adding more stations until finally all were maintained full time. Training missions were started back in January 1954 when the first aircraft and aircrews arrived. By June of that year, routine radar training missions were being flown on station.

The first air defense operations began with participation of AEW&C planes in the nation-wide exercise CHECK POINT held in July 1954. During this two day exercise, the total complement of six EC-121's provided radar cover off Seattle, San Francisco, and Los Angeles.[37] The effort was relatively ineffective, however, because of communications limitations and poor procedures. But much was learned about the aircraft and about techniques.

The first station manned was on the West Coast starting on 1 August 1954. WADF's operations order establishing the station called for operation of one aircraft eight hours per day (0900 to 1700).[38] The station was located off the 28th Air Division's area. On 17 September 1954, a second station was started in the same general area.[39] The plan was to increase the first station to 16 hours daily. By the end of 1955, one station was manned full-time; another partially.[40] These aircraft in the 28th Division's area reported to the radar station at Mill Valley Air Force Station, California.[41]

While the planes were on station, the commander of the division in which they were operating had operational control.[42] The division commander could re-deploy, recall, or assign subsector responsibility as required. The AEW&C plane was to patrol around a control point described in "georef" coordinates and latitude and longitude. From operating experience and tests held by the

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Air Proving Ground Command it was found that flying at a higher altitude than the 2,500 feet once thought necessary was more satisfactory. The APGC, reporting in September 1955 on the results of its second phase of the aircraft operational suitability tests, stated that:[43]

> Comparison of the blip/scan or tracking capability curves shows that during the test the RC-121 achieved the best performance against the B-29 type target with the radar platform at 15,000'. This was true whether the target was at 500' or at 20,000'.

The APGC also noted in this report that the EC-121's tracking performance against high altitude jet bombers was marginal in all cases. At any rate, CONAD stated in its operational plan issued in June 1955 that AEW&C aircraft would fly at altitudes between 5,000 and 15,000 feet.

The first operating station was started on the East Coast on 21 September 1955.[44] This one was manned around-the-clock.

One very great problem remaining in operations in late 1955 was that of obtaining frequencies for the extensive communications system. CONAD handed Air Force Headquarters a communications plan covering the needs for all parts of the seaward extension system - AEW&C aircraft, picket ships, and Texas Towers - in June 1955.[45] For the whole system, CONAD asked for a minimum of 32 UHF channels and 50 other channels in families of frequencies.

The Joint Communications-Electronics Committee of the JCS asked for a reduction.[46] It was difficult to get such a great number of frequencies. The committee suggested that a group of common frequencies be used for command and control circuits. The common frequencies would be less than the number of specific circuits in CONAD's plan. A second suggestion was to use multiplex teletype in place of voice telling circuits from the picket ships to shore.

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CONAD said that the first suggestion was not acceptable, but that the second had merit and would be investigated.[47] If it proved feasible, it would be adopted and the number of frequencies reduced accordingly. In the meantime, operations were being carried out by using frequencies from ADC's emergency net and a few others given temporarily by USAF and the Navy.[48]

Aircraft and Support Deficiencies

ADC had accepted the EC-121 before it had been tested by the Air Force. The reason, ADC explained, was that because of the "considerable cost of each aircraft and the pressing operational requirement for immediate seaward extension, no aircraft have been allotted specifically for test purposes."[49] Instead, the Air Proving Ground Command ran tests concurrently with operations at McClellan AFB. An evaluation of the plane and its equipment was started in August 1954 and completed in May 1955 - a period of nine months.

The APGC concluded from its investigation that the aircraft was unsuitable for its mission. The reasons were (1) inability to operate in all types of weather, (2) inadequate navigation facilities, (3) inadequate air-ground data transmission system, and (4) limited range and height accuracy of the AN/APS-45 height finder.[50] The height finder did not have as great a range as the search radar. Neither was very great. The search radar, APGC reported, provided early warning coverage (based on 20% blip/scan tracking capability) against high flying (40,000 feet) jet targets at 173 nautical miles; against low-altitude (20,000 feet) targets of the TU-4 type at 193 nautical miles.[51] The height finder, they stated, could, on the average, measure height of a B-29 target to a range of only 80 miles.[52]

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But the EC-121, the APGC concluded, did have value as an interim AEW&C aircraft:[53]

> The RC-121 in its present configuration has a significant Air Defense potential. The search radar can present an effective barrier (with about 200 miles spacing between radars) against TU-4 type aircraft flying at medium or even low altitudes. Against jet bombers (B-47's) at higher altitudes, the APS-20 is considerably less effective (but this is true of radars in general). The radar evaluation tests indicate that the equipment can only partially satisfy the surveillance requirements (detection and tracking) against jet bombers.

The deficiencies found by the APGC were confirmed by the Air Force Inspector General who surveyed the EC-121 supporting system in April 1955. The IG added that the system was harmed by a complex method of procurement, poor liaison between the Air Force and the Navy, lack of a central monitoring agency, and inadequate electronic supply.[54]

The EC-121 was produced according to Navy specifications and was procured by this service. The aircraft had, therefore, to meet both Navy and Air Force mission requirements. General Gibson pointed out that this resulted in having equipment that was satisfactory for one but was not necessarily satisfactory for the other.[55]

Also, certain equipment required by one was not needed by the other. ADC's materiel chief, Major General Marshall S. Roth, said that the greatest difficulty with Navy procurement was a delay in exchange of information between the services on modifications and test results.[56] This was mainly on the electronics system. There were few difficulties on the engine or airframe. This delay in exchange of data had held up correction of deficiencies in some cases.

ADC replied to the IG that it had long been aware of these deficiencies and problems. Much time and effort had been spent trying to make improvements.

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Many modifications had already been made to the equipment and many others had been proposed. But ADC had not been able to keep up.[57]

> The machinery and personnel know-how in this command and other commands for handling and keeping up with this highly complicated weapon system has not kept pace with the numerous problems that have arisen. Patch work fixes have been applied, but complete control has eluded this command.

As to reasons for this, ADC named (1) a delay in initial provisioning because AMC delayed in designating the prime depots, (2) lack of group experience in the USAF EC-121 weapon system project office because of frequent changes in personnel, (3) Navy cognizance over contract allocation of major components and spares, and (4) Navy control of nine electronic systems in the plane. ADC said also that the program suffered "because many Air Force agencies apparently do not realize that a great deal of extra effort must be expended in order to resolve the numerous problems encountered by this command when it accepted this untried and unproven weapon."[58]

ADC asked that much more additional emphasis be given at USAF level. The thought was that this might result in releasing more manpower for monitoring the program, lowering the time taken in the modification processing system, adding funds for the modifications, hastening shipments of spares, and expediting publication of handbooks for the EC-121.

But ADC's conclusion was that they had accepted the aircraft too soon. It should have gone to ARDC and APGC for complete testing first. "It wasn't until after we had received the aircraft that the principal deficiencies which are now causing the trouble were discovered. The decision to accept Navy aircraft then in production did not give this headquarters and Headquarters USAF time enough to program proper facilities for its effective support."[59]

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In the meantime, General Gibson wrote that he did not believe that the wings could maintain the aircraft at the flying rate required for full operations.[60] Each plane would have to fly 172 hours per month.

The AEW&C project people in Colorado Springs agreed with General Gibson's conclusion that 172 hours was too much. They felt that possibly each squadron should have 13 to 15 aircraft which would make a flying rate of only 133 to 153 hours per month necessary.[61] But they did not know exactly how to solve the problem. It was the ADC Headquarters view that no more EC-121's in their current configuration should be purchased.[62] The 8th Air Division was told that the only solution appeared to be to limit its operational goals with the EC-121 and then to get better aircraft.

To clinch the need to drop the operational goal, word came of a slippage in aircraft delivery. This was caused by a delay in procurement of enough radar to match the production of aircraft at Lockheed.[63] The planes coming off the line for which there was no radar were to be stored until the radar arrived. Some 13 aircraft would be affected.[64] Delivery would be cut by this number between October 1955 and March 1956. They were to be added to the delivery beginning in March, with all returned by October 1956, at which time all the EC-121's currently contracted for were to be delivered.

## Change In Operational Goals

As a result of all these problems ADC had to revise its plans greatly. On 9 September 1955, ADC moved the date for operational readiness for the 551st Wing at Otis back eight months to 1 November 1956.[65]* The date for the 552d Wing

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* Because WADF compromised these dates, they were moved back 15 days in mid-December to 15 October 1956 for the 551st and 15 December 1956 for the 552d.

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at McClellan AFB was left at 1 January 1957. For both wings, the requirement for flying 172 hours per month on each plane was dropped to 140 hours. The concept of each wing manning four stations continuously was changed to "will man continuously 24 hours a day as many stations as possible, utilizing a minimum of 3592 hours per month for station keeping and enroute time."[66]

Then in December, ADC asked USAF to increase the aircraft authorizations for each wing to 34 EC-121's and two C-121's.[67] The latter were to be used for training and support, leaving the EC-121's for the primary mission. ADC explained that each plane could fly 140 hours per month which would provide a total of 5,040 hours monthly (36 X 140). This, ADC felt, was sufficient to once again permit each wing to man four stations continuously. ADC pointed out that actually if all the attrition EC-121's already purchased were used, there would be enough to assign 34 to the wings. USAF would have to buy only the two C-121's per wing to meet ADC's request.

Because of the change in operational-ready dates, ADC asked that the 8th Air Division, scheduled for deactivation in mid-1956, be retained until one month after the McClellan wing became operationally ready, or 1 February 1957.[68] USAF had not given its approval at year's end.

