



DEPARTMENT OF THE NAVY
NAVAL RESEARCH LABORATORY
4555 OVERLOOK AVE SW
WASHINGTON DC 20375-5320

IN REPLY REFER TO
5720/FOIA-15-0007
1030/15-0007
January 19, 2015

Mr. John Greenwald
The Black Vault

[REDACTED]
Transmitted Via Electronic Mail

Dear Mr. Greenwald:

This is in response to your letter to the Naval Research Laboratory (NRL) dated October 25, 2014 citing the Freedom of Information Act (FOIA), and requesting copies of documents from Project Argus. Between August and September 1958, the US Navy exploded three fission type nuclear bombs 480 km above the South Atlantic Ocean, in the part of the lower Van Allen Belt closest to the earth's surface. In addition, two hydrogen bombs were detonated 160 km over Johnston Island in the Pacific.

Following a search of the NRL Technical Library, the enclosed record is forwarded per your request. Fees associated with this FOIA have been waived.

Should you have any questions regarding the foregoing, please contact me at 202-767-2541.

Sincerely,

A handwritten signature in black ink, appearing to read "Richard L. Thompson".

RICHARD L. THOMPSON
Freedom of Information Act Officer
By direction of the Commanding Officer

Enclosures

This document is made available through the declassification efforts
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The Black Vault



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Project ARGUS—A Program of Isolation and Confinement Research

William W. Haythorn
Behavioral Sciences Department
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The Navy has long been aware that prolonged isolation and confinement of men in relatively small vehicles or habitats can have undesirable effects—not only on their social-emotional well-being, but also on their performance effectiveness. Thus, to study the problem, the Navy established Project ARGUS (Advanced Research on Groups Under Stress) at the Naval Medical Research Institute in 1962. Initial funding was provided by the Office of Special Projects.

The immediate objectives of Project ARGUS were to build a body of scientific knowledge regarding the effects of isolation and confinement, the nature of individual differences in tolerating such stresses, and the effects of various techniques used to minimize any impairment of psychological functioning resulting from them. The long-range goal of the program was to provide a base of knowledge which would aid in developing improved vehicle design criteria, selection and training procedures, and crew management techniques. Also, this knowledge would contribute to the development of advanced sea-based deterrent systems, deep submergence systems, man-in-the-sea habitats such as Sealab, manned spacecraft, etc.

Initially, heavy emphasis was placed on identifying and assessing the effects of stress encountered in closed ecological systems in which normal atmospheric conditions would be maintained. Four sources of stress seemed paramount: stimulus reduction, social isolation, confinement, and interpersonal friction. Anecdotal and research data from a variety of sources, e.g., submarines, Antarctic weather stations, Arctic radar stations, and laboratory studies, indicated that these four sources were capable of impairing man's adaptation and performance in many ways. These same sources of stress also appear relevant in hyperbaric systems such as Sealab. However, in such systems they are combined with increased pressure, exotic gas atmospheres, and the physical dangers of working in a marine environment outside of the capsule.

The ultimate objective of the research program was (and is) to improve the cost effectiveness ratio of future Navy underwater systems. Thus, an effort was made to construct a conceptual framework which would relate the effectiveness criteria to the group behavioral processes which determined these criteria. These processes, in turn, would be related to the variables involved, i.e., the kinds of people comprising the crew; the

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nature of the environment provided the crew; and management interventions such as training, leadership, and incentive programs. In this manner, a chain of causal relationships was envisioned which would link crew compositional, environmental, and management intervention variables with the intra-crew processes which produce critical outcomes. The research program was then developed within this framework.

Stimulus Reduction

Most isolated duty assignments provide a lower degree of stimulus variety than that which is normally available. Feelings of boredom and monotony, which are associated with stimulus reduction, have often been cited as causes of performance impairment in operational situations. In extreme cases, *e.g.*, a high altitude pilot on a routine night patrol, or a soldier standing a lonely nightwatch, there are almost no stimuli for the man to react to. Laboratory research on stimulus deprivation has reported extreme responses to such extreme degrees of stimulus reduction. These responses include hallucinations, claustrophobic reactions of fear and anxiety, detriments in perceptual and cognitive functioning, a heightened desire for almost any kind of stimulus, changes in sensory acuity, feelings of subjective stress, changes in EEG recordings, etc.

In this area, Project ARGUS has attempted to quantify these responses more precisely than has been done heretofore, determine individual differences in responses to stimulus reduction, and determine the efficacy of stimulus enrichment procedures in eliminating the undesirable effects. In the most recent, on-going study, individual subjects have been confined to small rooms under conditions of complete darkness and silence for seven days. They are then compared with other subjects, similarly confined, but with ad lib access to lights, reading material, television, AM-FM radio, recorded music, and conversation with another subject on a mutual desire basis. In this study, 19 out of 40 stimulus-deprived subjects were unable to complete the seven-day period of confinement. Only one out of 20 stimulus-enriched subjects were unable to complete it.

