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MILITARY OPERATIONS IN SPACE

1. PROBLEM: To present the Air Force Concept for Operations in Space.

2. POSITION: For the near and mid-term, the most urgent military requirement of the United States is for a force capable of surviving an enemy surprise attack and destroying the enemy nuclear delivery forces, either on the ground or enroute to target. The Air Force, in fulfilling its weapon system development responsibilities to the commanders of the offensive and defensive forces of the United States, must consider all possible means for providing, on a continuous basis, this required military capability.

During the history of aeronautical weapon system development, and the inevitable race for superiority between offensive and defensive forces, the performance characteristics of weapon systems have increased to the point where it is now possible to achieve extreme altitudes and speeds and infinite duration, without the need for sustaining propulsion. Orbital or "space" systems designed to take advantage of these technological breakthroughs will be considered, and in some cases developed, in the continuing attempt to provide the most effective means for performing specific, essential military missions.

It should be noted, however, that the Air Force has no separate doctrine or concept for the employment of weapon systems which exceed some arbitrary velocity and altitude or which operate in some artificially segregated medium. Inventory weapon systems have been designed to complement each other. Manned bombers, strategic missiles, satellites and all other weapon systems must be employed within the same concept by the appropriate commanders without special concern for the performance characteristics involved. All fulfill coordinated roles in the total aerospace.

With regard to development, the Air Force will develop orbital or "space" systems only if they show promise of: Performing an essential military mission which can be performed in no other way; performing an essential military mission more effectively at a justifiable increase in cost; or performing an essential military mission in an acceptable manner at a reduced cost over other methods of performing the same mission.

Immediate applications of the unique capabilities of "space" systems are being made at this time in order to provide essential intelligence (SAMOS) and warning (MIDAS) information which is otherwise unobtainable. Possible future applications could provide a defense capability against enemy-launched ICBMs during the launch phase of their trajectories (SPAD) or the unique capability to launch an attack against any target in the world from a distance of a few hundred miles away. Later, there will be a requirement for satellite inspection and destruction, for friendly satellite servicing and for manned reconnaissance. Intensive study programs are underway now to determine the technical and economical feasibility and the military usefulness of such systems.

1. PROBLEM: To explain the Air Force understanding of the Air Force role in space today based on current directives, both with regard to over-all DOD responsibility and relationship with other Services.

2. POSITION:

a. Air Force role is prescribed in laws, and current directives and instructions of the Secretary of Defense.

b. DOD Directives charges the Department of the Air Force with equipping Air Force forces for combat operations, including necessary supporting research and development of weapons and equipment.

c. Air Force was assigned responsibility to develop, produce or procure, and launch space boosters, and to perform necessary systems integration with these boosters incident to above activities.

d. Air Force has been assigned payload responsibility for the Interim Satellite Early Warning System (MIDAS) and Phase I of Satellite Reconnaissance System (SAMOS).

e. The Air Force anticipates assignment of responsibility by the DOD for developing future space systems based upon the primary interests and special competence of the Air Force.

g. Following specific assignment of payloads are approved:

(1) Interim Satellite Early Warning System - Air Force

(2) {Phase I of Satellite Reconnaissance System} Air Force

(3) Interim Satellite Navigation System - Navy

(4) Interim Satellite Communications System - Army

3. BACKGROUND: DOD Directive 5100.1, 31 December 1959, and memorandum by Secretary of Defense to Chairman, JCS dated 18 September 1959.

