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(1) Conduct of in-house analytical studies to provide a continued appraisal of technology as it affects and will influence future space systems. Currently, a comprehensive study of this type is being conducted to determine the impact of space technology on naval operations.

(2) Study of means to extend and improve knowledge of the basic sciences through use of high altitude vehicles for collecting basic research data. The principal effort in this field is currently devoted to balloon research and to the use of sounding rockets, such as ARCAS and HUGO.

(3) Provision for supporting and contributing research through the sponsoring of contracts for studies in the basic scientific fields. These include propulsive power, materials research, chemistry, physics, and the other basic sciences. ONR biomedical research is covered in the section below.

NRL Programs. In addition to the development of the Dark Satellite Surveillance System, NRL carries out direct research, supporting research, and contributing research for astronautics. An example of direct research is the development of the payload for an electronic intelligence satellite, TATTLETALE, which the Navy has proposed to ARPA for financial support and full development.

Navy Bioastronautics Programs

As with other Navy efforts in astronautics, a great deal of basic research carried on in the bioastronautics field is not always specifically denoted for space projects. The highly specialized Navy medical facilities continue to produce basic information which can be utilized to place man in space. The Bureau of Medicine and Surgery, supported by the Bureau of Aeronautics, is expending considerable effort toward supporting the Navy's Space program. The bulk of bioastronautical work is carried out by four laboratories: the Naval Medical Research Institute, Bethesda, Maryland; the U.S. Naval School of Aviation Medicine, Pensacola, Florida; the Air Crew Equipment Laboratory, Philadelphia, Pennsylvania; and the Aviation Medical Equipment Laboratory, Johnsvile, Pennsylvania. The first two activities are wholly staffed by - and are under the operational military and technical control of - the Bureau of Medicine and Surgery. However, the school frequently investigates work under Bureau of Aeronautics funding. Both activities are heavily engrossed

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(d) Date Completion of Development is Required. An interim S- or X-band satellite ELINT system is required by mid-calendar 1959 or as soon thereafter as possible.

Dates for completion of specific systems following the interim system will be specified in the Development Characteristics or other directives.

(9) Operational Requirements SC-06302 Communications Satellite Relay Systems.

(a) Operational Concept. The advent of artificial satellites and associated space technology constitutes a breakthrough which ultimately can revolutionize military long distance radio communications.

There are two known basic techniques for utilizing satellites and related media for long distance radio communications (i.e., active and passive relay). "Active" satellites are those capable of radiating signals generated by one or more transmitters which are carried by the satellite. If the satellite is also equipped with signal receiving equipment, capable of modulating the satellite's transmitter(s), the satellite then can function as an "active relay". "Passive relay" satellites and related media are basically radio reflectors which are in orbit. Ordinarily, they cannot transmit information originating within themselves or their surroundings as can "active" satellites, nor can they regenerate received radio signals as can "active relay" satellites.

It is visualized that the majority of the Navy's long range communications of the future will be accomplished or supplemented by systems which utilize active (real time and delayed) satellites, passive satellites (both natural and artificial), or any material (chaff, ionized clouds, etc.) in orbit which can serve as a reflector.

(b) Operational Requirements. There is a Navy requirement for a long distance communications system which can be met with current space technology. Four basic types of operations should be established as follows:

(i) Fixed point-to-point communications.

(ii) Communications between mobile units (ships, aircraft, and space vehicles).

(iii) Communications between mobile units and shore facilities.

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(2) The Navy is sponsoring an ELINT-collecting satellite reconnaissance program called TATTLE-TALE. Plans are being made and components developed for a small, simple vehicle which is both feasible and capable of meeting national intelligence requirements, and which can be operational in about a year - if supported. Support has not been forthcoming to date and the future of TATTLE-TALE is undetermined.

(3) The Navy (ONR) originated and is now participating in the NASA weather reconnaissance satellite project, TIROS. The Naval Photographic Center and Photographic Interpretation Center will perform the major processing steps in preparing the images. Under present research concepts, this weather reconnaissance data will have little operational value because of the time delay before it is transmitted, processed, and available.

(4) The Navy (BUAER) has generated many studies of manned earth reconnaissance satelloids (discussed in Part IV and Appendix F), as has the USAF in their DYNA-SOAR program. These programs are competitive with unmanned satellites described here.

(5) The Navy (ONR) and several other agencies have developed vertical probes (Navy HUGO, for example) which have successfully demonstrated the feasibility of local area reconnaissance from outside the atmosphere.