As discussed earlier, ADC decided not to activate the 966th Squadron in November as planned. There were no aircraft for it. ADC said that modification of the EC-121's would take about 12 aircraft from the command at all times and would take about two years to complete.[69*] This loss of planes plus the need

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* A small modification was started in July 1955. This program, called BISQUICK (Bureau of Inspection Survey - Quick), provided nine EC-121's with better cabin cooling.

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to give extra aircraft to each wing made it impossible to give any to the 966th. For this squadron and the six others authorized by USAF yet to be activated, ADC wanted a new aircraft that was better suited to the mission.

The last EC-121 was to be delivered in late 1956. ADC wanted a much more advanced aircraft for the future. The proposed requirement for this aircraft called for a 20 to 24 hour endurance in all conditions of weather.[70] Other requirements included the ability to perform its mission at 25,000 feet, space for a double crew, and greater noise and vibration suppression. Equipment requirements included identification capability, automatic navigation, passive detection capability, semi-automatic ground environment system capability and greatly improved radar. Of great promise in the radar field, was an ultra high frequency type that was being tested.[71] By using this radar and turbo-prop engines, the AEW&C aircraft could be flown at higher altitudes.[72]

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# Chapter Four

# PICKET SHIPS FOR AIR DEFENSE

## Picket Ship Policy

The first high level policy on Navy participation in air defense was made at the Key West Conference in 1948 (see Chapter One). The Navy agreed to help repel an air attack with what forces it could provide in accordance with doctrines and procedures established by the Joint Chiefs of Staff. The Chief of Naval Operations then issued a statement of interim policy to serve until the JCS as a group issued instructions.[1]

The first formal request for picket ships was made by air defense officials to USAF early in 1950. Soon after, a need for ten stations - six off the east coast, four off the west coast - was established with USAF. The Navy felt that it did not have the resources to provide the ships needed continuously. The best it could do was to provide for a meager allocation in an emergency. On 22 December 1950, the CNC directed that two ships be always available on 24 hours notice off the east coast.

This remained the arrangement until the fall of 1952. However, additional ships took part in exercises and other joint training.

In September 1952, Admiral William Fechteler, the CNO, issued a new statement of policy on air defense. His statement reaffirmed the policy of aiding the Air Force to defend against air attack by providing for temporary employment of units of the operating forces in port or temporarily ashore and units of the Reserve Fleets and other naval facilities.[2] But



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Admiral Fechteler distinguished between these forces that would be temporarily employed in an emergency and picket ship forces that might be provided for continuous support even in peacetime. The latter he dealt with in a separate statement.

In his first statement on forces other than picket ships, he reiterated the view of his predecessor that the Atlantic and Pacific Fleet Commanders were responsible for air defense against attack coming through their areas "to be undertaken outside the area of responsibility of the air defense agencies but in concert with those agencies."[3] Unlike his predecessor, however, Admiral Fechteler said he considered Air Force responsibility to extend to the seaward limits of its shore-based radar. The previous policy statement had said to the limits of the fighter aircraft control system.

ADC objected to Admiral Fechteler's proposed limitation. Picket ships and AEW&C aircraft would greatly extend the area in which interceptors could be controlled.[4] Therefore, ADC felt, the limit should not be that reached by the shore-based radar, but that reached by the operational limits of the weapons employed. As will be seen later, this controversy was settled by the establishment of a contiguous area off the nation's shores, in which the Continental Air Defense Command had operational control and responsibility, and an early warning zone. For the sea part of the early warning zone, the Commanders of the Atlantic and Pacific Fleets became responsible.

To return to the situation in 1952, the CNO said in his statement on picket ships that the Air Force Chief of Staff had given him a list of stations to be covered.[5] Admiral Fechteler said that to cover these would take more ships than foreseen and would necessitate a raising of Navy force levels, but he wished to support the Air Force as fully as possible.

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Admiral Fechteler saw a way of killing two birds with one stone. The two fleet commanders were responsible for air defense in their areas and needed ships. The Air Defense Command needed ships. Why not combine the requirements in one force? He proposed creating two additional commands, one in the Atlantic and one in the Pacific, to perform "continuous picket functions in support of all military commanders whose primary mission require surveillance...."[6]

As it turned out, separate picket force commands serving all agencies were not established, at least not at this writing. Instead, ships were provided or were to be provided for both the air defense combat zone and the early warning barrier.

In keeping with his policy, Admiral Fechteler provided for a picket ship on full-time duty to develop techniques and procedures. He directed in September 1952 that one picket ship station be manned continuously and one intermittently off the east coast.[7] On the 23rd of this month, one ship went on full time.[8]

Operations and Training

With the placing of one ship on full-time duty, training and work on procedures began on a continuous basis. Actually, however, intermittent operations for this purpose had started earlier. Picket ships, as has been mentioned, had taken part in local joint training and large-scale exercises for some time. Operation of ships specifically assigned for this purpose did not begin, however, until mid-1952. This dates from shortly after activation by the Navy of Escort Squadron 16 in March.[9] Two destroyer escorts, fitted with additional radar and communications equipment, were assigned at this time -- USS Harveson and USS Joyce. Four others were added by November -- USS Strickland, USS Kirkpatrick,

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USS Fessenden, and USS Otterstetter. Escort Squadron 16 began operations with EADF in June 1952. One ship was ordered to a station for periods of two to six days to test voice communications with AC&W squadrons.

Beginning in September, manning of one station started on a continuous basis. The ships of the escort squadron took turns at this duty, manning one of the six stations established off the east coast. A second ship was kept on standby duty. Also, at this time, EADF was sending Commander Destroyers Atlantic Fleet its publications so that his other destroyers could take part in air defense if necessary.[10] COMDESLANT had over 100 destroyers possessing an air defense capability, though to a lesser extent that the modified DER's.

The years 1952 and 1953 were spent in testing and in training. From June 1952 to May 1953, in fact, the mission assigned to the picket ships was communications testing, primarily.[11] After this date, it became air defense.

The greatest problem was finding a suitable communications method. Originally, it was decided at JCS level that the Navy would supply the ship-to-shore communications.[12] The Navy thought that its regular ship-to-shore system could handle the communications.[13] The Navy's plan was for the ships to report to a Navy shore radio station. This station was then to send filtered data to an AC&W station by landline. But air defense officials felt that direct ship to AC&W station communications would be better. The Air Force asked the Navy to assign two day and two night frequencies for each of the six picket stations, or a total of 24.[14] The CNO replied that he thought the regular naval communications system would do the job and refused the frequencies.[15] Because of the CNO's views, ADC directed its defense forces to test the Navy system.

It became apparent almost immediately that the Navy's original scheme was unsatisfactory. It took too much time. An average of 20 minutes was needed to transmit data from the ships to the AC&W station through the Navy station.[16]

There followed an extensive series of tests with nearly everything being tried including CW, radio-teletype, and voice, with various methods of linking the ship and the AC&W station. To aid in the tests, the Navy set up a radio station at a Sea-Air Rescue station near Newport, Rhode Island, called Beavertail.[17] During the tests it served as a relay and monitoring station. The final method decided upon, as the most rapid means, was high frequency voice reporting from the ship directly to the AC&W station.[18] A monitor was found desirable and so Beavertail was retained.

The radio plan as eventually worked out was as follows.[19] On the East Coast, five ground radio stations were established (the same five that were to handle AEW&C communications): P-13 Brunswick NAS, Maine; P-10, North Truro, Massachusetts; P-45, Montauk Point, New York; P-54, Palermo, New Jersey; and P-56, Cape Charles, Virginia. Each of these stations was to have one picket ship reporting to it. The reason for only five stations was that early in 1954, ADC reduced its requirements by one station off the east coast. Besides having one of these stations assigned as a primary reporting point, each ship was assigned one of the other stations as a secondary reporting point in case of failure of the first station.

A slightly different system was to be set up for west coast pickets. Only three communications stations were established: McChord AFB, Washington; Hamilton AFB, California; and Norton AFB, California.

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## Indoctrination and Procedures

In mid-1953, a continuous program for exchange of personnel for indoctrination was started. However, some exchange had taken place earlier. In 1952, for example, 40 officers and men from picket ships visited various AC&W sites, with some of them actually standing duty.[20] During 1952, ten Air Force AC&W personnel visited picket ships.

The first training of any consequence in controlling Air Force interceptors by ships of Escort Squadron 16 began in February 1953.[21] During this year, 29 intercepts were conducted by picket ships. In January 1954, in-port interceptor control training was started to supplement on-station training.

As early as 1951, EADF had issued operating procedures for picket ships in air defense. An EADF SOP published in 1952 described the picket ship patrol area as a circle 50 nautical miles in diameter with the center located at the ship's control point.[22] The ship was not to be more than 25 miles from this control point.

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# Chapter Five

# THE CONTIGUOUS SYSTEM AND THE EARLY WARNING ZONE

## Navy Responsibility Established

The most important landmark in the history of picket ships in air defense was reached at the end of 1953. At that time, Admiral Fechteler's successor, Admiral Robert B. Carney, signed an agreement with General Nathan F. Twining (who succeeded the late General Vandenberg) that pledged everything that air defense officials had been seeking for so long. By its terms, the Navy would provide ships and lighter-than-air aircraft to extend ADC's shore-based radar coverage seaward contiguously off both coasts.[1] The forces in this contiguous system were to be directed by ADC. The Navy was also to provide forces for extending the early warning system seaward. The forces for these early warning "sea flanks" were to be under the fleet commanders. But they were to coordinate their plans with ADC.

These responsibilities were firmly established in the fall of 1954 with the creation of the joint, tri-service command for air defense -- the Continental Air Defense Command. As noted earlier, the JCS set up this command on 1 September 1954.