4. INDIVIDUAL QUALIFIED TO PROVIDE FURTHER INFORMATION:

Lt Col Foster L. Smith, AFXPD-PL, X-55053

USAF AND RELATED SPACE ACTIVITIES

1. PROBLEM: To present current Air Force activities in space.

2. POSITION: The current Air Force space program is not an Air Force program in the sense that a large part of the space related research and development activities conducted by the Air Force are under the direction of other agencies.

a. Air Force Systems - DISCOVERER, SAMOS, MIDAS, DYNA SOAR and HETS.

b. ARPA Systems - SPACE TRACK, STEER, TACKLE, DECREE.

c. ARPA Applied Research & Miscellaneous Projects - Space Power, Propulsion, Space Subsystems, Space Studies, Miscellaneous.

d. Air Force Applied Research - Nuclear effects, Aerodynamic decleration, Materials research, Guidance Systems, Weapon fire control, Crew station design, Space propulsion, Space power, Surveillance techniques, Communication techniques, Electromagnetic warfare, Electronic techniques, Infrared, Aerospace environment, Biologistics, Human performance.

e. Air Force Study Program - Global Surveillance System, Strategic Orbital System, Strategic Interplanetary System, Lunar Observatory, [24-Hour Reconnaissance Satellite, Satellite Interceptor System,] Strategic Lunar System, Advanced Ballistic Missile Weapon System, Intercontinental Glide Missile (CGM), Recoverable Booster Support System.

f. NASA Systems - MERCURY, DELTA, ABLE, CENTAUR, TIROS.

g. Facilities - Air Force has facilities to do space program.

MAJC AIR FORCE SPACE PROJECTS
(Exclusive of various Applied Research and Studies)

1. AIR FORCE

   a. DISCOVERER — R&D program developing hardware for later systems

   b. SAMOS — [Reconnaissance Satellite]

   c. MIDAS — [Missile Defense Alarm Satellite]

   d. AGENA — Satellite Vehicle for second stage of DISCOVER, SAMOS, MIDAS. Improved version, AGENA-B, used with SAMOS, MIDAS

   e. DYNA SOAR — Military Test System of Rocket Boosted Aircraft

   f. HETS — High Velocity Rocket Test System for use in R&D Program (Coordinated with a related NASA program called SCOUT)

2. ARPA, with Air Force Assistance:

   a. SPACE TRACK — Detection, tracking and cataloging of satellites

   b. NOTUS — Communications Satellite Program consisting of:

      (1) STEER - 4 satellites in polar orbit - 6 hour periods.

      (2) TACKLE - Advanced version of STEER, 4 satellites in polar orbit, 6 hour periods.

      (3) DECREE - Several (2 or 3) satellites in stationary (24 hour period) equatorial orbits.

3. NASA, with Air Force Assistance:

   a. MERCURY — Man in Space Project

   b. CENTAUR — High Energy Upper Stage, with Hydrogen Engine

   c. DELTA — Space Probe (THOR & AEROJET second stage)

   d. ABLE — Space Probe (ATLAS OR THOR Boosted Aerojet Second Stage)

   e. VEGA — Upper Stage for Atlas, (Now Cancelled, replaced by AGENA-B)

   f. TIROS — Cloud Cover Satellite Using DELTA configuration

   g. SATURN — 1.5 million pound 8 engine booster.

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TAB A - AIR FORCE SYSTEMS

I. The DISCOVERER program consists of design, development and flight testing of 29 two-stage vehicles, using THOR as first stage booster and AGENA as second stage. Prime contractor is Lockheed Missiles and Space Division. DISCOVERER program will test AGENA satellite vehicle and subsystems, ground communications and tracking network in support [of SAMOS and MIDAS.] Eight DISCOVERER vehicles were launched in CY 1959.

Funding:	FY 59 and Prior Years	FY 60
	$137.5 M.	$68.9 M.

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II. The SAMOS Program consiss of [advanced reconnaissance system to provide continuous visual and/or electronic surveillance of the potential enemy and associated satellite nations.]

[Reconnaissance equipment will be in the AGENA vehicle. During development a dual capability visual and ferret payload will carry only the visual or ferret payload.] The system is composed of the satellite vehicle, ATLAS ICBM booster, launch and tracking facilities and communications and data processing.

First R&D launch scheduled for Mid-1960.

Funding:	FY 59 and Prior Years	FY 60
	$100.2 M.	$170.3 M.

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III. The MIDAS program objectives are [based on achieving an early warning infrared detection system. Orbiting satellites will detect infrared radiations released by enemy ICBM launches.]