(6) The Navy has many special capabilities that are essential to the effective and economical development of reconnaissance satellites (particularly SAMOS) including sensor development laboratories, range and recovery support, and analysis capabilities. The Naval Photographic Interpretation Center has justifiably achieved national prestige in its field of reconnaissance interpretation, including research for better tools and methods of intelligence processing. The wealth of experience possessed by the Center's personnel and the excellence of the plant and its equipment, constitute valuable Navy assets.

CONCLUSIONS

(1) Navy reconnaissance requirements demand full participation in and exploitation of Project SAMOS.

(2) Because of the great expense of satellite reconnaissance, and considering that the requirements of the services overlap and parallel each other, a truly joint program is necessary to meet most of the requirements.

(3) A joint program would require - as a minimum - that planning, operational control and data processing be coordinated within a single joint command.

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(4) Separate but coordinated development of reconnaissance vehicles, with responsibility for particular sensors assigned to individual services.

(5) Individual monitoring and data processing stations (including stations afloat) to be funded, manned, and operated by the individual services contributing to a joint effort.

(6) Considerable research of naval interest is associated with reconnaissance developments.

(7) The present limitation on data transmission from reconnaissance satellites dictates the use of capsule recovery to retrieve data. Simplified reconnaissance devices such as TATTLE-TALE can utilize simplified telemetry or data read-out links. Experimental evidence is needed to determine the optimum compromise between data complexity and data transmission simplicity.

RECOMMENDATIONS

(1) That the Navy press to participate in the ARPA advanced reconnaissance satellite system SAMOS.

(2) That the Navy undertake the development of: interim or simplified astronautic payloads, such as TATTLE-TALE; vertical probes, such as HUGO as backups or alternates to SAMOS; sea-launching and air-launching vehicles; direct read-out capabilities; and sea recovery systems.

(3) That, in the SAMOS system, the Navy concentrate in the area of sensor development, data read-out and handling, and data interpretation;

(4) That the Navy seek the establishment of joint command for SAMOS satellite operations with direct access to raw reconnaissance data obtained from this system.

COMMUNICATIONS SATELLITE

CONSIDERATIONS

(1) The U.S. Navy is the only agency in the world that conducts operations with all types of vehicles, in all media, in all parts of the world. Consequently, Navy requirements for

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(10) The resources and priority assigned to making man a part of payloads in space practically insures that this objective will be successfully accomplished.

(11) The functions which can be performed by man in space payload cannot be delineated prior to his introduction into the space environment.

EXISTING EFFORTS

(1) The responsibility for both the short term and the long range space research programs has been assigned to NASA. Both are oriented towards achieving a better understanding of the world around us.

(2) NASA is using the support of NRL, other service laboratories, and educational institutions to assist in implementing the U.S. Space Science Program.

(3) Since these programs are funded by NASA, the design initiative — which is so important in developing efficient military application payloads for these experiments — will not be fostered in the supporting laboratories.

(4) The Naval Research Laboratory has been requested by NASA to propose a solar monitoring satellite experiment which will continuously monitor the complete spectrum of solar emission for a period of over a year.

(5) The TRANSIT navigational payload represents the only [illegible] payload project in the Navy. The [illegible] satellite payload design is currently supported by [illegible] Navy funds. All other satellite payload efforts in the Navy are in [illegible] part of payloads designed and developed by other [illegible].

(6) There is no effort in the Navy, brought to the attention of [illegible] planning stage, which [illegible] of the future large payloads which will become [illegible] the military of the U.S. regardless of what action the Navy may choose to take or not to take.

[illegible] years [illegible] level of professional competence in pursuing [illegible] work required to support man in functioning in the [illegible]

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atmosphere physics. NRL did much in this field, using the AEROBEE-HI and other rockets during the IGY. NRL has the in-house capability for development of satellite instrumentation and for the conduct by use of computers of theoretical research on satellite orbits. Work is being carried out on the improvement of computers and data reduction and analysis systems. The sensing package for the proposed TATTLETALE electronic intelligence satellite is being developed. Finally, NRL has recently completed a feasibility and development study of a communication relay satellite, using techniques developed in connection with the moon relay communications system.

Supporting research. NRL current work which has direct application to space technology:

(1) Development of balloon radiosonde system for collection of meterological data.

(2) Instrumentation applications and systems development.

(3) Theorectical and practical studies in liquid propellants.

