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SMAMA SUPPORT OF WS-117L

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DISCOVERER SATELLITE: MIDAS: SENTRY

Designed and built by Lockheed Missiles and Space Division, the first of a series of DISCOVERER satellites was successfully placed in orbit in February. The Division has also been assigned the responsibility of systems manager for PROJECT MIDAS — an early warning system against ballistic missile attacks. The project will investigate the use of infrared sensors for detecting aggressor missiles at the moment of launch; and PROJECT SENTRY — an advanced satellite reconnaissance system. DISCOVERER, MIDAS and SENTRY are programs of the Advanced Research Projects Agency under the direction of the Air Force Ballistic Missile Division.

Portion of Lockheed Advertisement
Clipped from SPACE/AERONAUTICS
September 1959

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SMAMA Historical Study No. 35

SMAMA SUPPORT OF WS-117L

(Title Unclassified)

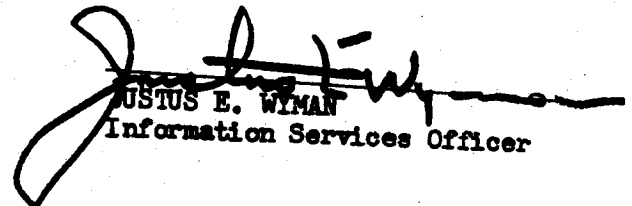
By

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SMAMA Historian

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JUSTUS E. WYMAN
Information Services Officer

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EXHIBITS

- No. 1. Aviation Week Clipping, October 14, 1957
2. New York Times Clipping, 20 August 1959
3. Highlights of 117L Logistics Plan
4. Brochure on GFE

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SMAMA SUPPORT OF WS-117L

CHAPTER I

PROGRAM DEVELOPMENT

The Superman and Buck Rogers-type developments of the 1950s were largely a result of the competition for supremacy between the world's great powers. On the one hand was the Communist dominated world led by the ruthless dictators in the Kremlin with world domination their announced goal. On the other, the free world led by the U. S., was determined to preserve freedom where it still existed and build hope for release of those already enslaved.

~~(S)~~ Among the developments none stirred the imagination more than the program we here discuss—a program which ultimately would permit the free world to maintain an effective worldwide detection and monitoring system. The vehicles to be used were WS-117L satellites travelling over polar orbits.

While SMAMA played only a small role in the development phase, we tell the story briefly as background against the day when SMAMA's role would increase in importance.

BACKGROUND

The WS-117L program was the culmination of intensive studies dating from 1945. In 1947 scientists determined that satellite launching was feasible and the Department of Defense soon became convinced that the satellite would have military usefulness. The Department started official go-ahead action in March 1955 by issuing GOR (General Operating Requirements) No. 80 (SA-2C).

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During 1955 and 1956 Air Force officials set up the systems requirements, evaluated the designs submitted, and approved the development plan. In August 1956 they issued the development directive. In October 1956 the Air Force let Letter Contract AF 04(647)-97 to Lockheed Aircraft Corporation, Missiles System Division—later changed to Missile and Space Division—making them the weapon system contractor. They definitized the contract in January 1958 and executed a new letter contract to add to and speed up the program. This letter contract—No. 181—became a supplement to Contract -97.

The WS-117L program, previously referred to as Pied Piper, Big Brother and ARS (Advanced Reconnaissance System) bore the official nickname "New Horizon."¹ It was the only reconnaissance satellite program under development by the Air Force. Its development embraced three related but distinctly separate programs: Discoverer, Sentry, and MIDAS. Each of these will be discussed later.

Objectives²

~~(S)~~ The overall objectives of these combined programs were to establish a system of continuous survey of otherwise unmonitorable territory; to provide intelligence information warning of impending or actual enemy action, missile launching, etc., and to determine enemy potentials—forces, stockpiles, and industrial and war making capabilities.

~~(S)~~ Objectives of those responsible for WS-117L development were (1) to find the best balance between early availability, effectiveness, and

1. Lockheed Syllabus, "Satellite Development Programs," Introduction, Jan '59. (Secret)

2. Ibid.

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overall economy in manpower and funds, and (2) advance step by step with a series of reconnaissance systems capable of collecting high priority intelligence on enemy potentials and actions at the earliest date.¹

Management Organization

To provide effective management and coordination of the Air Force Ballistic Missile program the ARDC (Air Research and Development Command) set up in 1953 a Western Development Division at Inglewood, a suburb of Los Angeles. The title later changed to Ballistic Missiles Division. Hq AMC saw the need to have an office near to handle its part in the programs and in 1955 it established a Ballistic Missiles Office (BMO) at Inglewood. This office grew in importance, under the impetus of an expanding missiles business in Southern California, and in 1957 Hq AMC made it responsible in the same degree as a Lead AMA for managing contracts and supervising maintenance. Maj Gen Ben I. Funk was the Ballistic Missiles Manager (BMM) in command. To provide logistics services Hq AMC set up a Ballistic Missiles Logistics Office (BMLO) at Mira Loma, California.

It was soon evident that the BMO had neither the manpower nor experience to accomplish the extensive Lead AMA duties required and Hq AMC arranged for SBAMA to take over the bulk of the load and designated the SBAMA commander, Maj Gen E. W. Anderson, Deputy BMO. SBAMA took over the operation, with the BMO retaining the policy-making function. The BMLO operation moved from Mira Loma to and was absorbed in SBAMA.

1. Lockheed Syllabus, "Satellite Development Programs, Introduction, Jan 59.

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SBAMA, as ISM (Logistics Support Manager) for Atlas, Titan, and Thor missiles, had hoped in addition to be given full AMC responsibility for the WS-117L,¹ but AMC decided otherwise. In May 1958 an AMC letter assigned the WS-117L to SMAMA for logistic support.²

Orbiting Projections Affected by Sputnik

~~(S)~~ As the WS-117L programs took shape in 1957 Air Force plans called for the first satellite to go into orbit in June 1959. Others would follow over a period of years.

~~(S)~~ But Sputnik (October 1957) apparently changed these projections.³ It seemed to provide the incentive needed so that funds and manpower became available to the newly organized ARPA (Advanced Research Projects Agency) for a rush program. The first R&D (Research and Development) orbiting was tentatively pushed ahead to October 1958. Others were to follow with increasing frequency.

The Air Force was to have nothing to do with the manned version of the satellite since it was not a part of the defense program. NASA was directly responsible for such.

Program Acceleration - 1958

~~(S)~~ Prior to January 1948 plans called for the ICBM Atlas (SM-65) to be used in boosting all Discoverer/Sentry satellites to orbital heights. In January 1958, following the Soviet successes, the ARS program received top Defense Department (DI) priority. The Department of Defense

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1. History of SBAMA, July-December 1958, pp 14-15.
 2. Ltr, Lt Gen Wm. F. McKee, Vice Comdr, AMC, to Comdr SMAMA, subj: Assignment of the WS-117L, 20 May 58.
 3. Aviation Week of Oct 14, 57 stated, "Soviet satellite launching will spur research and development efforts on advance US space vehicles, including Pied Piper." See Exhibit No. 1 for copy of article.

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authorized the flight test date for Atlas-boosted satellites moved ahead approximately a year and assigned the name "Sentry" to the project. Nineteen IRBM Thor (SM-75) power plants were allocated to the program to develop orbital capability and test the ability to recover payloads from orbit. This portion of the program was assigned the name "Discoverer." The survey portion of the Sentry program, to determine application of satellites to missiles warning and defense, was assigned the name MIDAS (Missile Defense Alarm System).

(S) The Sentry system divided for development into the following major subsystems:

Four under the satellite vehicle—airframe, propulsion, auxiliary power, and guidance and control.