MIDAS will use the ATLAS ICBM first stage and the AGENA vehicle as the second orbiting stage. The first R&D launch is scheduled for early 1960.

Funding:	FY 59 and Prior Years	FY 60
	$29.2 M.	$59.7 M.

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IV. The Boost Glide System (DYNA SOAR) is a 3-step program. Step 1 comprises a military test system of full scale, but lightened (6,000 pounds), unmanned gliders, boosted by a TITAN "A" ICBM. Follow-on flights will utilize manned gliders (9,400 pounds) with the same boost system.

In Step 2 unmanned and manned gliders will be boosted to global range or orbital flights for further research, testing of military equipment and specific determinations of military application.

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TAB C - ARPA APPLIED RESEARCH AND MISCELLANEOUS PROJECTS (CONT.)

	Funds Committed by ARPA
Subsystems for Meteorological Projects (Data Processing Equipment)	$1,151,000
Develop Upper Stage Vehicle - AJ10-104 (TRIBE Program)	$8,156,000
Modify the AGENA Upper Stage (TRIBE)	$4,250,000
Delivery and Launching of a THOR-DELTA, THOR-104, two THOR-AGENA Vehicles for TRANSIT (Navigational Satellite) Program	$6,092,000
Portable Down-Range Tracking and Telemetry Equipment for THOR-EPSILON Launchings (TRIBE Program)	$ 485,000
Delivery and Launching of two THOR-104 Vehicles	$3,500,000
SAMOS [(Reconnaissance Satellite)] Launch Facility & Missile Assembly Building Construction	$9,000,000
Construction of Large Thrust Test Stand at Edwards AFB	$7,557,000
Modification of Launch Stand 17B at Atlantic Missile Range.	$ 240,000

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TAB D - AIR FORCE APPLIED RESEARCH (CONT.)

SPACE VEHICLE POWER SYSTEMS: - Study, design, development and test of advanced nuclear and solar power systems for providing reliable light weight power sources in military space vehicles. Study of the potential of the photo process for the conversion of solar energy into useful power. Advanced studies of power systems to permit optimization of systems for specific missions and to exploit more advanced means of generating electrical and mechanical power in space vehicles. Research and investigation leading to the use of thermionic converters for producing power in space vehicles. FY 59 - $2.3 M; FY 60 - $9.7 M. UNCL

SURVEILLANCE TECHNIQUES: - Development of techniques to permit positive recognition of space vehicles and identification of their purpose. FY 60 - $1.1 M. SECRET

COMMUNICATIONS TECHNIQUES: - Improvement of current techniques and exploitation of new techniques for communications with space vehicles. FY 59 - $3.2 M.; FY 60 - $4.2 M. SECRET

ELECTROMAGNETIC WARFARE: - Development of techniques for electronic countermeasures [and ferret reconnaissance.] FY 59 - $0.6 M; FY 60 - $0.8 M. SECRET

ELECTRONIC TECHNIQUES: - Development of (1) smaller, more reliable electronic devices through molecular techniques, and (2) higher power RF sources at microwave frequencies. FY 59 - $.2.2 M; FY 60 $6.7 M. SECRET

INFRARED COMPONENTS AND TECHNIQUES: - Development of [(1) television type tube sensitive in the infrared rather than the visible region of the spectrum for detection and tracking, and (2) more sensitive and versatile methods of recording visual images.] FY 59 - $0.4 M; FY 60 - $0.6 M. SECRET

AEROSPACE ENVIRONMENT: - Studies relating to the characteristics of the atmosphere, the ionosphere and interplanetary matter as related to the accomplishment of military missions. FY 59 - $3.1 M; FY 60 - $3.1 M. SECRET

BIOLOGISTICS: - Studies relating to human capabilities and environmental problems in aerospace flight. FY 59 - $1.7 M; FY 60 $2.0 M. UNCLASSIFIED

HUMAN PERFORMANCE: - Studies on performance and training of military personnel in relation to advanced weapon systems. FY 59 - $0.5 M. FY 60 - $1.2 M. UNCLASSIFIED

TAB E - AIR FORCE STUDY PROGRAM

The Air Force is conducting, under the Air Research and Development Command System Requirement Progran, a space study program. Under this program, the ARDC releases a document to the industry which describes, in general terms, an area of operation or a capability which could have value to future Air Force operations. The industry, using Air Force and/or company funds, conducts a study to determine possible military missions and the weapon systems that might perform these missions.

