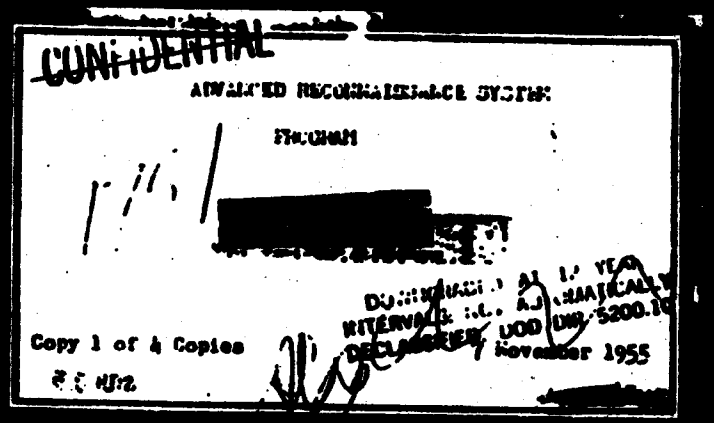

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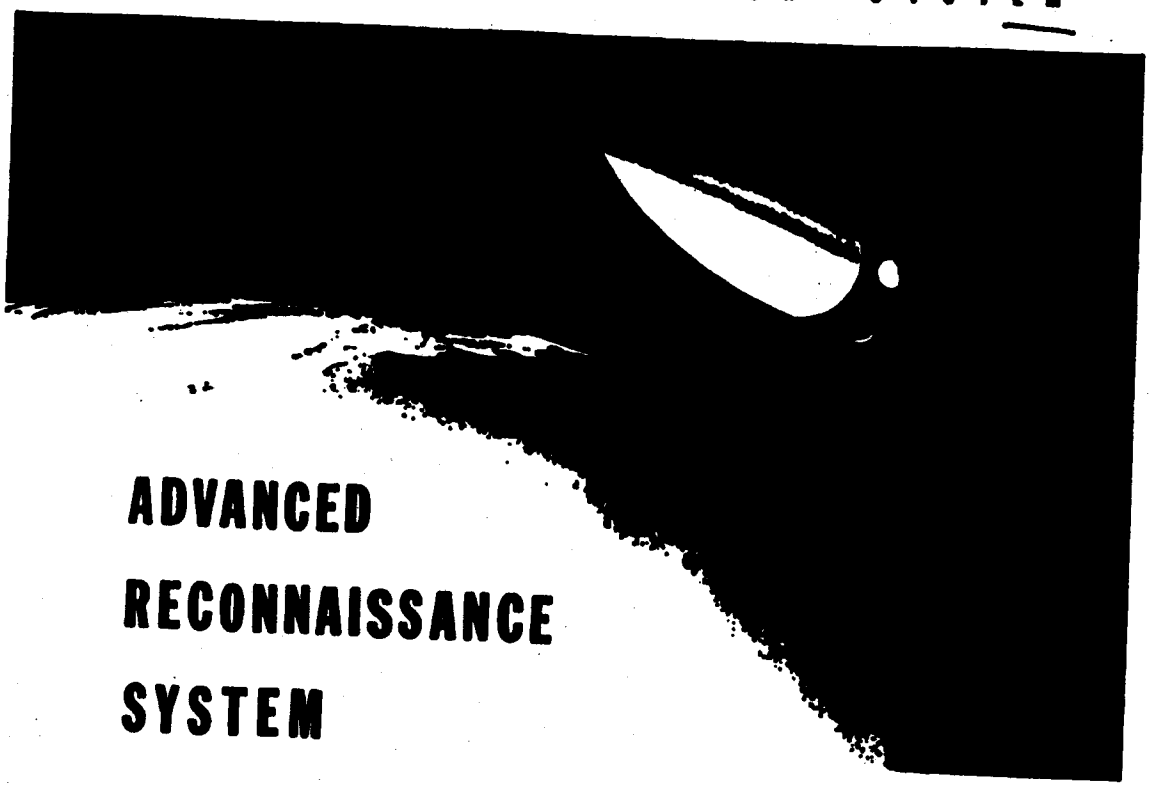

ADVANCED RECONNAISSANCE SYSTEM

Technical Development Program
Nickname "Pied Piper"

[redacted]

Project 1115
MX 2226

[redacted]

AD 55 12792

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FOREWORD

7 November 1955

This brochure was compiled for the expressed purpose of making available to Brigadier General Schriever a compilation of the status of Advanced Reconnaissance System Program, Project 1115 (Pied Piper). Although it was compiled for this expressed purpose, its contents were drawn from the working documents to The Weapon System Project Office without alterations except to bring the material up-to-date as of the above date. The material was selected to supplement an oral presentation on 9 and 10 November 1955 at Western Development Division Air Research and Development Command. Under separate cover is being delivered one (1) copy each of the First Quarterly Reports of the Advanced Reconnaissance System Design Studies prepared by Radio Corporation of America, Lockheed Aircraft Corporation, and Glenn L. Martin Company.

Pending is the receipt of a new System Requirement which, it is understood, will establish a new Responsible Agency and Participating Centers and will give further direction to the Program.

Distribution:
WDD - Brig Gen Schriever
RDZPI - Lt Col Gomez

[redacted]
Lt Colonel, USAF
Chief, [redacted] Weapon System Project Office
[redacted] Missile Division
Directorate of Systems Management

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Security Policy

Maintenance of proper security on this program is of paramount importance

A Top Secret

(1) All information which contains or implies a date of operational availability

(2) All information pertaining to the progress as a weapon system

B Secret

Other aspects of the ARS program, as well as exploitation of the Satellite

Security Policy

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ADVANCED RECONNAISSANCE SYSTEM

I N D E X

7 November 1955

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SUMMARY OF FEEDBACK PROJECT

In the Fall of 1945, at the conclusion of World War II, the Navy acquired the German work in the field of earth-circling satellites, and this work was used as a basis for a contract with the Glenn L. Martin Company to continue studies in this field.

In the spring of 1946, the Army Air Corps became aware of the Navy's efforts and as a result the first job undertaken by the newly formed RAND Corporation, then a part of the Douglas Aircraft Company, was the conduct of studies similar to those being conducted by the Glenn L. Martin Company.

In April 1947, the Bureau of Aeronautics of the Navy presented material to the Research and Development Board, showing why the Office of Naval Research should be designated as the coordinating agency for the "Earth Satellite Vehicle". This same letter to the Research and Development Board included a statement that "such a vehicle is technically possible". Later, in September 1947, the RAND Corporation, also determined that a satellite is technically feasible.

During January 1948, both the Navy and the newly formed Air Force presented arguments to the Research and Development Board which showed that each service should have sole responsibility for developing an earth-circling satellite. In reviewing the efforts of both services it was shown that the Navy spent most of its time on the very small details of such a system while the RAND Corporation emphasized the practical applications of existing state-of-the-art to such a vehicle. On 16 January the Navy withdrew their letter to the Research and Development Board, which claimed sole rights for satellite development. In February, 1948, the Air Force requested the RAND Corporation to establish a finite program for the study of satellite development. Shortly afterwards the

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Research and Development Board concurred with the Air Force's undertaking this program and stated that the RAND Corporation should have the sole responsibility in this field. The Navy and the Glenn L. Martin Company were phased out at this time.

RAND established what came to be known as Project Feedback, and at the request of the Chief of Staff of the Air Force, addressed itself to determining if a military use exists for a satellite vehicle and if so, to suggest one such military system, and to recommend its development when the technological state-of-the-art indicated that such action was practicable.

In completing the Feedback Project in 1954, RAND Corporation concluded that the conduct of visual or electronic reconnaissance is the most promising military use for an early unmanned satellite vehicle, and the final result of the Feedback Project is a suggested minimum pioneer visual reconnaissance system.

It must be emphasized at this point that this suggested system is not a design, but a summation of typical and feasible suggestions for individual system components.

The suggested satellite vehicle is seen as a two-stage rocket of conventional design, which propels a "Reconnaissance Head" to an orbit about 300 miles above the surface of the earth where this satellite will revolve around the earth about 15 times per day, and remain aloft for a period of one year or more.

At take-off, the total vehicle will be about 80 feet long with a diameter of about 9 feet and a gross weight of about 100,000 pounds. This weight is based upon the use of gasoline, liquid oxygen as a fuel.

The initial thrust requirement at take-off will be 285000 pounds provided by two 120,000 pound thrust rocket engines and two smaller gimballing engines of 22,500 pounds thrust each. After about 2 minutes of burning the booster will drop away and the second stage, with about 30,000 pounds thrust will power the satellite to the

velocity necessary to coast to orbital altitude.

The take-off trajectory will be an optimum ascent path in the sense that it will have been calculated for a minimum gross take-off weight. The booster will burn for approximately 2 minutes and the vehicle will have an altitude of 29 miles and a velocity of 11,500 ft/sec. The second stage burning time, 2-1/2 minutes, will give an altitude of 66 miles and a velocity of 26,700 ft/sec. Then there is a long coasting period of 35 minutes duration, during which time the velocity will fall to 24,520 ft/sec. Finally, when the satellite has reached orbital altitude, four small vernier motors will provide the final velocity increment of about 500 ft per second to place it on its approximately circular orbit. The take-off distance totals about 7,500 nautical miles and the whole process from launching to orbit will take about 40 minutes.

The take-off guidance system is seen as a wholly self contained inertial system. A satisfactory orbit can be reached within an error of plus or minus 25 miles of altitude and 1/10th degree of azimuth.

Before going any further, some of the operational considerations leading to the choice of a particular orbit for a satellite should be reviewed.

First, the area of the earth which can be "seen" by a satellite is bounded by the latitudes equal to the angle which the orbital plane makes with the equatorial plane. Thus, the first parameter in the selection of the orbit will be governed by the latitude of the area which is to be examined.

However, the selection of the orbital azimuth is governed by another important factor. Assume, as RAND Corporation did, that the desired operational duration of the satellite is one year. If the orbital plane of the satellite is fixed in inertial space, daylight zones, representative of the seasons, move with respect to this plane. In winter, for instance, the satellite on a polar orbit would never get out of the twilight

zone in the northern hemisphere and an entire 3 month visual reconnaissance season would be lost.

However, the oblateness of the earth causes a rotation of the orbital plane about the earth's axis, which, in the case of a retrograde orbit, is a "Regression of the Nodes". This regression rate, which is similar to the precession of a gyroscope, is a function of the inclination of the orbit to the equator, the period becoming infinite for an orbit which passes over the poles and decreasing southward to zero for an equitorial orbit. This regression rate has been calculated to be one degree per day for a retrograde orbit which is inclined at 99degrees to the equator. This means that the satellite would be on an orbit where daylight operation could be continuous all year round.

In choosing the orbital altitude for the satellite, a compromise has to be made between the advantages of the increasing altitudes, which give a greater duration in orbit and an increased line of sight distance for communication: and those of the lower altitudes, which decrease the size of the optical system needed to obtain visual detail and the decreased amount of energy required to establish the vehicle inits orbit.

All of these considerations led to the basic orbital altitude choice of 300 miles, this assumes that reconnaissance information can be recorded aboard the satellite and played back, at a selected time, to the ground.

The actual satellite vehicle will have a length of about 30 feet., a diameter of 8 feet., and at this stage, will weigh about 4500 pounds of which 1500 pounds will constitute its payload.

The major operating components of the satellite vehicle while on orbit are first, the auxiliary power plant. This is seen as a small nuclear reactor, in which the working fluid operates a turbine to drive an electrical generator. The power requirements of the satellite vehicle are estimated at about 2 to 3 kilowatts. All

rejected heat from this and other satellite components must be radiated from the vehicle's skin, as conduction losses are not possible at this altitude due to the lack of an atmosphere of any consequence.

The second major operating component of the satellite is the attitude control system which keeps the vehicle oriented vertically to the earth. A vertical platform is established by a horizon scanner, in which an infrared photo tube detects the horizon through rotating optical system. This rotating system establishes the earth as a disk, and determines the instantaneous vertical to the center of that disk. The scanner actuates pitch and roll gyros. The yaw gyro senses the direction of the orbital plane. All three gyros actuate corresponding reaction wheels whose axis are constrained along the principal axes of the satellite vehicle and these in turn, correct perturbations imposed on the vehicle while on orbit.

Both of these components are in being to service the heart of this vehicle, which is the TV optical system. Before examining that, it is necessary to review the basic assumptions which served to establish the reconnaissance capabilities of the suggested system. As a result of study of simulated satellite television pictures, it was determined that a scale of 1/500,000 would represent a minimum plausible scale for pioneer type reconnaissance, which involves very broad coverage at a small scale. This picture scale of 1/500,000 would permit observations of:

A. Airfields

B. Industrial Concentrations.

C. Bomb Damage by High Yield Weapons

D. Harbors and Shipping

E. Major Lines of Communication

F. Urban Areas.

G. Large Military Installations.

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Through use of a 36" focal length lens in a TVCamera, utilizing a standard 3" image orthicon, a TV Picture on the photo cathode of 1/500,000 can be achieved by the satellite. This picture will cover an area roughly 10 x 10 miles. The space-borne TV optical system will consist of two basic parts:

A. The TV Cameras and Scanning Equipment

B. The Recording Equipment, Play Back, and Communications Link.

In the TV Camera equipment, two standard 3" image orthicons would be used in conjunction with a segmented 12 mirrored wheel which permits optical scanning on either side of the satellite's orbital path to a distance to 200 miles; in other words, the satellite will "sweep" a path 400 miles wide.

The second part of the system is the recording unit in which the photographs made over enemy territory would be stored after each pass and retransmitted to a USAF Ground Station or stations depending on location and orbit. The recorded information would be erased after each transmission and the tape reused on the next pass by the satellite.

A transmitter of about 10 watts output on a frequency of about 7500 MC is used for communication with the ground.

At the ground station the vehicle is tracked while transmitting and simultaneously it is receiving instructions from the ground regarding activities on its next pass. These instructions, resulting from [illegible] computations, would cover, for instance, the time of TV operation for next pass of the satellite, and the satellite antenna position for making the next contact with the ground.

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The satellite's main input to the ground station will be in the form of TV images recorded on tape by the ground station. A monitor projector would permit immediate interpretation of selected scanned areas for targets, and perhaps the production of a small scale mosaic for weather analysis.

For full and detailed interpretation, however, the tape would have to be taken immediately to an intelligence center, which would also serve as a repository for all information gathered by the satellite. The intelligence center would be responsible basically for:

A. Data Handling.

B. Selection of Material for Complete Analysis

C. Preparation of Large Scale Mosaics.

D. Interpretation of Individual Pictures.

E. Preparation of Maps and Charts.

F. Finally, and most important, the dissemination of intelligence information to the using agencies.

To accomplish pioneer reconnaissance of the entire Soviet Union in a single day, a strip about 1,000 miles wide would have to be photographed on each pass. However, a compromise to a 500 mile strip width has been made to provide minimum photographic detail for our pioneer reconnaissance. Therefore, it would take something over 3 days for a single satellite vehicle to cover the entire Soviet Union. Also, the effects of cloud cover must be considered based on general knowledge of the soviet climatology on a year round basis, it is to be expected that the satellite would see about 95% of the Soviet Union in the first 15 days of operation, and would probably see essentially 100% by the end of the first 30 days.

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Assuming that the straight line-of-sight horizon would limit communication between the satellite and the ground station, some ground station layouts, in which a 300 mile orbital altitude and an 83 degree orbital azimuth is used, should be examined.

All daylight passes over the USSR will come within the communications range of a single Alaskan Ground Station.

A second, and possibly more desirable arrangement from the standpoint of security and proximity to the intelligence center, involve two stations in the United States. Here it would be necessary to wait several hours for results of the two passes over the eastern USSR and this would require an additional tape storage capability; or another vehicle 12 hours out of phase with the first one.

In order to maximize the utility of a satellite type vehicle for reconnaissance purposes, it is very important that we foresee at least the possibility of utilizing this vehicle for surveillance purposes.

This type of operation would, of course, require photography at a much larger scale than would be acceptable for pioneer or first look type reconnaissance. In its investigation, Rand has assumed that a scale 1/125,000 is plausible for this purpose, on a minimum basis. With this scale some things on the earth that move can be seen. However, in achieving this greater detail, it is necessary that we give up a certain amount of coverage. For instance, to achieve a scale of 1/125,000, an optical system of 157" focal length would be needed and the strip on the earth scanned by the satellite during each pass would be reduced from 400 miles to approximately 25 miles. This type of reconnaissance would produce photographs about 2 miles on a side. However, in order to achieve this detail, about one year would be needed for complete coverage of the Soviet Union with one vehicle. Of course, in

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this case, the answer is to use a number of vehicles simultaneously.

It must be remembered that the system just described is not a system under development, as such, by the Air Force. Neither is it an ultimate in this type of system, but rather operational advance which appears to be feasible with a minimum of development effort. It is a concept for the use of typical and feasible components for a satellite borne system as envisioned by the Rand Corporation.

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ADVANCED RECONNAISSANCE SYSTEM

THE PIED PIPER PROJECT (PROJECT 1115) SUMMARY

6 November 1955

In carrying forward from the Feedback Program, a course of action was indicated which called for the accomplishment of two objectives: First, we have to establish that the critical components of this Satellite Reconnaissance System will, in fact, be obtainable and will perform the functions for which they are desired, and Second, we must ascertain that these components can be successfully integrated into a working reconnaissance system. Around these two objectives, the activities of the Advanced Reconnaissance System Weapon System Office are being aimed. The organization of the office itself is so arranged into two sections: One a Technical Program Section and a System Integration Section. Actually, and for the purpose of this presentation, the system problems and their related tasks for solution are also so arranged.

In many technical areas the Advanced Reconnaissance System Program will depend upon other Research and Development Programs to provide many of its basic components. Notably, from the Air Force's Intercontinental Ballistic Missile Program we expect to derive the rocket engines, fuels, and basic inertial guidance systems for placing the satellite on its orbit, in addition to the necessary ground launching equipment and techniques for the vehicle itself. From Project Lincoln and the Air Force's Information Data Handling System we expect to derive much in the way of techniques for data handling and processing. From the IGY Orbiters and the Scientific Community in general we plan to obtain some and probably a major portion of our Geophysical Data.

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The program of separate tasks aimed at advancing the State-of-the-Art is not a new one. Rand, having recognized that critical areas exist, had initiated studies to investigate these areas and solve the associated problems. Our present Technical Program continues Rand's work and extends it to investigate critical areas not covered by other Air Force Development Programs. It is important to note here that our program considers only items which are critical to the development of the Advanced Reconnaissance System. Areas which are not critical or which are under development by other Air Force Programs are not given consideration by our present program.