Two under the reconnaissance element—visual and ferret.

One each for tracking, acquisition and readout, technical operations control center, and intelligence processing center.

Lockheed, as prime weapon system contractor, was responsible for all but (1) the intelligence data processing which was under Thompson-Ramo-Woolridge and supervised by Rome Air Development Center (RADC), and (2) command communications under Kellogg Switchboard and Supply Division of International Telephone and Telegraph, also supervised by RADC. Under the three-way program, Discoverer would continue as an "open end" research program general in nature, while Sentry and MIDAS on reaching some degree of productive capability would come under Air Force control.

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Agency Responsibility

Overall responsibility for developing the Air Force Reconnaissance satellite program went originally to the Western Development Division—since changed to Ballistics Missile Division (BMD)—of ARDC.¹ Following the creation, in February 1958, of the Advanced Research Projects Agency (ARPA) under the OSD, direction of the satellite development and its funding went to that agency.²

SMAMA next entered the picture as the systems began taking shape, in providing logistic support on behalf of AMC. On 20 May 1958 AMC made the LSM assignment to SMAMA.³

Contractors

While Lockheed Aircraft Corporation was the principal contractor for the WS-117L project many others came prominently into the picture as subcontractors.⁴

To provide the second stage propulsion, ARPA chose the Bell Aircraft Corporation's Hustler rocket engine. The Navy's Lockheed-built Polaris had been considered⁵ but apparently the solid propellant booster was too heavy for the second stage use. The lighter Hustler would do the job and be less burdensome to the 1st stage booster.

~~(S)~~ Four subcontractors had to do with developing and providing elements of the visual reconnaissance package for the satellite. They were: Eastman Kodak, Columbia Broadcasting System, General Electric, and Fairchild Camera and Instrument Corporation.

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1. Lockheed Syllabus, "Satellite Development Programs" Sec I, Jan 59.
 2. Ibid.
 3. Ltr, Lt Gen McKee, Vice Comdr, AMC, to Comdr, SMAMA, subj: Assignment of the WS-117L, 20 May 58.
 4. Lockheed Syllabus.
 5. Aviation Week, 24 Nov 58, "Sentry Satellite Shot Planned for Dec 15."

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(S) Airborne Instruments Lab, Inc. contracted to provide the electronic or ferret reconnaissance package, while Aerojet General Corporation did the same with the infra-red recon package.

Finally, among the principal subcontractors, Philco Corporation contracted to provide the acquisition and readout subsystems needed to get info from and commands to the satellite in orbit.

IMS

Lockheed Aircraft Corporation centered its missile and satellite production in its new plant at Sunnyvale, California. This was adjacent to Moffett Field near San Jose at the southern tip of San Francisco Bay, and only a short distance from Palo Alto where there was another Lockheed facility. SMAMA became responsible for administering AMC contract interests at this Lockheed plant and on 23 June 1958 AMC established a Plant Representative Office there; under SMAMA jurisdiction, to provide the needed administrative services.¹

Involved as it was with a considerable amount of this country's highly classified defense and space exploration projects the security aspects of the plant required close watchcare. A historical report of 27 March 1959 told of an "unsatisfactory" security rating having been issued on 20 August 1958.² The AFFRO worked with IMS to correct the deficiencies by establishing effective basic policy and an adequate security organization.

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1. AMC GO 50, eff 23 June 1958.
 2. Historical Rpt of Ch, Security Div, AFFRO, to Dpty AFFRO, 27 Mar 59, in SMAMA Hist Archives.

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Developing the Satellite Program

(S) As the programs developed, planners called for two basic types of satellites: one would relay to the ground the data gathered; the other (introduced into the program in January 1958) would release a payload intended for recovery.¹ They scheduled the booster portion of SM-65 Atlas to power the former while Thor IRBM booster was to be 1st stage power for the latter initially. Thor was used because it was available (Atlas wasn't) when the payload recovery program got underway.

The satellite program divided itself logically into three major parts.² First, was the research, design, development, and manufacture of the vehicles and their payloads, the communication networks, and the ground support equipment. Next was the selection of launching and tracking sites; the design and construction of support facilities; and the determination of manpower requirements. Finally, there was the actual launching and tracking, and the gathering, processing, interpreting, and disseminating of data.

Then there was, from the SMAMA point of view, an additional portion of some magnitude—the logistic support of the program in all its parts.

THE SATELLITE

(S) Characteristics of the WS-117L that set it apart as a most extraordinary and effective weapon were many:³

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1. Lockheed Syllabus.
 2. Ibid.
 3. Ibid.

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1. Because its orbit was North-South, almost over the Poles, it was to be capable of complete target coverage. The earth rotating under it would make possible a view of the entire earth's surface every 12 hours by just one satellite.
2. It was to have the ability to locate very accurately any given target and then provide constant surveillance of the target areas.
3. It could provide instantaneous warning of ICBM attacks so that effective counter measures might be taken.
4. Its creators claimed it to be nearly invulnerable to attack or counter-measure. (Aviation Week of October 14, 1957 gave the opinion that "relatively simple countermeasures probably could be used to bring them down."¹ Currently, however, SMAMA's LSM had no knowledge of effective countermeasures development.²)
5. No aircrews were necessary in filling the mission designed for the WS-117L.
6. No overseas bases were needed.
7. Its data gathering rate would be tremendous and this would make it very economical per unit of data.
8. It would provide a fast response—make quickly available the information it obtained.
9. Its growth potential was without limit.
10. Data gathering life—when perfected—might be a full year.

1. See Exhibit No. 1.



2. Interview, Tal T. Barnes and Robert E. Thompson of the WS-117L Div, 13 Aug 59.

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Satellite Components¹

(S) The Discoverer, Sentry, and MIDAS systems, while different in their payload and mission, used much of the same equipment. The satellite vehicle itself consisted of the airframe, the propulsion system, an auxiliary power system and a guidance and control system. Its overall length was almost 19 feet and its diameter was 5 feet.

(S) The nose cap was designed so that it could be dropped off as the satellite went into orbit. This would expose the data-gathering devices that were housed in the nose cone so they might perform their mission. This nose cone, also removable from the rest of the satellite, provided approximately 30 cubic feet— about 35 per cent of its volume—for housing the payload equipment. A contemplated rearrangement in the nose cone, from a radial  to an egg crate  plan, would increase considerably the capacity of its payload compartment.

(S) The mid-body section contained the JP-4 fuel tanks and oxidizer tank. The oxidizer used in the first and second launching was called IRFNA (inhibited red fuming nitric acid). Later launchings used the improved oxidizer UDH (unsymmetrical dimethyl hydrazene). Beams in the aft section, which surrounded the rocket engine, provided support for batteries, antenna, pressure vessels, control gas jets, geophysical research instruments, and the propulsion system. Eighteen batteries, each 8" x 12" x 1 1/2", fitted into their compartments.

1. Lockheed Syllabus, Sec. II.

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Total payload, in nose cone and aft section, occupied about 85 cubic feet.

An arrangement to separate the satellite from its booster was a set of small retrorockets whose explosion slowed down the booster.

(3) The satellite propulsion system consisted of (1) an XLR-81 rocket (the Bell-Hustler) engine, (2) fuel and oxidizer tanks, (3) pressurization and vent system, (4) helium spheres, and (5) ullage control rockets. The rocket engine produced a thrust of 15,000 pounds for two minutes burning time. Its firing following the brief period of free coasting, gave the necessary push to proper orbiting speed. A proposed procedure called "dual burn" would permit higher orbital altitudes or heavier payloads. The satellite's engine would burn twice—once right after booster separation and again briefly to give required velocity in orbit. The propellant tanks were kept under pressure, while in operation, by helium. The small ullage rockets, using solid fuel, were fired just before the engine ignition. The acceleration provided a gravity effect to position propellants aft in the tanks and assure that the liquids were at the pump inlets.