The results of the contractors' studies are evaluated by the Air Force and are used either to define weapon system requirements or future study efforts.

The past year's program consisted of the following Study Requirements.

Study Requirement	Title
ARDC SR 126	Boost Glide
ARDC SR 178	Global Surveillance System
ARDC SR 181	Strategic Orbital System
ARDC SR 182	Strategic Interplanetary System
ARDC SR 183	Lunar Observatory
ARDC SR 184	[24-Hour Reconnaissance Satellite]
ARDC SR 187	[Satellite Interceptor System]
ARDC SR 192	Strategic Lunar System
ARDC SR 199	Advanced Ballistic Missile Weapon System
ARDC SR 79500*	Intercontinental Glide Missile (ICGM)
ARDC SR 89774	Recoverable Booster Support System

*This Study Requirement supersedes SR 126, Addendum No. 1, dated 20 March 1959.

These studies were funded at $2,900,000 in FY 59. $3,300,000 FY 60 funds for this program are on the Director of Defense Research and Engineering deferred list and have not been released to the Air Force.

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MILITARY POTENTIAL OF SPACE IN USAF PLANNING

1. PROBLEM: What is the Air Force Policy for planning space weapon systems?

2. POSITION: The Air Force position regarding the potential of space and the space weapon systems that should be developed is as follows:

a. Active Offense: The primary space offensive weapons will continue to be ICBM's and improved revisions of ICBM's. As the potential enemy begins to develop an effective defense against simple ICBM's, new systems such as the Quasi-Ballistic Missile, the Boost-Glide Missile, and the Orbital Missile will be added to the inventory.

b. Active Defense: There is an urgent requirement for the development of an effective AICBM. The Air Force believes that the most promising approach is an orbital-based missile designed to intercept during boost, using infrared sensors. A concentrated study and research program should be addressed to this concept.

(1) Defense against hostile satellites is desirable now and will be urgently required in the near future. This capability should consist of a ground-based surveillance system, [a ground-based satellite inspector-attack system, and a ground-based anti-satellite missile.]

c. Supporting Systems: Space systems offer the most effective means for providing [early-warning, reconnaissance,] and communication. Systems for these types of missions are now under development. In addition, space systems for [mapping] and weather appear promising.

d. Study Programs: Space appears to offer a number of advantages in high velocities, difficulty of interception, advantage of position, overall coverage, etc. Studies should be continued to constantly evaluate the possibilities of developing space [weapon systems that would dominate other weapon systems.]

MILITARY POTENTIAL OF SPACE IN USAF PLANNING

1. PROBLEM: To present Air Force recommendations on a future program for Space Projects.

2. POSITION: The Air Force recommendations for future Space Projects are as follows:

a. New military space and ballistic missile systems are required in the near term future. (Ballastic missiles are included because of the technical and operational interrelationship with space systems).

(1) Improved ICBM's

One or more improved versions of the present ICBM's (ATLAS, TITAN, MINUTEMAN) to provide increased range, payload, reliability, simple decoys, etc.

(2) Either a Quasi-Ballastic Missile (QBM) or an Intercontinental Glide Missile (ICGM)

(a) QBM

A large ICBM with midcourse maneuvering and/or terminal guidance and including more sophisticated decoys and penetration aids.

(b) ICGM

An intercontinental missile that uses aerodynamics lift for reentry and/or exit and for increased range and maneuverability.

(3) Orbital Missiles

A missile that will be based in space or can be launched and recalled after one or more orbits. This system will be less vulnerable to enemy attack because of its location and speed.