One of the critical items is that of providing sufficient auxiliary power. In 1951, at the request of the Air Force, the Atomic Energy Commission sponsored four separate contracts for first phase of feasibility studies of an Auxiliary Power Plant based on a nuclear source of energy. Two of the contractors studied the nuclear reactors as a heat source and two studied the use of radio-active material to provide heat. All four contractors indicated that a nuclear auxiliary power supply is feasible. On 1 September of this year, the Air Force in coordination with the Atomic Energy Commission, solicited proposals from outstanding members of industry to provide and develop the technical data necessary to establish a firm basis for the final design of Nuclear Powered Auxiliary Power Plant. Our efforts at this time will include, if necessary, the design, manufacture, and test of an experimental nuclear heat source, the equipment required to transform this heat energy into the required electrical power along with also the necessary power control equipment, and a heat sink capable of rejecting the entire heat output of the

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Satellite payload under its expected operating conditions. All of these equipments contained in this sub-system will be designed for long unattended operation in space. The proposals have been received and their evaluation completed from these proposals the Atomic Energy Commission and Wright Air Development Center will procure probably two contractor teams to carry out this task.

A little later in 1952, a contract was initiated by the Air Force with North American Aviation, Incorporated, to study ways of stabilizing a satellite vehicle while in orbital flight. This appeared to be necessary to permit its use as a military system. This study resulted in the proposed longitudinally stabilized system which you may have heard of in the past. This configuration utilizes a horizon scanner and reaction wheels. We now have a second naturally stabilized system which you see here in which the vehicle has a dumbbell or shootree mass distribution and maintains a vertical attitude in flight. Under this contract, experimental models of the horizon scanner and the control wheels are being fabricated and the scanner will be tested on 15 November 1955 of this year. The horizon scanner will be carried to altitude (90,000 - 110,000 feet) by means of balloons to test its efficiency in determining the horizon. Further development of the attitude control system, including the necessary computers, is to continue at North American during Fiscal Year 1956. We expect this task to be terminated at the end of this Fiscal Year with complete design specifications for an attitude control and basic inertial guidance system.

The heart of this satellite system of course is its reconnaissance unit, and this equipment has been given considerable attention over the past several years. Also in 1952, the Air Force contracted with Radio Corporation of America to suggest a feasible visual reconnaissance system for the satellite. Their basic proposal is that

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incorporated in the Final Feedback Report. Since establishing the basic concept, much breadboard work has been done by Radio Corporation of America in an attempt to prove the feasibility of their ideas. At the present time they are building a laboratory model of a complete 38 inch Focal Length Optical System. This model is expected to be completed February 1956 and probably will be tested in Fiscal Year 1956. This will also be accomplished with the aid of high altitude balloons. In connection with the reliability problems expected as a result of long-term satellite operation, Radio Corporation of America has spent considerable time in the life-test of critical television components. Radio Corporation of America has spent part of their effort in the recording of TV information on magnetic tape. This is work in addition to their much publicized effort for the National Broadcasting Company. Radio Corporation of America has made considerable progress in this area and has demonstrated a frequency multiplexing technique for an eight megacycle recorder. In recognition of the complexity of the recording problem, a back-up effort is being undertaken. Through the Rand Corporation, a contract is currently being negotiated with the Ampex Corporation on the West Coast for the purpose of also studying and developing techniques which may provide a suitable solution to the wide-band recording problem.

The possibility of utilizing the sun as a source of auxiliary power for a satellite vehicle continues to merit consideration. Recent investigations with cadmium sulphide crystals show that they possess a relatively high photovoltaic efficiency. A contract with the Harshaw Chemical Company has resulted in a small solar battery utilizing cadmium sulphide crystals capable of producing up to fifty millionths of power. This contract is aimed at a solar power system which will provide moderate amounts of power; as an example, up to 100 watts at the beginning

There are good indications that one square meter of cadmium sulphide crystals exposed to sunlight will produce approximately this amount of power. The contractor expects to demonstrate this experimentally during this Fiscal Year. We are familiar with and are taking cognizance of work in this field that is being accomplished by other agencies. At the conclusion of the present contract in January 1956, further work in this area may be placed with a development and manufacturing company to proceed concurrently with the basic research program.

A parallel study of both the basic inertial guidance system and the attitude control system for the satellite vehicle was initiated with MIT last year. This study is being phased into the work currently under way at Massachusetts Institute of Technology on an Inertial Guidance System for the ICBM. Through Fiscal Year 1956 this contract will carry through to completion from theoretical and experimental component fabrication to a finalized design of a complete single package inertial guidance control system. It should be noted that the Air Force, in recognition of the difficulty of this area, has initiated parallel studies and essentially placed the problem under competition. There is evidence that the Air Force has realized a benefit from this competition.

One of the more difficult problems in the establishment of any reconnaissance system is to strike a delicate balance between the user of intelligence and that which can be provided to him. This task for the study of intelligence parameters is designed to keep a continuing thumb on both the projected needs of the intelligence people and the expected capabilities of a satellite vehicle reconnaissance system. A further output of this task will be to make greater use of the information which a satellite system can provide. This task was initiated during Fiscal Year 1955 as an in-house study at Rome and is being carried out as a continuing

project with contractual assistance this year. This has been one of the most active tasks since the commencement of design studies. Included as participants have been the DIO, USAF, ATIC, ACIC, Syracuse University, and Boston University. Work is included from the field of basic information content.

Probably one of the most important problems to be solved during the development of the Advanced Reconnaissance System will be that relating to the capability of the intelligence agency to utilize the vast amount of intelligence information which is potentially available from this type of system. When one considers that a single satellite vehicle of the type described in the Feedback Project may be capable of producing up to 100,000 pictures daily, and when one further considers that utilizing such vehicles for surveillance could possibly require numbers of vehicles to be operating simultaneously, one can quickly see that this information will swamp all currently known or considered means for processing such intelligence. This task has also become quite active since the commencement of the design studies.

It has long been recognized that radiations emanating from a nuclear fueled power supply would be quite likely to damage the satellite's components, particularly the electronic gear. To further study this problem, a task has been initiated, to be carried out in conjunction with the Aircraft Nuclear Propulsion Program, to determine the radiation damage threshold levels in electronic components. This information would be used to assist design engineers in the selection of adequate components and techniques to be included in future systems in order to insure optimum reliability. The end item of this particular task will be a comprehensive report presenting the threshold damage levels of all airborne electronic components which will be utilized

by the USAF.

In the recent years, the Air Force has become increasingly aware of the potential value and importance of electronic reconnaissance. This technique has progressed far from its original state when it was simply used for ascertaining the type of chaff to drop during a bomb strike. It promises, in the future, to become a means of intelligence collection as important, if not more important, than photo or visual type of reconnaissance. The purpose of this task is to carry on from recently completed feasibility studies and provide techniques and experimentation leading to the development of equipment which will conduct electronic reconnaissance under unattended conditions aboard a satellite. The basic intent of this task is to provide an electronic reconnaissance capability for the Advanced Reconnaissance System. Current work is "in-house" at WADC. Qualified sources are being considered at this time and a contract is expected by 1 December 1955.

With component reliability as one of the major problems of satellite operation, this next task, planned for initiation in Fiscal Year 1956, will obtain design criteria for electronic components having an operational life of 10,000 Hours or more in the satellite's environment. The statement of work has been prepared and proposals will be solicited before 1 December 1955. Other work is planned in the field of mechanical components and overall system reliability. The Bell Telephone Laboratories, Ramo Woolridge, and Redstone Arsenal are under consideration for mechanical and overall reliability studies.

During Fiscal Year 1956, at Rome Air Development Center, a task has been undertaken to conduct in-the-house studies on the acquisition, tracking, and command equipment necessary for use with a satellite vehicle. These studies will be used to provide guidance to Weapons System Design Contractors and provide monitorship of the

of the contractor's efforts in this area. Specific problems areas are to be investigated with contractual assistance.

An other task initiated during Fiscal Year 1956 is a general consultant service or special research study task. The development of a system such as the Advanced Reconnaissance System will encompass practically every field of science known to the Air Force, Industry, and the Scientific Community in general. Competence in these various fields will be utilized as required in a consultant and advisory capacity by the Weapon System Project Office and the participating Centers.

Not delineated, but under consideration are tasks to cover the problems of special fuels for air starts of successive stages of rocket motors, weather forecasting from satellite reconnaissance data, AFU's for an interim or limited duration system, and special problems relating to expected environmental conditions.

North American Aviation, Inc. has been working with ammonia-liquid fluorine as a propellant pair for the past several years. The results of this work indicates that there is much to be gained by using this propellant combination for accelerating the various secondary stages of the Advanced Reconnaissance System's vehicle. The specific impulse of the combination is greater than 260 lb sec/lb, and the density of fluorine is relatively high when compared with other propellants.

This completes a description of the tasks which are under way to resolve the first of the Advanced Reconnaissance System Two-Fold Program --that of establishing that the state of the art will be such as to allow the development of the critical components necessary to do the reconnaissance job. Other tasks are to be initiated as it becomes evident that additional critical areas exist. Indicated on the accompanying organizational charts is the organizational 'set-up' within the Weapon System Project Office for handling the Technical Program.

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As a "LINE" organization under the weapon system officer, we find the Technical Program Section. This section is charged with the responsibility of exercising technical and management cognizance over the State-of-the-art program, and this is accomplished through the various Laboratories and Research Agencies of the Wright Air Development Center, Rome Air Development Center, and Air Force Cambridge Research Center. These agencies supply or provide the individual Technical Competence, Facilities, and Resources necessary to actually monitor and direct the technical tasks. Through these agencies the individual tasks may be found functioning either in industry under contract to the Air Force, or as individual and discrete technical tasks "in the house" of the Laboratories. By far, the major part of these tasks are out in industry or in the educational institutions of the nation. It is felt that this operating arrangement allows a relatively small number of people within the Weapon System Office to fully utilize the potential of the Laboratories and Research agencies of the Air Research and Development Command Centers and also to call upon industry to participate in the areas of their special aptitudes -- for it has been presumed that in the final system development, it will be industry, in one form or another, that will be a prime system manager.

Now, as to how the Weapon System Project Office is attacking the second major objective, that of integrating the various components, both space borne and ground based into a workable Advanced Reconnaissance System. It is within this area that major strides have been taken in the past year.

System Requirement Number 5 provided the authorization to proceed with detailed design studies by industry. The selection of the contractors from industry to be solicited for proposals for design studies was made by Headquarters Air Research and Development Command in coordination with the Air Materiel Command and Headquarters Air Force. Among the considerations for the selection of sources was the assumption that a principle advantage to

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the program can be gained by maintaining a secure program throughout its design and development. This essentially limited the number of sources solicited. Also considered was the fact that this is a reconnaissance system involving the launching of a vehicle into orbit for the ultimate purpose of collection and dissemination of intelligence information. Therefore, the problem of providing an air frame and engines need not be the sole guide to the type of contractors to be solicited. As the sources that were solicited is noted, it will be recognized that there were ostensibly two air frame manufacturers and two electronic manufacturers. Those solicited were the Lockheed Aircraft Corporation, The Radio Corporation of America, The Glenn L. Martin Company, and the Bell Telephone Laboratories. The Bell Telephone Laboratories declined to submit a proposal. Since the middle of June of this year, the other three contractors have been proceeding with Design Studies. The contractors are studying the entire system. The objective is to determine whether a military intelligence system aimed at satisfying the national requirements of the future can be foreseen at this time with sufficient definitude to indicate full scale development, and to establish the direction and magnitude of the technical programs needed to realize development. Here again, it will be recognized that the problem of proving feasibility is our primary one. The study encompasses the launching to the generation of the intelligence from the data collected. Again, it is emphasized that this is a system - "If ever there was a weapon system this is it".

The missions to be accomplished by the system are as follows:

First, that of providing physiographic pioneer and surveillance coverage of the USSR and its satellites. For the physiographic or TV type system, it should be capable of providing routine target reconnaissance mapping.

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[redacted] MISSIONS

- To provide physiographic pioneer & surveillance coverage of the USSR and satellites.
- To provide and maintain continuous and comprehensive surveillance of the electronic activities of the USSR.

Each mission carries a firm requirement for suitable data handling & processing capability both in the vehicle and on the ground.

The test prog. will involve firing instrumented test vehicles. One such satellite test vehicle will be a "Research Lab. Model" able to obtain & transmit to earth scientific data on the space environment.

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DESIGN STUDY OBJECTIVE

To determine whether a military intelligence system aimed at satisfying the national intelligence requirements of the future can be forseen at this time with sufficient definitude to indicate full development. and to establish the direction and magnitude of the technical programs needed to realize development.

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pioneer terrain reconnaissance, weather reconnaissance, and high yield bomb damage assessment. A second mission is that of providing and maintaining continuous and comprehensive surveillance of the electronic activities of Soviet Russia. Within this mission, it is expected to provide enemy order of battle, the capabilities of the enemies offensive and defensive systems, indication of enemy intentions, their electronic activities schedules, and their utilization of the frequency spectrum. It is also recognized that a test program will be involved and will require the launching of instrumented test vehicles. One such vehicle will be a Research laboratory model able to obtain and transmit to the earth scientific data on space environment. The Advanced Reconnaissance System has co-missions, physiographic and ferret, and involves a testprogram utilizing a satellite vehicle. These design studies are expected to culminate in a straightforward plan for the development of a complete reconnaissance system within the framework of the missions; along with the latest and most realistic estimates of full scale development, both time and costwise. This information is of vital importance to the final decision as to whether or not this nation is to have a satellite borne reconnaissance system.

Noting, the Program Implementation Chart it can be seen what was considered an appropriate program for the next few years. Note here that prior to 1 July of this year the program was carrying only individual tasks aimed at state-of-the-art advancement. Beginning with July this year (actually 15 June 1955) the design phase was undertaken and is currently under way with Lockheed, Radio Corporation of America, and Glenn L. Martin doing design studies. Concurrently, is the continuation of the state-of-the-art tasks under this project. On 1 July of next year, the Weapon System Project Office is scheduled to receive from the design study contractors, design studies from which may be prepared, if feasible, a development plan. This development plan may be expected to be completed by about 1 October of next year. From the

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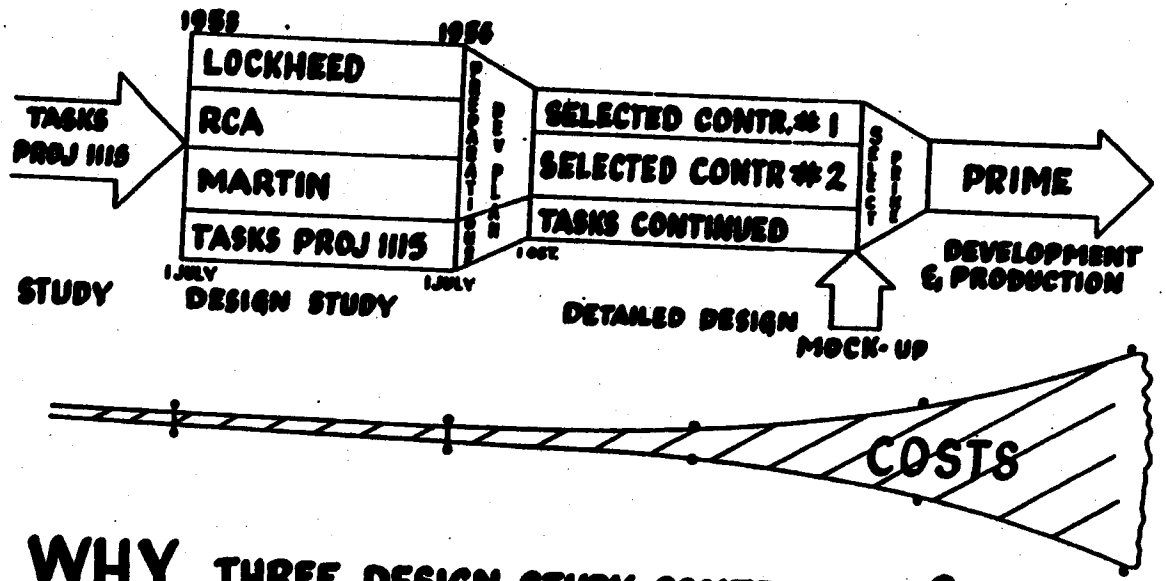
PROGRAM IMPLEMENTATION



WHY THREE DESIGN STUDY CONTRACTORS?

1. RELATIVE SMALL COST OF DESIGN STUDY TO DEVELOP COSTS
2. SUFFICIENTLY DIFFERENT APPROACHES TO PROBLEM INDICATED IN PROPOSALS
3. ENHANCES COMPETITIVE NATURE OF STUDY & DEVELOPMENT

[redacted]

[redacted]

problem of making a final evaluation of whether or not, from the design studies, it can be determined that a satellite form reconnaissance system is feasible and if a system is feasible, which of the design studies and their contractors reflect the best competence for continuing in the detail design phase. We must decide which of the design studies should continue. For this purpose there has been established an Advisory Group made up from the Centers and covering the various Technical Areas of the system and also containing people of sufficiently recognized overall stature to make a sound evaluation. This team, it is felt, will be able to follow the program throughout its design study phase and will be better able, at the time of receipt of the design studies, to make a best evaluation and recommendation.

Little has been said to this point of the problems that are foreseen or that are given considerations at this time. There are of course many, both technical and management-wise. The technical problems, can be attacked if they are recognized and those that are recognized are being attacked through our technical tasks. But have we recognized all of the critical areas which need to be investigated?

In recognizing that there may very well be critical areas that are not being covered the Weapon System Project Office is constantly vigilant for signs that indicate that we may be over-looking some area. As the program continues full use will be made of recognized leaders for guidance as to areas that should be covered. Notably, from our consulting service contract, it is expected that this type of competence to review our work will be gained.

Then of course the very nature of a satellite platform has its problems. There is a virtual absence of information as to the environment in which it will be operating. Therefore, the requirement for an early geophysical

and environmental collection program is recognized, and in realization of this problem the project is anxious to participate with the scientific community in general, or others who may have programs under way which will provide us with these geophysical data. For only when this information is available can the designers proceed in the engineering manner to which they are accustomed. It is also recognized that if the scientific community in general, or others, do not have under way or do not plan to conduct programs which will provide this information, it will necessarily become an early part of this our program to collect geophysical information. It is felt that this system probably is the only military system that can logically place valid requirements for data collection against any orbiter that may come into existence.