Auxiliary power supply systems—batteries—furnished needed electrical power to the precious data-gathering and releasing equipment, etc. Currently under development to secure long duration, reliable operation, and maximum simplicity with minimum weight, were (1) higher energy batteries, (2) solar photovoltaics (generating electromotive energy from sunlight), (3) nuclear radioisotopes, and (4) nuclear reactors. Numbers 1, 2 and 3 were expected to be available in 1960; 4 in 1963.

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Booster Power

On the credit side of the WS-117L development program was the almost immediate availability of necessary booster power. It was only necessary to make minor adjustments in order to utilize the power plants already developed for the IREMs and ICBMs. Had the reconnaissance-type satellites required a special type of booster to place them in orbit their cost would have been infinitely greater and their date of effective utilization might have been delayed dangerously.

The special power units that were needed to give the satellite its final push into orbit and position it properly for performing its info-gathering mission did require a lot of attention and technical know-how. Their size and costs were small when compared with the Thor, Atlas, Jupiter, and the multiple rocket boosters of the future, each of which in turn were power plants or potential power plants for the WS-117L.

Communications¹

(S) There were several important functions of the communications system: First, it provided information to prove that the satellite had actually gone into orbit, and made it possible to compute its orbital path and speed. Second, it received and executed both programmed and unprogrammed commands. Third, it performed telemetering service, measuring and recording desired distances. Fourth, it transmitted its collected information data from the satellite to the ground. Finally, the

1. Lockheed Syllabus, Sec III. Details on communications functions may be found under Discoverer, Sentry, and MIDAS discussions.

communications system included ground communications which transmitted tracking data, payload data, and administrative traffic.

Costs

The original investment in Pied Piper or WS-117L was \$4 million. This later was increased to \$12 million for the first year.¹ The WS-117L program was supported at \$55 million in 1958.² USAF asked for \$215 million for FY 59 but ARPA set \$152 million as a "more proper figure for the present."³ Letter contract No. 181—supplement to Contract -97—brought the dollar value of the 117L program to \$202 million for FY 59,⁴ while additional reprogramming increased the amount to \$213.4 million as of 8 June 1959.⁵

For the Sentry only the FY 60 Financial Plan provided \$179 million for ARPA's use. SMAMA's FY-60 budget for the 117L program was \$605,000.


tions submitted by SBAMA and ROAMA in addition to SMAMA.

1. Aviation Week, October 14, 1957, "USAF Pushes Pied Piper Space Vehicle." See Exhibit No. 1.
2. Ibid.
3. Aviation Week, 16 June 1958, p 28.
4. Historical data from AFPR, Lockheed Missiles & Space Div, Sunnyvale, California, 25 Mar 59. Cy in SMAMA Hist Archives.
5. Aviation Week, 8 June 1959, p 28.
6. Ballistic Missile and Space Systems Budget Estimate as of July 1959. Prepared by SMAMA's Budget Div assisted by DLIS.

CHAPTER II

WS-117L PROGRAMS

As has already been indicated, the currently conceived WS-117L program was divided into three separate and distinct parts. This chapter will give some details and descriptive info on each.

DISCOVERER

The Discoverer portion of the WS-117L program was concerned mostly with the recovery of payload.¹ It embraced a series of Thor-boosted satellites, the first of which—called "Discoverer I"—was fired into orbit on 28 February 1959;² a second—Discoverer II—on 13 April 1959; a third—Discoverer III carrying four gray mice—on 3 June 1959; a fourth—Discoverer IV—which failed to orbit, on 25 June 1959.³ Discoverer V and VI were fired into orbit on August 13 and 19 respectively. Others, at the rate of one or more a month were scheduled for orbiting during the remainder of 1959.

Involved in the Discoverer program were a number of government agencies in addition to SMAMA with its limited logistical support. These were: the AF School of Aviation Medicine, the AF Bioastronautical Directorate, Wright Air Development Center, Holloman Air Development Center, Los Alamos Scientific Laboratories, Hickam AF Base, and the US Navy.

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1. Lockheed Syllabus, "Satellite Development Programs," Sec IV, Jan 59.
 2. Actually, the first attempt was on 21 Jan 59. Malfunctions prevented its leaving the launching pad.
 3. The degree of success of these firings will be discussed later.

Tracking stations for the Discoverer, fully equipped and manned, were at Vandenberg AF Base, at Point Mugu, and at the Palo Alto Development Center in California; at Annette and Kodiak in Alaska; at Kaena Point, Hawaii; and on a specially equipped ship at sea.

Two versions of the recoverable capsule—Mark I and Mark II—were specially prepared and equipped for early firing. Mark I would accommodate mice and weighed a total of 195 pounds. Mark II would carry a six pound rhesus monkey, and the capsule's total weight was to be 279 pounds.

Roy W. Johnson, director of ARPA, described the Discoverer program as being extremely broad.¹ He said there were no limitations as to the launching locations, types of boosters, or on the services or contractors who would do the work. He described it as an "open-end" research program which might continue over a period of many years if funding was provided.

Discoverer I

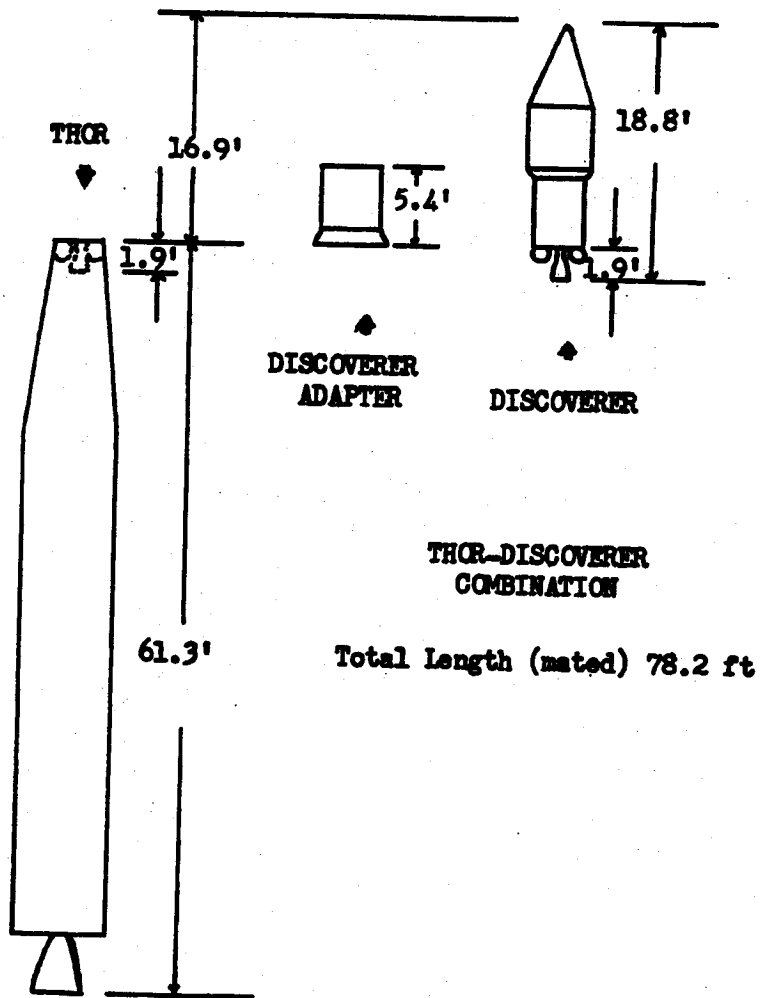
The first satellite to be launched from the new Pacific Coast site at Vandenberg AF Base was Discoverer I on 28 February 1959. While not successful in orbiting a stabilized vehicle, the launching demonstrated the feasibility of using a Thor and Bell Hustler rocket engine combination to put a relatively heavy satellite into orbit. A report of the launching described the acceleration and burning time of the Thor booster as being "right on the button."² The separation and coast period followed

1. Aviation Week, 8 Dec 58, p 31.

2. Irving Stone in Aviation Week, 9 Mar 57, article titled: "Orbiting Discoverer Eludes Tracking."



DISCOVERER I LAUNCHING, VANDENBERG AF BASE, 28 February 1959



Over-all length of Discoverer I, including a modified Douglas Thor and Lockheed satellite vehicle, is 78.2 feet. Satellite was the first to be launched from Pacific Missile Range.