(4) Earth Orbiting Instrumented Satellite

Continued development and improvements in the following satellites are required:

(a) [Early Warning Satellite] (MIDAS)

(b) Reconnaissance and Intelligence Satellite (SAMOS)

(c) Communications Satellites (STEER and DECREE)

(d) Mapping/Geodesy Satellite (SALAAM)

(e) Weather Satellite (TIROS)

(5) Boost Glide System (DYNA SOAR)

Continued development of the DYNA SOAR through step 3 to provide for the initial manned capability for a near orbital or orbital maneuverable military system.

(6) Anti-Intercontinental Ballistic Missile (AICBM)

There is an urgent requirement for the development of an effective AICBM. The Air Force believes that the most promising approach is an orbital-based missile designed to intercept-during boost using infrared sensors. A concentrated study and research program should be addressed to this concept.

(7) Satellite Defense System

An effective satellite defense system will be composed of the following three elements:

(a) Space Surveillance System (SPACE TRACK)

A ground-based capability for the detection, identifications, track, prediction and cataloguing of all satellites.

(b) Satellite Inspector

A ground-based inspector-attack system which will have the capability, on a sampling basis at least, of performing detailed inspection of suspicious objects in space and some capability for negation of any hostile system.

(c) Anti-Satellite Missile

A ground-based missile with the capability to eliminate or negate the types of satellites that have been identified as threats by the satellite inspector.

MILITARY ORGANIZATION FOR SATELLITE AND SPACE VEHICLE OPERATIONS

1. PROBLEM: To explain briefly the Air Force position on military organization for satellite and space vehicle operations.

2. POSITION OR POLICY: A fundamental issue has been raised with respect to direction, control, coordination and operation of space weapon systems: Whether it is desirable to establish a separate military agency for the operation of military space systems or whether these systems should be integrated with other related weapon systems of the unified and specified commands.

The Air Force considers that operational satellites and space vehicles will in every instance now foreseen constitute a logical and essential growth of present means of mission accomplishment possessed by the unified and specified commanders. The assignment of space systems to the unified and specified commanders appears to be the only prudent and efficient course of action, and no separate agency under the JCS should be established for the operation of space systems.

To eliminate any basis for inter-service duplication and confusion, the Air Force has proposed that military satellite and space systems be assigned in the following manner:

a. Space weapon systems should be assigned to unified commands on the basis of system function and mission for integration with related weapon systems.

b. There are two broad military functional areas - offensive and defensive.

c. Strategic offensive systems, including reconnaissance and strategic weapon delivery systems should be assigned to the Strategic Air Command.

d. Defensive and warning systems should be assigned to the North American Air Defense Command. (While it is appreciated that NORAD's area of responsibility is limited to the North American Continent, the pre-eminence of NORAD in air defense matters in assuring national survival from a global threat make it essential to establish NORAD as the focal point of these operational matters.)

e. The provision of weapons operating in space should be upon the basis of providing to commanders of established unified and specified commands better tools and means to carry out assigned tasks essential to the defense of the U.S.

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SUMMARY HISTORY WS-117L

In 1946 the USAF directed the Rand Corporation to study the feasibility of accomplishing reconnaissance from satellites. When, in 1947, the study concluded that a reconnaissance satellite was feasible additional emphasis was given to engineering studies of critical subsystems of such a system. By March 1955 a G.O.R. had been published. Finally, after suitable source selection procedures, a prime contract for development of the WS-117L Advanced Reconnaissance System was awarded to the Lockheed Aircraft Corporation in October 1956.

It is quite certain that the launch of Sputnik I by the Soviets on 4 October 1957 gave an acceleration to this program it might not otherwise have had. For this reason mention should be made of some of the more significant post-Sputnik events which occurred:

1 Nov 1957 - SecDef authorized acceleration at maximum rate consistent with good management.

1 Jan 1958 - Early orbital capability of a WS-117L satellite was authorized through use of available THOR boosters (DISCOVERER).

7 Feb 1958 - Authority for fiscal and technical direction over WS-117L vested in ARPA.

5 Nov 1958 - ARPA separated MIDAS (Subsystem G) from the WS-117L and provided $750,000 for three months work (approximately 5 million USAF dollars loaned to support this program for six months pending decision from ARPA to provide maximum support).