The JCS ruled on both the contiguous system and the early warning system.[2] For the former, they set up a Navy force -- "naval forces of the contiguous radar coverage system" -- and allocated it to CONAD along with the Air Defense Command and the Army Antiaircraft Command. The headquarters



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of the Navy forces was set up at CONAD Headquarters in Colorado Springs. The first commander of the Naval Forces Continental Air Defense Command was Rear Admiral Albert K. Morehouse. Additionally, naval components were established at defense force and air division level.

The JCS provided that CONAD's chief was to have operational control over all forces assigned or other wise made available. This, of course, included the Navy forces of the contiguous system.

In regard to the seaward extension of the early warning system, the JCS provided that the forces and operations of the sea flanks were to be under the Commanders in Chief Atlantic and Pacific Fleets. However, they directed these commanders to support CONAD in accordance with JCS approved plans and with mutual agreements so as to insure that the sea flanks would meet the needs of CONAD. Also, one of CONAD's responsibilities was to plan for early warning systems and procedures in coordination with appropriate United States and Allied commanders.

Admiral Carney directed that the Navy forces to be assigned initially to the operational control of CONAD were to be the ships of the contiguous radar coverage system while on station.[3] To improve the efficiency and readiness of naval forces in the two systems, he told his Pacific and Atlantic Fleet Commanders to develop and test new tactics and equipment, to hold exercises, and to make forces available for these functions.[4] Among the subjects to be explored, which included improved identification and communications, was the possibility of employing a carrier force in conjunction with the early warning system for identification, tracking, and interception at sea in an emergency. He noted that in general the duties of individual units participating in either the contiguous or early warning systems were the same. Training in either would be beneficial to the other.

The Combat Zone Picket Ship Program

The plan issued in June 1955 set forth CONAD's requirements for the forces providing the seaward extension of what it called the air defense combat zone, the area "encompassed by a line representing the maximum limit of contiguous radar cover around the United States and certain parts of Canada and Mexico."[5]

This was the two-stage plan discussed before. In the first stage, CONAD wanted to build up to five picket ship stations off each coast. In the second, CONAD wanted to add two stations to the west coast which had a long area exposed to Russian bases and where there would be no Texas Towers. The two additional stations would make it possible to give coverage from off Vancouver Island, British Columbia, clear down to Baja California. This made a total of 12 stations, or two more than initially required (see Chapter One). But the Navy had already planned for 12 stations by this time.[6]

The CONAD plan for deployment of picket ship stations (five east coast, seven west coast) not only differed in total numbers from the original, but also in numbers for the east coast. Initially, six stations had been planned for the east and four for the west. Early in 1954, ADC decided to reduce the eastern stations to five.[7] When EADF planners heard of this, they expressed surprise and confusion.[8] In another letter, they listed some twenty references dating back to October 1950 calling for six stations.[9] ADC replied that five stations met the need when considered along with planned AEW&C stations and Texas Towers.[10]

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## Assignment of Ships to the Combat Zone

The Navy had used destroyers early in the postwar period for air defense picket duty and later had used destroyer escorts. While both were excellent as pickets, they were designed for fleet duty and were expensive to operate in continental air defense. Their optimum speed was greater than that needed for offshore patrol. They carried weapons and some personnel that were not needed. A ship with less powerful engines that would use less fuel and without the extra equipment and men required for fleet duty was more practical.

The Navy chose the old Liberty-type transport of World War II fame. It began taking some of these transports from mothballs and converting them into pickets (see drawing on next page). In their new role, they were termed YAGR's (meaning miscellaneous auxilliary ocean radar station ship) and renamed to match their role of watching the skies for enemy planes. The first of them, USS Guardian, was commissioned in February 1955.

The Navy planned to man all stations in the contiguous or combat zone with YAGR's. For the early warning sea flanks, however, it planned to use destroyer escorts (DER's). The latter were also to be used in the contiguous system until their places could be taken by YAGR's.

In August 1954, Admiral Carney directed that a second station be manned full-time.[11] This was done on the seventh of the following month.[12] Early in 1955, a third station was added and by July, five East Coast stations were manned.*

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* According to COMNAVFOREASTCONAD Operations Plan No. 1-55, 1 May 1955, the five east coast stations were located as follows: (1) 42"47'N, 68"23'W; (2) 41"00'N, 68"00'W; (3) 40"00'N, 70"00'W; (4) 38"56'N, 72"05'W; (5) 37"41'N, 73"00'W.

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# LIBERTY SHIP CONVERSION TO RADAR PICKET YAGR

ADVANTAGES: 1. PROVIDES SATISFACTORY PICKET SHIP AT REASONABLE COST
2. CAPABLE OF OPERATING ON ECONOMICAL BASIS

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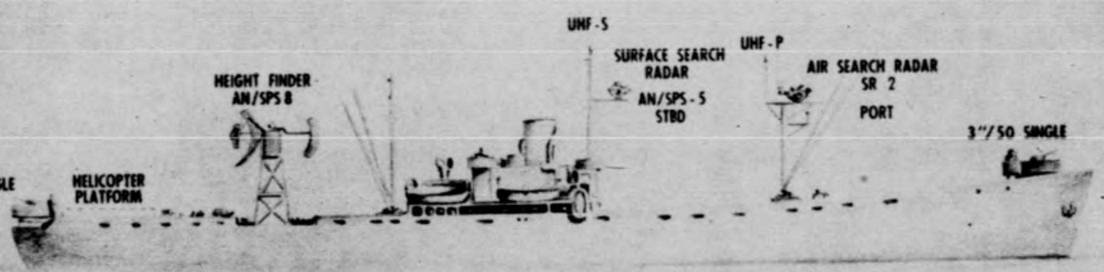


CHARACTERISTICS REQUIRED:

- STABLE RADAR PLATFORM
- SEA AND STATION KEEPING QUALITIES SUITABLE FOR ALL WEATHER CONDITIONS
- SUFFICIENT SPACE FOR INSTALLATION OF RADAR, CIC & COMMUNICATIONS
- ADEQUATE LIVING & MAINTENANCE FACILITIES
- HELICOPTER PLATFORM (SPACE RESERVED)

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DER's were used exclusively until June. On the 23rd, the first YAGR, USS Guardian (YAGR 1), went on station number Two.[13] Three other YAGR's went into service in July. Two more DER's were added to east coast operations by year's end.

In addition to the four YAGR's, the Navy was using six DER's off the eastern seaboard. The ratio of ships to stations was roughly three DER's per station and four YAGR's for three stations. The reason for the smaller number of YAGR's was that they could stay on station from 30 to 32 days; the DER's for only about two weeks. In July, east coast stations One and Five were manned constantly by DER's; stations Two and Four by YAGR's. Station Three was manned primarily by YAGR's with DER's filling in.

The first west coast station was manned on 30 July by USS Haverfield (DER 393). Three more DER's were put on west coast duty by the end of the year. Training and testing began late in the year on the second station which was scheduled for full-time manning on 1 January 1956.

The Navy schedule called for manning five west coast stations by July 1956.[14] Four YAGR's and six DER's were to be on duty at this time in the Pacific. The five eastern stations were to be manned entirely by YAGR's by July 1957; five western stations a year later. This schedule phased in a sixth western station in July 1957. No schedule for the seventh station had been established at this writing.

## Operations

The Commander Naval Forces Eastern CONAD* issued an operations plan in

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* This was the eastern component at defense force level of the Naval Forces Continental Air Defense Command.

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May 1955 covering picket ship operating procedure, stations and manning priority, and communications.[15] He directed that control of picket ship active air defense functions while on station was to be by the joint air division commander in whose sector the ship was operating. When not on station, control of DER's was to be in the hands of Commander Destroyer Force, Atlantic Fleet; of YAGR's, Commander Eastern Sea Frontier.

COMNAVEASTCONAD directed that ships patrol within a circle 25 nautical miles in radius from the control point of the station. Ships were considered off station when more than 25 nautical miles from the control point, or unable to perform their mission.

This procedure was altered in November by CONAD. It ordered picket ships to maintain patrol along the axis of the barrier to a distance of 40 miles on each side of the ship's station.[16] The purpose was to increase the probability of detecting low level attacks. Movements of the ships were to be synchronized so as to keep a constant distance between each ship. This shifting patrol was to be varied in speed and time at the discretion of the defense force commanders in order to eliminate the possibility of an enemy forecasting the future position of any picket ship.

This change in operational procedure accompanied an order by CONAD to move picket ship stations on both coasts about 200 nautical miles out to sea from their current and planned positions.[17] This move was to be made by 1 December 1955. The reason for the move was to gain greater warning time for readying the defenses. The new positions were tested in Exercise CRACKERJACK, held in December, to find the best future locations of the ships.

Two reports of picket ship operations give some indication of their per-

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formance and the extent of normal operations. The first report covering operations from December 1954 through March 1955 showed that the DER's made a total of 131 training intercepts and 15 active intercepts.[18] The average detection range of the ships was 90 miles, with a maximum range of 157 miles. The average error in picket ship plots was 5.4 miles. Voice communications with ADDC's was 77 per cent effective on the average.

The second report was by the commander of USS Skywatcher (YAGR 3) on his operations in July 1955 who reported attempting seven training intercepts and completing five. He said his SRa radar "proved to be a reliable air search radar with some surprising results."[19] Aircraft were picked up below 20,000 feet at an average range of 125 miles and above this altitude at 188 miles. The maximum UHF communications range with interceptors was 90 miles.

As with the AEW&C force, picket ship operation was hampered by not having enough suitable frequencies. Because high frequencies were so difficult to get, ADC decided to try to get along with a smaller number. To a request by WADF in September for more frequencies, ADC replied:[20]

> In view of the extremely congested high frequency spectrum and the remote possibility of obtaining clear channels, it is necessary that we take a realistic approach to obtain ship-to-shore communications based on current equipment and its limitations.