SANTA MARIA
CALIF.

PACIFIC OCEAN


PACIFIC OCEAN

MILITARY
RESERVATION

VANDERBERG
A. F. BASE

PT. ARGUELLES
NAVAL TEST
FACILITY

PT. ARGUELLES

■	ATLAS V TITAN PAC
□	THOR PAC
---	SA PAC SA
●	
	
MILES	

the prescribed pattern, the Bell Hustler rocket cut in as planned, and its burning time was just as it had been projected. The velocity measurements and ground radar tracking indicated that thrust of the Hustler and orientation of the second stage vehicle were perfect to establish the planned orbit.

Tracking stations lost telemetry contact with the satellite 8 minutes, 56 seconds after firing. It was then approximately 30 miles off its planned trajectory. About 22 hours later trackers picked up signals which approximated the predicted position and convinced them that the satellite was in orbit. The spotty nature of the signals led the authorities to believe that the radio transmitters weren't functioning properly or that the vehicle was tumbling when it should have stabilized.

Roy Johnson, Director of the Advanced Research Projects Agency (ARPA), considered that the test of the propulsion system was good but that the test of the stabilizing equipment and the tracking was inadequate.¹

Discoverer II

On 13 April at Vandenberg AF Base, contractor personnel launched Discoverer II into a polar orbit. A primary objective of ARPA and the Air Force in this particular firing was the testing of the technique for recovery of the satellite's 195-pound re-entry vehicle containing

1. Irving Stone in Aviation Week, Mar 9, 59, article titled: "Orbiting Discoverer Eludes Tracking."

a 160-pound instrument capsule. Another objective was the testing of the mechanism intended to stabilize and prevent the satellite from tumbling so the cameras would always be pointed toward the earth.

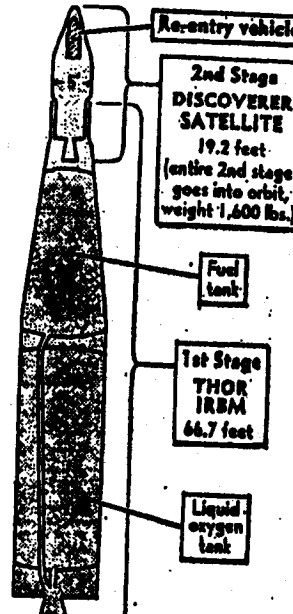
While not successful in its recovery objective, it was apparently successful in becoming stabilized in orbit. Mr. William H. Godel, director of planning for ARPA said the satellite would be a "very significant first" if it achieved only proper stabilization in its orbit.¹

Hopes for achievement of the first objective which, according to Mr. Godel, had only a "very, very remote" possibility of success,² faded when timing was found to be faulty. The satellite went into orbit slightly lower than planned, causing it to circle the earth in 90.5 minutes instead of 94 minutes.³ The timing device to separate the re-entry vehicle was set for the 94-minute orbital period. Repeated attempts to re-set it by radio command failed. As a result, the capsule separated from the satellite when it was in the north polar regions instead of in the vicinity of Hawaii as planned. Because both the recovery package and the rocket casing that remained in orbit emitted radio signals it was possible for tracking stations to determine that the separation had been successful.

The course of the satellite during its seventeenth pass around the world—the pre-set separation pass—plus Air Force reports of visual

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1. Quoted in New York Times Apr 14, 1959, p C21.
 2. Ibid.
 3. Ibid.

THE VEHICLE



Re-entry vehicle


2nd Stage DISCOVERER SATELLITE
19.2 feet
(entire 2nd stage goes into orbit, weight 1,600 lbs.)

Fuel tank

1st Stage THOR IRBM
66.7 feet

Liquid-oxygen tank

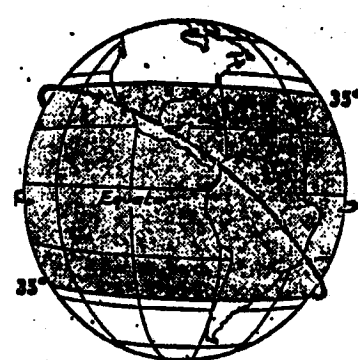
WHAT HAPPENED



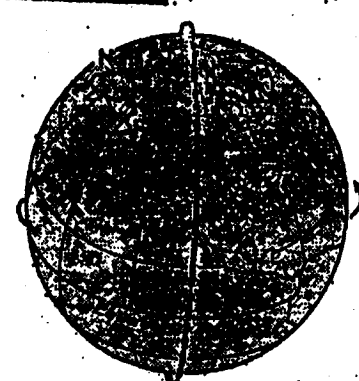
1. Timer was to detach re-entry vehicle on 17th circuit of earth for recovery in Pacific near Hawaii.

2. Timing was off and re-entry apparently occurred in this region of the Arctic Ocean.

IMPORTANCE OF POLAR ORBIT



1. Typical Cape Canaveral orbit is inclined at 35-degree angle to Equator. As earth rotates beneath it, satellite covers only shaded area of earth between 35° North and South.



2. But Discoverer, launched from California in polar orbit, crosses Equator at 90-degree angle, passes over both poles and in time traces longitude-like lines over all earth.

sightings, tended to support the reports that the capsule had landed near Spitsbergen in the Arctic Ocean, (see illustration).

Discoverer III¹

Discoverer III blasted off from Vandenberg AF Base on 3 June 1959 for what was to have been this country's first attempt to collect biological data for orbital flight. This effort failed. All attempts to track the second stage vehicle were in vain. Air Force officials assumed that the satellite did not achieve sufficient velocity for outer space and that it re-entered the earth's atmosphere and burned up.

Four laboratory trained black mice in the 160-pound recovery capsule were to have provided the first US biological data from orbital flight. Primary interest was in the effect of cosmic radiation. Black mice were chosen because cosmic radiation exposure can cause a noticeable change in hair pigment.

Discoverer IV,² V, and VI³

Fired at 3:49 P.M., 25 June 1959, Discoverer IV was to be a test of equipment—nothing was in the life capsule. It failed to orbit. Had orbit been achieved, the Air Force would have attempted an aerial catch of the capsule near Hawaii. Discoverer V and VI were fired on 13 and 19 August respectively. The orbiting in each case was successful

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1. New York Times, p 2B, 7 Jun 59, and Aviation Week, 8 Jun 59, p 33.
 2. Sacramento Union, 26 Jun 59.
 3. New York Times, 20 Aug 59. See Exhibit No. 2.

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but the scheduled recovery of ejected instrument capsules failed. Their signal devices failed to work and without signals the Air Force was unable to locate them.

SENTRY AND MIDAS

Two programs from which SMAMA would ultimately acquire a heavy workload if they went on to completion as planned, were the Sentry and MIDAS programs. As soon as either became operational, its full logistic support management would fall on SMAMA. Until that time the support from SMAMA was limited.