17 Dec 1958 - SAMOS reoriented by the ARPA in following manner:
a) deletion of 6" camera development
b) acceleration of 36" camera readout system
c) institution of recovery program to do: (1) mapping and charting; (2) high resolution (5') photo reconnaissance.

30 Jan 1959 - Date of submission of current development plans for SAMOS, MIDAS and DISCOVERER.

26 May 1959 - ARPA deleted the mapping and charting development effort from SAMOS.

24 June 1959 - ARPA advised AFBMD to defer work on recovery program pending review of the entire program for FY 1960.

23 July 1959 - Air Council considered the FY 60 and FY 61 programs which subsequently did not receive approval from ARPA.

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GENERAL BACKGROUND - WS-117L

The concept for using a satellite as a platform for reconnaissance equipment was a natural outgrowth of the requirement for obtaining intelligence information of a potential enemy whose area and security precludes the effective collection of this information by ordinary aerial reconnaissance or other usual means. The need for timely and continuous intelligence information, to assess a potential enemy's capabilities and probable intent, has become more critical as the advancement of technology has produced offensive weapons with intercontinental range and greater destructive powers. The impetus which motivated the military establishment to foster work on new methods for collection of intelligence information came from the realization that current, reliable, prehostilities intelligence information is required to insure proper direction of national planning in the development of effective counterforce weapons and counterforce strategy.

The results of the numerous studies conducted since 1946, at the direction of the Department of Defense, established that a Satellite Intelligence System was feasible and would satisfy to a great extent the requirements for intelligence information to aid the national planners in making decisions.

The concept of the Advanced Reconnaissance System is a result of studies conducted at the Rand Corporation. A study completed in 1947, together with similar investigations by other contractors, concluded that a satellite vehicle was feasible as a reconnaissance vehicle but not as a weapons carrier. In 1950, the Research and Development Board vested satellite custody in the Air Force, and Rand was directed to explore its possible military utility.

Recommendations for an expanded study of reconnaissance applications were made to the Air Staff in late 1950, and a formal report (Rand-217) followed in April 1951. Feasibility studies for critical subsystems initiated at the time were television (RCA), attitude control (North American Aviation), and nuclear auxiliary power units (Bendix Aviation, Frederick Flader, Allis-Chalmers and Virto Corporation).

Recommendations for the ARS development were made by Rand in November 1953, and these were followed by a final report (Rand-262) in February 1954. Subsequently, the Air Force issued System Requirement No.5, dated 27 November 1954, later revised on 17 October 1955, and General Operational Requirement No. 80 (SA-2C), dated 16 March 1955. In the spring of 1955, design study proposals were solicited by the Air Force from selected contractors.

The number of sources solicited was limited by the Government's desire to maintain a secure program throughout the design and development phase. The WS 117L 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 airframe and engines did not need to be the sole guide to the type of contractors solicited. Those solicited were the Lockheed Aircraft Corp., the Radio Corporation of America, Glenn L. Martin Company, and Bell Telephone Laboratories. Bell Telephone Laboratories declined to submit a proposal.

The three contractors conducted their design studies between June 1955 and March 1956. These design studies culminated in three separate and distinct development plans. The Lockheed proposal was considered to meet the requirements most satisfactorily.

An ARDC System Development Directive No. 117L was issued on 17 August 1956. The development and test of WS 117L was awarded the Lockheed Aircraft Corp. on Contract AF 04(647)-97 in October 1956. The Massachusetts Institute of Technology was awarded the contract for research and development of the WS 117L Guidance and Orbital Attitude Control Equipment on Contract AF 04(647)-103 in November 1956. Executive management of the project is the responsibility of AFBMD.

By decision of the Secretary of Defense, 1 November 1957, the directive was issued to proceed with the WS 117L at the maximum rate consistent with good management.