ADC felt that the immediate need was for one reliable circuit from ship to shore and directed its field forces to work toward this end. Efforts were then to be put on the use of other techniques such as radio-teletype so as to lower the number of frequencies needed and yet meet the ultimate communications requirement.[21]

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## Seaward Extension of the Early Warning Lines

As early as 1948, air defense planners had seen a need for an early warning line of radars across northern Canada and extending out to sea with ships or planes (see Chapter One). This early plan called for a sea flank running from Alaska to Hawaii on the western side and from Greenland to Newfoundland and down to Puerto Rico on the eastern side.

Other proposals followed and the idea was discussed at various levels, but it was not until late in 1953 that high level agreement was reached. In October of that year, a joint Canada-United States Military Group recommended installing a line of radars generally along the 55th parallel in Canada.[22]

The following year, location studies were made. While the land portion of this line, which was first termed the Southern-Canada and later the Mid-Canada line, was to be generally in the hands of Canada, sea flanks were to be managed by the United States. The American Joint Chiefs of Staff approved establishment of sea lines from Hawaii to Kodiak Island, Alaska, on the Pacific side and from Newfoundland to the Azores on the Atlantic side.[23] The Mid-Canada line was to be operating by about 1957.

In the meantime, consideration was given to construction of a second line much further north at about the 69th parallel.[24] The reason for this second line, which became known as the Distant Early Warning (DEW) Line, was that the Mid-Canada line would not give enough warning time. The Military Study Group mentioned above expressed this view on the need for a line in the far northern regions:[25]

> A review of intelligence reveals that by the time a /Distant Early Warning line/ could be installed, the USSR could have available numbers of aircraft of such advanced performance that a line as far north as

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practicable is essential to provide the required warning time.

In other words, warning of an attack by faster bombers being built by Russia had to be sent from a line across the top of the North American continent if the defenses were to be readied in time. A minimum of two hours was needed. A joint Air Force-RCAF group reporting later in 1954 said that Soviet aircraft development made the need urgent: "a requirement for distant early warning exists now and by 1957 an adequate distant early warning system will be a vital necessity."[26]

This did not mean abandonment of the Mid-Canada line. It was to be kept to provide defense in depth. The Military Study Group said that it was "essential for providing the minimum amount of warning necessary for, and adaptable to, active air defense."[27]

By late 1954, both the USAF and the RCAF had decided to cut out the Alaskan link to the Mid-Canada line.[28] Rather, the Pinetree radar chain coming up from Holberg, Vancouver Island, was to be connected to it at Dawson Creek, British Columbia. The Mid-Canada line was then to run from Dawson Creek to Hopedale, Labrador, where it was to connect with the NEAC radar system running down to Cape Race, Newfoundland.

The National Security Council recommended to President Eisenhower in February 1954 that a distant early warning system be built as soon as feasible.[29] He approved the recommendation. The following month the Secretary of Defense directed the services to implement the elements each was responsible for. This was followed by the study quoted above by the Canada-United States Military Study Group. They recommended the establishment of such a line and for other groups to be convened to choose the locations and equipment. A Locations Study Group

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was then appointed.

Before the latter group made its first report, the American and Canadian air defense commands finished studies of line locations. In a joint report, which favored keeping the DEW line on this continent rather than extension to Europe, they proposed the line as follows:[30]

(a) From Hawaii by sea to Kodiak (there to be integrated with the Alaskan radar system).
(b) To Herschel Island thence to Padloping Island in the Davis Strait.
(c) Across the Davis Strait to Greenland, then south to Cape Farewell.
(d) From Cape Farewell by seawing to the Azores.

The Locations Study Group issued its first report in November 1954.[31] They also recommended that the Hawaii to Kodiak sea line, originally planned for the Mid-Canada line, serve as the Pacific extension for the DEW line. They proposed using the Alaskan coastal radars from Kodiak and running the line over to Cape Dyer and across the Davis Strait to Holsteinborg, Greenland, but made no suggestion for the area beyond. But among the proposals being studied by this group was one put forth by the Navy for extending the sea line from Greenland to England via Iceland and the Faroes.[32]

CONAD's chief, General Chidlaw, objected at once to consideration of an eastern extension to England. He said that a line to England was not acceptable for continental air defense purposes and could not be justified. Therefore, continued study of it was "an unnecessary waste of time."[33] General Chidlaw reiterated CONAD's previous proposals and the joint CONAD-RCAF proposal for extension of the line to the Azores. This line was flexible and was less susceptible to false crossing for "spoofing" purposes. An inter-hemispheric line was not feasible or practicable, he declared. "This statement is predicated on the

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unreliability of existing communications, intelligence complications, and the inability to regulate and control world wide air traffic, thereby, permitting an intolerable number of unidentified aircraft line crossings and spoofing raids by the enemy."[34]

By the end of 1954, approval had been obtained from the Canadian Government to construct the land portion of the DEW line.[35] A contract was signed between the Air Research and Development Command and the Western Electric Company for the design, construction and installation. A target date of 1 July 1957 was set for its completion.

In January 1955, the JCS approved the portions of the line on which there was general agreement: Hawaii to Kodiak Island by sea, then by land to Cape Dyer.[36] Nothing was approved beyond Cape Dyer, including the Atlantic sea flank.

In June 1955, CONAD's Deputy Commander, Major General Frederic H. Smith, Jr., presented CONAD's case to the JCS for the Greenland-Azores line and its reasons for opposing the Navy-proposed Greenland-England line. The line to England, he said, would be approximately 1,230 miles from the nearest Soviet base on the Kola Peninsula and about six hours flying time to the United States east coast.[37] If the Russian Long Range Air Force operated across this line, it would be operating in territory closer to its home than to the United States. CONAD felt that this line would be too easy to spoof. Its commander would be put in the position of not knowing what to do if the line was crossed, for crossing it would not necessarily mean that an attack was coming. "The United States would have difficulty in molding world opinion to the extent that any crossing of this line would be considered a direct threat to the United States."[38]

The Azores line would be closer and would not have these disadvantages

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to the same extent, General Smith continued. It would be about 2,190 miles from the nearest Soviet base and about four and one-half hours flying time. This line would be close enough to justify action by CONAD if crossed in large numbers. He conceded that this line could also be spoofed, but he felt that the United States would be on firmer ground in challenging Russia's right to cross it.

Better identification of transoceanic traffic was another factor listed in favor of the Azores line. A warning line, General Smith explained, should be so situated that flights would penetrate it as close to a right angle as possible to permit identification. The Azores line would allow this. But the England line would run just about parallel to routes followed by normal traffic.

Another point was flexibility. Initially, a line could be run from Newfoundland to the Azores as planned originally for the Mid-Canada line. Then in a later period, it could be swung up to southern Greenland. Or, it could be moved shoreward to add to the contiguous system if needed.

Meanwhile, Admiral Carney proposed that a joint Navy-Air Force group study possible relocation of the already approved Pacific sea extension.[39] His proposal was to use land-based radars along the Aleutians and then to go by water to Midway. USAF agreed to the study to get information for future consideration of any relocation. But it emphasized that nothing should be done that would stop the current Pacific program.[40]

In answer, the new CONAD commander, General Earle E. Partridge* expressed

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* General Partridge moved from command of the Far East Air Forces to that of CONAD in July at General Chidlaw's retirement.

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surprise at the fact that this matter had been given to a group in Washington.[41] The JCS had named his headquarters as an important planning agency for early warning systems. He suggested that it would be more appropriate for the JCS to ask his views on any relocation. USAF replied that it would try to get the study responsibility moved to CONAD.

However, USAF advised in September 1955 that it had stopped trying to transfer the study responsibility because of "current budgetary considerations" and that the study would be made there.[42] CONAD's answer was to reiterate its previous stand:[43]

> CONAD desires that the Pacific extension of the DEW line remain as presently directed by the JCS. Location of the line here provides information most responsive to Continental air defense requirements. Request Headquarters USAF support this position to the utmost in the conference with the USN.

At the end of the year, CONAD learned that the location of the line was to be changed. The JCS reversed their previous decision for the western sea flank to run from Hawaii to Kodiak and approved the location of it between Midway and Adak in the Aleutians.[44]

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# Chapter Six

# TEXAS TOWERS

## Origin Of The Idea And Approval By USAF

Up to this point, this study has treated the use of radar-equipped ships and planes for extending the warning net off shore. It has been shown that the employment of both in continental air defense had been thought of and even planned for as early as 1947. A relative latecomer to the planning for off-shore warning was the idea of using stationary platforms for radar.

In the summer of 1952, scientists at the Lincoln Laboratories of the Massachusetts Institute of Technology studied means of putting radar off-shore.[1] They concluded that a means was offered by the shoals lying off the northeast coast. On these shoals, they believed, platforms similar to those used by oil companies for off shore well drilling could be built to hold heavy radar. These proposed platforms were dubbed "Texas Towers."

There were five strategically located shoals in the North Atlantic on which Texas Towers could be built. Their names and approximate locations were:* Brown's Bank, 75 miles south of Nova Scotia; Cashes Ledge, 100 miles

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* The locations proposed by Lincoln, which with slight variations became the selected sites, were as follows:

| | | |
|---|---|---|
| Nantucket Shoal | 49"45'N | 69"19'W |
| Georges Shoal | 41"44'N | 67"47'W |
| Cashes Ledge | 42"53'N | 68"57'W |
| Brown's Bank | 42"47'N | 65"37'W |
| Unnamed Shoal | 39"48'N | 72"40'W |



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east of New Hampshire; Georges Shoal, 100 miles east of Cape Cod; Nantucket Shoal, 100 miles southeast of Rhode Island; and an unnamed shoal 80 miles southeast of New York. At Cashes Ledge, Georges Shoal, and Nantucket Shoal, the water was some 50 to 60 feet deep. But at Brown's Bank and at the unnamed shoal the water was considerably deeper, over 100 feet.