Also, there is that problem of funneling, by one means or another, all the work that is being done in the state-of-the-art advance into the design studies and into the design itself. This is no simple problem. Here again both of the operating sections realize that this must take place and they are constantly striving to assure that work done by others reaches the design study contractor. It can be reported at this time that there has been a recognition on the part of the design study contractors that if they are to remain competitive they must utilize all information that is available from outside sources.

There is also the problem of the security of the program. As pointed out before, there is a genuine realization by the Weapon System Project Office that a principal advantage can be gained in the military application of the system if the program in its development can be kept secure: and the Weapon System Project Office is striving to carry out a

[redacted] [redacted]

secure program. Inherent in carrying out a secure program are a multitude of problems associated with the day to day activities of the management people. We are also constantly wary to secure that precedents relating to the use of satellite vehicles are not established which might hamper this system in its test phase of military application. We recognize that the satellites which may come about as a result of the MIT Program can provide the program with much of the engironmental data. Again though, it is recognized that there may be precedents established which would preclude our own test programs and which might at sometime preclude the utilization of the system except in war time.

In conclusion, it is desired to highlight some of the points which it is felt have been important. First, the object of the Advanced Reconnaissance System Program, at this stage, is one of proving feasibility. (By experimentation and actual rigging). There is enthusiasm that a workable system will evolve. But, the door is open and all information will be entertained to support that this is an unfeasible concept and that further Air Force dollars should not be spent as such. (2) The program, at this time, is considering only such items as are critical to a satellite space-borne reconnaissance system. (3) Wherever it appears to be feasible, the element of competition is interjected and it appears at this time that through this competition that the Air Force has gained benefits. (4) The Program has a system concept. This is visualized as a system from the point of launching a vehicle into orbit for the purpose of the collection to the dissemination of the intelligence information. (5) The program at the present time is organized and carried out as a straightforward Weapon System Project Organization utilizing the services of the participating Center. (6) There are many problems and they can be summarized as follows: that of the lack of geophysical information upon which detail design can be initiated. It is recognized that the program may be deficient [redacted] overlooking critical

[redacted]

[redacted]

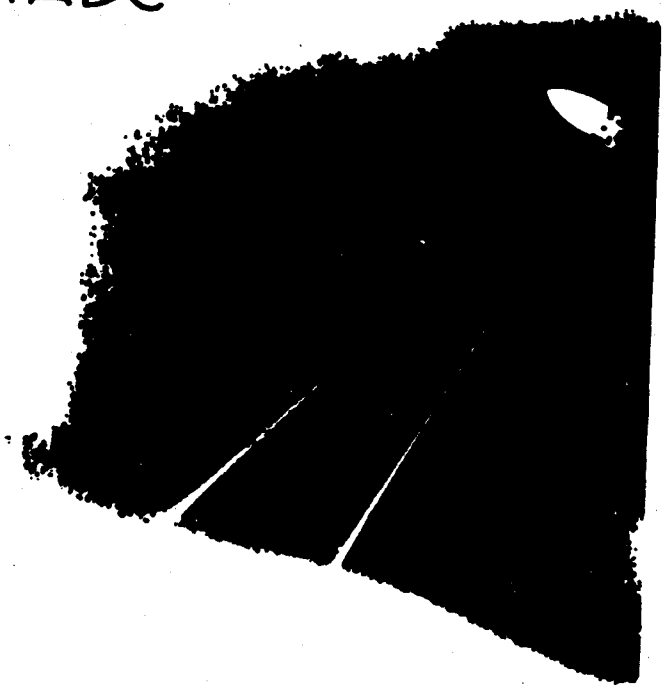
[illegible]MITTED STUDY

RADC

CONTRACTOR [illegible]

ENGINEER [illegible]

c/o: Provide [illegible]
the ARS project [illegible]
their contract [illegible]
in the design [illegible]
ing formulas [illegible]
all pe[illegible]
Para[illegible]
pres[illegible]
inform[illegible]



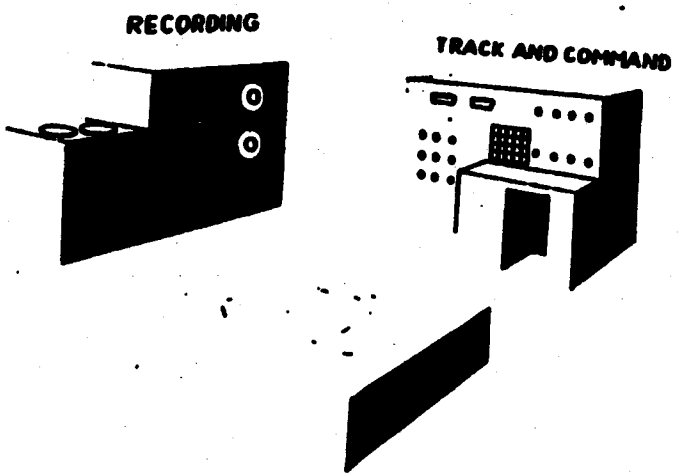
[redacted]

Study of Intelligence Processing Methods

[redacted] CONFIDENTIAL

TASK [illegible]

RADC



CONTRACTOR: TO BE SELECTED

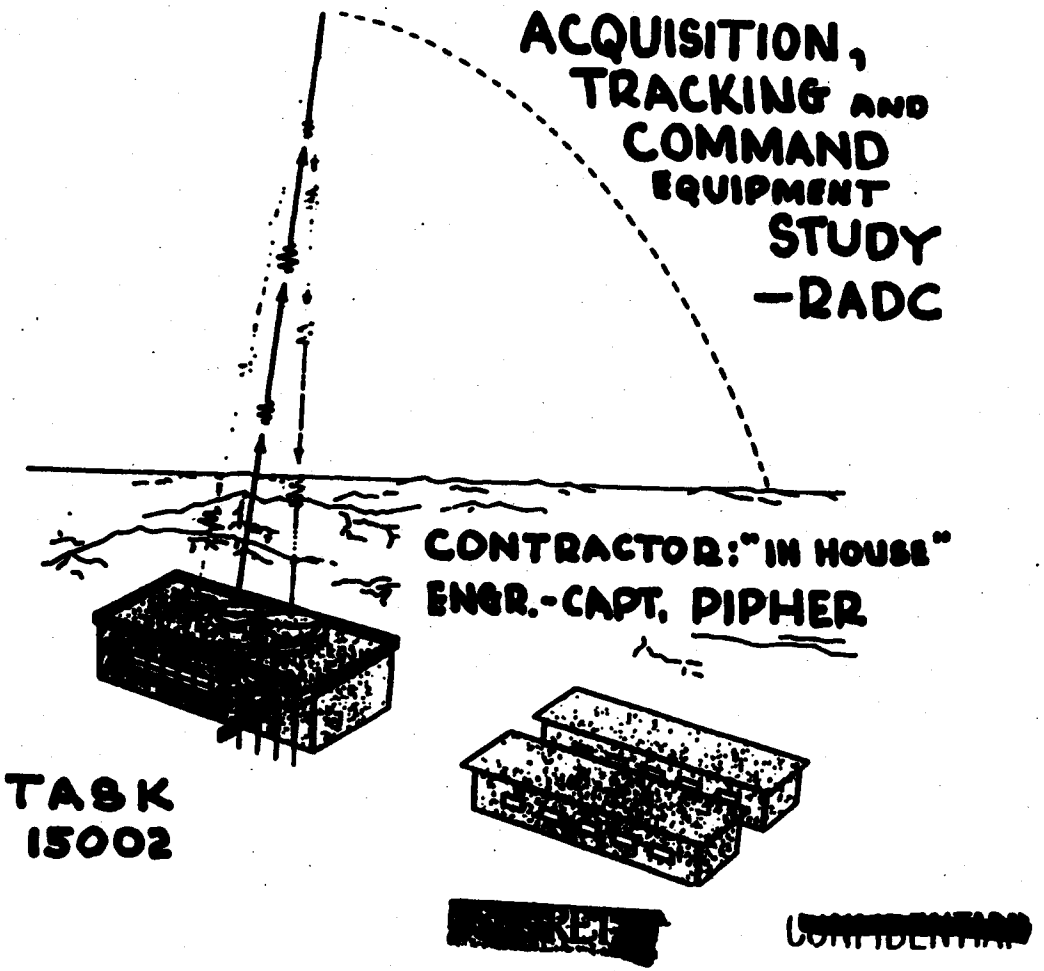
ENGINEER: R.H. JOHNSON RADC

To determine systems and equipment design characteristics essential to the processing and dissemination of intelligence information relative to the ARS system.

SECRET [redacted]

[redacted]

[redacted]



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DESIGN STUDY
ADVANCED RECONNAISSANCE SYSTEM MX 2226
TASK 21010

CONTRACTORS: GLENN L. MARTIN, LOCKHEED AIRCRAFT AND RADIO CORP. OF AMERICA.

ENGINEER : F.C. RUNGE

OBJECTIVE : To determine whether a military intelligence system aimed at satisfying the national intelligence requirements of the future can be forseen at this time with sufficient definitude to indicate full development; and to establish the direction and magnitude of the technical programs needed to realize development.

[redacted]

55-RDZ-9554

[redacted]

[redacted] [redacted]

SPECIAL RESEARCH STUDIES

TASK 21011

CONTRACTOR : NONE

ENGINEER : CAPT. J.S. COOLBAUGH

OBJECTIVE : SR No. 5 dated 29 Nov. 1954 directs that ARDC make maximum use of the scientific & technical competence within the nation. This competence should be recognized & utilized when required in a *CONSULTANT* and *ADVISORY* capacity by the Weapons Systems Project Office responsible for the Advanced Reconnaissance System.

[redacted]

55-RDZ-9554

[redacted]

[redacted] (CONFIDENTIAL)

ADVANCED RECONNAISSANCE SYSTEM

TASK - 1115-30205

TITLE- COMPONENT DEVELOPMENT FOR ROCKET ENGINES USING HIGH PERFORMANCE PROPELLANTS (FLOURINE)

ENGINEER - Capt. R. S. Decker, Power Plant Lab, WCLPN, WADC

CONTRACTOR - NORTH AMERICAN AVIATION

OBJECTIVE:

Effort under this task will be devoted to basic experimental investigations and tests of high performance rocket engine propellants and the establishment of design parameters for the development of a 35000 lb. thrust chamber using a flourine-ammonia combination.

[redacted] (CONFIDENTIAL)

55 RDZ-9554

ADVANCED RECONNAISSANCE SYSTEM.

Brief

PHILOSOPHY OF ORGANIZATION:

In carrying forward from the Feedback Program, a course of action is indicated which calls for the accomplishment of two major objectives:

First, we must establish that the critical components of this reconnaissance system will, in fact, be attainable and will perform the functions for which they are designed - we must establish a satisfactory state-of-the-art with respect to the critical components.

Second, we must ascertain that various components can be successfully integrated into a working reconnaissance system.

Both of these objectives being of the same importance to the success of the program, it is anticipated that each will require about the same amount of management personnel and direction. It is further anticipated that both objectives will be of a continuing nature for the next 2 or 3 years and will be generally definable within the program. There will be the requirement that they be closely coordinated. These two (2) general objective areas are delineated in the Project Illy Development Plan and in the System Requirement (illegible) for the Advanced Reconnaissance System (ARS).

Predicated upon the discreteness of the two (2) objective areas, an organization of the ARS Weapon System Project Office will have a functional breakdown into two major sections to handle the two (2) objective areas. These two (2) functional sections are to be known as the Technical Program Section and the System Integration Section.

The Technical Programs Section will require technical expertise to carry out its technical programs aimed at state-of-the-art advancements and will be responsible for technical interaction with [illegible] and the direction and [illegible] of technical contracts. It will be responsible for the determination of the level of technical effort required to meet specific requirements and will be responsible for monitoring the technical progress of contracts. It will be responsible for maintaining close working relationships with [illegible] to be maintained between its members and others (including technical advisors) to assure the proper coordination of efforts within the policies and directives received from the Weapon System Project Officer, higher authority, and the approved Development Plan. Included in the authority assigned this section will be the authority to establish such technical tasks and/or projects as may be necessary. Technical tasks presently underway in the laboratories at RADC will fall under the cognizance of Technical Programs Section. The Acquisition Tracking and Command Equipment Task at RADC will also fall in this Section. One of the tasks at RADC (Intelligence Information Handling and Intelligence Processing) and the Geographical Programs Branch will be under the cognizance of the System Integration Section as well as the Design Study Task. Future tasks will be made cognizant to the appropriate section.

As an adjunct to the ASIC management will be a clerical organization to serve in the sense of staff capacity. It is felt that in any major system organization there will be a requirement for administrative assistance to the responsible parties. There are in effect in this program various operational functions which must be coordinated to minimize personnel requirements and insure economy and effectiveness. Secondly, a single periodic report to higher headquarters requires a single integrated report for the various aspects of the program. This management reporting and coordination can best be effected through staff assistance to the Weapon System Officer. The organization will have an "Operations and Administration" manager for this "staff" assistance.

will recognize their ultimate responsibility for the technical adequacy of the system.

There appears to be a requirement for officers (military or civilian) in a clarification of R&D administrators to serve the two principle sections of the organization and their associated functional divisions in the Air Force in the future. Beneath these heads, personnel with technical specialities appropriate to the system would be desirable. An R&D Staff Assistant should be assigned to the position the Operations and Administration "Staff." the AFSC SSPO. It is inadequate and many of the working arrangements of the organization remain implicit. There is nothing inflexible about the chart and changes will be necessary. Alteration and/or expansion of the organization will be studied from time to time in light of changes in objective, personnel assigned and relationships required.

A Technical Advisory Group, consisting solely of individuals with confidential scientific, technical, and management competence will be required to advise, counsel, and guide the successful integration of this system, and to evaluate, to this end, the contractor's progress in the design, study and system development. The enlistment of all available "real talent" to monitor the system progress is deemed the only solution to culturing the threshold state-of-the-art into the reality of a reliable system.

ADVANCED RECONNAISSANCE SYSTEM

WEAPON SYSTEM PROJECT OFFICE

WEAPON SYSTEM PROJECT OFFICER - Lt Col W. G. King, Jr/ Mr. R.B.Copeland GS-13

FUNCTION: The Advanced Reconnaissance Weapon System Project Office is the control point for the management control of the Advanced Reconnaissance System Program. It is established to achieve proper phasing of actions in development, procurement, maintenance, and supply, thereby insuring timely delivery and support of the Advanced Reconnaissance System. It provides the control contact point for Industry - Air Force relations. T-1

This function will be accomplished within the framework of the approved Development Plan and appropriate direction from higher headquarters utilizing the services of assigned ARS WPO personnel and the personnel and facilities of Participating Centers.

STENOGRAPHIC & CLERICAL

STENOGRAPHER - E. Pendleton- GS-4

FUNCTION: Stenographic Assistance T-5

OPERATIONS AND ADMINISTRATION

R & D STAFF ASSISTANT - UNASSIGNED

FUNCTION: Serves as a staff member of the ARS Weapon System Management, providing staff guidance and continuity to the administration and operation of the Weapon System Project Office. T-4

TECHNICAL PROGRAM SECTION

R & D ADMINISTRATOR -Capt J.Coolbaugh-1/Lt A.Barber

FUNCTION: As a line member of the ARS Weapon System Project Management, the Technical Program Section will, through the appropriate Laboratories and Research Agencies of ADC, RADC, and AFCRC, assure & exercise technical cognizance over the ARS technical program aimed at state-of-the-art advancement and providing component development to show feasibility of the various system components.

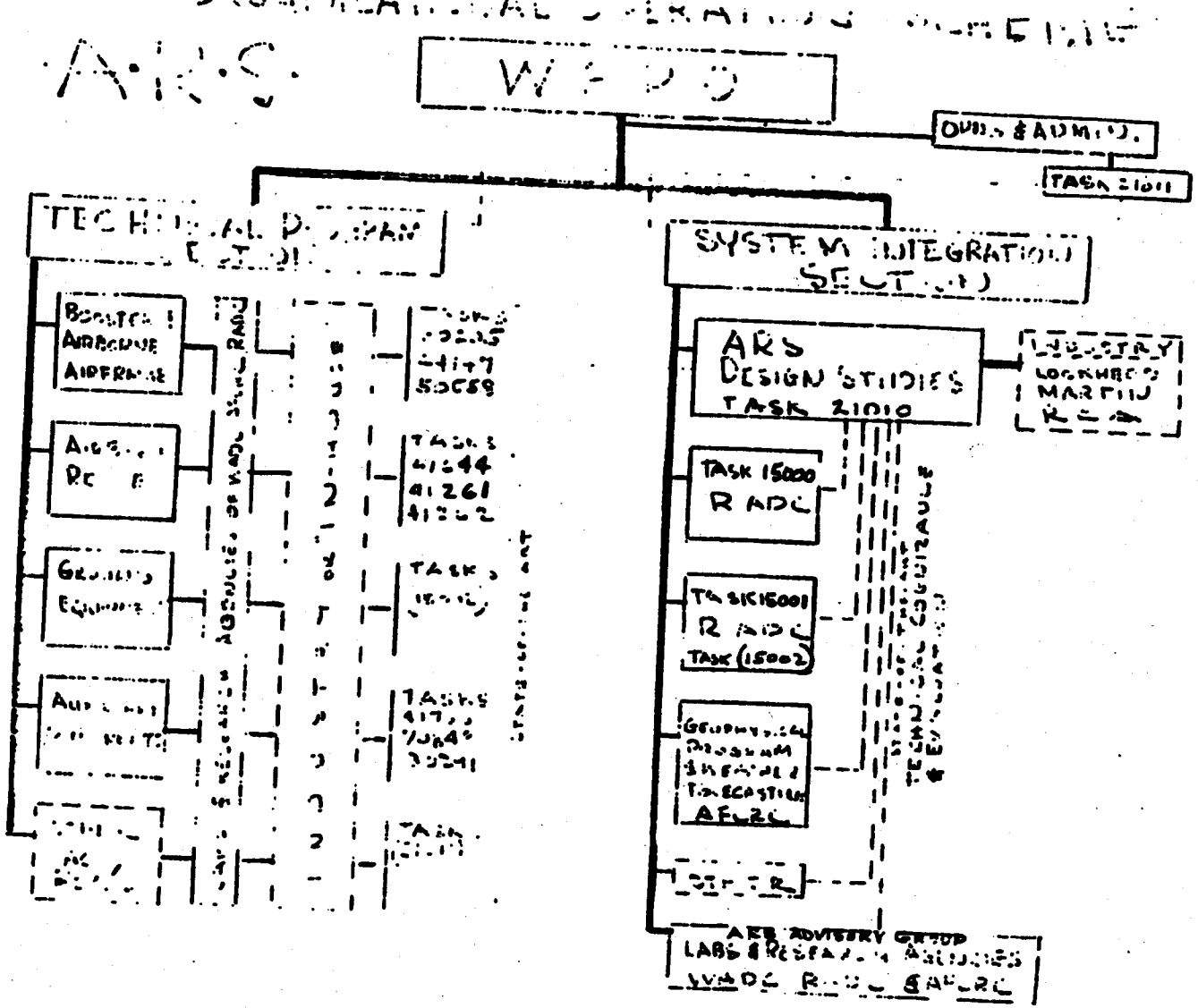
As a representative of the ARS Weapon Systems Project Office, serves as Coordinator in liaison and presentations with elements of the Air Force and other Agencies. T-2

SYSTEM INTEGRATION SECTION

R & D ADMINISTRATOR - Capt W.O. Troeschel

FUNCTION: As a line member of the ARS Weapon System Project Management, the System Integration Section will, through the appropriate participating centers assure and exercise technical cognizance over the ARS System Integration program aimed at determining whether a military intelligence system aimed at satisfying stated intelligence requirements can be foreseen at this time and to establish the direction and magnitude of the technical program required to realize development.