(4) The conduct of nuclear research for propulsion and auxiliary power.

Contributing research. NRL carries out continuing work in electronics, instrumentation, electrical power systems, auxiliary power systems, telemetry, development of detectors of all types, antenna improvements and developments, high frequency radar research, and basic studies in materials research, physics, chemistry, and the life sciences.

PROJECT TATTLETALE

Agencies involved. CNO, BUAER, NRL

Program description. Proposal for a satellite to provide early and relatively inexpensive electronic intelligence coverage of the USSR. (See Figures 21-22.)

Brief history. In June 1958, NRL developed a proposal for an ELINT satellite. A full report was submitted to CNO in October 1958. CNO sent the proposal to ARPA in February 1959. ARPA funds for support of TATTLETALE do not appear to be available. There is also a problem of obtaining a booster to put up an R&D TATTLETALE model, although there is a possibility that the TATTLETALE payload could be put up piggyback with the second TRANSIT launch.

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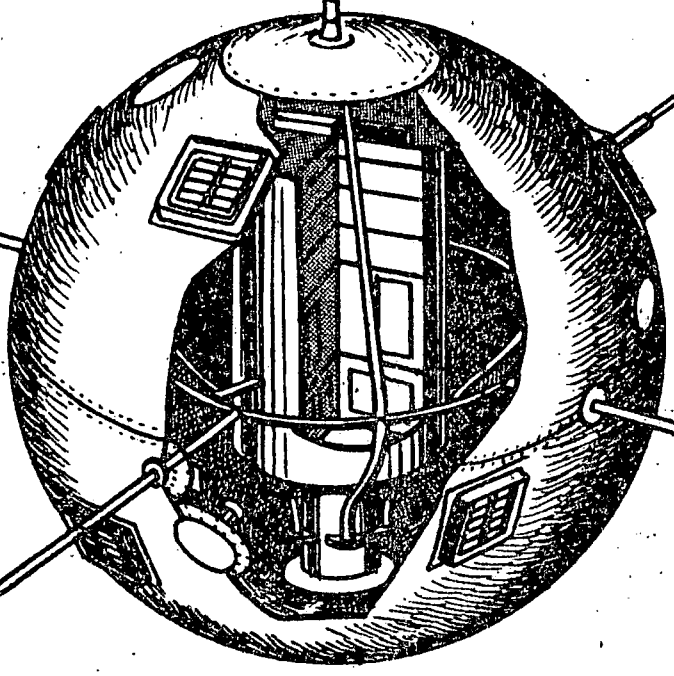