ADC liked the idea and recommended it to USAF in September of that year. Lincoln's suggestion, ADC said, "has considerable merit and proposes to be an economical partial solution towards meeting picket vessel requirements of this Command."[2] ADC did not mean that picket ships could be eliminated from their requirements, but rather that a smaller number of ships might be needed and overall coverage could be increased. ADC recommended "that these off-shore stations be considered along with picket vessels as a means of fulfilling the urgent requirement for seaward extension of radar coverage...."[3]

The following month, Air Force Headquarters said that it would consider the possibility of using towers and ships in combination and in March 1953[4] asked ADC what it wanted at the towers in order to develop a requirement. ADC told Washington that its concept was to automatize and remote all operations so far as possible to keep personnel requirements to a minimum.[5]

The estimated personnel requirements for two time periods were presented. The first was for the remainder of the period of the manual system, the second for the period when the air defense system became semi-automatic.* For the manual period, ADC said that somewhere around 27 men would be needed on each

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* For information on the semi-automatic system, termed SAGE (Semi-Automatic Ground Environment), see the ADC, Operational Plan, Semi-Automatic Ground Environment System for Air Defense, 7 March 1955 (Doc 449, Hist. CONAD/ADC, Jan-Jun 1955).

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tower. With the semi-automatic system only around 17 would be needed, with the requirement for scope operators deleted. ADC did not plan to put controllers on the towers in either time period. The command thought it possible to send all data to a parent radar station or, in the later period, to a computer center, where all interceptions could be controlled. This was considered to be a much more economical method.

As for radar, ADC wanted the AN/FPS-3 search set and a good height finder, such as the AN/FPS-6. For communications to shore, ADC recommended submarine cable; for air operations, UHF, with high frequency equipment for back-up.

ADC submitted a more complete and firm list of equipment in late summer of 1953. The command asked for one AN/FPS-3 and two AN/FPS-6's on arctic towers and with radomes.[6] To remote the data to shore, ADC requested the Slowed Down Video Transmission System. Among other items listed were two AN/GRD-32 UHF transceivers and an AN/APR-9 Passive Detection set.

In November 1953 USAF drew up a planning guide for Texas Towers.[7] It presented a number of interesting facts for consideration of the USAF staff agencies: (1) The National Security Council had stated in September that contiguous radar coverage seaward should be effected as soon as possible; (2) The Air Force air installations officer had said that the Texas Tower type of construction was feasible; (3) The Judge Advocate General had ruled that the construction of Texas Towers on the high seas adjacent to the territorial waters of the United States was not a violation of international law; and (4) Each Texas Tower with all equipment including submarine cable would cost about $4,000,000.

USAF notified ADC in January 1954 that it approved five Texas Towers and that they had been included in the FY 1954-55 budget program.[8] The Navy's Bureau

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of Yards and Docks was to supervise the construction. USAF named the Air Force Installations Representative, New England Division, Corps of Engineers as the Air Force agency to monitor the project. Technical radar plans and engineer assistance were to be furnished by the Rome Air Force Depot.

In March 1954, USAF authorized the Bureau of Yards and Docks to prepare the contract plans and specifications.[9] At this time, USAF assigned project numbers to the towers. They were: TT-1 (for Texas Tower-1), Cashes Ledge; TT-2, Georges Shoal; TT-3, Nantucket Shoal; TT-4, Unnamed Shoal; and TT-5, Brown's Bank.

The Navy contracted with a joint venture of the De Long Corporation and the Raymond Concrete Pile Company in July 1954 to make core drillings. Site surveys were made in the summer by two engineering firms with the assistance of these two companies and other agencies. Their feasibility report dated October 1954 became the site survey report.[10] In December, the Navy gave a contract to the Bethlehem Steel Company to build the first tower.[11] For this tower, ADC chose the Georges Shoal site, which was on one of the more shallow locations and situated off the area where the first semi-automatic system was to go into operation. This tower had been given the project number Texas Tower Two. The Raymond and De Long Companies were given a contract to tow the tower to the site and to erect it.

The location of Texas Tower Two was described by Mr. George F. Tait, Vice President of the De Long Corporation and Texas Tower project manager, as follows:[12]

> The site is in the midst of the great shoal area known as Georges Bank. This shoal covers hundreds of square miles and consists of alternate shoals and deeps harassed by innumerable tide

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rips formed by the very strong conflicting currents. The entire area is avoided by mariners and even commercial fishermen generally pass it by. Georges Bank has only one attraction - at some points the water is shallow enough to permit the permanent emplacement of a radar platform....

## Erecting The First Tower

September 1955 was set as the beneficial occupancy date for tower Two and June 1956 as the date for the start of operations.[13] The tower was built by Bethlehem Steel at its Quincy, Massachusetts, yard. While it was officially launched on 20 May 1955, it was not actually floated until two weeks later because of trouble in launching. On 3 June, it was floated to another dock where temporary legs were installed and it was fitted for sea. It sailed for the site on 12 July, arriving two days later.

At the site, workmen of the Raymond and De Long Companies dropped temporary legs to the shoal 55 feet down in order to jack the tower up.[14] They raised it until the bottom of the hull was 63 feet above water, its permanent position. Then the three permanent caissons, which were ten feet in diameter and 185 feet in length, were sunk into the shoal to a depth of 48 feet. Inside each caisson they inserted a steel tube six feet in diameter running from the main deck down about 140 feet. This tube was to provide housing for utilities and connections for supply of fuel oil and fresh water. The space between the inner tube and the outer was filled with concrete. The bottom 40-odd feet was filled entirely with concrete. An outer shell, 15 feet in diameter, was placed around the bottom 60 feet of each caisson and also filled with concrete.

The hull was triangular in shape, about 200 feet on each side (see photo-

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graph on next page). It was 20 feet deep, divided in the center to make three decks: the lower deck which was the bottom of the structure; the second deck inside the main hull; and the main or top deck. On the main deck was placed a deckhouse or radome deck. This ran the length of one of the 200 foot sides and was 12 feet high and 60 feet wide.

The bottom deck was for storage tanks and pumps. The second deck was for living quarters, administrative offices, galley and mess hall, food storage, heating and ventilating equipment, and power generating equipment. The main deck was kept clear of obstructions for use as a landing platform for helicopters. In the center of the radome deck and raised about 28 feet was the AN/FPS-3 search radar's antenna. Flanking this antenna at radome deck level were the two AN/FPS-6 antennae. All radar operating equipment was housed in the space under the radome deck.

The hull and its equipment weighed about 6,500 tons. The reason for only three legs was to keep resistance to wave forces to a minimum.[15]

Beneficial occupancy by the Air Force and ADC was made on 2 December 1955, three months later than originally scheduled mainly because of delays in launching. By this time, however, ADC saw that operation at the tower could begin sooner than expected. The equipment could be installed much earlier than thought at first. The Middletown Air Materiel Area advised that communications and electronic equipment would be installed and operating by the end of January 1956.[16] In July 1955, ADC moved the date up to 1 February, four months earlier than scheduled.[17]

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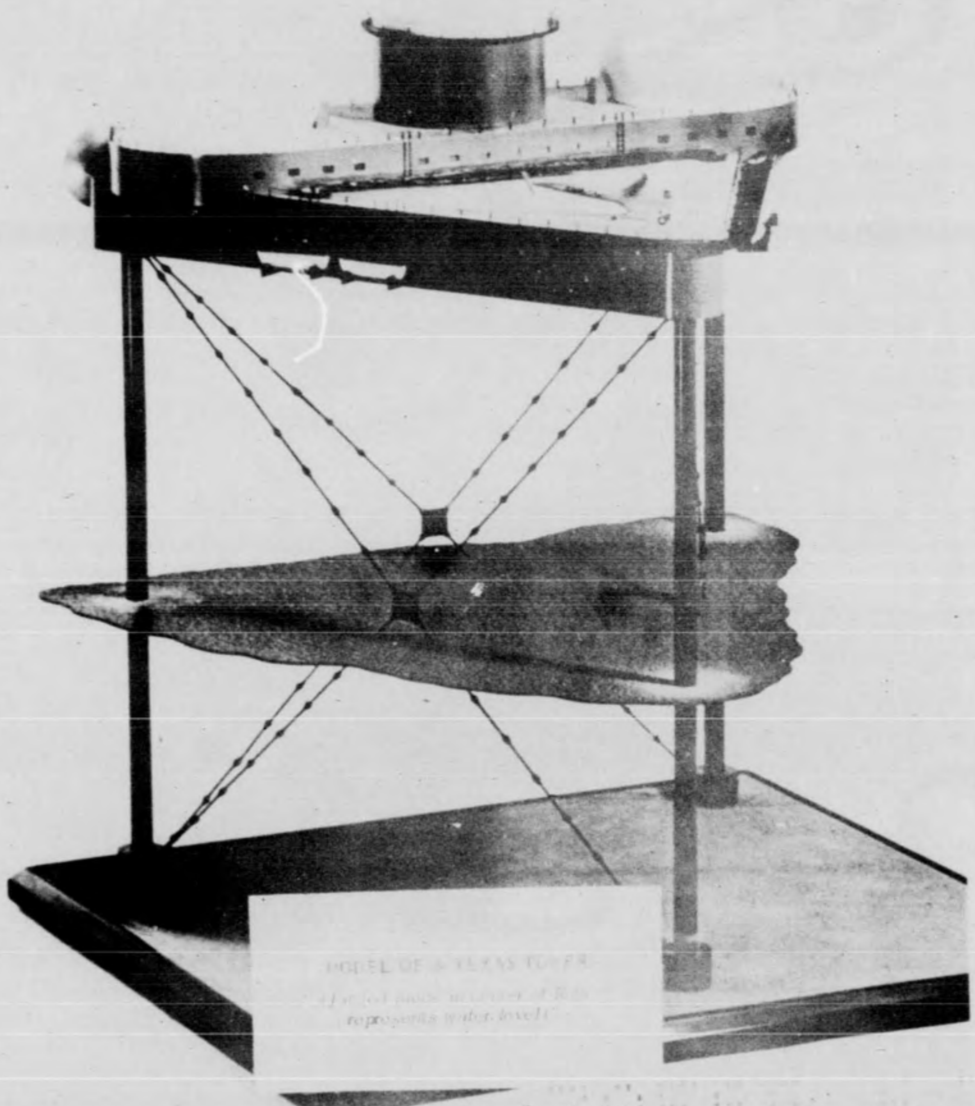
MODEL OF A TEXAS TOWER

## Operational Procedures, Manning, And Support

In the meantime, ADC was working on the operational procedures, manning, and support for towers in general and for TT-2 in particular. ADC planned to use TT-2 as a test case for the other towers.