As a representative of the ARS Weapon System Project Office, serves as coordinator in liaison and presentations with elements of the Air Force and other Agencies. T-3


ARS
WPPO
OPNS & ADMIN.
TASK 21011
SYSTEM INTEGRATION SECTION
ARS DESIGN STUDIES TASK 21010
INDUSTRY LOCKHEED MARTIN
TASK 15000 RADC
TASK 15001 RADC
TASK (15002)
AFRL
ARS ADVISORY GROUP

Advanced Reconnaissance System

WEAPON SYSTEM PROJECT OFFICE

I. FUNCTION

The Advanced Reconnaissance Weapon System Project Office is the control point for the management control of the Advanced Reconnaissance System Program. It is established to achieve proper phasing of actions in development, procurement, maintenance, and supply, thereby insuring timely delivery and support of the Advanced Reconnaissance System. It provides the Central contact point for Industry - Air Force relations.

This function will be accomplished within the framework of the approved Development Plan and appropriate direction from higher headquarters utilizing the services of assigned ARS WSPO personnel and the personnel and facilities of Participating Centers.

TECHNICAL PROGRAM SECTION

I. FUNCTION:

As a line member of the ARS Weapon System Project Management, the R&D Administrator for Technical Program will, through the appropriate Laboratories and Research Agencies of WADC, RADC,&AFCRC, manage and exercise technical cognizance over the ARS technical program aimed at state-of-the-art advancement and providing component development to show feasibility of the various system components.

As a representative of the ARS Weapon Systems Project Office, serves as Coordinator in liaison and presentations with elements of the Air Force and other Agencies.

II. RESPONSIBILITIES AND AUTHORITY:

Within the limits of the approved System Program, regulations and directives of higher headquarters and WSPO policies and procedures, the R&D Administrator for Technical Program is responsible for and has commensurate authority to accomplish the fulfillment of the duties set forth below. He may delegate to members of his organization and to members of appropriate laboratories and research organizations technical portions of their responsibilities, together with the appropriate authority for their fulfillment, but he may not delegate or relinquish his overall responsibility for the results of the ARS Technical Program.

A. Operations and Activities

1. Formulates or receives and recommends for approval, policies

for carrying out a technical program to satisfy the requirements of the Advanced Reconnaissance System and will administer such policies when approved.

2. Will establish and administer procedures pertaining to the Technical Program.

3. Will establish, through appropriate agencies, definitive tasks, aimed at eliminating technical problems contemplated in component development or as may be required to advance the state-of-the-art to assure component feasibility.

4. In conjunction with the R&D Administrator for System Integration, will anticipate problem areas associated with the integration of components into the system, establishing technical tasks to alleviate these problems.

5. Serves as a system office member on Evaluation Teams for contractor proposals and competitive contracts; and in recommendations for sole-source contracts.

6. Maintains as a part of the system office files appropriate technical documents relating to technical tasks. As required, arranges with Task Project Engineers for release of task reports to agencies having the need-to-know. Establishes this need-to-know to obtain technical reports and liaison for technical task contractors within the ARS Technical Program.

E. Organization

Will recommend changes in the basic structure and complement of

the Technical Program Section.

C. Budgeting and Program Documentation

1. Will make recommendations for amounts and types of funds required to carry out the technical program.

2. Monitors the preparation of Purchase Requests and Work statements and recommends approval thereof for contracts within the Technical Program.

3. Recommends alteration in program funds distribution during the fiscal year as may be required to adjust technical program as new problem areas arise.

4. Drafts Program Documentation for the ARS Technical Program as required under ARDC Reg 80-4 and other pertinent directives.

III. RELATIONSHIPS:

The R&D Administrator for Technical Program will observe and conduct the following relationships. He may delegate portions of the conduct of such to members of his section, but may not delegate his overall responsibility or accountability for their proper conduct.

A. With the ARS Weapon System Project Officer.

1. Accountable to the WSPO for the fulfillment of function, responsibilities and authority, and relationships, and for their proper interpretation.

2. Will relieve the WSPO of Administrative detail as outlined in this guide or as specified.

B. With the R&D administrator for System Integration Program.

1. Will coordinate the activities of the section with those of the System Integration Section on matters of Mutual concern.

C. With the ARS Operations and Administration Unit.

1. Will seek and accept the functional guidance from this unit with respects to administrator practices, documentation, budget practices, and standardization of operations.

D. With Laboratories & Research Agencies of WADC, RADC, and AFCRC.

1. Will seek the technical guidance of these agencies in matters relating to the Technical Program.

2. Will act for and in behalf of the WSPO in liaison, coordination and correlation of the technical advice of these agencies and maintain such formal relationships as may be necessary to assure that sufficient documentation exhibits are available to allow review of the relationship by the WSPO and others.

E. With Others.

1. In the conduct of these relationships, will establish and maintain those contacts necessary to the fulfillment of his function.

2. The WSPO may specify, from time to time, other relationships to be conducted.

SYSTEM INTEGRATION SECTION

I. FUNCTION:

As a line member of the ARS Weapon System Project Management, the R&D Administrator for System Integration will, through the appropriate participating centers manage and exercise technical cognisance over the ARS System Integration program aimed at determining whether a military intelligence system aimed at satisfying stated intelligence requirements can be forseen at this time and to establish the direction and magnitude of the technical program required to realize development.

As a representative of the ARS Weapon System Project Office, serves as coordinator in liaison and presentations with elements of the Air Force and other Agencies.

II. RESPONSIBILITIES AND AUTHORITY:

Within the limits of the approved System Program, regulations and directives of higher headquarters and WSPO policies and procedures, the R&D Administrator for System Integration is responsible for and has commensurate authority to accomplish the fulfillment of the duties set forth below. He may delegate to members of his organization and to members of appropriate participating centers technical portions of these responsibilities together with the appropriate authority for their fulfillment, but he may not delegate or relinquish his overall responsibility for the results of the ARS Technical Program.

A. Operations and Activities.

1. Formulates, or receives and recommends for approval, policies for carrying out a system integration program to satisfy the requirement of the Advanced Reconnaissance System and will administer such policies when approved.

2. Will establish and administer procedures pertaining to the System Integration Program

3. Will establish through appropriate agencies, studies by industry aimed at determining whether a military intelligence system should be taken under development and to determine the extent of a technical program required to undertake this development.

4. In conjunction with the R&D Administrator for Technical Program, will anticipate problem areas associated with the integration of components into the system, recommending technical tasks to alleviate the problems. Will systematically dessiminate to study contractors the technical information becoming available from ARS Technical tasks, state of the information, and other pertinent technical information from whatever source available for consideration in the preparation of studies.

5. Serves as a system office member on Evaluation Teams for Contractor proposals and competitive contracts, and in recommendation for sole-source contracts.

6. Maintains as a part of the system office files appropriate study documents relating to system integration. As required, arranges with Study Contractors for release of System Study reports to agencies

having the need-to-know. Establishes this need-to-know, to obtain technical reports and liaison for Study contractors within the ARS Program.

7. May establish definitive tasks, through appropriate agencies, to support the System Integration.

B. Organization.

Will recommend changes in the basic structure and compliment of the System Integration Section.

C. Budgeting and Program Documentation.

1. Will make recommendations for amounts and types of funds required to carry out the System Integration Program.

2. Monitors the preparation of Purchase Requests and Work statements and recommends approval thereof for contracts within the System Integration Program.

3. Recommends alterations in program funds distribution during the fiscal year as may be required to adjust system integration program as new problem areas arise.

4. Drafts Program Documentation for the ARS System Integration Program as required under ARDC Reg 80-4 and other pertinent directives.

5. Prepares and maintains, as a part of the system office files, such general Back-Up Documentation, ie. Proposal Evaluation, Competitive Contract Evaluation etc., as may be pertinent to the System Integration.

III. RELATIONSHIPS

The R&D Administrator for System Integration Program will observe

OPERATIONS AND ADMINISTRATION

I. FUNCTION:

Serves as a staff member of the ARS Weapon System Management, providing staff guidance and continuity to the administration and operations of the Weapon System Project Office.

II. RESPONSIBILITIES:

Within the directions of the Weapon System Project Office and pertinent regulations and directives, will establish and coordinate practices and procedures including but not limited to the following: Management Reports, Budgeting, Security, Presentation and chart control, program documentation and reporting system, system file maintenance, technical report distribution, contract files, and time and cost assignment.

Will establish and actively manage such technical or consulting tasks as may be directed by the Weapon System Project Office.

and conduct the following relationships. He may delegate portions of the conduct of such to members of his section, but may not delegate his overall responsibility or accountability for their proper conduct.

A. With the ARS Weapon System Project Officer.

1. Accountable to the WSPO for the fulfillment of function, responsibilities and authority, and relationships, and for their proper interpretation.

2. Will relieve the WSPO of Administrative detail as outlined in this guide or as specified.

B. With the R&D Administrator for Technical Program.

1. Will coordinate the activities of the section with those of the Technical Program on matters of mutual concern.

C. With the ARS Operations and Administration Unit

1. Will seek and accept the functional guidance from this unit with respects to administrator practices, documentation, budget practices, and standardization of operations.

D. With Laboratories and Research Agencies of WADC, RADC, and AFCRC.

1. Will seek the technical guidance of these agencies in matters relating to the System Integration Program.

2. Will act for and in behalf of the WSPO in liaison, coordination and correlation of the technical advice of these agencies and maintain such formal relationships as may be necessary to assure that sufficient documentation exhibits are available to allow review of the relationship by the Weapon System Project Office and others.

E. With Others.

1. In the conduct of these relationships, will establish and maintain those contacts necessary to the fulfillment of his function.

2. The Weapon System Project Office may specify, from time to time, other relationships to be conducted.

ADVANCED RECONNAISSANCE SYSTEM

TECHNICAL ADVISORY GROUP ORGANIZATIONAL PHILOSOPHY

The threshold state-of-the-art in which the majority of the planned sub-systems of the Advanced Reconnaissance System reside, mandate the establishment of a select group of highly competent advisors to support (including evaluation) and/or recommend actions to the Weapon System Office throughout the progress of the program. Personnel for such an Advisory Group were drawn from the Management and Technical Competence of the Participating Centers. (See letter dated 4 Oct 55) . Supplementing this competence, the full utilization of the outstanding scientist throughout the Nation is anticipated and this will be effected through the Special Research Study Contracts.

The establishment and coordinate operation of this Group was planned with considerable caution. It was emphasized from the inception that its membership would not constitute mere organization representatives, who took little active interest in the project outside of the meetings arranged for them to attend. Rather, individuals of specifically associated, direct talents and expressed interest in Advanced Reconnaissance System development were chosen.

Such a Group has been established as a formal part of the Advanced Reconnaissance System Organization and is, at present, actively engaged in evaluating the Contractor's First Quarterly Progress Reports. The Technical Advisory Group, as it is called, is a cardinal monitor of the System Integration Activity, as a whole. Members of this Group were chosen by virtue of Supporting Centers' recommendations.

Through this formal Advisory Group, it is hoped to preclude the randomness of endeavor often associated with extreme extensions of multiple state of the art and complex system integration.

Directorate of Systems Management
Wright-Patterson Air Force Base, Ohio

MDZSGG October 4, 1955

SUBJECT: Project 1115, Advanced Reconnaissance System, Technical Advisory Group

TO: Commander
Rome Air Development Center
Griffiss Air Force Base
Rome, New York (Also sent to AFCRC and WADC)

1. Reference is made to paragraph II.2. (Responsible Agency: Directorate of Weapons Systems Management and collaboration with participating Centers) of ARDC S.R. No. 5, and also, to AFR 80-4, which emphasizes a continuing objective of ARDC to promote the maximum utilization of all its resources, particularly that of technical competence and experience (Chapter 1, Section IV, Paragraph 5.e).

2. In view of the above direction, and an immediate need for formalizing the establishment of a qualified Advanced Reconnaissance System Technical Advisory Group to guide the development of the system, presently in crucial formative stages, it is recommended that the following participating Centers and supporting agencies submit a list of individuals who will function as members of such a group:

AFCRC: Directorate of Geophysics Research
Directorate of Electronics Research

RADC: Directorate of Intelligence
Directorate of Electronics

WADC: Directorate of Laboratories
Directorate of Research

3. This group should afford a combined technical and scientific competence in all major design and operational areas exhibited by an ultimate Advanced Reconnaissance System. Individual members should have at their disposal specifically assigned or supervised personnel qualified in sub-areas for advisory support of actions or decisions.

4. The joint team, or individual, activities will be coordinated with, or prescribed and arranged, by the Advanced Reconnaissance System Weapon System Project Office.

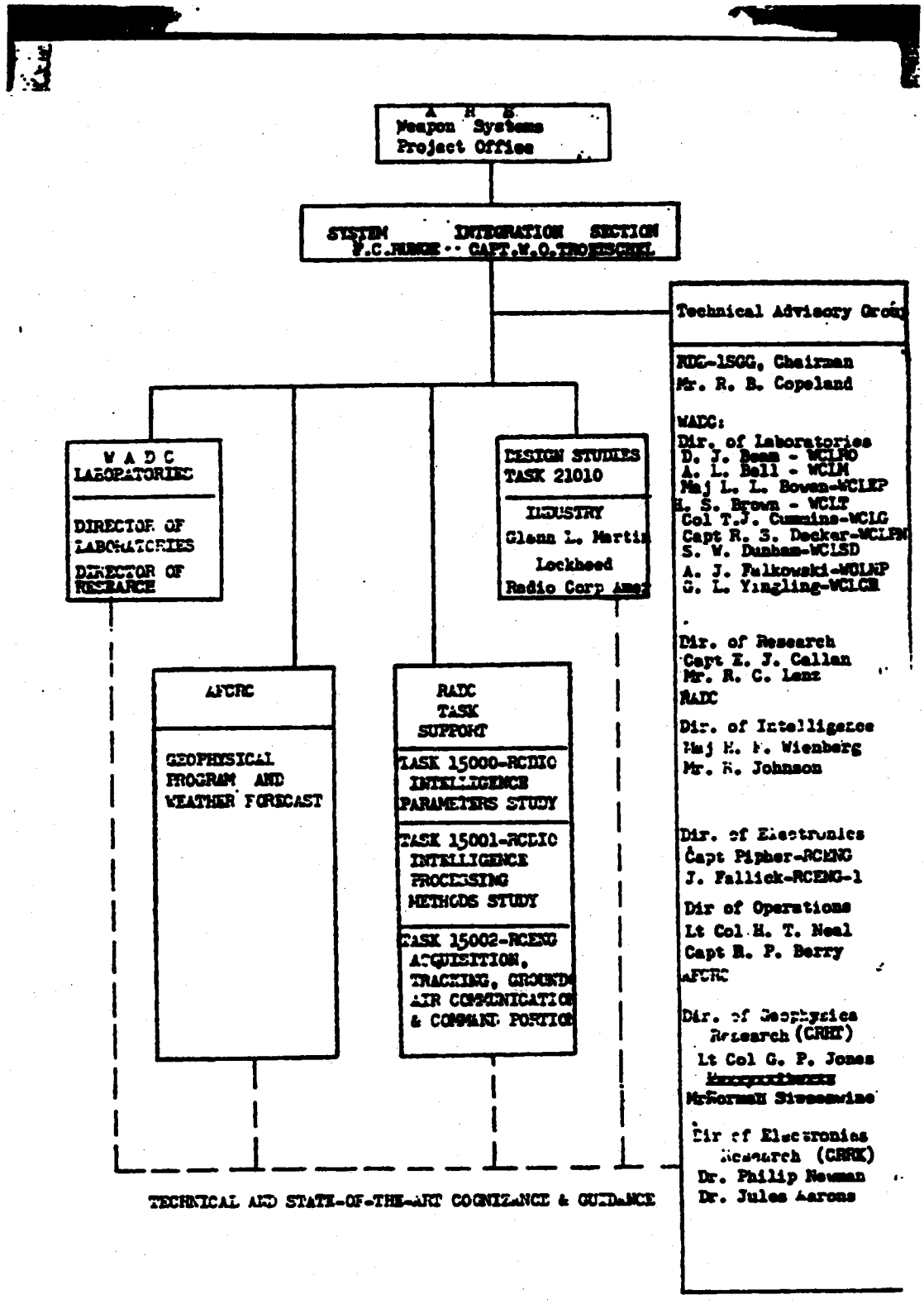
5. Suggestions and comments, as to team ground rules and operation, are invited, and will be aimed at an initial group meeting, and conclusions compiled for distribution.

6. The attached Functional Areas Chart clarifies the influential position of the Technical Advisory Group in the fulfillment of directed Advanced Reconnaissance System objectives.