Proposed Satellite Configuration

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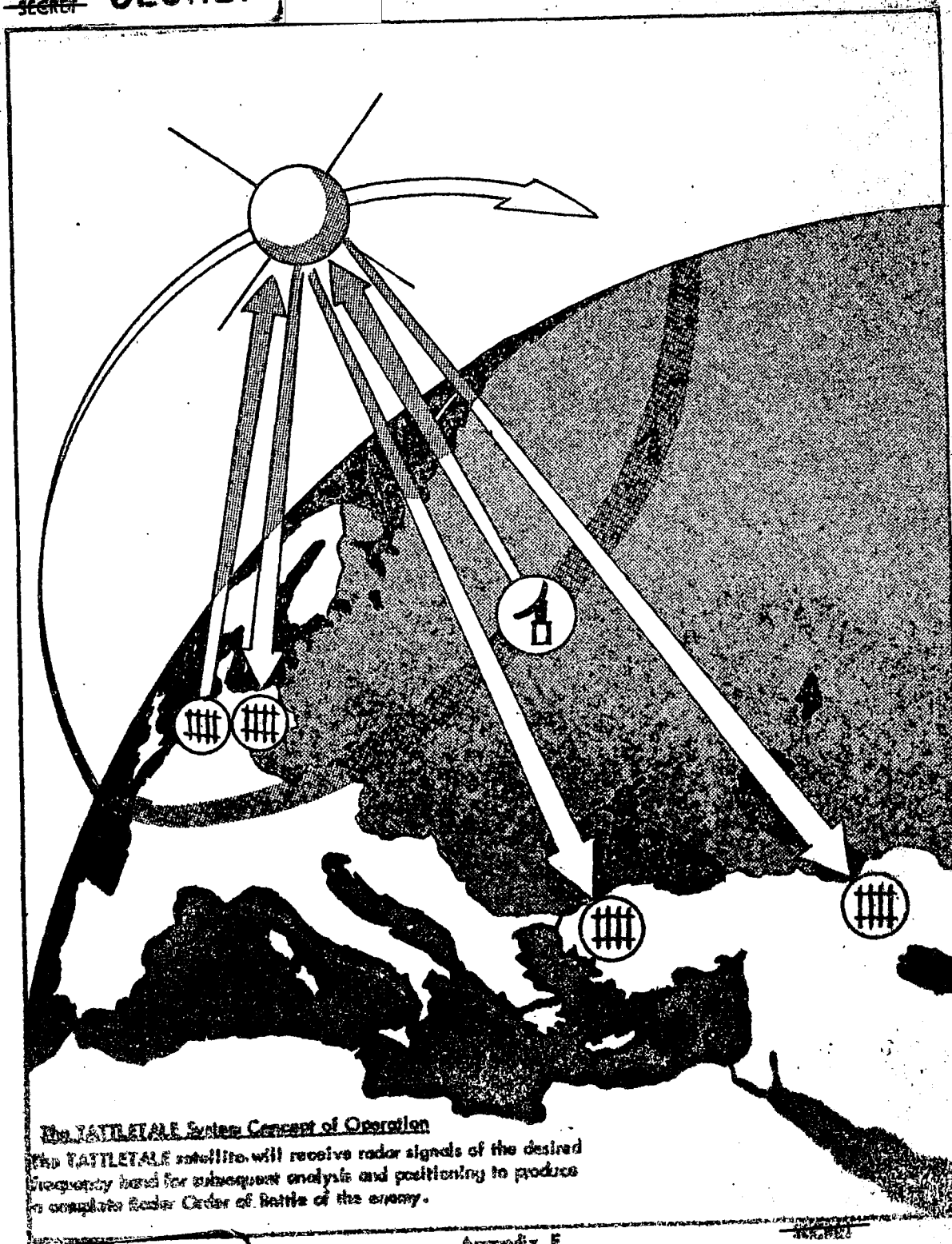

The TATTLETALE System Concept of Operation

The TATTLETALE satellite will receive radar signals of the desired frequency band for subsequent analysis and positioning to produce a complete Radar Order of Battle of the enemy.

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Appendix F
Figure 22

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Funding. BUAER has funded TATTLETALE work carried out by NRL with $375,000 of ECM research money.

Schedule. A TATTLETALE payload could be launched within six months of go-ahead.

Description of program. The initial objectives of the TATTLETALE proposal would be to provide information on USSR radar, initially S-band, as follows: antenna scan rates, pulse repetition rates, type radars, radar disposition, locations (within about 50 miles), as well as locations of radar R&D and manufacturing activity. S-band coverage has been selected for first development, since 40 per cent of USSR radar is in this band. TATTLETALE could also cover, with additional satellites, the X, C, and L bands.

Technical approach. The TATTLETALE satellite would be a 40 pound ball of the VANGUARD variety. In addition to the sensor equipment, it would include a 108 MC transmitter to establish the satellite's ephemeris. Life of one year is anticipated, with solar cell power. The satellite would be placed in a 70° orbit which would provide good coverage over the USSR, as well as permit read-out to existing ELINT stations, and control (i.e., ON-OFF interrogation) from a station in [redacted] On command, the satellite would provide a 15 minute read-out twice daily. Data processing would be accomplished by a central station in the U.S.

Other pertinent data. TATTLETALE could be launched by several existing boosters. CNO is now in receipt of a proposal to utilize the POLARIS as a booster. This is entirely feasible; further, this propsoal would permit seabased launching, which is most attractive from security and orbit control standpoints. The Navy has the necessary resources to carry out the project in this manner, from initiation to completion of launching, entirely "in-house". For example, NRL could design and develop the payload; NOTS Inyokern is fully qualified and capable of designing, building and assembling the third stage to the basic POLARIS propulsion system. The staffs of NRL and possibly the VANGUARD Division of NASA could provide technical consultation to NOTS Inyokern. A POLARIS missile without the warhead or guidance system would be needed.

After construction and assembly, Navy crews could carry out the entire launching operation from the Observation Island. A minimum of outside contractor support would be necessary. Because outside contractors, who could carry out the development most expeditiously, are already heavily engaged in high priority programs, an "in-house" effort would cause the least disruption to important programs. This project supports Navy Operational Requirement [illegible], Electronic [illegible] Satellite System.