The Command issued its first general operational plan for Texas Towers in mid-1954.[18] It reiterated its original concept that the search radar data should be sent to a parent shore station. All interceptors would be controlled by this shore station. Height information, however, was to be determined by the tower operators and reported by voice to the parent station. ADC listed the parent stations for the towers as follows: P-10, North Truro, Massachusetts, for TT-2; P-13, Brunswick NAS, Maine (later changed to P-10), for TT-1; P-45, Camp Hero, New York, for TT-3; P-9, Navesink, New Jersey, for TT-4; and P-13, Brunswick NAS for TT-5.

ADC planned that communications to the shore station were to be by submarine cable and by tropospheric scatter radio. A high frequency radio voice channel was planned also fur use in case of failure of the main communications sets. For ground-to-air commmnications, ADC wanted a minimum of four UHF tactical channels plus the UHF AICC and emergency channels. ADC wanted four multichannel (AN/GRC-27) for the tactical circuits and two single channel (AN/GRT-3, AN/GRR-7) for the AICC and emergency circuits.

ADC found soon after issuing this plan that it could not get an adequate submarine cable in time for operation from the first tower. In August 1954, ADC told USAF that both the Air Materiel Command and the American Telephone and Telegraph Company had advised that a minimum of two years would be required to put in a dependable cable.[19] ADC suggested the use of tropospheric scatter

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as the primary communications, at least for initial operations at the first tower.[20] This suggestion, the command said, was to "insure that the Air Force is not forced into installation of an incorrectly designed submarine cable facility under pressure of meeting an operational date...."[21]

Because there was no other choice, tropospheric scatter radio became the primary means of communications to shore for the first tower. To meet the time deadline, however, the first equipment had to be commercial type installed on a commercial contract.[22] Later, this equipment was to be replaced with military equipment. One high frequency voice circuit was also provided for emergency communications. Installation of submarine cable was held up pending further study.

At the end of 1955, it appeared that ADC would also be unable to realize its concept of remoting the search radar data to shore prior to operation of the semi-automatic or SAGE air defense system. When the SAGE computer (AN/FSQ-7) came into operation, tower search radar data could be sent to shore by means of the Lincoln Fine Grain Data System, AN/FST-2. But ADC wanted to transmit the data prior to that time, right from the beginning of tower operations. ADC thought that Slowed Down Video equipment could be used for this and so stated in its plan of July 1954. However, in tests held before this device was installed, it proved unsatisfactory because it gave multiple returns on single aircraft and had considerable azimuth inaccuracies.[23]

Realizing that it might not be able to transmit the data, ADC made provision for controlling from the first tower. Four control positions were installed on the tower.[24] Later, ADC planned to install the AN/GPA-37 on the tower if no means for sending the data back to shore had been found. ADC

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wanted this equipment at the tower (or possibly towers), as at its other radar stations, to increase their capability. The AN/GPA-37, termed the Radar Course Directing Group, would perform routine calculations and provide a memory and display, thus enabling a director to handle a larger number of interceptions. This equipment was scheduled for delivery beginning in mid-1956.

But ADC still wanted to remote the tower search radar data. ADC explained to the Rome Air Development Center that, "In an effort to reduce the number of operational personnel on the Texas Tower, this headquarters desires to remote all control functions to the shore direction center."[25] And to ARDC, it said, "Satisfactory equipment for remoting the radar video from the Texas Towers... would increase the ground control effectiveness. This would in turn increase, proportionately, the effectiveness of the manned and unmanned interceptors."[26]

In January 1955, the Command sent a requirement to ARDC for remoting equipment to take the place of slowed down video.[27] ARDC replied that it had been given no requirement previously for video transmitting to shore-based manual centers and that no effort had been made to develop such equipment.[28] ARDC said that it understood that the AN/GPA-37 was to be operated manually at the towers until the SAGE AN/FSQ-7 center was in operation. Then, the tower data could be sent by the Fine Grain Data System, AN/FST-2. ARDC advised that it was unlikely that equipment for remoting to the manual system could be developed "even on a crash basis in sufficiently short time to provide a material time advantage over the programmed date of the AN/FST-2 - AN/FSQ-7."[29] This fine grain data system was scheduled for 1957.[30]

ADC pursued the matter further. It learned from the Rome Air Development

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Center that a system known as RAFAX (Transmitter Coordinate Group OA-682/GPA-29) might do the job and was in production.[31] USAF opposed this, however, recommending that controlling be done from the tower until the fine grain data system was installed:[32]

> To provide remoting equipment prior to the installation of FGD for SAGE will necessitate the re-engineering of a video transmission system such as RAFAX and installing it as an interim system. The developmental effort and re-engineering required will be expensive in both money and manpower.
>
> The time period involved...in relation to the SAGE implementation does not justify the engineering and installation of interim point-to-point data transmission equipment.

By April 1955, ADC had changed its plans and decided to control from the tower in the initial stage of operation. An operational plan issued in this month stated that in the first stage the tower was to operate manually as a direction center.[33] Radar data was to be sent to the parent direction center where identification was to be performed and tactical action initiated. Scramble orders were to be issued by the parent center (in the case of the first tower this was the 762d AC&W Squadron at North Truro) and aircraft directed to the tower area where control might be passed to the tower directors.

Beyond this, ADC planned an intermediary stage prior to going into SAGE operation. In this second stage, the search radar video and air-to-ground communications would be remoted to the parent center from tower two - if a means became available. At the end of 1955, nothing for this purpose had been developed. When the SAGE center came into operation, the search radar data was to be automatically fed into the AN/FSQ-7 computer at the shore station.

The manning for one crew on the tower was set at 41 by ADC in its plan for mid-1954. ADC changed this figure to 46 early in 1955.[34] The greatest change resulted from the necessity to control from the tower. Three controllers

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and two radar maintenance personnel were added to the proposed manning. Some other changes were also made such as the addition of a utilities supervisor and a winch operator and the deletion of electronic countermeasures personnel. No passive detection or other ECM gear was programmed for the tower and the latter personnel had been put on the manning table in error.[35] But the result of all the changes was a net gain of five.

ADC asked in June 1955 for the addition of two airmen heating specialists to the tower manning, bringing the total up to 48.[36] USAF approved 47 men per detachment, deleting one cook (which left three).[37]

In order to rotate tower personnel at regular intervals, ADC wanted a crew ratio of two, or a second detachment.[38] USAF opposed this double manning, calling it a luxury, and maintained that the shore crew would have nothing to do.[39] USAF agreed to the need for rotation, but recommended rotating tower duty among all personnel of the parent squadron.

In defense of its double manning plan, ADC claimed that the number of men in each crew was very conservative.[40*] There were far more positions on the tower than crew members, ADC said, and all men would have to handle several jobs in which they would be cross-trained. Because each man would have part time jobs in addition to his main duty, hours of work would be long. These long hours plus the confining nature of tower living would combine to make frequent rotation necessary.

To rotate all of the men of the parent squadron as USAF proposed would have meant that each man would have had to receive additional training. ADC cited as one example the fact that the towers were to have an AN/FPS-3 search radars.

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* The tower could accommodate 76 people.

The AN/CPS-6B was the primary search radar of all the parent shore stations except P-45, Camp Hero, New York. The squadron personnel would have to learn both equipment if they went to the tower. ADC considered such a training burden impractical.

ADC disagreed that there would be any idleness at the parent site. For one thing, transportation difficulties would make it impossible to move an entire crew at one time. For the most part, replacement would be on an individual basis so that there would be nearly a constant rotation. The parent squadron would have a training program continually for tower people. And the shore site would have a large workload in supporting and working with the tower such as plotting and telling data from the tower. Tower personnel would be used to handle these extra jobs.

Despite ADC's protestations, USAF disapproved a crew ratio of two, authorizing a ratio of only 1.5.[41] A plan for crew rotation had now to be worked out. Another factor that would have to be considered in the rotation plan was the decision made at the end of October to give overseas credit and pay for tower duty.[42]

For training of tower personnel, ADC planned to use training standards currently in effect.[43] No skills would be required that were not already covered by a USAF AFSC. ADC expected to work out a program with ATRC to provide the necessary schooling to insure the availability of qualified personnel in phase with the operational dates of the towers.

To provide the initial personnel for tower number Two, the 762d AC&W Squadron, its parent unit, was to be increased in size. This organization was to be used as a test to find the most suitable type of organization for the towers.