FOR THE COMMANDER:

1 Incl:
ARS System
Integration Chart

/s/ WILLIAM G. KING, JR
Colonel, USAF
Chief, MX-2226 Weapon System Project Office
Bombardment Missile Division
Directorate of Systems Management



A R S SYSTEM INTEGRATION FUNCTIONAL AREAS CHART

PERSONNEL BRIEF

KING, WILLIAM G., JR LT COL, USAF 8356A

DUTY AFSC-8446 - Duty Assignment: Weapon System Project Officer, Advanced Reconnaissance System

EDUCATION AND TRAINING:

B.S.C.E., Kansas State College, 1946

MBA (Management of R&D), University of Chicago, 1954

Graduate of US Army Guided Missiles School (graduate level, 10 months course of academic training in aeronautics and electronics) 1949

Registered Professional Engineer, State of Kansas

RESEARCH AND DEVELOPMENT AND TECHNICAL EXPERIENCE:

Former U. S. Army duty with AntiAircraft Artillery and Corps of Engineers. Was one of three (3) Air Force Officers to attend the Army's Guided Missile School, at Fort Bliss, Texas. Upon completion of the school, was assigned to the Joint Long Range Proving Ground (later AFMTC) from 1950-1953. Assigned to duty with Directorate of Technical Operation and worked as officer in charge of the field parties which make the explorations for site selection of the Downrange Stations. Subsequently was assigned for a tour as Grand Bahaman Auxiliary Base Commander during the initial use of the range for Matador flights. Following this tour at Grand Bahaman, returned to AFMTC as Deputy Chief of the Technical System Laboratory. As such was responsible for providing facility planning and engineering of facilities and various special equipments for the Florida Missile Test Range. As the Range became completed, the responsibility for engineering was merged with responsibility for installation maintenance and the 6550 Installations Group formed. Became Commander of this Group and performed this assignment until assignment to the University of Chicago for the R&D Management Course.

Since completing the work at Chicago, assignment has been to Advanced Reconnaissance System Project Office.

PERSONNEL BRIEF

COPELAND, ROBERT B. CIVILIAN - GS-13 C-6234

DUTY ASSIGNMENT: Supervisory Aircraft Development Control Engineer (Bombardment Missile Division)
Assistant Weapon System Project Office - Advanced Reconnaissance System

EDUCATION AND TRAINING:

B.S. - Bowling Green State University - 1934

Post Graduate - University of Pittsburgh - Ohio State University

Air Force Introduction to Management

RESEARCH AND DEVELOPMENT AND TECHNICAL EXPERIENCE:

1941 to 1948 - Project Engineer for Remote and Automatic Flight Control Systems for Pilotless Aircraft, Missiles and Targets.

1948 - 1954 - Supervisory General Engineer, Chief of Remote Flight Control Section for Research and Development of Systems, Subsystems and components and Techniques for Remotely and Automatically Controlling Pilotless Aircraft, Guided Missiles, Targets, Drones and Guided Bombs. This work accomplished either as New Developments under Laboratory Engineering direction or specifically in support of Fighter and Bombardment Missiles Programs was concerned primarily with the following areas: autopilots, inertial guidance equipments, speed control systems and the application of new techniques including transistors, magnetic amplifiers, etc., to insure the maximum reliability consistant with requirements. The section furnished technical assistance and consultant services to the Weapon System Project Offices and Air Force Contractors in Remote Control and Stabilization of Guided Missiles for Flight testing and recovery. The Remote Control Section was

required to participate throughout the Air Force (Missile) Weapon Systems Development Program and included the final comments or recommendations for engineering approval prior to production release.

1954 to Present: Assistant Chief, Weapon System Project Office - MX-2226, Bombardment Missile Division Directorate of Systems Management.

PERSONNEL BRIEF

HUNGE, FRITZ C. GS-12 Civilian

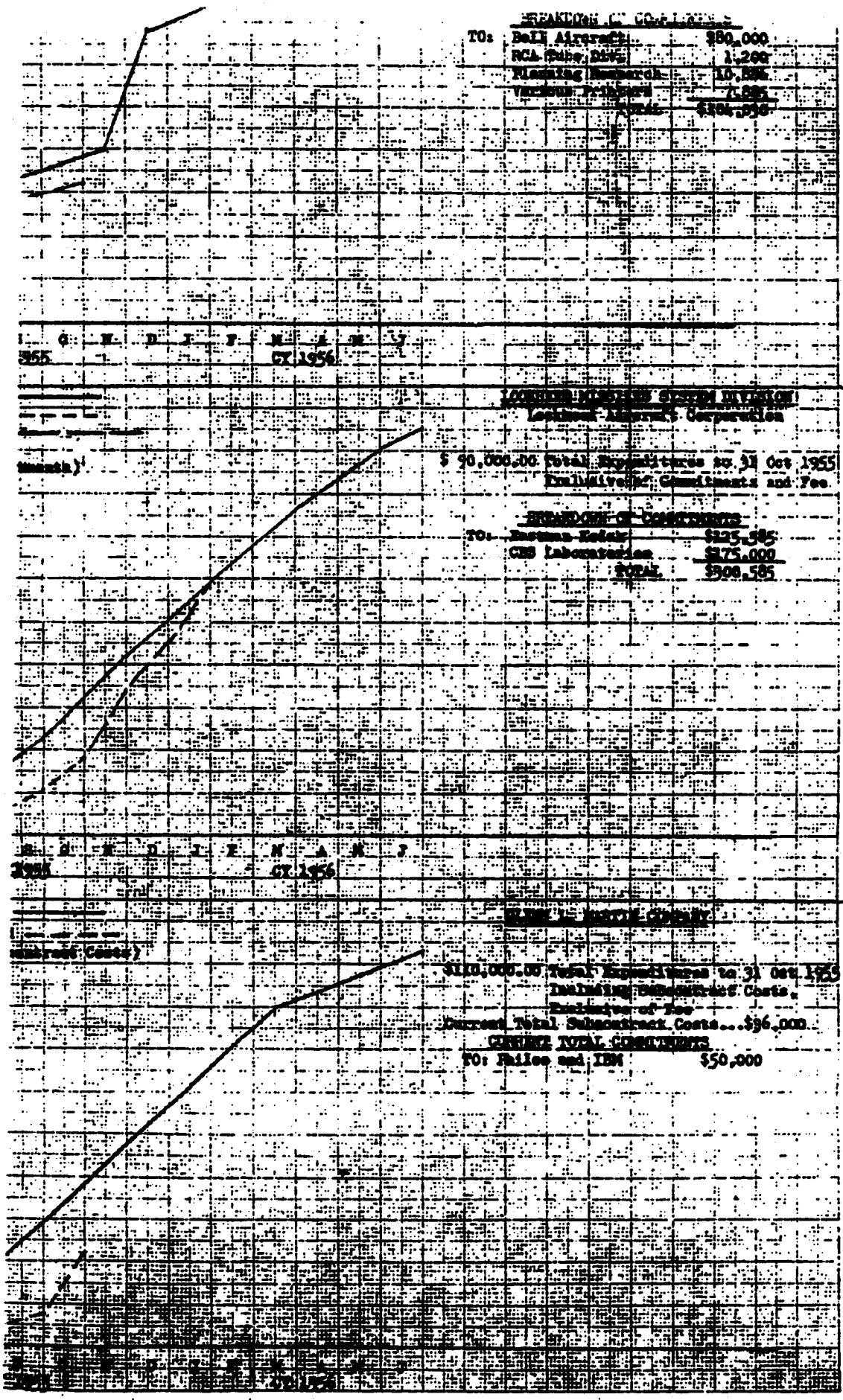
DUTY ASSIGNMENT: Chief, System Integration Section, Advanced Reconnaissance System

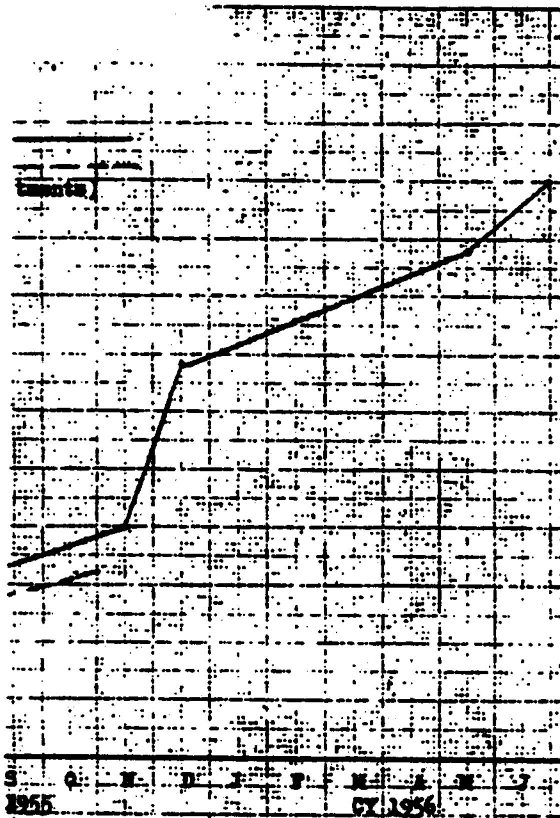
EDUCATION AND TRAINING:

B.M.E., General Motors Institute of Technology, 1949
General Motors Management Course, 1948
E.M. Electronics Fundamentals - Keesler AFB, 1951
USAFOCS, Lackland AFB, 1951
Officers Electronic Fundamentals, Keesler AFB, 1952
MATADOR Operations, Guidance and Control Officers' School, Lowry AFB, 1952

RESEARCH AND DEVELOPMENT AND TECHNICAL EXPERIENCE:

Latter phase of college co-op time and one year after graduation spent at Cadillac Motor, G.M. Corp., as New Developments Body Research Engineer. Latter part of service tour spent as research and development staff assistant to the MATADOR Project Officer, monitoring drone MATADOR, and all ground support equipment progress. Two years, Sep 53 - Sep 55, spent as flight and static test engineer, Redstone Missile Firing Lab., on extended loan from Chrysler Corp., Missile Branch, to establish familiarity with flight and static engine and missile testing to develop an eventual contractor firing capability. Six months were spent at Redstone Arsenal on Booster engine inspection firings, final inspection, and system studies. Three months were spent as part of the stand operating crew at NAA Santa Suzanna Redstone R&D and acceptance cold-flow stands (familiarization with data reduction and engine calibration). Six weeks as crewmember at WEPG-NAA Sook Stand - Redstone acceptance firings. One year as test engineer - ground and on missile components - Redstone Missile Firing Lab, Cape Canaveral, Fla. Participated there in numerous firing and transition to and development of new checkout and launch area.


TO: Bell Aircraft $80,000
RCA (Tube Div) 1,200
Planning Research 10,885
Varidyne Products 7,885
$104,970
I G M D J F M A M J
1955 CY 1956
$ 90,000.00 Total Expenditures to 31 Oct 1955
Inclusive of Commitments and Fee
TO: Eastman Kodak $125,585
CBS Laboratories $175,000
TOTAL $300,585
S O N D J F M A M J
1955 CY 1956
$110,000.00 Total Expenditures to 31 Oct 1955
Including Subcontract Costs,
Exclusive of Fee
Current Total Subcontract Costs...$36,000
TO: Philco and IBM $50,000

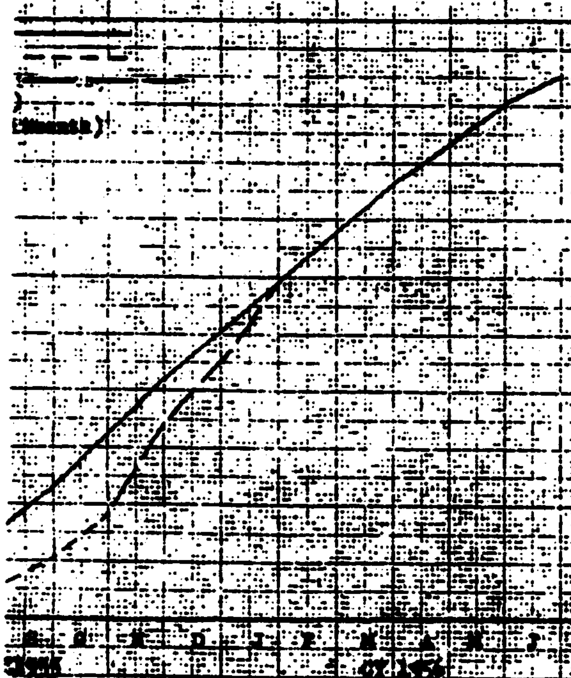


RADIO CORPORATION OF AMERICA
Engineering Products Division

$ 61,568	Total Expenditures to 31 Oct 1955
104,030	Commitments
$165,598	Total (Incl Prop. Amt Fee)

BREAKDOWN OF COMMITMENTS

TO:	Bell Aircraft	$80,000
	RCA Tube Div.	1,200
	Planning Research	10,8[illegible]
	Various Printers	7,885
	TOTAL	$104,030

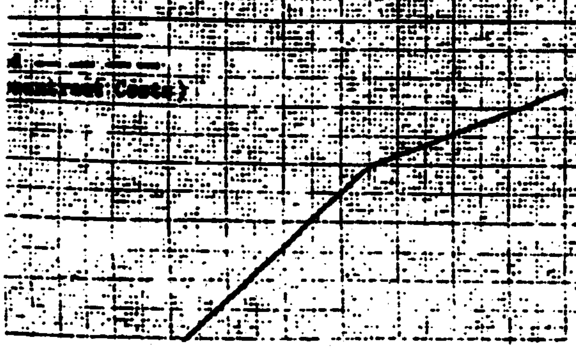


LOCKHEED MISSILES SYSTEM DIVISION
Lockheed Aircraft Corporation

$ 90,000.00 Total Expenditures to 31 Oct 1955
Exclusive of Commitments and Fee

BREAKDOWN OF COMMITMENTS

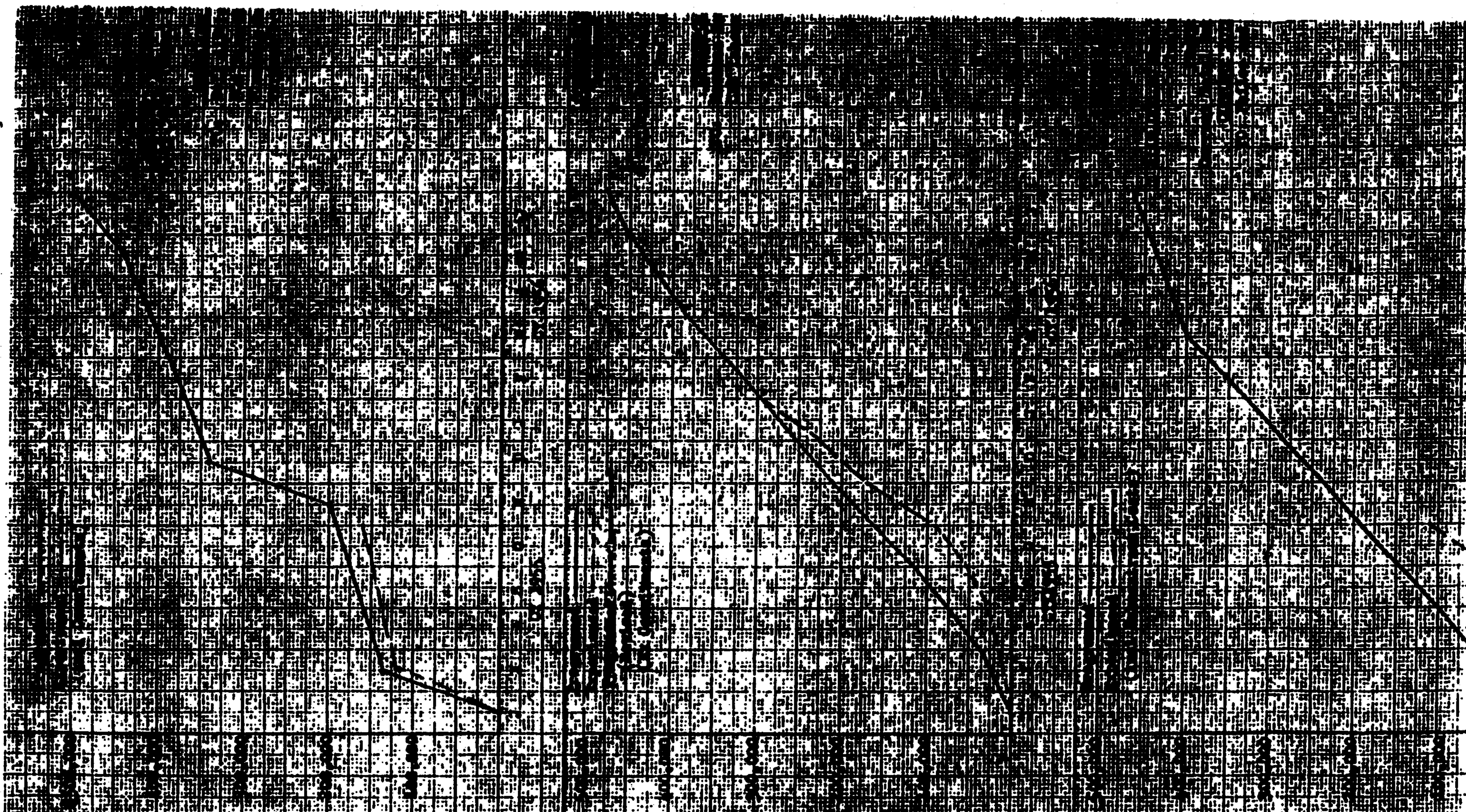
TO:	Eastman Kodak	$225,585
	CBS Laboratories	$275,000
	TOTAL	$500,585



[illegible] L. MARTIN COMPANY

$110,000.00 Total Expenditures to 31 Oct 1955
Including Subcontract Costs,
Exclusive of Fee
Current Total Subcontract Costs...$36,000

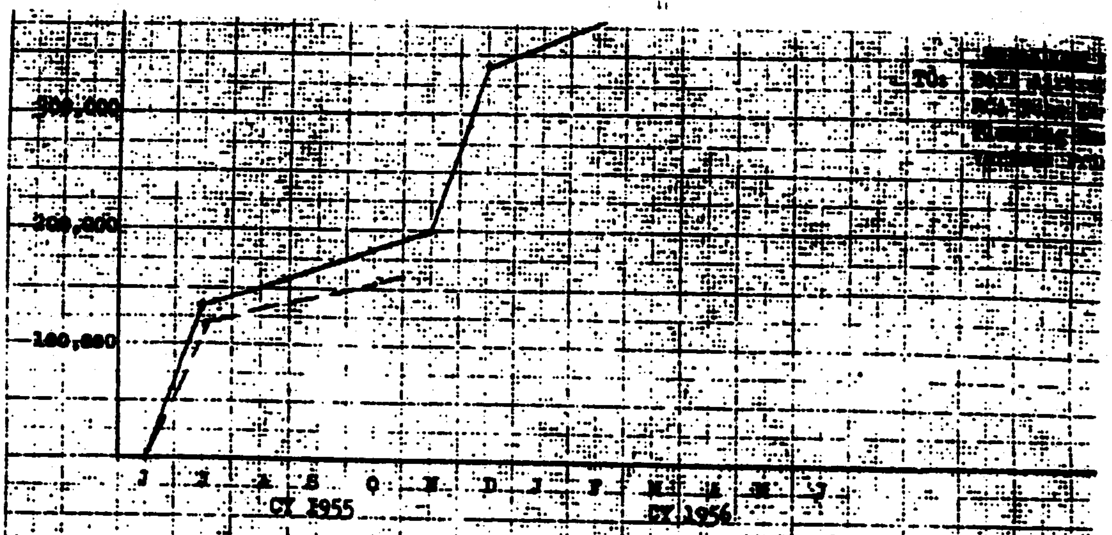
CURRENT TOTAL COMMITMENTS
TO: Philco and IBM $50,000