During the test, the differences between the two experimental groups in subjective stress and emotional symptomatology were measured. To assess stimulus hunger, subjects in both groups were permitted to listen to a very monotonous recording of an old stock market report. The subjects could trigger the recording by pulling continuously on a spring-loaded lever. There were no differences between the two groups at the outset of the experiment. However, by the last day, stimulus-deprived subjects were listening for more than two-thirds of the time the stimulus was available. Stimulus-enriched subjects were scarcely listening at all.

A vigilance task provided for subjects indicated that performance improved under conditions of stimulus reduction. This improvement was probably due to the increased stimulus hunger and the resulting arousal



Monitors in the central experimental control room

value of any stimuli that occurred. Responses to a symptomatology questionnaire indicated three distinct clusters of symptoms associated with stimulus reduction: tedium and monotony, worry and fright, and positive contemplation (a tendency to accept the situation and reflect on life in general, the meaning of things, etc.). Although stimulus-deprived subjects showed more of all three kinds of symptoms than stimulus-enriched subjects did, different subjects appeared to respond to the situation in different ways. It is expected that further research will reveal that, by studying a subject's personality characteristics, an experimenter will be able to predict how he will respond to stimulus reduction.

Data obtained to determine individual differences in tolerance to isolation included personality measures, physiological measures obtained during a pre-experimental baseline period, and restlessness indicators obtained during the first few days of exposure to experimental conditions. Analyses thus far completed indicate that individuals who are unable to endure prolonged exposure to conditions of stimulus reduction are those who normally enjoy a wide variety of sensations and experiences, have a relatively high level of serum uric acid prior to the experiment (and before they know to which condition they will be assigned), and evidence a high degree of restlessness at the very outset of the experiment. Further refinement of these predictive measures is expected to result in improved selection and psychiatric screening of personnel for isolated duty assignments.

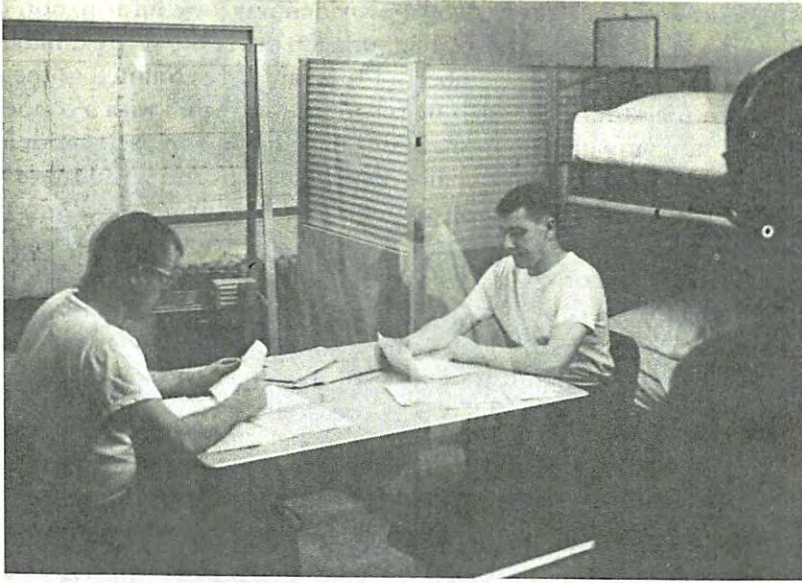
Crews in Isolation

The project's first laboratory study of isolated groups was aimed at determining the degree to which isolation and confinement affected group adaptation and performance, and the degree to which such effects were modified by crew composition considerations. Eighteen pairs of men were selected in such a manner that in each experimental condition, *i.e.*, isolation and non-isolation, one third was homogeneously high, one third heterogeneous, and one-third homogeneously low with regard to each of four personality variables: dogmatism, need achievement, need affiliation, and need dominance. The isolated pairs were assigned to spend ten days in a 12 × 12 room and perform scheduled tasks with virtually no contact with the outside world. Non-isolated pairs were assigned to work in identical rooms on the same tasks on the same schedule. However, they were free to leave the rooms between tasks, eat in the regular enlisted men's mess, sleep in the barracks, partake of routine recreational facilities, and, in general, live and work much like everyone else on the base.