Sentry¹

(S) In January 1958, spurred by Sputnik, the Atlas boosted reconnaissance satellites program was given high (DX) priority and set up as a separate project under the name Sentry. The balance of the program—that pertaining to payload recovery—then became the Discoverer program. Later, near the end of 1958, that portion of the Sentry program concerned with infra-red detection systems was assigned the name MIDAS (Missiles Defense Alarm System) and made a separate project.

(S) Sentry's purpose was to utilize satellites as data gathering media. Its highly sensitive equipment would locate accurately all electromagnetic radiations emitted from any place in the world. It would transmit this info back to our forces and intelligence agencies.

(S) Two types of systems were under development for Sentry. One was the use of cameras for visual determination of enemy potentials. The

1. Lockheed Syllabus, Sec V.

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other was use of electronic devices and was called ferreting. It was this system that would catch and transmit the electronic emissions from enemy territory. It would provide info on imminence of hostilities, on offensive and defensive systems, and on technological capabilities. It would be capable of obtaining info even on camouflaged installations not shown in photos.

~~(S)~~ Advanced systems being planned would include an alarm system to provide instantaneous transmission to the ground of intercepted signals of a critical nature such as those associated with an ICBM launching.

MIDAS (Missile Defense Alarm System)¹

~~(S)~~ The Midas program embraced infra-red sensing techniques that aimed at perfecting (a) a missile defense alarm system, (b) an ICBM precision tracking and prediction system, (c) an airbreathing vehicle tracking and prediction system, and (d) a ground surveillance system. The detection equipment, communications equipment and necessary auxiliary power would weigh a total of about 628 pounds. Aerojet-General Corporation was the principal subcontractor for the reconn package.

For a simple defense alarm system Midas would employ about 20 satellites—sufficient, if properly spaced over polar orbits, to provide constant coverage over any given territory.

1. Lockheed Syllabus, Sec VI.

CHAPTER III

SMAMA'S ROLE

As a representative of AMC, SMAMA management set to work early in 1958 on plans and on an organization for handling the WS-117L support. Although the full impact of the program on SMAMA was still some time in the future, sufficient had been done, and was being done to justify examination and treatment in this study.

SMAMA'S WS-117L DIVISION

As we have shown, on 20 May 1958 SMAMA became logistic support manager (ISM) for the WS-117L.¹ In anticipation of a workload in this new assignment, SMAMA initiated an organization under the Plans and Programming Office to lay the groundwork. This organization grew in size and importance as added info on the system development became available. Supply, Procurement, and Maintenance Directorates all became involved so that, with the establishment of the new Directorate for Logistic Support Management on 1 January 1959, an organization for the WS-117L weapon system became one of its major divisions. Frank L. Grow, formerly in Plans and Programming and closely associated with the system's introduction and growth at SMAMA, became division chief.

Situated in Building 50 near the office of the LSM Director, with a complement of some 13 personnel at the end of June 1959, the 117L Weapon

1. Ltr, Lt Gen Wm. F. McKee, Vice Comdr, AMC, to Comdr, SMAMA, subj: Assignment of the WS-117L, 20 May 58.

System Division was performing all SMAMA assigned Logistic Support Management functions in behalf of AMC as FY 59 drew to a close.

A NEW AMC-ARDC PATTERN

When SMAMA first took over its assigned duties with the 117L, those in charge found themselves in difficulty. The overall jurisdictional picture was still evolving. Several agencies were giving orders and attempting to answer questions. ARPA, BMC, BMO, AMC, and SBAMA were all deeply involved. None had the answer in some instances.¹

When the Air Force set the 117L program in motion it by-passed the Ramo-Woolridge Space Technology Lab (STL) and decided to do its own system management through ARDC. This was the first non-air breathing rocket system to have a prime contractor designated and not to have STL manage several "associate" contractors' efforts.

A standard AMC-ARDC pattern was developing. ARDC was to supervise system development by the contractor to the point where the weapon system would achieve initial capability—not necessarily be fully operative. At this point AMC would take over logistic support. With the -117L, SMAMA became AMC's agent. AMC was, however, very much interested before the weapon system reached the initial capability point. It, through BMO, was to do the buying according to ARDC specifications and, through SMAMA, was to evaluate the supportability of the hardware—the systems and subsystems—being developed for ARDC. If this hardware became the initial capability

1. Interview with Robert E. Thompson, Ch, Programs & Integration Br, WS-117L Div, 13 Aug 59.

hardware, SMAMA would specify and ARDC provide an initial spares package. This was known as incremental provisioning and had initially been a responsibility of BMC for the strategic missiles (SMs). Because BMC was not manned for it, SMAMA's LSM served as technical advisor to determine the initial spares package.

This new responsibility, made firm by an AMC letter,¹ became one of the major duties of the LSM in connection with the WS-117L.

Another major responsibility was to assure contractual requirements for provisioning of future needs to receive development failure and consumption data. As there had been no experience in the operation of similar weapons, the failure and consumption data of the Research and Development (R&D) program was to be used as a basis for initial provisioning. This valuable information was being obtained from the contractors who operated the R&D sites.

This requirement allowed electronic data processing (EDP) machines to be utilized for initial and follow-on provisioning. Failure and consumption data had to be provided in a form specified by exhibit attached to the R&D contract, making it compatible with the EDP input data format.

In connection with these difficult situations, General Funk, commander of BMC, suggested that SMAMA assign a liaison representative to their center.² Security restrictions, he pointed out, prevented formalizing much of the data which should be known to the LSM. A top caliber liaison man would bridge the gap.

-
1. Ltr, Gen McKee to Comdr, SMAMA, 24 Oct 58, subj: AMC Logistics Sup Policy.
 2. Ltr, Gen Funk to Gen Price, personal, 10 Apr 59.

In response to this suggestion SMAMA assigned Jack Griffin to the liaison post, effective 1 May 1959.¹ His presence in the BMC and BMO jointly manned WS-117L Project Office proved to be of value to them and to SMAMA. By telephone, by mail, and by occasional trips he kept the local 117L people alerted to all developments and he provided needed services to the BM people in behalf of SMAMA.

SMAMA'S SUPPORT FUNCTION

SMAMA's role in the WS-117L program, although minor while none of the systems were operational, was unique in Air Force history. Never before had AMC, through one of its AMA's, given support to a weapon system while still in the research and development stage. This support, while sizeable and increasing, was limited to certain specialized equipment—i.e., SMAMA became single point manager on AF standard and common items for the 117L.

With eyes to the future when it would exercise full ISM responsibilities after one of the weapons became operational, SMAMA offered its services so that its managers might gain experience and be organized and prepared against the day of greater responsibility. Representatives of BMD and LMSD were vocal in their appreciation for SMAMA's assistance.²

SMAMA's role in the Discoverer program would never be very large but with Sentry and MIDAS—when they became operational—it would be heavy.

1. Interview with Talton T. Barnes, Ch, Plans & Systems Br, WS-117L Div, 13 Aug 59.

2. Ibid.

Transportation responsibilities in behalf of the Air Force, for the WS-117L contract had been at San Bernardino AMA. Effective 22 June this responsibility transferred to SMAMA and the LMSD contract was revised accordingly.¹ All Government Bills of Lading for movement of WS-117L government owned items came under SMAMA control.

Budget Preparation and Approval

During the early summer of 1959 the WS-117L Division prepared its annual budget for submission to AMC. AMC approved the budget—approximately \$45 million—substantially as it was submitted.² This SMAMA prepared budget provided primarily for common items and personnel costs. Ballistics Missile Division of ARDC was to budget for initial spares peculiar to the satellite.