The tower was to be considered as an auxilliary station to North Truro AFS and the commander of North Truro as the tower commander.[44] He was to have custody of the tower. The accountability was to be assigned to Otis AFB as if the tower were merely another building at North Truro.

Since operations had not yet started at the tower, there was no experience in normal day-to-day living. Obviously, there would be certain disadvantages. The space was small; there would be problems of isolation and monotony. What had been done to make life as pleasant as possible was summarized by EADF's Vice Commander, Brigadier General Donald B. Smith, at the launching of the first tower:[45]

> A great deal of attention has been paid to their comfort while on this lonely duty. Their quarters are bright and cheerful; the most modern equipment is being installed; recreational equipment of all types have been provided and there will be moving pictures, radio and, if possible, television, for the entertainment of those not standing watch. There is a completely equipped dispensary for their medical care. There will be regular mail service and a well stocked library.

For support of the tower, ADC's first plan was for assistance from the Navy. ADC planned that the Navy would furnish sea transport for the normal transportation of all personnel and supplies.[46] In addition, all rations and fuel were to be supplied by the Navy. Major repair of the installations and periodic inspection of the life boats were also included in the Navy's responsibility.

ADC asked USAF in January 1955 to make cross-servicing agreements with the Navy for this support.[47] USAF replied that it opposed this concept, however, and that it believed that the Air Force should provide as much support as possible. A support plan was finally worked out at an ADC-USAF conference at the Pentagon in March.

The plan agreed upon was for normal transportation of men and dry cargo to be by ADC-assigned helicopter.[49] Liquid cargo was to be supplied by ships of the Military Sea Transport Service, the Navy or Coast Guard, or a private company.

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Fresh water was to be provided by distillation of sea water at the tower. Emergency transportation was to be by sea or air, depending upon availability of transportation and the nature of the emergency.

USAF authorized two H-21B type helicopters immediately for support of the first tower.[50] These aircraft, together with their crews, were assigned by ADC to the 564th Air Defense Group at Otis AFB. The commander of the parent 762d AC&W Squadron was to have operational control of the helicopters. The H-21B was a large, twin-rotor helicopter of tandem configuration. In addition to its two crew members, it could carry 20 passengers or a cargo of around 4,000 pounds.

Four additional H-21B's were to be assigned for support of the remaining squadrons. ADC considered that a total of six helicopters was enough to handle transportation to the five towers. But in an effort to assure constant availability of one helicopter and to provide for unforeseen needs while the first operation was tested, two helicopters were provided for the first tower. ADC thought also that some sea transport might have to be added for normal transport of men and goods.[51]

Texas Tower Two was to be operated as a detachment of the 762d AC&W Squadron according to an EADF plan for logistics issued in July 1955.[52] EADF made the 4707th Air Defense Wing at Otis AFB responsible for support and named the 564th Air Defense Group, also at Otis, as the support base for all supplies except communications and electronics. The 4700th Air Defense Group, Stewart AFB, New York, was named the electronic support base.

A 45-day supply of food was to be kept on the tower (30 day normal, 15 day field rations). There was to be a 30-day stock of fuels, lubricants, and

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water. Electronics and general supplies and equipment were to be kept at a 45-day supply. For power, TT-2 had eight 100 KW diesel generators programmed initially. ADC decided that this was inadequate and added two 250 KW generators.[53] The other towers were to receive seven 250 KW generators, or 200 KW generators, if there was not room enough for the larger units.

Program For The Four Other Towers

Two of the other four Texas Towers were to be built in Fiscal Year 1956 and the remaining two in FY 1957. In October 1955, USAF asked what priority ADC wanted for the remaining towers.[54] ADC's list in order of priority was as follows: TT-3, Nantucket Shoal; TT-4, Unnamed Shoal; TT-1, Cashes Ledge; and TT-5, Brown's Bank.[55] ADC explained that these priorities resulted from the operational date of March 1957 for the first SAGE subsector. Towers Three and Four were to be tied into this subsector. USAF therefore scheduled these two towers for construction first -- in FY 1956; towers One and Five for the following year.[56]

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# Chapter Seven

## 1955 TO 1960

### Status Of The Off-Shore Force At The End Of 1955

At the end of 1955, the forces operating off-shore were all in the combat zone and consisted of the following. Off the east coast, five picket ship stations and one AEW&C station were manned around-the-clock. On the Pacific side, one picket ship station was manned full-time and another was on training and testing status. One AEW&C station was manned continuously and another partially.

As planned at this time, the 551st AEW&C Wing at Otis AFB was to be operationally ready by 15 October 1956; the 552d Wing at McClellan AFB by 15 December 1956. These two wings and the three tactical squadrons of each had been activated by the end of 1955. Five west coast picket stations were to be manned full-time by July 1956. The first Texas Tower was to begin operating by about February 1956; two others in FY 1956 and the last two in FY 1957.

Beyond this, planning called for a sixth Pacific Coast picket station in July 1957 and a seventh at a later date. In the next three and one-half years, seven more AEW&C tactical squadrons were programmed. By the first quarter of FY 1960, two additional squadrons were to be added to the west coast and five to the east coast.

The CONAD plan issued in mid-1955 called for a two-stage build-up.



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In the first, CONAD wanted five AEW&C stations and five picket ship stations off the west coast; and six AEW&C stations, five picket ship stations, and five Texas Towers off the East Coast. In the second stage, it planned to build up to 12 AEW&C stations in the Atlantic, but not to increase the other forces. In the Pacific, it planned eight AEW&C stations and seven picket stations. No specific dates had been set for these stages. CONAD's planners hoped that by around 1960 there would be enough forces for this second stage.[1]

In the first phase, CONAD's plan for deployment was to give coverage from Maine to Florida at high altitude (65,000 feet) out to 550 nautical miles and at low altitude (surface) out to 320 nautical miles; off the Pacific Coast at high altitude out to 460 nautical miles and at low altitude out to 280 nautical miles.* CONAD's deployment plan for the second stage was for the purpose of increasing low altitude coverage off the east coast out to 500 nautical miles and to completely cover the length of both coasts.

The map which follows shows the planning in 1955 for coverage when the second stage was reached. Prior to operation in this stage (or time period) many changes could, and undoubtedly would, be made. The purpose here is to give some indication of what CONAD wanted and foresaw as the off-shore combat zone coverage in the 1960 time period.

To achieve this goal, radars had to be greatly improved, particularly on AEW&C aircraft and picket ships. CONAD said in its plan that it needed radars available by December 1956 that were capable of detecting and tracking targets with the equivalent of one square meter reflecting surface at ranges up to

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* These figures were to be changed undoubtedly in the near future -- probably out to greater distances. There was, for example, the current evaluation of employment of picket ships 200 miles further out. A decision on their final location had not been made at the end of the year.

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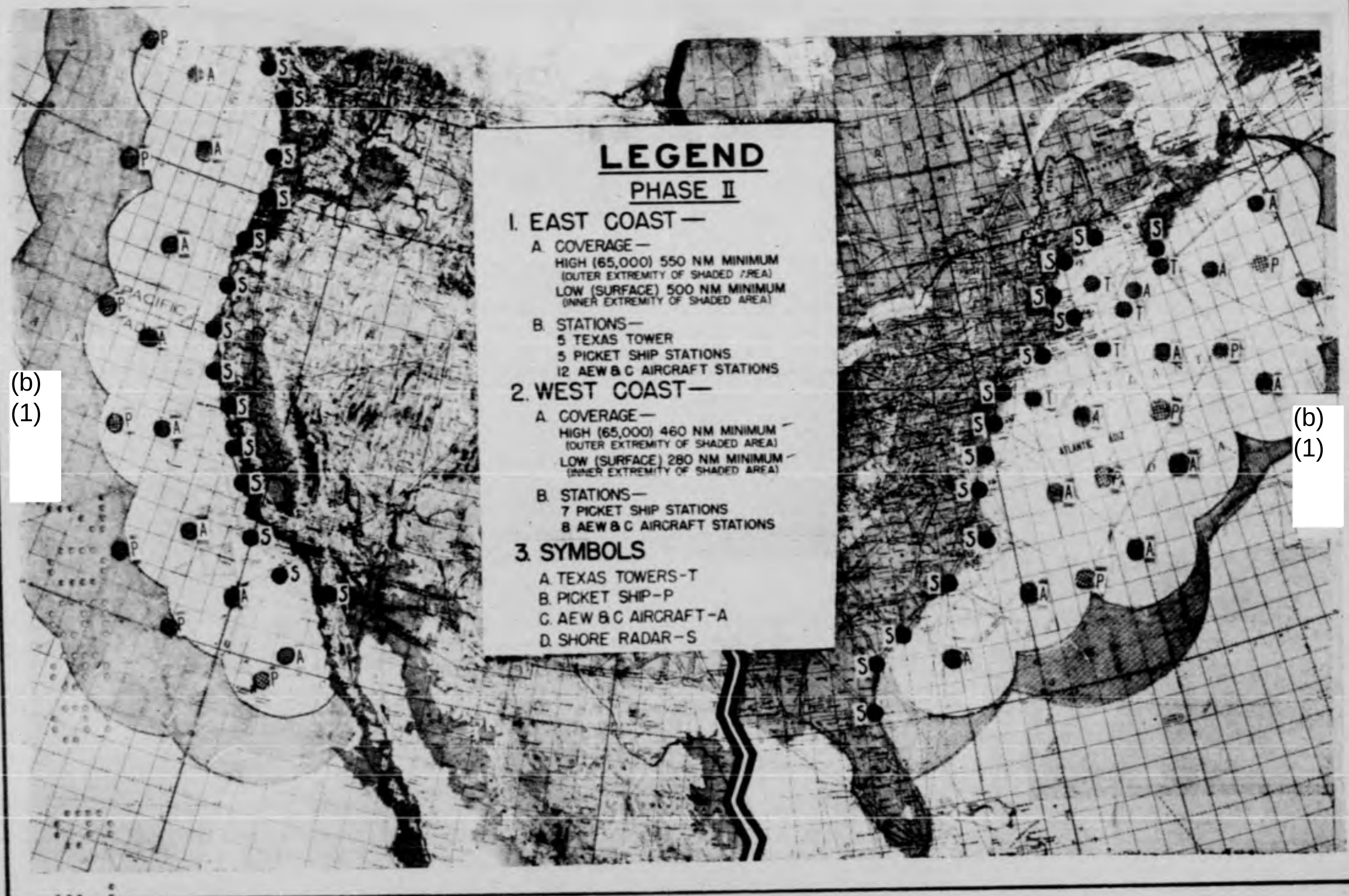
LEGEND
PHASE II
1. EAST COAST—
A. COVERAGE—
HIGH (65,000) 550 NM MINIMUM
(OUTER EXTREMITY OF SHADED AREA)
LOW (SURFACE) 500 NM MINIMUM
(INNER EXTREMITY OF SHADED AREA)
B. STATIONS—
5 TEXAS TOWER
5 PICKET SHIP STATIONS
12 AEW & C AIRCRAFT STATIONS
2. WEST COAST—
A. COVERAGE—
HIGH (65,000) 460 NM MINIMUM
(OUTER EXTREMITY OF SHADED AREA)
LOW (SURFACE) 280 NM MINIMUM
(INNER EXTREMITY OF SHADED AREA)
B. STATIONS—
7 PICKET SHIP STATIONS
8 AEW & C AIRCRAFT STATIONS
3. SYMBOLS
A. TEXAS TOWERS-T
B. PICKET SHIP-P
C. AEW & C AIRCRAFT-A
D. SHORE RADAR-S
PACIFIC
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(1)