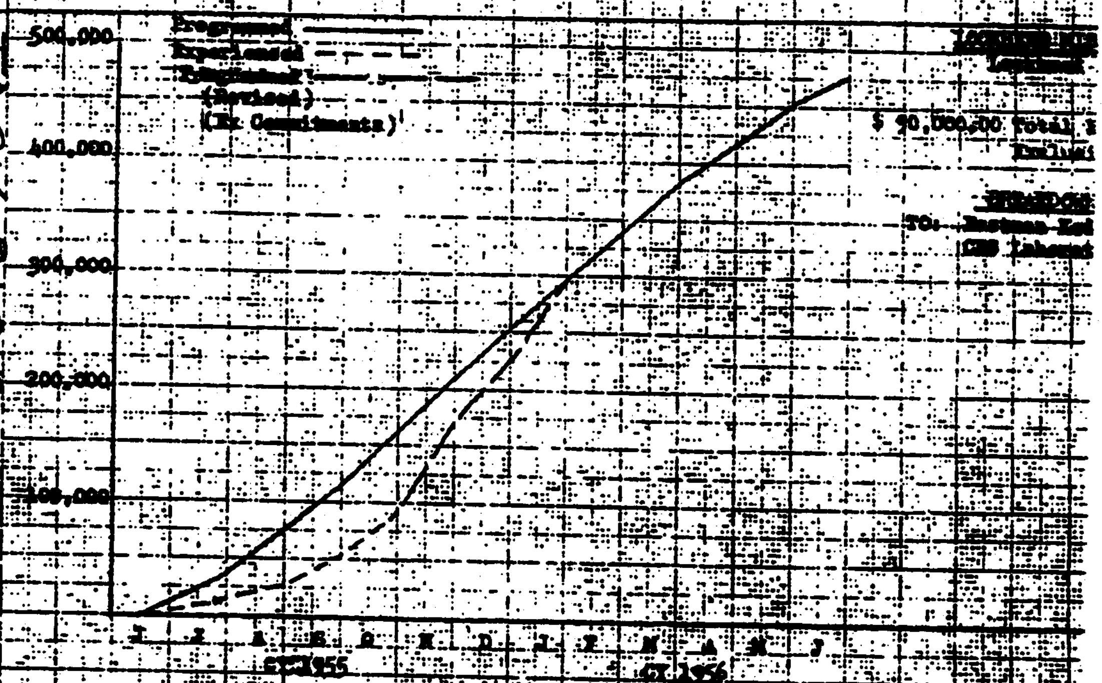


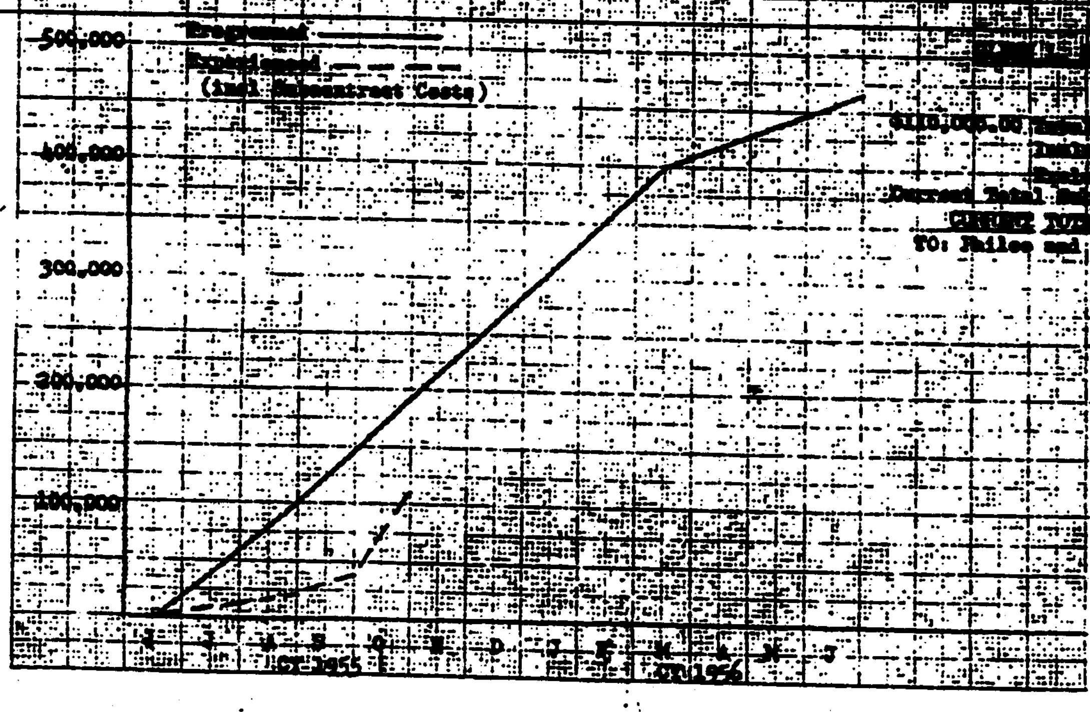
TASK 21010
EXPENDITURES

7 Nov 14

TASK 21010 EXPENDITURES







7 Nov 1955

TASK NUMBER AND TITLE	TASK MONITORS	MONITOR	PURCHASE REQUEST #	P.R. INITIAT. DATE	P.R. CONTINUED DATE	P.R. OBLIGATION DATE	CURRENT ACTIVE AMOUNT	CONTRACT NO. AF33(616)-	CONTRACTOR
22650 Design Study - Advanced Reconnaissance System WS2206	WADC WCRRR Mr. F. C. Hauge 30121	WADC Lt. R. S. Washburn 30232	UCRIN 175626			7 Oct 55	260,500 (60)	3104	R.C.A.
						30 Nov 55	260,500 (60)	3105	L.A.C.
						29 Jun 55	260,500 (60)	3106	G.E.M.
23081 Special Research Studies	WADC WCRRR Capt J. S. Coolbaugh 30121	WADC Lt R. S. Washburn 30232	UCRIN 692847	24 Jan 55	7 Oct 55	15 Dec 55 Target	40,000 (Est)	3291	Univ. of Michigan
41147 Attitude, Guidance and Control	WADC WCLRR-3 Mr. F. E. Gunthner 28145	WADC Lt J. U. Gay 23211	UCRIN 392706	22 Dec 55	28 Sep 55	15 Dec 55 Target	129,729 (Likely 60)	2137 Sup 10	M.A.A.
30898 Attitude, Guidance, onControl	WADC WCLRR-5 Lt W. O. Covington 31230	WADC Lt. A. A. Kaufman 23211	UCRIN 392563	1 Aug 55	20 Sep 55	7 Nov 55 Target	300,000 (Est)	2039 S/A 10	M.I.T.
			392972	15 Dec 55 Targ t			25,000 (EXCESS)	"	"
30898 Auxiliary Power Plant for A.R.S. (Nuclear)	WADC WCLPD Lt. C. E. Johnson 28147	WADC Lt R. S. Washburn 30232	UCRIN 1599	15 Dec 55 Targ t.		31 Dec 55 Target	700,000 (EXCESS)		Not Yet Chosen
70843 Auxiliary Power Plant for ARS (Solar)	WADC WCRRR Mr. L. L. Antes 22154	WADC Lt. R.E. Schuldmann 29236	UCRIN 4095	14 Oct 55		1 Jun 56 Target	120,000 (Init)	2682	Harshaw Chemical
			4092 4093	27 Oct 55 "		15Feb 56 Target	75,000 60,000 (Init)		
41261 Television Techniques for A.R.S.	WADC WCLRR Mr. J.H. Dunkely 27277	WADC Mr. H. Yates 22201	UCRIN 9432		6 Oct 55	15Nov 56 Target	474,063 (Est)	2576	R.C.A.
41262 Radiation Reconnaissance Orpability Study for A.R.S. (Parrot)	WADC WCLRR Mr. W. A. Rook 27277	WADC Mr. H. Yates 22201	UCRIN 9456	27 Sep 55		15 Jun 56 Target	530,000 (Init)		Not Yet Chosen
43644 Electronic Component Parts Application Criteria for 10,000 hour Reliable Operation	WADC WCRRR Mr. S.J. Brooks 31202	WADC Lt J. C. Spadone 29102	UCRIN 1083				250,000 (Sup Init)		
41700 Effects of Nuclear Radiation on Electronic Components	WADC WCRRR Capt H. E. Griffith	WADC Lt J. C. Spadone	UCACE 382316	29 Jan 55	24 Jun 55	23 Jun 55	526,705	3091	Admiral

[redacted] FISCAL YEAR 1956 FISCAL PROGRAM SUMMARY [redacted]

Correct to 7 Nov 1955

P.R. INITIAT. DATE	P.R. CONCURRENT DATE	P.R. OBLIGATION DATE	CURRENT ACTIVE AMOUNT	CONTRACT NO. AF33(616)-	CONTRACTOR	COMMENCEMENT DATE	COMPLETION DATE	PREVIOUS FUNDING	STATUS**	REMARKS
		7 Oct 55	249,500 (CR)	3104	R.C.A.	1 Jun 55	30 Jun 56	None	Active	$250,000 in process of being added to contract by change order to fully satisfy deficit funds.
		30 Sep 55	249,500 (CR)	3105	L.A.C.	13 Jun 55	30 Jun 56	None	Active	(SAME REMARK AS ABOVE)
		29 Jun 55	249,500 (CR)	3106	G.L.M.	8 Jun 55	30 Jun 56	None	Active	(SAME REMARK EXCEPT CHANGE AMOUNT TO $246,563)
24 Aug 55	7 Oct 55	15 Dec 55 Target	40,000 (CON)	3291	Univ. of Michigan	15 Dec 55 Target	30 Jun 56	None	In process of being written, negotiations completed	Call type contract to permit maximum flexibility in application. It is anticipated that an additional $25,000 will be made available during current F.Y.
21 Sep 55	28 Sep 55	15 Dec 55 Target	123,729 (Likely CR)	2137 Sup 10	R.A.A.	1 Dec 55 Target	1 Jul 56	862,981	Proposal being evaluated	Of the $862,981 placed to date on this contract $700,000 is 1115 funds. $23,500 has been estimated for conduction of hi-altitude balloon tests.
1 Aug 55	20 Sep 55	7 Nov 55 Target	300,000 (CON)	2039 S/A 10	M.I.T.	31 Oct 55	1 Jul 56	250,000	Ltr Contract being written	Letter contract being written is to be definitized by 26 Nov 55. Approximately $20,000 of 1115 money will be obligated by letter contract. A total of $300,000 of 1115 money will be obligated by definitive contract. Additional funds required to test breadboard system under simulated environmental conditions.
15 Nov 55 Target			25,000 (EXPEDIT.)	"	"		"		PR written	
15 Nov 55 Target.		31 Dec 55 Target	700,000 (EXPEDIT.)		Not Yet Chosen	31 Dec 55 Target	31 Dec 56	None	Not yet active	Proposals from selected contractors received on 17Oct55 presently being evaluated by both USAF & ARC. Anticipate 2 or 3 parallel procurements, depending on the outcome of evaluations. Selected contractors will receive 2 contracts each, one from USAF of approx $300,000, and one from ARC of approx $100,000 for the best source.
14 Oct 55		1 Jan 56 Target	120,000 (INIT)	2682	Harshaw Chemical	1 Jan 56 Target	31 Dec 56 Target	100,000	Proposal due 18 Nov 55	Present Harshaw contract expires 1Jan56. 4092 is a multiple source procurement. Proposals due 6Dec55. 4092 Subject " Electroding Crystals". 4093 Subject "Crystal Growth" other data same as 4092.
27 Oct 55		(1Feb 56 (1Target	75,000 60,000 (INIT)							
	6 Oct 55	15Nov 56 Target	474,063 (Con)	2576	R.C.A.	1 Oct 55	30 Sep 56	500,000	Rp for ARDC Approval	Total RAND Funds - Approximately $238,000 -Previous to 1115 contract.
27 Sep 55		15 Jan 56 Target	500,000 (Init)		Not Yet Chosen	15 Jan 56 Target	15 Jan 57 Target	None	Proposals due 15 Dec 55	Seven sources were sent a Request for Proposal 7Nov55
			250,000 (Exp Init)			15 Dec 55 Target		250,000	PR Written	
19 Jan 55	14 Jun 55	23 Jun 55	526,785	3091	Admiral	1 Jul 55	1 Jul 56	---		

Radiation Reconnaissance Capability Study for A.R.S. (Parvo)	Mr. W. A. Rook 27277	Mr. M. Yates 22202												
1644 Electronic Component Parts Application Criteria for 10,000 hour Reliable Operation	WARC WCREB Mr. S.J. Serub 34202	WARC WCREE Lt J. C. Spadaro 29202	1013				250,000 (Exp Init)			15 Dec 55 Target		250,000		RE M:
11700 Effects of Nuclear Radiation on Electronic Components	WARC WCREB Capt H. E. Griffith 28115	WARC WCREE Lt J. C. Spadaro 29202	382316	19 J n 55	14 Jun 55	23 Jun 55	524,785 (EE)	3081	Admiral Corp	1 Jul 55	1 Jul 56	None		Acti:
30805 Component Development for Rocket Engines Using High Performance Propellants(Fluorine)	WARC WCLRE Capt R. S. Becker 28211	WARC WCREH Lt S. L. Rasco 34234	11030	15 N v 55 Targ t			200,000 (EXPENDITURE)	2836	N.A.A.	1 Jun 56 Target		518,227		Acti:
15800 Intelligence Parameters Study for A.R.S.	RARC RCREO Mr. R. Johnson Rome 3200 Ext 2139		332791			2 May 55	120,000 (Est)	AF30(602) 1409	Planning Research Corp.	1 Oct 55		None		Acti:
15801 Study of Intelligence Processing Methods-A.R.S.	RARC RCREO Mr. R. Johnson Rome 3200 Ext 2139		332640		1 Nov 55 approx		90,000 (Est)		Aero Service Corp	9 Nov 55 Approx		None		Cont: sign
15802 Acquisition, Tracking, Ground Air Communications and Command Portion of the A.R.S.	RARC RCREO Mr. J. Rallis Rome 3200 Ext2136													

ADDITIONAL FUNDS SCHEDULED FOR COMMITMENT PRIOR TO 1 DECEMBER 55

Geophysical Program	AFCRC Lt Col G.P. Jones Hubbard 27730 Ext 2	150,000 (TRANS)	
Electronic Research	AFCRC Mr. P. Neumann	140,000 (TRANS)	
Special Research Studies	AFCRC - Lt Col G. Jones	25,000 (TRANS)	

*Current Active Amount (RCRE-3-1115) refers to Project 1115 funds.

**ACTIVE - using this term in regard to status means that money on the P.R. is obligated and being expended. This only has meaning in the procurement sense as the testimony to funds using without 1115 funds as an "in house" effort of any to funded by another project.

[redacted]

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4)		Lexcom	Target	Target		15 Dec 55
30 all)			15 Dec 55 Target		250,000	RR Written
55	3091	Admiral Corp	1 Jul 55	1 Jul 56	None	Active
30 INT)	2134	M.I.A.	1 Jan 56 Target		538,327	Active
000 .)	AF30(602) 1407	Planning Research Corp.	1 Oct 55		None	Active
30 4)		Aero Service Corp	9 Nov 55 Approx		None	Contr being signed

No 1115 funds to date. Of $24,705, 114,482 has been spent. $200,000 of 1115 funds has been allocated for this work. The balance of funds is made up of M.P.A. and Lab.

RR 11480 to be initiated for $200,000 of 1115 money(FY56) to extend contract one year. Present contract is for $538,327 which began 1 Jan 55 (In RR / 277080). Of this amount, $299,925 is 1115 money (FY55) placed by S/A on 15 Dec 54. Funding is to continue through FY 59 by 1115.

Contractor has begun work. $90K has been set aside to amend existing contract and to intensify effort in area. FY57 funds required ($80K to substantiate and sustain efforts.

Contracts being negotiated Whittron Electronics and T.V. Corp $25K. Title: "Whittron Projection System Study Int. Contract Date 1 Dec 55.
Battelle Memorial Inst. Obligated $30K. $90K. None ARE Funds already backing project ARE Funds awaiting existing contract. Title: Survey of Intelligence Presentation and Graphic Arts Tech. and Equip.'s. Intended to emphasize Large Scale Autom. Display Techni-ues pertinent to ARE. Est. Contr Award. Date: 1 December 1955.
Special Research Study Contract to Boston Univ. P.O.# 332331-15 Nov 55. Contr not signed..$15K committed.

FY56 funds have been applied to in the house effort to support beacon telemetering development, ground display and playoff. Anticipate $100K in FY 57 to build operational model of beacon telemetering expected to be perfected by that time. Anticipate $150K FY 57 funds to investigate and study: Geometric dilution of precision for two-ghanilled tracking system (b)tracking curves for two-ghanilled tracking system (c) optimum techni-ues for measuring velocities (d) space polarization and frequency diversity techni-ues to determine what improvements in tracking performance can be gained by using same. (e) new digital ranging systems. These projects would extends into FY58.

0 4)						
0 45)						
30 42)						
e effort	[redacted]					

Funds are being transferred to AFSMC on or about 15 December 1955. Task documentation to be forwarded to USAF approximately 30 December 1955.

Funds are being transferred to AFSMC on or about 15 December 1955. Task documentation forwarded to USAF approximately 30 December 55.
Funds transferred approximately 1 October 1956. Money to be used on cell type contract to support Illis Design Studies.