WS-117L Logistics Plan

Also, in July, preparation of the WS-117L Logistics Plan became a SMAMA responsibility.³ After receiving comments and suggestions from other agencies concerned—BMD, EMC and SBAMA—SMAMA technicians assembled and refined the plan so that it was ready to be submitted for approval before the end of August. Its approval by higher headquarters would be a major milestone in WS-117L history at SMAMA.⁴

Pioneering in a new field, the Logistics Plan designated SBAMA as 117L/SM-65 Equipment Manager since that AMA was LSM for the Atlas,

-
1. Minutes of Comdr's Staff meeting with DISM, 15 Jun 59, par 7.
 2. Minutes of Comdr's Conf with DISM, 27 Jul 59, par 8.
 3. Ibid, par 9.
 4. Interview, Talton T. Barnes, Ch, Plans & Systems Br, WS-117L Div, 13 Aug 59. See Exhibit No. 3, "Highlights of 117L Logistics Plan."

(SM-65). SBAMA would provide direct support to the launch complex for booster ground support equipment (GSE) and ground operating equipment (GOE). Also, SBAMA would support direct mission installed facility-type items and provide supporting spares for all categories in connection with the booster. However, overall management responsibility for the satellite, including the booster, would remain with SMAMA, the LSM.

The Plan provided for use of the Standard Integrated Data Processing System because the time factor precluded the development of a new system and the Standard system was capable of processing actions rapidly on a wide range of items.

In Supply, the Plan made the LSM responsible for projecting requirements and managing distribution of all AF standard items and spares for R&D. While GOE (ground operating equipment) was a part of the production contract like the satellite vehicle itself, GSE (ground support equipment) and spares for both GOE and GSE were to be provisioned by the LSM.

Maintenance, under the Plan, was to be performed by the using command's operating squadrons and by AMC depots. The LSM would propose the phasing in for depot work of peculiar items as it was able to determine depot capability.

Maintenance Problems¹

AMC's entry into space satellite programs, such as the WS-117L, brought difficult phasing and training problems in maintenance requirements.

1. Info obtained from Frank L. Grow, Ch, 117L Div, DLSM, 15 Sept 59.

Aircraft maintenance guidelines were of little use. Transition from R&D to test, and then to operation did not proceed in the same distinguishable manner as it did with aircraft programs. A contractor gave the Air Force a complete system when he developed an airplane, but a satellite system was not deliverable in the same manner. The ground sites for launch, tracking, readout, and control were a part of the system. The contractor for the 117L was expected to turn over to USAF, equipped and functioning ground sites along with the completed satellites.

While there would be more than one tracking station and read out station to be equipped, there weren't enough to justify production line overhaul of the equipment. Space programs such as the 117L, were highly "customized;" more so, even, than the missiles programs.

While the boosters of missiles and satellites were the same type, their handling before firing was different. The ballistic missile program normally involved considerable holding and a lot of practicing up to launch, but the satellite was a launch-when-ready deal.

The task of taking over maintenance of a highly complex system which would be in full operation on the day of delivery would require a lot of positive planning and preparation. Primary emphasis would be on training the operational command and in developing the system. AMC maintenance training would necessarily have to be done later.

While contractor maintenance might be used initially, the AMC objective was to bring the maintenance work "in-house" as soon as possible.

In order to grow up with the system SMAMA's DISM arranged for maintenance teams to do on site work on government furnished equipment (GFE) being used by the contractor. During the summer of 1959 SMAMA had a communications and electronics team stationed at Vandenberg AF Base where launching was done and where a tracking station was located.

Depot level maintenance of GFE on site by AMC teams would release contractor personnel for R&D work and give AF people needed experience.

Support Problems in GFE and Spares

USAF's involvement in the space programs made necessary some radical departures in methods of support in the research and development (R&D) phase since great quantities of government furnished equipment (GFE) were involved.

SMAMA became vitally concerned in these new developments in connection with its part as LSM in the WS-117L program. Having one of the highest priorities possible the program needed to be freed from all hindrances to its rapid progress.

The normal procedure had been for the contractor to requisition through the Plant Representative to the proper AMC depot. They used a separate Form 1149 for each line item. Requisitions and the varied responses to them normally went by mail.

To whip this horse and buggy system, representatives of BMC, SMAMA's LSM, and the AF Procurement office at Lockheed went to work in December 1958 on an improved system.¹ How would some of the support techniques,

1. Brochure, "Supply of Government Furnished Equipment and Spares for Space Programs," by Frank L. Grow, Ch, WS-117L Div, DISM. See Exhibit No. 4.

used for first line aircraft, work with R&D on the WS-117L? They found the answer and developed a mechanized system that reduced contractor effort to a minimum and made use of the modern AMC data-handling equipment to speed action on GFE and spares.¹

The system developed would no doubt be of use in future space programs in connection with R&D.

Transceiver Service

Requirements for GFP in support of the 117L test sites while processed through the transceiver network after receipt by the LSM at SMAMA, were submitted by the contractor on handscribed forms. On being advised of this, General Price asked that action be taken to establish transceiver hook-up between SMAMA and the LMSD at Sunnyvale.²

In a 25 June letter to Dan Haughton, Executive Vice President of Lockheed Aircraft Corporation, General Price invited the LAC plants of both Sunnyvale and Burbank to join the AMC transceiver network "to simplify and expedite transmission of Supply data." He reminded Mr. Haughton that the costs—installation, rental, etc.—would be recoverable under terms of the production contract.

Lockheed at length prepared and submitted the desired requests.³ SMAMA forwarded them to Hq AMC for approval.

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1. Brochure, "Supply of Government Furnished Equipment & Spares for Space Programs," by Frank L. Grow, Ch, WS-117L Div, DISM. See Exhibit No. 4.
 2. Minutes of Comdr's staff meeting with DISM, 15 Jun 59, par 8.
 3. Request for service at Sunnyvale received 31 Aug 59.

While actual installation was still some time in the future it apparently was on its way at both Sunnyvale and Burbank. When completed this service would add measurably to the WS-117L program's effectiveness.

Summary

SMAMA's DLSP, in assuming its responsibility with WS-117L support, seemed to be fully aware of the extent of its current scope of operations. Treading untried paths its technicians were laying plans and setting up machinery against the day of expanded operations.

Plans for full utilization of EDP in supply support, advance experience training of maintenance technicians, and a program of becoming familiar with equipment needs gave assurance of a healthy overall support to the 117L satellite program currently and in the years to come.

GLOSSARY

AFFRO	Air Force Plant Representative Office
AMC	Air Materiel Command
ARDC	Air Research and Development Command
ARPA	Advanced Research Projects Agency
ARS	Advanced Reconnaissance System
BLMO	Ballistic Missiles Logistics Office
BM	Ballistic Missile
BMC	Ballistic Missile Center
BMD	Ballistic Missile Division
BMM	Ballistic Missiles Manager
BMO	Ballistic Missiles Office
EDP	Electronic Data Processing
GFE	Government furnished equipment
GFP	Government furnished property
GOE	Ground operating equipment
GOR	General operating requirements
GSE	Ground support equipment
ICBM	Intercontinental ballistic missile
IIRBM	Intermediate range ballistic missile
IRFNA	Inhibited red fuming nitric acid
LMSD	Lockheed Missiles and Space Division
LSM	Logistics Support Manager
MIDAS	Missile Defense Alarm System
OSD	Office of the Secretary of Defense
R&D	Research and Development
RADC	Rome Air Development Center
ROAMA	Rome Air Materiel Area
SBAMA	San Bernardino Air Materiel Area
SMAMA	Sacramento Air Materiel Area
SMs	Strategic missiles
UDH	Unsymmetrical dimethyl hydrazene
WS	Weapon System

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EXHIBITS

- No. 1. Aviation Week Clipping, October 14, 1957
2. New York Times Clipping, 20 August 1959
3. Highlights of 117L Logistics Plan
4. Brochure on GFE

Exhibit 1

Aviation Week Clipping
14 Oct 57

C O P Y

USAF PUSHES PIED PIPER SPACE VEHICLE

Washington - Soviet satellite launching will spur research and development efforts on advance U.S. space vehicles including Lockheed Aircraft Corp.'s Pied Piper project. Pied Piper, sponsored by USAF, is an earth-circling reconnaissance satellite. A later version would be manned.