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250 nautical miles and at altitudes up to 65,000 feet; by 1960 of detecting missiles of 1/4 square meter reflecting area up to 100,000 feet and horizontally to 250 nautical miles.[2] However, CONAD noted that while these were its requirements, that the "State of the Art in Air Defense equipment development may not permit full realization of all requirements in the time-period 1957-1960."[3] But CONAD wanted the best equipment available to be used for the seaward extension elements.

As noted earlier, the EC-121's were limited to flight at between five and fifteen thousand feet, and were deployed to provide low altitude coverage. Their AN/APS-20 search radar was found by APGC to give warning at 173 nautical miles of jet targets at 40,000 feet and at 193 nautical miles at 20,000 feet of TU-4 type target. But the height finder had a much shorter range -- around 80 miles - according to the APGC.

Very limited range data was available on the performance of the picket ship radars, as ADC advised USAF in December 1955.[4] According to ADC's information, the SRa search radar had a range of 125 miles at 20,000 feet against a B-29, reduced to 90 miles at 10,000 and 30,000 feet. The AN/SPS-12 search radar had an estimated range of 150 miles at 20,000 feet on a B-29, reduced to 120 miles at 10,000 and 30,000 feet. It had only limited capability above 40,000 feet. The SPS-8A height finder had a maximum range of 150 miles against a B-29.

Only the Texas Tower would have radar with ranges approximating what CONAD wanted in its early seaward extension phase. The AN/FPS-3 search radar, when modified with the AN/GPA-27, would give coverage between 500 feet and 60,000 feet. Its range on a B-47 type target would be approximately 50 nautical miles at 500 feet and 200 nautical miles at 60,000 feet. The AN/FPS-6

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height finder had a range of approximately 200 miles between 50,000 and 60,000 feet.

### The Shape Of Things To Come

In addition to the above items, a number of other developments were being considered for the future off-shore warning system. For airborne early warning, CONAD was considering a larger and improved model of the Lockheed Constellation, modification of the B-36, other four-engine aircraft, and the use of lighter-than-air airships.

Two squadrons of lighter-than-air airships (one for each coast) had apparently been programmed by the Navy for use in continental air defense beginning in 1956.[5] Each squadron was to be equipped with four airships, probably the ZPG-2W and the ZPG-3W (see photograph following of the ZPG-2W airship with a search radar antenna on the bottom and a height finder antenna on the top). CONAD had not developed an operational concept for these airships at the end of 1955, but it was likely that they would be used to supplement the inner row of AEW&C stations below the 40th parallel.

Other possibilities being looked at by CONAD's plans people included buoys that could be anchored in deep water (up to 12,000 feet) and could carry unattended radar,[6] and the so-called Armstrong platform. The latter derived its name from the man who had conceived of floating sea bases, primarily for aviation use. The Armstrong platform, as currently envisioned, would be manned and would be larger than the Texas Tower. Thought was being given to the possibility of its being armed with missiles. The Armstrong platform could be used in very deep water, possibly as much as 15,000 feet, by a system of floats and chain anchors.[7] Thus, it could provide a stable platform for radar far out to sea.

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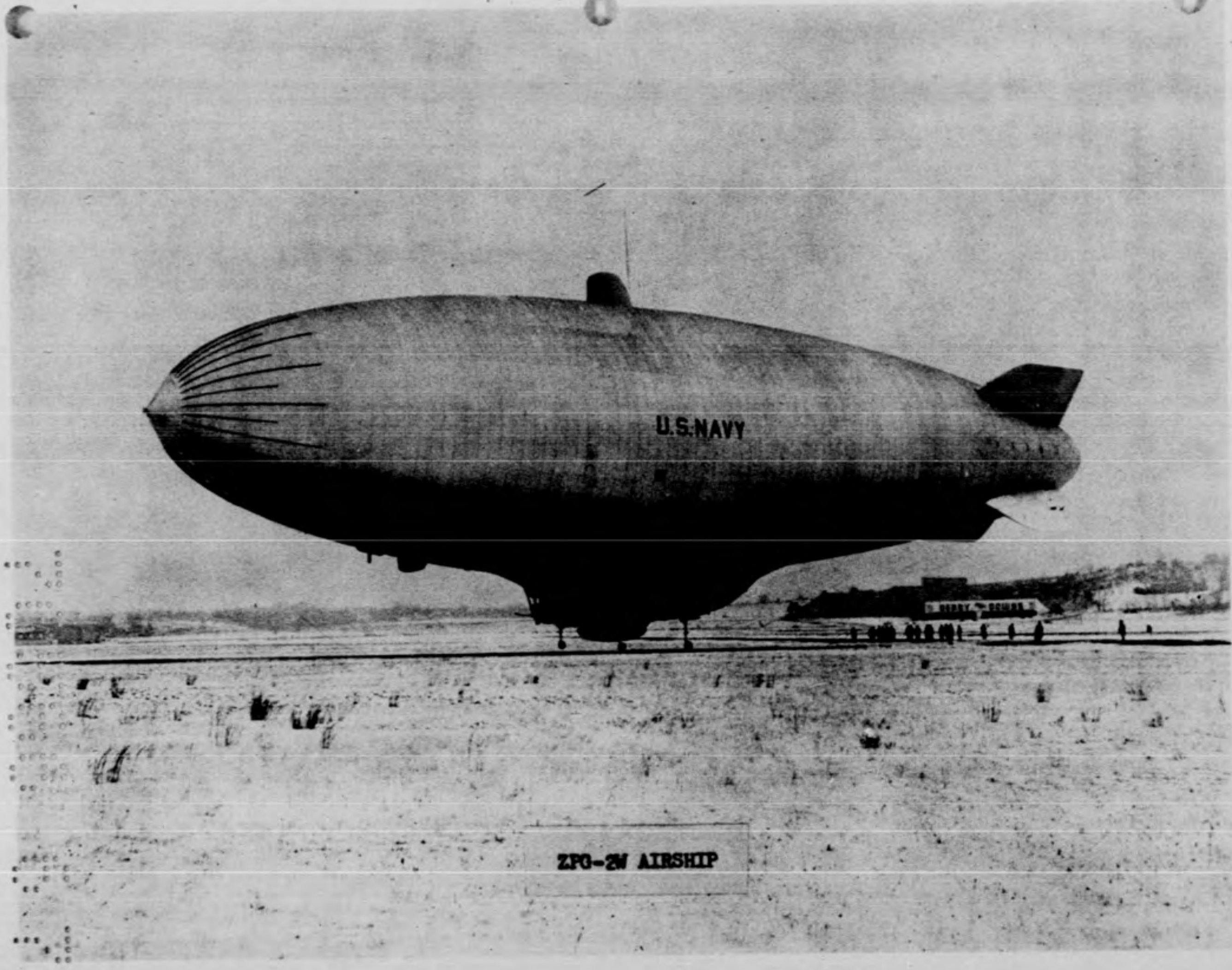


ZPG-2W AIRSHIP

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(DOC_____). Indicates that the document is a supporting document to this study only and is located at the Headquarters CONAD/ ADC Historical Directorate and the Headquarters USAF Historical Division.

(ADC, Semi-Annual Period, Doc_____). ("A" refers to the period 1 January to 30 June, "B" to 1 July to 31 December). Indicates that the document has been used as a supporting document to a previous Headquarters ADC History, as shown, and is located at the Headquarters CONAD/ADC Historical Directorate and the USAF Historical Division.

(ADC Unit, Semi-Annual Period, Doc_____). Indicates that the document has been used in an ADC unit history and is located in the particular unit's files, at the Headquarters CONAD/ADC Historical Directorate, and at the USAF Historical Division.

(HRF_____). Indicates that the document has not been used in a previous history and is located only in the Headquarters CONAD/ ADC Historical Directorate.

(Hqs CONAD/ADC Staff, e.g., P&R). Indicates that the document is located in the files of a particular staff agency only.



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