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[redacted]

Auxiliary Power Plant

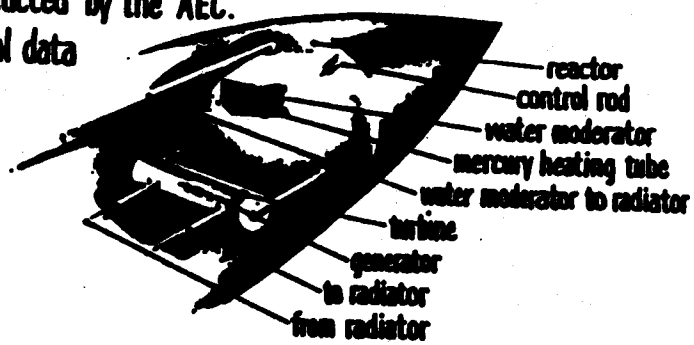
TASK 30291

[redacted]uxiliary power plant

Contractor: none selected - (par. 4d. add-ons - task 3029w will not be implemented until specifically authorized by Hq. ARDC.)

Engineer: Lt. C. Johnson - WCLPU

Objective: Extend the studies conducted by the AEC. 1952. - To accumulate technical data necessary to provide a firm basis for the final design of a nuclear auxiliary power plant.



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55-RDZ-9554

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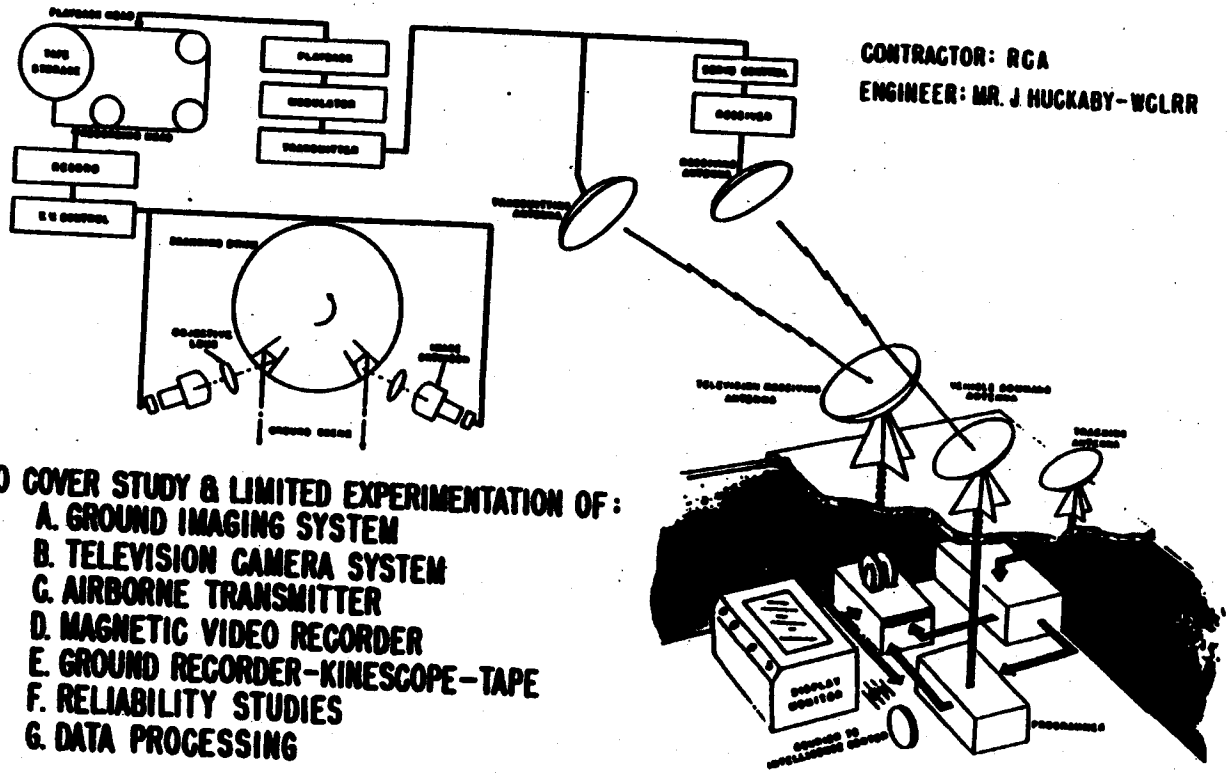
TV Techniques for Advanced Reconn. System

TASK 41261



CONTRACTOR: RCA

ENGINEER: MR. J HUCKABY-WCLRR

TO COVER STUDY & LIMITED EXPERIMENTATION OF:

A. GROUND IMAGING SYSTEM
B. TELEVISION CAMERA SYSTEM
C. AIRBORNE TRANSMITTER
D. MAGNETIC VIDEO RECORDER
E. GROUND RECORDER-KINESCOPE-TAPE
F. RELIABILITY STUDIES
G. DATA PROCESSING

[redacted]

55-HDZ-9554

[redacted]

[redacted]

RADIATION RECONNAISSANCE for ADVANCED RECONNAISSANCE SYSTEM

TASK 41262

CONTRACT : NONE

ENGINEER : W.A.RECK - WCLRR

OBJECTIVE : Provide techniques for an electronic reconnaissance system for use in a satellite vehicle. The system must be capable of sensing the presence, location & technical parameters of enemy electromagnetic radiations.

[redacted]

55-RDZ-9554

[redacted]

ELECTRONIC COMPONENTS SUPER RELIABILITY

TASK 41644

CONTRACTOR : NONE

ENGINE : S.J. SEREDA

OBJECTIVE : Extend the investigation of the reliability of electronic components into the area of super reliability. The effects of the overall system and its environment are to be taken into consideration.

[redacted]

55-RDZ-9554

([redacted])

[redacted] [redacted]

Effects of Nuclear Radiation on Electronic Components

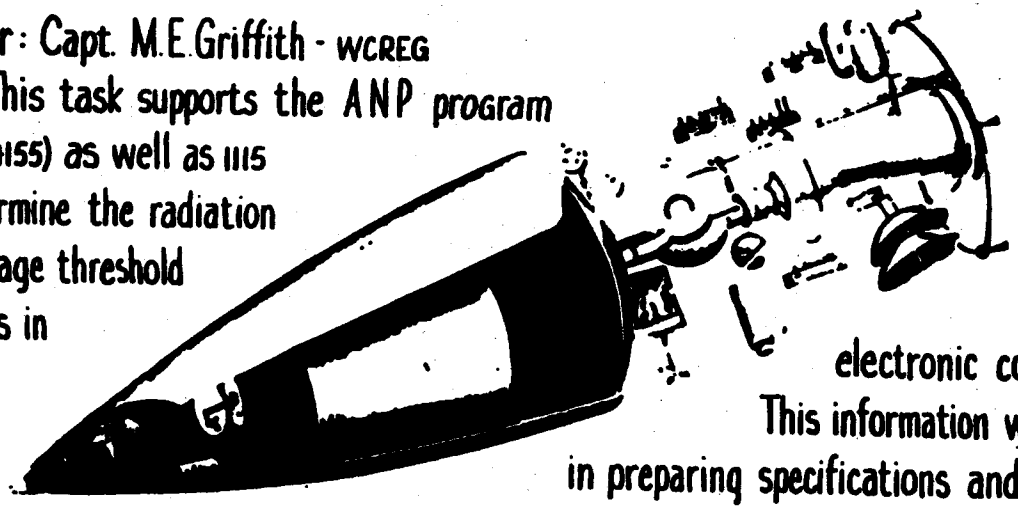
TASK 41700

Contractor:

Engineer: Capt. M.E. Griffith - WCREG

This task supports the ANP program (4155) as well as 1115

To: determine the radiation damage threshold levels in

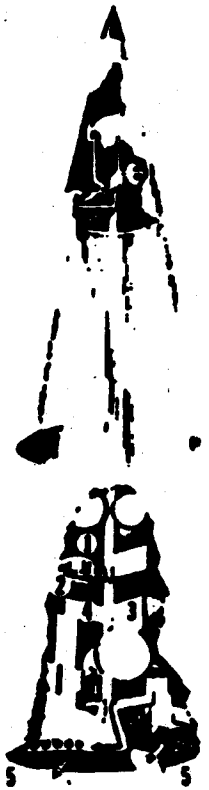


electronic components. This information will be used in preparing specifications and reports to assist the design engineer.

[redacted] [redacted]

Attitude Sensing [redacted] Guidance and Control

TASK 44147



Contractor NAA

Engineer F K Guenthner WCLND

To cover study & limited experimentation of :

- Self-contained Pre-orbital guidance and control.
- Guidance & control through transition from pre-orbital coast to a nearly circular orbit.
- Orbital attitude sensing & control.

[redacted]

[redacted]

[redacted]

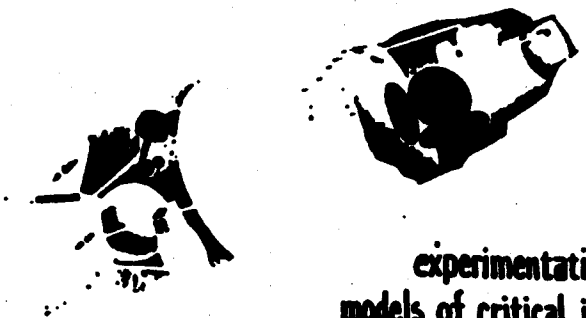
Orbital Attitude Sensing and Control

TASK 50558

Contractor: M.I.T.

Engineer: Lt. W.O. Covington – WCLSN

To provide for parallel development of attitude sensing & control equipment to include limited fabrication of and



experimentation with breadboard models of critical items.

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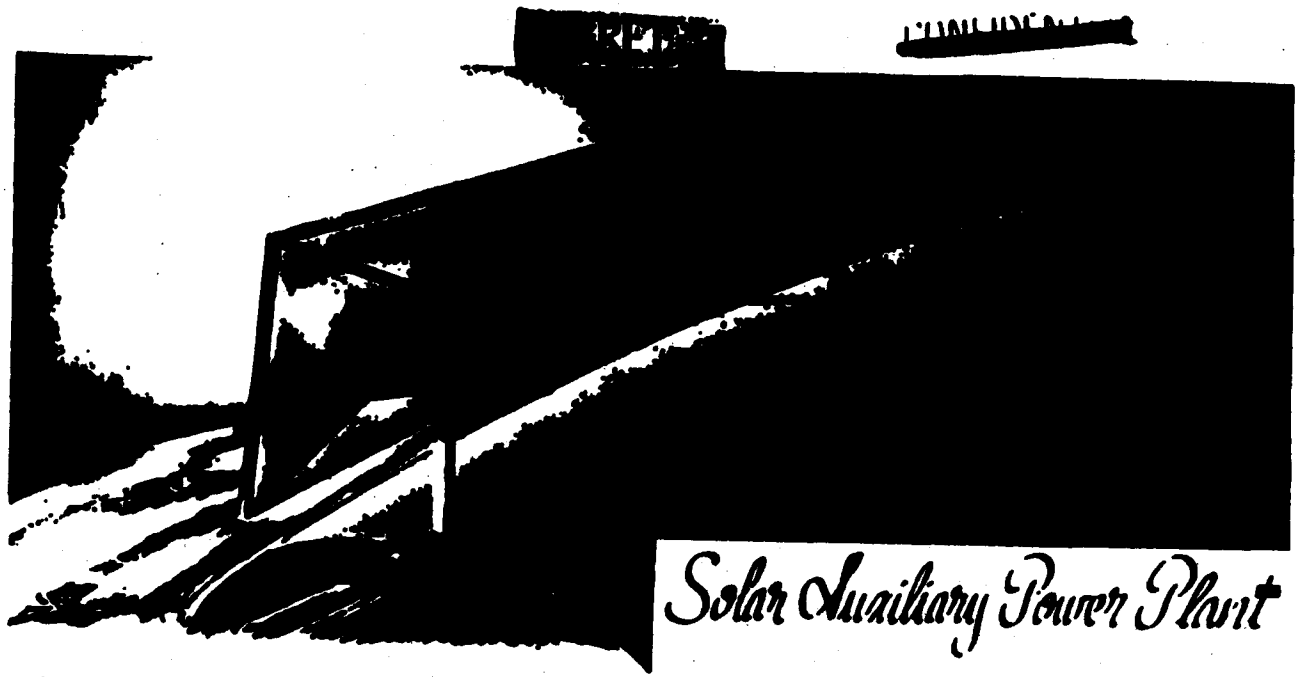

Solar Auxiliary Power Plant

Contractor: Harshaw Chemical - Engineer: D.C. Reynolds W.C.R.R.H.

To Provide That Research and Development Necessary:

1. Determine the feasibility of using substances showing promising photo-voltiac properties to convert solar energy to electrical energy in sufficient quantities for MX 2226.
2. To obtain operational data on the effects of environment on the efficiency of the cells.
3. Determine the optimum techniques and materials for obtaining the maximum effective transfer area.

~~SECRET~~ : ~~CONFIDENTIAL~~

PERSONNEL BRIEF

COOLBAUGH, JAMES — Captain, USAF — 17584A

DUTY AFSC -8446 - Duty Assignment: Chief, Technical Program Section

EDUCATION AND TRAINING:

B.S. in Military Science, United States Military Academy, 1947

Pilot Training, rated as a pilot, 1948

M.S.A.E. (Guided Missiles), University of Michigan, 1952

RESEARCH AND DEVELOPMENT TECHNICAL EXPERIENCE:

First assignment after completion of the Guided Missiles Course at the University of Michigan was to the New Developments Project Office of the Bombardment Missiles Division of WADC. From September 1952 until May 1954 was spent in supervising studies which were intended to highlight practical applications of advanced state-of-the-art concepts to bombardment missiles. In December 1953, when Project Feedback was phased out and Project 1115, the Advanced Reconnaissance System, was initiated, was assigned to the Project and prepared the initial project documentation.

Since that time, assignment has been continuous in the Advanced Reconnaissance System Project Office.

PERSONNEL BRIEF

TROETSCHEL, WILLIAM O. Captain, USAF A01903533

DUTY AFSC 8464 - Duty Assignment: Research and Development Staff Assistant, System Integration Section, Advanced Reconnaissance System

EDUCATION AND TRAINING:

B.S.E.E., USAF Institute of Technology, 1955

One year, University of Alaska, 1952-53

One year, Lawrence Institute of Technology, 1940-1941

Six months, Naval Research Laboratories (Electronic-Countermeasures), 1943

One and one-fourth years, Navy Radio and Radar Materiel School, 1942 - 1943

Registered Professional Engineer, State of Ohio

Member Institute of Radio Engineers

RESEARCH AND DEVELOPMENT AND TECHNICAL EXPERIENCE:

From 1948 until recall to active duty in 1951, was Chief Engineer for commercial Television-FM-Radio station with full responsibility for technical operation and engineering personnel.

From 1951 to 1953, was assigned as Communications Operation Officer in Alaska with responsibility of providing multichannel VHF communication capability for entire Territory of Alaska. Received a Commendation Medal for this work from Maj. Gen. W. D. Olds.

Was assigned to duty at USAF Institute of Technology in 1953. During summer of 1954 worked on special project for the New Developments Project Office of the Bombardment Missile Division of WADC.

After graduating from the USAF Institute of Technology in August 1955, assignment has been continuous in the Advanced Reconnaissance System Project Office.

[redacted]

PERSONNEL BRIEF

HERTHER, JOHN C. 1/Lt, USAF AO-3016090

DUTY AFSC: 8464 - Present Duty Assignment: Research and Development Staff Assistant, Technical Program Section, Advanced Reconnaissance System

EDUCATION AND TRAINING:

B.S.M.E., North Carolina State College, 1953

M.S.A.E., Massachusetts Institute of Technology, 1955

Distinguished Military Graduate ROTC - Master's Thesis: 'A Transition Control System' (SECRET) performed under ARS Attitude Guidance and Control Study contract at Instrumentation Laboratory, MIT.

RESEARCH AND DEVELOPMENT TECHNICAL EXPERIENCE:

During the summer of 1953 was employed by an aircraft manufacturer as a Research Technician in the Structures Test Laboratory.

In 1953 was accepted for USAFIT Training at MIT in the AF Weapon Systems course in the Aeronautical Engineering Dept. under Dr. C. S. Draper.

During the two years academic tour as a USAFIT student at MIT, received training in inertial navigation, fire control, computers, aerodynamics, structures ballistics, gyro theory, electronics, etc.

Chose to work on Guidance and Control efforts underway at MIT for Master's thesis. In collaboration with Lt. M. R. Malcolmson, wrote a thesis proposing computers to operate durin, vehicle coasting portion of ascent trajectory to place vehicle on a circular orbit.

Since completing the work at MIT, assignment has been to the Advanced Reconnaissance System Project Office.