Two of the nine isolated pairs were unable to complete the ten-day assignment and two other pairs displayed a high level of interpersonal hostility. In one such case, the experimenters were required to intervene to avoid serious physical conflict. None of the non-isolated pairs had any such difficulty. Responses to subjective stress and symptomatology questionnaires indicated that men in the isolated groups experienced considerably more stress than the non-isolated group members did. Also, members of the isolated pairs exchanged more varied and intimate personal information. This latter finding is consistent with anecdotal observations which indicate that men in isolated groups use each other as significant sources of stimulation and, in some cases, get to know each other too well too soon.

Although members of isolated pairs experienced heightened levels of subjective stress, they performed cooperative tasks better than their control counterparts did (as long as they were able to endure the assignment). An examination of the relationship between subjective stress and increased performance suggested that it was a function of an inverted U relationship, with increasing stress producing better performance up to moderate levels of stress. Both the stress and performance results indicated that hypothetically compatible pairs of men (*i.e.*, one man high and the other low on need for dominance, or similar personalities on the other three dimensions) experienced less stress under conditions of isolation than hypothetically incompatible pairs did.

Data were also obtained regarding the use subjects made of the space and objects in the room, and the degree to which they spent their free time in solitary versus joint activities. Analysis of these data indicated



! pair working on a decoding task (distortion caused by taking picture through viewing glass)

isolated pairs of men tended to withdraw from each other and establish clear-cut territorial preferences to a significantly greater degree than control counterparts did. This was especially true of incompatible mixed groups with the nature of the incompatibility determining the direction of the social interaction and territorial relationship. For example, pairs who were incompatible on people-oriented variables (affiliation and dominance) tended to establish clear-cut territorial preferences, while pairs incompatible on dogmatism and achievement showed no territorial tendency. Also, pairs who were incompatible on egocentric variables (dominance and dogmatism) produced a high level of social interaction, while pairs incompatible on affiliation and achievement tended to withdraw from each other (*i.e.*, engage in more solitary than joint activities). These two interpersonal adjustment processes—establishing territorial claims and withdrawing socially—appear to be mechanisms for coping with interpersonal stress.

A study of isolated pairs of men indicated that the effects of isolation and confinement on social-emotional well-being and performance were significant. It also demonstrated that the effects of isolation on performance were significantly modified by crew composition, particularly by a factor related to interpersonal compatibility.

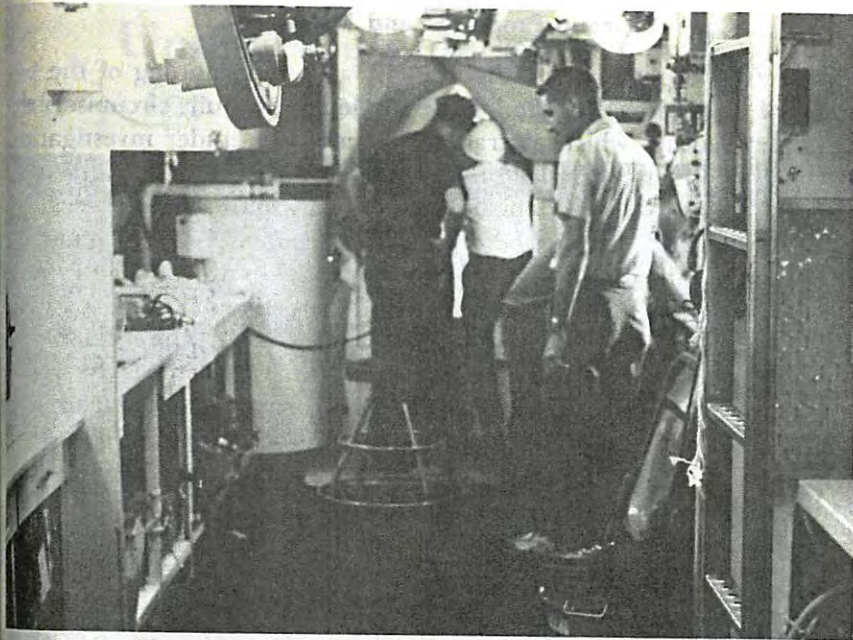
A second study of isolated pairs, recently completed, was addressed to the question of the degree to which modifying isolation conditions would affect the responses of group members. In this study, eight isolation conditions which differed in the degree of privacy permitted, the degree

of contact with the outside world provided, and the information given the subjects regarding the length of mission duration were examined. In half of the groups, both members of the pair were confined to the same room. In the other half, each man had his own room with a connecting door to his companion's room. Half of the groups in each condition of privacy were provided essentially no contact with the outside world. In the other half, there was not only voice contact from mission control, but also occasional playing of popular music, questions and answers from the Playboy Advisor column, and non-current news reports. In half of each of these four conditions, subjects were told that their mission would last four days. In the other half, subjects were told that the mission would last 20 days (the actual duration of all missions was eight days). Thus, the experiment was a two by two by two design, with eight conditions of isolation and at least three groups in each condition.