Russia is working on at least one project similar to Lockheed's.

Popular nickname for Pied Piper is Big Brother. Weapons system number is WS-117-L. Lockheed calls the project ARS for Advanced Re-connaissance System.

Aeronutronic Systems Inc. also is conducting studies along lines similar to Pied Piper (AW July 22, p. 53), using its own and Air Force funds.

Rand Corp., supported chiefly by Air Force research funds, has pushed work on such satellites for the last 10 years. Other services also have plans for advanced satellites, including manned vehicles.

Pied Piper dates back to early 1956 when an airframe-avionics team headed by Lockheed won a competition against two or three other teams. Columbia Broadcasting System is probably Lockheed's teammate, with Eastman Kodak as an associate participant.

Original investment in Pied Piper was \$4 million; this later was increased to \$12 million for the first year.

Satellites for WS-117-L would carry television, photographic cameras, infrared spotter or radar scanner systems.

Systems Laboratories, Inc. holds a one year contract, awarded about three months ago by Rome Air Development Center, for ground handling studies in connection with Pied Piper. Amount is approximately \$140,000.

Its work is to determine requirements and accuracies needed for interpretation and processing of data relayed from the satellite and construction of large mosaics or maps.

The feeling is that Pied Piper could not be ready in the unmanned version before 1960 unless a tremendous effort is placed behind it. Manned version, even on an accelerated schedule, is closer to 1965.

Manned vehicle would remain in its orbit for perhaps a month. Biggest problem for a manned satellite probably is still recovery.

Launching vehicle for the reconnaissance satellite probably will be a three or four-stage liquid rocket system, with North American Aviation Inc. and Aerojet-General Corporation as the most likely engine manufacturers.

Approximately 500 to 1000 lb thrust will be required for one lb of satellite weight.

Orbit for unmanned Pied Piper would be between 300 and 1000 mi. Lower orbits, better for reconnaissance work, are worse from the standpoint of damage caused by denser air.

When satellites move from the area of collectors of geophysical research data to earth reconnaissance vehicles, legality will become a problem. Unless they are launched in a cooperative effort such as the International Geophysical Year, or with prior agreement among countries, relatively simple countermeasures probably could be used to bring them down.

Other problems include:

DATA TRANSFER from satellite to earth. "Picture" taken by satellite scanner must be changed from film or camera to electrical signals which modulate transmitter for relay to a ground station where data would be put into continuous map form or recorded on film or magnetic tape.

ROTATION OF THE SATELLITE on its own axis. It will have to be oriented to keep its camera, infrared spotter, radar antenna or whatever pointing in the right direction. This will require power and add to complications of equipment.

JAMMING. In addition to possibility that satellite could be shot down, equipment probably can be jammed or fooled comparatively easily.

Nevertheless, the ARS satellite is not considered a particularly difficult project, but more a question of adequate research and development funds and time. Problems of power to put the satellite into orbit and reliability of the equipment it will carry can be overcome with sufficient resources.

—from Aviation Week
October 14, 1957

Exhibit 2

New York Times Clipping
20 Aug 59

NEW DISCOVERER PLACED IN ORBIT

Air Force to Attempt Again to Regain Capsule From a Parachute Today

VANDENBERG AIR FORCE BASE, Calif., Aug. 19 (AP)—The Discoverer VI satellite rose into orbit today. It carries a capsule the Air Force hopes to snatch from the air as it parachutes earthward near Hawaii tomorrow.

The 1,700-pound satellite was caught by tracking stations in Alaska as it was completing its first circuit of the earth. It was launched at 3:20 P. M. New York time.

The Air Force said it was circling the earth's poles once every ninety-five minutes. It is expected to stay in orbit at least thirty days.

The satellite is following an egg-shaped path. It comes within 128 miles of earth at its closest point and goes as far out as 527 miles.

Radio Signals Strong

Radio signals are loud and strong, indicating that the satellite is stable in orbit, the Air Force said.

In Sunnyvale, Calif., Maj. Gen. O. J. Ritland, commander of the Air Force Ballistic Missile Division and Henschel

Brown, general manager of Lockheed Aircraft's missiles and space division, said in a joint statement:

"The successful orbiting of two Discoverer satellites in less than a week marks a tremendous forward step in the scientific study of space vehicles and their applications.

"It is indicative also of the accelerating pace of United States activity in the space field. Through the information and experience gained in the Discoverer series, the Advanced Research Projects Agency, the Air Force and Lockheed rapidly are preparing the way for the first man in space."

Second Stage by Lockheed

Lockheed makes the Discoverer second-stage rockets. The nineteen-foot second stage went into orbit. One of the Discoverer series is to study techniques of sending man into space and back.

A thousand things could go wrong in the Air Force's try to recover the capsule. Such a recovery has never been made.



Associated Press Wirephoto

SUCCESS: Rocket carrying Discoverer VI satellite leaves its launching pad at the Vandenberg Air Force Base, Calif. Satellite achieved polar orbit.

If all goes right, the capsule will be kicked loose from the rocket's nineteen-foot second stage tomorrow afternoon. The capsule would descend on a parachute, sending out radio signals. A squadron of C-119 Flying Boxcars, based in Hawaii, would go after it. They will try to snatch it with trapeze-like contraptions attached to each plane.

Beacon Failed Friday

Such a catch was planned last Friday, the day after the successful launching of Discoverer V. But the radio beacon in the capsule apparently failed. Waiting planes got no signals.

Discoverer VI is seventy-eight feet long. Its first stage was a medium-range Thor missile employing a powerful new hydrogen fuel first used successfully in Discoverer V.

Surging failures, the rocket would eject its capsule twenty-six hours after launching.

There were many instruments in the capsule, but no animals. This type of capsule is expected to take monkeys into space later in the Discoverer series.

SATELLITE EJECTS 300-LB. CAPSULE

But Air Force Planes Fail Again to Catch Package in Test in Pacific

WASHINGTON, Aug. 20 (AP)—

Another attempt to recover a capsule ejected from a satellite apparently failed today.

The Defense Department announced that a capsule had been ejected successfully from the orbiting Discoverer VI at 8:27 P. M. Eastern Daylight time as planned but that no signals had been received from the capsule after the ejection.

This was substantially what happened a week ago in a similar test.

The Pentagon issued a statement at about 7:45 P. M. on the attempt made today as the satellite passed on its north-south course in the area of the Hawaiian Islands.

"The director of the Advanced Research Projects Agency announced that Discoverer VI satellite ejected its capsule at 8:27 P. M. [Eastern Standard time] as programmed," the statement said.

"Since ejection, no signals have been received from the capsule and the recovery team in the area has reported no visual sightings.

"Therefore it is unlikely that the capsule will be recovered, although the search will be continued for a number of hours."

The 300-pound capsule contained instruments but no living thing.

The capsule went aloft yesterday fixed in the nose of the Discoverer VI satellite.

A squadron of Air Force C-119 Flying Boxcars, each plane equipped with a trapeze-like recovery net, had planned to catch the capsule.

The project is aimed at solving the re-entry problem.