The primary objective, established by the USAF's General Operational Requirement for WS 117L, was to "provide continuous (visual, electronic or other) coverage of the U.S.S.R. and satellite nations for surveillance purposes." In its capacity as Prime Weapon System Contractor, operating under the direction of AFBMD, Lockheed initiated a broad program of research and development to meet this objective; the program included both visual and electronic reconnaissance systems.

On 30 June 1958, the Advanced Research Projects Agency (ARPA) Order No. 9-58 was issued confirming previous Department of Defense directives for the assumption of responsibility by ARPA for the Advanced Reconnaissance Satellite Development Program. This directive established the Director, ARPA, as the source of policy and technical guidance for future WS 117L development.

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BACKGROUND - SAMOS

General Operational Requirement No. 80 was revised on 26 September 1958, placing additional requirements upon the Weapon System. Two (2) significant additions included in the revised GOR 80 were the requirements for a recoverable satellite for intelligence use and a mapping and charting addendum to the GOR.

On 1 December 1958 the ARPA proposed, in a memorandum report, a reorientation of the WS 117L program. This proposal was directed to The Under Secretary of the Air Force in a memorandum on 5 December 1958. The reorientation was generated as the result of the ARPA being provided with the consolidated SAMOS intelligence requirements by the Air Force (ACS/I).

As the result of the reorientation directives of early December, AFBMD presented a briefing to the ARPA on 15 December which included an analysis of the ARPA proposed program and an AFBMD counter proposal. The results of the briefing and subsequent negotiations culminated in an ARPA memorandum to The Under Secretary of the Air Force, dated 17 December 1958. The 30 January 1959 Development Plan reflected the instructions of the 17 December 1958 memorandum with regard to program structure and technical objectives. Further, the 30 January plan provided for the development of a SAMOS Reconnaissance System which possessed the capability to satisfy the SAMOS intelligence requirements.

By Amendment No. 11 to ARPA Order No. 9-58, dated 14 April 1959, the ARPA announced qualified approval of the 30 January 1959 SAMOS Development and Funding Plan.

On 27 April 1959 the ARPA was briefed at AFBMD on the analysis and planning for new work for the SAMOS reoriented program. In late May 1959, AFBMD was notified by Headquarters ARDC (TWX RDZGW 26-5-43-E, dated 26 May 1959) that the ARPA approval of the 30 January SAMOS Development Plan did not include approval of the SAMOS recoverable mapping payload. In compliance with this directive instructions were issued to the contractor to terminate all work related to the development of a SAMOS mapping capability.

In late June, instructions were received from the ARPA (TWX 961412, dated 24 June 1959) to defer work on the SAMOS recovery program pending an ARPA program review. The reason for the deferral by the ARPA was fund limitations due to the demands of other programs. This deferral action by the ARPA will possibly delay the SAMOS system capability needed to satisfy the vital intelligence requirements of the Air Force.

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On 4 September 1959 ARPA directed that AFBMD proceed with contract negotiations that deferred the recovery costs but protected certain long lead time items, such as the E-5 camera, under a fund ceiling of $143.7 million.

On 9 September 1959 ARPA directed that AFBMD negotiate a program containing the High Resolution Recovery package and instructed that AFBMD was to reduce the readout programs as necessary to accomplish this goal. A new funding authorization of $148 million dollars for FY 60 and a planning level of [redacted] accompanied this directive.

In a memorandum to the Chairman, Joint Chief of Staff, subject: Coordination of Satellite and Space Vehicle Operations; dated 18 September 1959; the Secretary of Defense approved specific assignments to the Air Force of the interim satellite early warning system, MIDAS, and Phase I of the satellite reconnaissance system, SAMOS. The date of transfer of these systems from the Advanced Research Projects Agency (ARPA) to the Air Force would be subject to the approval of the Secretary of Defense. The Secretary announced that prior to assuming responsibility for a specific program, the appropriate military department would submit to the Secretary for approval detailed plans for the system including our relationship with Unified and Specified Commands and other appropriate agencies.