Although the data gathered in this study are still being analyzed, it is clear that the more austere conditions of isolation, as compared to the first study, produced a much higher rate of request for early release (53 percent of the pairs in the second study were unable to complete the assigned eight days of isolation). Furthermore, the different conditions of isolation produced different rates of aborting, and different levels of subjective stress and anxiety. The highest abort rates were produced by combinations of the no-privacy condition, no outside contact, and expectations of a 20-day mission duration. Further analyses are underway to determine the degree to which task performance, territoriality behavior, interpersonal interaction, and other aspects of adaptation and performance were affected by experimental conditions. The results of this study are expected to contribute to improved guidelines for the design and manning of underwater vehicles and other Navy systems which involve a high degree of isolation and confinement.

Man-in-the-Sea

Before the results of laboratory studies can be applied in an operational Navy setting, they must be evaluated in field research. To this end, the Project ARGUS staff participated in Sealab where it was possible to obtain not only extensive demographic, personality, and experience data regarding the aquanauts, but also a wealth of data regarding the subjective and objective adaptation and performance of aquanauts to the Sealab condition. Analysis of the data collected during this experiment has yielded a highly reliable and useful measure of effective performance, which includes both task and social effectiveness, and incorporates both objective and subjective data. By analyzing the relationships between the characteristics of individual aquanauts and their performance in Sealab, a preliminary basis is provided for selection of future



Sealab II aquanauts were observed by closed-circuit TV

aquanauts. These preliminary results, in addition to complementing current laboratory research, provide a basis for further examination of laboratory results in a man-in-the-sea setting and a set of data to be considered for developing further laboratory investigations.

In addition to providing substantive data, research on Sealab II provided opportunities for methodological and conceptual developments. The study combined the use of closed-circuit television, microphones and official records with more conventionally employed measures, *e.g.*, sociometric ratings, leader ratings and self-reports, as data sources. Research results in Sealab promise significant advancement toward more complete and valid data collection for groups under extreme stress in field settings.

The increase in sophistication of electronic devices, such as television and transistorized transmitters, is part of the methodological revolution in psychology which was employed in part by Sealab research. High speed digital computers are essential to the conduct of such research because of the masses of data generated and the complexity of analyses required. Conceptual models employing more detailed and sophisticated data can be expected as a result of methodological advances. The report of research on Sealab II also adapted and developed theoretical concepts which provide the link between laboratory and field research necessary to the analysis, understanding, and prediction of behavior in stressful environments.

Group Processes and Modeling

Some of the phenomena important to an understanding of the behavior of isolated groups can best be studied in carefully circumscribed laboratory settings which abstract the phenomena under investigation and deal with them exclusive of other possible variables. These include various group processes which are especially important in isolated groups, but which can not be readily or economically investigated in long-term isolation studies or in operational field settings. The Project ARGUS program has therefore included experimental social psychological studies of the contagion of aggressive behavior, the social penetration or acquaintance process, the social comparison process by which men evaluate the adequacy of their task performance, the reactions of mature and immature character structures to different leadership styles, the contagion of generous behavior, and the relationships between territorial preferences and interpersonal compatibility.

In an effort to integrate the various findings of Project ARGUS studies in a single conceptual framework, an effort has been initiated to develop a computer model of small crew behavior. This model is intended to incorporate the major findings of a variety of studies, to provide a symbolic analog of crew processes, and, ultimately, to provide a tool for testing the sensitivity of system performance to variations in psychological parameters. The modeling effort is expected to be a continuing process, which will incorporate greater degrees of sophistication as better empirical data become available, and provide a core around which further research investigations will be centered.

Navy Awards Contract for SABMIS Study

An industry team headed by the Hughes Aircraft Company, Fullerton, California, has been selected by the Navy to perform an advanced study of a Sea-Based Ballistic Missile Intercept System (SABMIS). The team also includes the Lockheed Missile Space Company, Sunnyvale, Calif. and the Newport News Shipbuilding and Dry Dock Company, Newport News, Va. The study, which will take about six months, will focus on a surface ship as a platform for the system.

A special Navy evaluation board reviewed proposals submitted by 23 companies. Bidders formed combinations of companies in order to meet the requirement that the SABMIS program must draw on experience in three fields: missiles, electronics (especially radar), and shipbuilding.

The study contract, which is a follow-on from previous SABMIS studies, is expected to lead to a preliminary design of a SABMIS system.

An Advanced Planning Briefing for Industry on Naval Ordnance and Missiles will be held at the State Department Auditorium, Washington, D. C., March 26-28. Additional information on this briefing, which is sponsored by the Naval Material Command and the American Ordnance Association, may be obtained from Mr. R. C. Lampert, Naval Material Command (MAT 032C), Washington, D. C. 20360.