Exhibit 3

Highlights of 117L
Logistics Plan

COPY

Prepared for Presentation
to General Price Sept 9, 59

HIGHLIGHTS OF 117L LOGISTICS PLAN

A. General

1. Program Designation

a. All references to WS-117L were changed to Space System 117L to make the terminology consistent with the Operational Plan. Also,

b. The code name "Sentry" has been changed to "SAMOS."

2. Atlas Booster Support

a. The 117L (SAMOS) includes the first stage SM-65 booster.

b. SBAMA is designated as 117L/SM-65 Equipment Manager and is given responsibility for providing direct support to the launch complex for booster GSE, GOE, direct mission installed facility-type items, and supporting spares.

c. At the same time the overall management responsibility of the LSM includes the booster.

3. Standard Data Processing System

The LSM will utilize the Standard Integrated Data Processing System. Factors considered in making this determination were:

a. The short time period available for developing and programming a new data system, and

b. The IOC II Data processing System provides an advanced, integrated system capable of processing actions rapidly on a wide range of items.

B. Supply

1. R&D Test Support

ISM is the focal point for projecting requirements and managing the distribution of all AF standard items and spares used in R&D Test Phase.

2. Ground Operational Equipment (GOE) and Ground Support Equipment (GSE)

a. GOE is a functional part of the weapon system and operates with the prime air vehicle in the performance of its mission; for example, launch, ground guidance, and read-out equipment.

b. GSE includes the normal ground handling, servicing, test, and check-out equipment.

c. GOE is procured on the production contract like the satellite vehicle. GSE, and spares for GOE and GSE, are provisioned by the ISM.

3. Accountability

The ISM maintains central knowledge of all direct mission assets located at all using command's logistics points.

C. Maintenance

1. Levels of Maintenance

At least initially, the normal three functional levels of maintenance workload (organisational, field, and depot) will be performed at two organisational levels:

a. Using Command's operational squadrons, and

b. AMC depot level. The "field" maintenance function will be accomplished by the operational squadron.

2. Organic (In-House) Maintenance

The ISM will continually study the AMC organic (in-house) maintenance capability and recommend dates for phasing peculiar item maintenance into the AMC system.

3. Technical Manuals

a. Pre-publication review of tech manuals prepared by the prime contractors will be accomplished by a Review Team established for this specific purpose.

b. The Review Team will be headed by a representative of AFBMD. The BMC, ISM, and using command are represented.

Exhibit 4

Brochure on GFE

COPY

SUPPLY OF
GOVERNMENT FURNISHED EQUIPMENT AND SPARES
FOR SPACE PROGRAMS

1 September 1959

Prepared by:

Frank L. Crow
Chief, WS-117L Division
Director of Logistic
Support Management

SUPPLY OF
GOVERNMENT FURNISHED EQUIPMENT AND SPARES
FOR SPACE PROGRAMS

Research and Development phases of Air Force weapon programs may present new requirements for AMC support.

The WSAF WS-117L Space Programs are a first indication and application of additional and advanced methods of support of Air Force research and development programs. The WS-117L Discoverer series was the first recognized. Tracking sites were needed on a priority basis at new locations to track and command the Discoverer. It was a part of the Lockheed Missiles and Space Division's responsibility to design and equip these sites. In order to save money and meet the immediate requirement, Lockheed turned to the USAF and DOD supply catalogues, stock list Technical Orders and any other reference source. In many cases, the equipment was to be modified and in other cases will eventually be replaced by contractor equipment, designed to accomplish the specific mission. Lockheed submitted their proposed equipment utilization to ARDC's Ballistic Missile Division for approval and the problem of obtaining the equipment was at hand.

The normal procedure for obtaining such equipment and spares support after BMD approval is for the contractor to prepare a requisition form 1149 with one-line item request on each form. The contractor is further responsible for directing the requisition through the Air Force Plant Representative to the proper AMC depot stocking the equipment or spare part. The usual procedure is to mail the requisition to the supplying

depot. The supplying depot then ships to the contractor or gives him status information by mail on what he has done with the requisition. The contractor is thus involved in preparing great numbers of 1149s, contacting several AMC or DOD agencies, and following up with these agencies. He receives a different response from each contact and is involved in a manual process throughout.

The great quantity of Government Furnished Equipment being programmed, the priority of the program, and the outmoded manual and mail 1149 System caused the AMC Ballistic Missile Center, the Air Force Procurement Representative at Lockheed, and the WS-117L Logistic Support Manager at Sacramento to look for a GFP supply method more befitting the program.

The program had a priority as high as any of the first-line Air Force inventory and was definitely in need of responsive support. The obvious line of thought was to see how some of the support techniques used for first-line aircraft would work in support of the R&D WS-117L Space Programs. There was little economic justification in hiring a contractor to make out manual requisitions and perform follow-up. The Volume XX of AFM 67-1 was the basic document to which we turned. All provisions of the document were not used, but today we have a Volume XX type supply support of Lockheed Missile and Space Division Government Furnished Equipment and spares parts. The WS-117L R&D program is now given USAF supply support through one of the USAF's most modern systems; contractor effort is cut to the minimum; and AMC data-handling equipment is accomplishing this support job as part of the regular routine at little extra cost.

Hq AMC was asked to assign an Air Force Weapon System Account Number for the WS-117L and also a Weapon System Designator Code Number. These were in fact assigned to the Sacramento Air Materiel Area and were the key to the use of a mechanized system and supervised Air Force Support of government-furnished property to the contractor.

The contractor was then sent a supply of AMC Form 182, which is a worksheet for preparation of punch card requisitions. To requisition a given item the contractor fills in one line across the AMC Form 182 and up to eight items can be included on a form. This form is sent to Sacramento where a 104P-1 punch card requisition is prepared from the data on the Form 180 and the requisition is automatically dispatched to the supplying depot by means of AMC's transceiver network. The Weapon System Designator is included on each requisition. By this number the supplying depot furnished status of their action back to the Sacramento Air Materiel Area, again by way of transceiver. They may indicate they are shipping the item, will ship in a limited time, have sent the request to another depot, or may tell the initiator to local purchase.

The WS-117L Logistic Support Manager at Sacramento files duplicate copies of all 104P-1 requisition cards; and, as the status actions come in from the supplying depots, these are matched against the requisition 104P-1 form to determine if action is complete.

While status information is going back to Sacramento, the material is being shipped from the supplying depot direct to the contractor. However, this phase of the supply process has also been improved. Lockheed

planned to use the material requisitioned at several locations. These locations were up to three thousand miles away from the Lockheed Missiles and Space Division. Thus, each location was assigned what the AMC calls a SNY number, which is simply a station number. The Lockheed Missile and Space Division can generate the requisition for government furnished property and can have it marked with the SNY number for a site in Alaska and have material delivered directly there.

In summary, the 117L Space Program is in research and development, and it has one of the highest priorities the nation can give. Government furnished equipment and spares are of great importance to the success of the program, and they are needed rapidly at specific locations. Lockheed is paid to do research and development work. Simplicity and responsiveness of the supply channels for obtaining government property proportionately reduces Air Force money used for research and development.

The AMC has met this logistic requirement by applying support methods originally designed for operation USAF Commands. These methods result in the following:

Well-managed supply by AMC supply experts using mechanized means and suspense systems;

Minimizing contractual dollars spent on supply actions;

Saving AMC money by eliminating costly handling of the manually prepared requisition and using the now standard 104P-1 punch card system;

A complete record at Sacramento of all contractor requests for use by the Logistic System Manager in determining future requirements for government furnished property; and

Savings in transportation and handling by delivery direct to using site.

Future research and development programs for space and missile programs will undoubtedly need government-furnished equipment and spares. These requirements will be as immediate and essential as those of operating commands, and the use of AMC's most advanced supply methods will be an economy in both time and funds.