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ADVANCED RECONNAISSANCE SYSTEM

TABULATION OF SUPPORTING PERSONNEL

CENTER	SUPPORT AREA	TASKS SUPPORTED	PERSONNEL PARTICIPATING •• Primary Support • Secondary Support IN ORDER OF MAGNITUDE SUPPORT
Wright Air Development Center	Guidance and Control	44147 50558	✓ •• Colonel T.S. Cummings ✓ •• Mr. F. K. Guenthner ✓ •• Capt W. McKenna ✓ •• 1/Lt W.D. Covington ✓ • Maj Tom Varney ✓ •• 1/Lt M. R. Malecmson ✓ •• Dr. W.E. Harris
	a. Flight Control		
	b. Aeronautical Research		
	c. Propulsion	30205	✓ • Mr. Jack Keating ✓ • Mr. J.W. Rogers ✓ •• Capt R. S. Decker ✓ • 1/Lt J. G. Hilden
	d. Equipment	21010	✓ • Maj L. L. Bowen
	e. Materials	21010	✓ • Dr. Erwin Neumann ✓ •• Mr. Leo Salzberg
	f. Aerodynamics	21010	✓ • Capt A. J. Mione ✓ • Mr. S.W. Dunham
	g. Communication-Navigation	21010	✓ • Mr. Fred Grazio • Mr. A.J. Falkowski
	h. Research Problems	21010	• Mr. R. C. Lenz • Maj Butsch •• Dr. DeVoe
	Auxiliary Power		
	a. Solar	70843	• ~~Dr. F.E. Clemens~~ ✓ • Lt Col G.M. Leiss ✓ •• Dr. L. L. Antes ✓ •• Mr. D.C. Reynolds ✓ •• Mr. Lawrence Green ✓ • Lt Wheeler

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CENTER	SUPPORT AREA	TASKS SUPPORTED	PERSONNEL PARTICIPATING •• Primary Support • Secondary Support IN ORDER OF MAGNITUDE SUPPORT
Wright Air Development Center (Continued)	b. Nuclear Additional Support (AEC)	30291	✓•• 1/Lt Carl Johnson ✓•• Major Anderson (AEC) ✓• Dr. Charles Russell (AEC) ✓•• Capt J. Helfrich (AEC)
	Electronics a. TV Techniques	41261	✓• Mr. D.J. Boam ✓•• Mr. J.H. Huckaby ✓•• Mr. Gordon Andrew
	b. Ferret c. Components	41261	✓• Mr. W. A. Rock ✓• Mr. F. E. Wenger ✓• Mr. B. E. Long ✓• Mr. S. Badger ✓• Mr. H.V. Noble
	d. Radiation Damage	41644	✓•• Capt M. E. Griffith
	e. Component Reliability	41700	✓•• Capt Gordon Dicker •• Mr. S.J. Sereda
	Technical Management	21010 & all WADC Tasks	•• Mr. A.L. Ball •• Mr. H.S. Brown •• Miss Doris Stang
	Buying and Contracting	21010,21011,30291	•• 2/Lt R.S. Washburn
		44147	•Lt J. W. Gay
		50558	• Lt A.A. Kaufmann
		41261	• Mr. V. Yates
		41262	• Mr. V. Yates
		70843	• Lt D.B. Scheideman
		41700	• Lt J.C. Spadone
		41644	• Lt J.C. Spadone
		30205	• Lt S. L. Dame

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CENTER	SUPPORT AREA	[redacted]	TASKS REPORTED	PERSONNEL PARTICIPATING •• Primary Support • Secondary Support IN ORDER OF MAGNITUDE SUPPORT
Rome Air Development Center	Intelligence and Data Processing		15000 and 15001	✓•• Mr. R.H. Johnson ✓•• Lt R. W. Moss ✓•• Lt C. W. Carson ✓•• Maj H. F. Weinberg
	Acquisition and Communications		15002	✓•• Capt R. W. Piper ✓ • Mr. Donald Dukes ✓ • Capt R. P. Berry ✓•• Mr. Joe Fallik
Air Force Cambridge Research Center	Geophysical Program		21010	✓•• Lt Col G.P. Jones ✓ • Mr. Henry Alberts ✓ • Mr. Robert Slavin ✓•• Mr. Norman Sissenwine
	Electronic Research			✓ • Dr. Philip Newman ✓•• Dr. Jules Aarons
Aeronautical Chart and Information Center	Reconnaissance, Mapping, Geodetic Control		15000 and 15001	•• Mr. William Berry • Mr. Lawrence Schimmerman • Mr. John Partsch • Mr. E. M. Thompson
Air Technical Intelligence Center	Intelligence		15000 and 15001	•• Colonel R.W. McDuffee • Mr. W.F. Barth • Mr. Charles F. Zimmerman •• Maj J. B. Sanders • Mr. T. J. Hiatt •• Mr. R. A. Johnson • Major C.B. Randall

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Center	SUPPORT AREA	TASKS SUPPORTED	PERSONNEL PARTICIPATING •• Primary Support • Secondary Support IN ORDER OF MAGNITUDE SUPPORT
RAND Corporation	System Studies and Wide Band Recording	21010	•• Mr. John Rantzicker •• Dr. Dick Raymond •• R. T. Gabler • Mr. H. D. Bloomfield • Mr. R. J. Lew •• Mr. E. C. Heffern

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AIR RESEARCH AND DEVELOPMENT COMMAND
Post Office Box 1395
Baltimore 3, Maryland

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SR No. 5
29 November 1954

SYSTEM REQUIREMENT

I. DIRECTED ACTION

Support to industry in the conduct of system design studies on the Advanced Reconnaissance System is directed. These studies will be conducted as a task of Project 115. System No. 117L has been assigned to the system resulting from these studies.

II. GENERAL INFORMATION

1. Title: (UNCLASSIFIED) Advanced Reconnaissance System

2. Responsible Agency: The Directorate of Air Weapon Systems Operations, Wright Air Development Center, will be the focal point within ARDC for initiation and administration of study contracts; and, in collaboration with participating Centers, evaluation of the studies and preparation of a System Development Plan. All policies, plans, and procedures affecting this program will be coordinated by the responsible agency prior to implementation.

3. Participating Centers: The ARDC Centers listed below will assume responsibility for specific technical design study areas as indicated:

ROME AIR DEVELOPMENT CENTER:

a. Information parameters, and data processing and handling techniques for the system.

b. Ground-air communications, including acquisition, tracking, and command of flight vehicle.

AIR FORCE CAMBRIDGE RESEARCH CENTER

a. Provide environmental data which affects vehicle design and test, such as pressures, temperatures, atmospheric composition, solar radiation and propagation characteristics.

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b. Prepare and implement geophysical research program based on utilizing test vehicles.

4. Target Dates:

Completion of design studies - 1 July 1956

Preparation of Development Plan - 1 October 1956

5. Related Systems: 107A, 104A, 315A, 516L

6. Participation and/or Coordination:

Air Proving Ground Command - Participation

Strategic Air Command - Coordination

Air Defense Command - Coordination

7. Funding Information:

Approximately $750,000 of the funds on RDSM 2-1115 is available for funding the studies in FY 1955.

8. References: SECRET Letter, Director of Research and Development, Headquarters USAF to Commander ARDC, Subj: "(Unclassified title Project FEED BACK", dated 9 August 1954, file AFDRD-SA.

(CONFIDENTIAL)

III. REQUIREMENT

1. General Philosophy

In order to [redacted] selection of the most effective approach to an Advanced Reconnaissance System concept which utilizes an [redacted] satellite as a system platform, it is essential that the existing and projected state-of-the-art in this field be adequately surveyed, and a determination made through system design studies by

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selected contractors, of the technical and economical magnitude of full system development effort. From these studies there will be prepared a Development Plan which will be used as a basis for choice of the Advanced Reconnaissance System to be developed for the Air Force inventory. It has been generally accepted that, with the advent of the very high yield super weapon, strategic target intelligence requirements for efficient use of such a weapon have become far less detailed than heretofore; but at the same time, the requirement for routine surveillance of an enemy's territory becomes all the more necessary to anticipate and circumvent his effective use of the same caliber weapon. In concept at least, the technical approach to this type of Advanced Reconnaissance System leads one to the artificial earth satellite which, with its inherent capability for routine, long duration flight and its apparent capabilities for the collection of reasonably detailed information from the surface of the earth, seems to make a satellite system attractive for strategic and national reconnaissance. Thus, the purpose of the design studies directed herein is to determine whether a military intelligence system aimed at satisfying the national intelligence requirements of the future, can be foreseen at this time with sufficient definitude to indicate full development; and to establish the direction and magnitude of technical programs needed to realize development. (SECRET)

2. Objectives of the Advanced Reconnaissance System

As a matter of general guidance, the following may be considered the intelligence objectives for the Advanced Reconnaissance System:

a. Continuous reconnaissance (visual, electronic, or other) coverage of the USSR and satellite nations, for surveillance purposes. Timeliness of receipt of the intelligence information is essential, with daily reconnaissance coverage at high resolution the ideal. In consideration of the requirement for earliest availability of the Advanced Reconnaissance System, the engineering progression and Air Force acceptance should be from the lesser to the greater resolution.

b. The resolvable surface dimension detail should be of the order of 100 feet or smaller. A capability of resolving detail to the degree that objects approximately 20 ft. on the side can be positively identified is the optimum in order to positively identify enemy weapon launching sites and associated activity. If this objective can be met, the many other intelligence requirements of larger surface dimension would automatically be satisfied.

c. The volume of intelligence delivered by this Advanced Reconnaissance System will be staggering. Therefore, the system, in order to be considered complete, must include a suitable associated data handling, recording, reduction, and filing system. The earliest acceptable system must have provisions for automatic data indexing, filing and storage. Final objective will be for completely automatic data processing, interpretation, presentation, and dissemination. All data handling systems conceived for the Advanced Reconnaissance System will be compatible with data handling equipment in contemporary use within the intelligence community.

d. The accuracy with which points on the earth's surface can be located by the Advanced Reconnaissance

System should be studied. While grosser accuracies can be accepted as interim solutions, the finer accuracies should be considered as the optimum and the goal for ultimate complete development.

c. Thorough investigation of all possible means of improving the intelligence collection capability of the Advanced Reconnaissance System; such as the application of stereo techniques to the analysis and interpretation of television images.
(SECRET)

3. Mission

a. The primary operational mission of the Advanced Reconnaissance System will be to provide pioneer and surveillance reconnaissance coverage of the territories controlled by the USSR and its allies. The system must be capable of obtaining:

(1) Routine target, mapping, pioneer terrain, weather, and photo intelligence data.

(2) Bomb damage assessment of high yield weapon strikes.

b. An alternate and co-equal mission for the Advanced Reconnaissance System will be to provide and maintain continuous and comprehensive surveillance of the electronic activities of the USSR as a means of securing basic Soviet intentions, intelligence, and capabilities intelligence. The electronic reconnaissance (ferret) system should be capable of:

(1) Sensing, coding, recording and retransmitting all significant electronic emissions on both a qualitative and quantitative basis.

(2) The location of areas of high electronic densities compatible with the resolution capabilities obtainable.

c. Each mission carries a firm requirement for a suitable data handling and processing capability both in the vehicle and on the ground.
(SECRET)

4. Physical Characteristics:

The Advanced Reconnaissance System can be described as follows:

a. A launching base which will consist of all facilities and equipment necessary for the proper launching of the satellite vehicle.

b. A satellite vehicle which will consist of the following sub-systems:

(1) Propulsion stage or stages necessary to boost the reconnaissance payload to its orbital altitude and once at this altitude to impart the velocity required to establish the satellite on its orbit.

(2) Guidance and control equipment to (a) guide the vehicle from the launching base to its orbit and (b) establish and maintain the reconnaissance payload in the correct attitude after it has been placed on orbit.

(3) Reconnaissance equipment that provides useable pictorial reconnaissance information for transmission to a ground receiving station. The alternate mission will require sensing equipment that is capable of detecting electromagnetic radiations instead of physiographic features.

(4) Information storage equipment with a capability of routinely storing the information gathered by the satellite vehicle until it can be transmitted to a ground receiving station.

(5) Transmitter equipment for transmission of the collected reconnaissance information, transmission and reception of any other information that is required to properly operate the satellite and its equipment.

(6) Miscellaneous equipment required for the proper functioning of the satellite; e.g., a transponder beacon to aid in the tracking of the satellite by a ground receiving station might conceivably be used.

(7) An auxiliary power supply to provide sufficient power for all of the satellite's needs.

c. The ground receiving station will consist of the following sub-systems:

(1) Receiving equipment to (a) receive the transmitted reconnaissance information, (b) enable vehicle tracking, and (c) any other information transmitted from the satellite.

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(2) Transmitter equipment to transmit any required information to the satellite.

(3) Information storage equipment that will retain the reconnaissance information transmitted from the satellite until it is fully used.

(4) Display equipment that will display the reconnaissance information as it is received and which can also be used for viewing stored information.

(5) Other equipment that is required for the handling, interpretation and dissemination of the reconnaissance data that is received.

(SECRET)

IV GUIDANCE

1. The basic purpose behind the systems design studies herein directed is to seek an assurance from responsible industry that an Advanced Reconnaissance System which is capable of meeting a stated military requirement is achievable. In addition, the system design studies should indicate the time in which a minimum useful military system can be made available, as well as the rate at which improved system capabilities can be expected, up to the most "sophisticated" Advanced Reconnaissance System indicated by the system objectives. The newness of this field of astronautics requires that we take advantage of as many technical approaches in this design exercise as economically possible.

2. In the artificial satellite we see a platform which at the present time appears to be limited in its military usefulness to that of making observations or relaying communications. This is a vehicle system singularly applicable to use as a reconnaissance system. The approach to the design of the overall system must be that of assuring a maximum military utility and reliability (since early models of the Advanced Reconnaissance System will undoubtedly be unmanned) of the reconnaissance sub-system; these factors will determine in turn the design objectives of the vehicle with its propulsion and guidance sub-systems.

3. One of the basic advantages of a satellite is its more-or-less unlimited duration of flight. If we were to try to take full advantage of this flight duration capability, it would be necessary to achieve flight equipment reliability far in excess of that which is possible today. There is a point at which a balance can be struck between efforts aimed at improving the reliability of flight components of the satellite, and the economy to be realized from the extended flight duration characteristics of a satellite. The system design studies directed herein should result in a suggested optimum system flight time, for which in-flight components should be designed.

4. In design of the Advanced Reconnaissance System, full advantage must be taken of those components, in existence or under development for other systems, which have application to a satellite-type vehicle system.

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Activity resulting from this directive must be fully coordinated, within ARDC, with related system developments to insure that no unwarranted duplication of study or design effort exists. Headquarters USAF will undertake necessary inter-service coordination.

5. In any proposed development program arising out of the system design studies, there will undoubtedly be a recommended test program involving the firing of instrumented satellite missiles for purposes. Such a test program should be so oriented as to maximize usefulness of the test vehicles to the research community in general as well as to satisfy scientific requirements of the Advanced Reconnaissance System. One result of the design study effort should be a proposed "research laboratory model" of the satellite test vehicle, capable of obtaining and transmitting to earth valuable scientific data on the space environment. (SECRET)

V OTHER INFORMATION

1. SECURITY

Maintenance of proper security of this program is of paramount importance. A basic guide to security will be the following: all information which contains or implies a date of operational availability for the Advanced Reconnaissance System, as well as information pertaining to its progress as a Weapons System will be classified TOP SECRET. Other aspects of the Advanced Reconnaissance System program, including its exploitation of the satellite, will be SECRET. (SECRET)

2. USE OF SCIENTIFIC CONSULTANTS

The broad group of the engineering, physical, and geophysical sciences, which is encompassed by a development such as that contemplated in the Advanced Reconnaissance System, requires that ARDC make maximum use of the scientific and technical competence within the nation. This competence should be recognized and utilized when required in a consultant and advisory capacity by the Weapons Systems Project Office responsible for the Advanced Reconnaissance System. Wherever possible, civilian scientists who can contribute to the success of this project should be engaged in the capacity of consultant to ARDC, and the results of their efforts made available to all contractors on an equal basis. (CONFIDENTIAL)

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3. PRIORITY

Efforts on design study of the Advanced Reconnaissance System herein described will be carried out under a priority sufficient to insure completion of work by the target dates directed in par II-4 above. (UNCLASSIFIED)

BY ORDER OF THE COMMANDER:

/s/ Elmer E. Ambrose
f/ ERNEST H. LJUNGQUIST
Colonel, USAF
Director of Weapons Systems
Deputy Commander/Technical Operations

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HEADQUARTERS
AIR RESEARCH AND DEVELOPMENT COMMAND
Post Office Box 1395
Baltimore 3, Maryland

Amendment No. 1 to
SR No. 5
8 August 1955

AMENDMENT TO ARDC SYSTEM REQUIREMENT

1. AMENDMENT

System Requirement No. 5, dated 29 November 1954, title, (UNCL) "Advanced Reconnaissance System", is amended as follows:

a. Add Par III4b(8); "A provision for self-destruction of the Satellite (CONF)", after III 4b (7)

b. Add to Par II 8, "OCR No. 80 (SA-2C) dated 16 March 1955, Title (SECRET Strategic Reconnaissance Satellite Weapon System"

(SECRET)

2. DIRECTED ACTION

Provision as stated above will be included in the current Design Studies. Consideration will include, but not be restricted to self-destruction by command, predetermined time delay, or other automatic means, or upon reentry. (CONFIDENTIAL).

BY ORDER OF THE COMMANDER:

W. J. THOMAS
Colonel, USAF
Chief, Technical Programming Office

/s/ERNEST N. LJUNGGREN
Colonel, USAF
Director of Systems Program Planning

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FTD No. 1115
14 Sept 1954

c. References

Letter, D/R&D DOR/D, Hq USAF to Hq ARDC, subject, (U) Project Feedback, dated 9 August 1954.

d. Other

The specific tasks of Project 1111 approved by this Directive are as follows:

1115-44147

1115-50558

1115-41256

1115-70843

1115-30291

Coordination will be maintained with the office of AMP on Task 30291.

BY ORDER OF THE COMMANDER:

/s/HERBERT N. LUNDGREN
Colonel, USAF
Director of Weapon Systems
Deputy Commander/Technical Operations

W. J. THOMAS
Colonel, USAF
Chief, Technical Programming Office
Deputy Commander/ Technical Operations

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HEADQUARTERS
AIR RESEARCH AND DEVELOPMENT COMMAND
Post Office Box 1395
Baltimore 3, Maryland

ARDC PROJECT DEVELOPMENT DIRECTIVE

PDD No. 1115

14 Sept 1954

1. DIRECTED ACTION

Implementation, within the limits established by the following paragraphs of this Directive, of Development Plan No. 1115, subject, (Unclassified Title) Advanced Reconnaissance System", dated 30 August 1954, is directed. Project No. 1115 originally approved on 12 May 1953.

2. ASSIGNMENT OF RESPONSIBILITIES

a. Primary responsibility for the implementation and execution of this Development Plan is assigned to Wright Air Development Center.

b. Responsibility for separate additional approved tasks of this Development Plan will be assigned through amendments to this Directive.

3. CHANGES

No changes to this Development Plan are required.

4. PERTINENT INFORMATION

a. Target Dates

It is anticipated that the project will be terminated by July 1956. At that time this project will form the basis for a full system development, or undergo redocumentation as a technical development program.

b. Funding Information

This project is being funded under line item No. 2-1115

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AIR RESEARCH AND DEVELOPMENT COMMAND
POST OFFICE BOX 1996
Baltimore 3, Maryland

Amendment No. 2
to PDD No. 1115
2 August 1955

AMENDMENT TO ARDC PROJECT DEVELOPMENT DIRECTIVE

1. AMENDMENT

ARDC Project Development Directive No. 1115, dated 14 September 1954, is amended as follows:

a. Amend paragraph 3 CHANGES to read: "No changes to this Development Plan are required, except that the project priority is increased to 1-A, precedence II-3". (SECRET)

BY ORDER OF THE COMMANDER:

/s/ ERNEST H. LJUNGQUIST
Colonel, USAF
Director of Weapon Systems

W. J. THOMAS
Colonel, USAF
Chief, Technical Programming Office

This Amendment is classified
SECRET IAW AFR 205-1, par 23.e.

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