On 23 October 1959, General LeMay in a letter to General Schriever concerning SAMOS and MIDAS, advised General Schriever that the ARPA funding level for SAMOS would be $159.5 million dollars in FY 60 and [redacted]

In compliance with the instructions of the Secretary of Defense on 18 September 1959, Hq USAF (AFDAT) issued instructions and guidance on 21 October 1959 which included the preparation of the necessary plans by appropriate commands for the transfer of SAMOS to the Air Force. The required plans and responsible commands were: Research and Development Plan, ARDC; Operational Plan, SAC; and Logistic Support Plan, AMC. The time scale for submission of these plans to Hq USAF was 23 November 1959, and reaffirmed the ARPA SAMOS funding ceiling for the R&D program as [redacted] between SAMOS and MIDAS.

A reclama on the effect of the above funding ceilings on the SAMOS development and operational programs was made by AFBMD on 17 November 1959. In this reclama AFBMD requested permission to present the development plans then in preparation which were the result of an extensive planning effort based on all planning guidance except that contained in the Hq USAF message of 13 November 1959. It was noted by AFBMD that the plans proposed for presentation would not be within the announced funding ceilings.

On 20 November 1959, Hq USAF reaffirmed the 13 November 1959 instructions and stated that the Development plans to be presented on 16 December 1959 would be consistent with funding ceilings; however, AFBMD could present as an additional agenda item a recommended program that exceeded the funding ceiling.

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On 21 December 1959, Hq USAF, after receiving guidance from the AFBMC, provided instructions to the AFBMD to prepare a revised develop-

[redacted]

Additional funds required for the program would have to be obtained by internal Air Force reprogramming action. The SAMOS program should emphasize photo over ferret and should press for earliest flight demonstration of both readout and recovery.

Presentation to DDR&E of Air Force approved plans for this program for FY 60 and FY 61 is scheduled for 15 February 1960.

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BACKGROUND - MIDAS

The possibility of accomplishing useful reconnaissance with satellite-borne infrared sensing equipment was recognized during the early design study of the Air Force Advanced Reconnaissance System, WS 117L. A proposal to this effect was included in LMSD-1536, Pied Piper Development Plan dated 1 March 1956, under Contract AF 33(616)-3105. The approach outlined in this report was in consonance with the general system development requirements which established the WS 117L Program.

Subsequently, a prime contractor was selected by the U. S. Air Force for the WS 117L Development Program. This work was undertaken under Contract AF 04(647)-97, supplemented by Letter Contract AF 04(647)-181. Under the terms of these contracts, the prime contractor was directed to conduct a program of research and development designed to accomplish satellite-borne reconnaissance using each of three payload systems: visual, ferret and infrared. Initial work in the infrared field was conducted as an integral part of the WS 117L development.

To meet the requirements of the contract, a complex of subcontractors was organized to assist the prime contractor in determining the feasibility and to establish the preliminary design of an experimental ICBM early warning system.

As a result of significant progress in this development program, the feasibility and the technical basis for a satellite-borne attack alarm system were presented in WS 117L Subsystem G Engineering Analysis Report, Attack Alarm System, dated 19 May 1958. On 5 November 1958 the ARPA published Order No. 38-59 which separated the Infrared Reconnaissance Development (Subsystem "G") from the basic SAMOS Program and established the Infrared Development as the Missile Defense Alarm System (MIDAS). An Air Force Space System Development Plan for the MIDAS Program was prepared in January 1959. This plan, submitted in accordance with ARPA Order No. 38-59 and USAF General Operational Requirement 80-3 and 80-3A, provided for the acceleration and expansion of WS 117L infrared reconnaissance development into the Missile Defense Alarm System. The system, as conceived, utilized a network of twenty (20) satellites on random orbits at a minimum altitude of 1000 nautical miles.

A paramount consideration of this development plan was to utilize a reasonable and conservative approach to the various problems involved in the MIDAS system. This approach in turn led to a number of initial design decisions, the basis of which was to minimize the number of required modifications to developments under way in concurrent WS 117L programs, as well as to minimize the number of uncertainties which would influence the over-all design.

It was, however, a basic premise of the development plan that continued system analysis, design, and measurement efforts would be made

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