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Project IDEALIST—OXCART—CORONA—GAMBIT—
QUILL—[redacted]—HEXAGON—DORIAN

SEMI-ANNUAL REPORT

TO THE

PRESIDENTS FOREIGN INTELLIGENCE

ADVISORY BOARD

ON THE

ACTIVITIES OF THE

NATIONAL RECONNAISSANCE PROGRAM

1 NOVEMBER 1965 — 30 APRIL 1966

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HANDLE VIA JOINT BYEMAN/TALENT-KEYHOLE/COMINT
CHANNELS ONLY

IDEALIST/OXCART/CORONA/GAMBIT/DORIAN
HEXAGON/QUILL/[redacted]

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I. FOREWORD

The organization and functions of the National Reconnaissance Office remain essentially unchanged since the last Annual Report to the Board, in October 1965. Additionally, there have been few significant changes in USIB intelligence requirements against which the efforts of the National Reconnaissance Program are directed. These items are not included in this Semi-Annual Report but will be covered in detail in the next Annual issue.

Recent significant decisions of the NRP Executive Committee concerning the new general search system (HEXAGON) and the initiation of the [redacted] program are reflected in this report.

II. BUDGET

Because of the sensitivity of its mission, the National Reconnaissance Program financial program is handled partly as classified open ("white") and partly as classified covert ("black"). The pages which follow show the National Reconnaissance Program financial costs, and the level of activity on which these costs are estimated, through 1971.

NATIONAL RECONNAISSANCE FINANCIAL PROGRAM - FY 1964 THRU 1971

[redacted]

	FY 64	FY 65	FY 66	FY 67**	FY 68	FY 69	FY 70	FY 71
TOTAL COSTS	[redacted]							
SATELLITE PROGRAMS:								
Broad Coverage:								
CORONA, ARGON, LANYARD								
New General Search								
Sub-Total								
High Resolution:								
GAMBIT								
G-3								
Sub-Total								
Special Payloads:								
SIGINT								
QUILL								
[redacted]								
Sub-Total								
Advanced Studies and Research								
Adv Development, Systems and Components								

* Includes exploratory development on FULCRUM [redacted], [redacted], and S-2 [redacted] in FY 1965. In FY 1966 and subsequent years, these are reflected in appropriate system entries.

** Based on President's Budget - program distribution expected to change somewhat.

	FY 64	FY 65	FY 66	FY 67	FY 68	FY 69	FY 70	FY 71
Support and Operations:								
Satellite Control Facilities	[redacted]							
AF Special Projects								
Production Facility								
Misc Investment & Operating								
Sub-Total								
SATELLITE TOTAL:								
AIRCRAFT AND SUPPORT PROGRAMS								
OXCART (A-12)								
AQ-12 Drone								
Advanced Studies and Research								
Support and Operations:								
Agency U-2's								
DOD U-2's								
Photographic								
Fuel, Agency P3's, Misc								
Sub-Total								
AIRCRAFT & SUPPORT TOTAL								
GENERAL DEVELOPMENT PROGRAM								
Satellite/Aircraft								

LAUNCH SCHEDULE BASIS FOR SATELLITE PROGRAM ESTIMATES

	FY 64	FY 65	FY 66	FY 67(c)	FY 68(c)	FY 69(c)	FY 70(c)	FY 71(c)
Broad Coverage:								
CORONA (a)	11	14	14	12	12	6	-	-
ARGON	3	1	-	-	-	-	-	-
LANYARD	1	-	-	-	-	-	-	-
New General Search	-	-	-	-	1	8	8	8
High Resolution:								
GAMBIT	8	11	12	14	5	-	-	-
G-3	-	-	-	8	12	12	12	12
Special Payloads:								
SIGINT-Booster Assigned [redacted]	[redacted]							
QUILL [redacted]	-	2(b)	-	-	-	-	-	-

(a) CORONA data does not include, in the FY 1966, 1967 and first half of FY 1968 time period, a variable number of reserve systems which could be launched if needed. However, these reserve systems are included in the 2nd half FY 1968 or FY 1969 launches. Accordingly, all CORONA planned assets would be launched by FY 1969.

(b) Two QUILLs were procured for launch in FY 1965. However, only one was launched.

(c) Based on President's Budget - it is now expected that New General Search launches will be delayed and on a 6 per year basis; that additional CORONAs will be necessary in FY 1969 to provide overlap; and that fewer GAMBITs will be launched in FY 1968.

III. COLLECTION OPERATIONS

This section of the report describes satellite and aircraft reconnaissance collection activities of the National Reconnaissance Program during the period 1 November 1965 through 30 April 1966.

A. Satellite Photographic Reconnaissance

CORONA (Photographic Search and Surveillance): There were five CORONA launchings during this reporting period and all ten payload capsules were successfully recovered. While two of the missions were degraded due to on-orbit malfunctions (see Footnotes 1 and 2) all provided usable intelligence information.

CORONA Highlights

Mission 1030-J, 9 to 19 March, was extremely productive (especially the second capsule) with highlights as follow:

a. Covered 13 of the 25 deployed ICBM complexes;

b. Revealed ten new, large, single silos at Zhangiz Tobe, Imeni Gastello and Dombarovskiy;

c. Achieved coverage of Tyura Tam with both capsules;

d. Revealed an AMM/SAM launch facility near Kalinin with three launch areas under construction;

e. The Novaya Zemlya nuclear test area was covered and new activity was observed in the underground test area;

f. A probable new class of missile destroyer was photographed at the Leningrad shipyards.

g. Semipalatinsk was covered on 13 and 17 March. The crater of the 13 February underground test now appears to be 190 feet deep rather than 300 as reported in the readout of 4025-G. No evidence was observed of preparation for the 20 March test.

Mission 1031-J, 8 to 18 April, acquired good coverage on the first bucket but was limited to mono coverage on the second bucket (see Footnote 2). Highlights of the missions were as follow:

a. Covered 14 of the 25 ICBM deployed complexes;

b. Obtained very limited coverage of the Tyura Tam missile test center;

c. Revealed four new single silo launch sites (large) at Uzhur, six at Kartaly and three in the Dombarovskiy complex;

d. Revealed new single silo (small) launch groups at Perm and Tatishchevo;

e. Covered the Sary Shagan missile test center on three successive days of coverage on the first bucket;

f. Covered three major nuclear production facilities.

Mission 1026-J, flown 28 October through 7 November, covered ten of the 25 deployed ICBM complexes and revealed two new large single silo sites at Uzhur and a possible new group of small single silos at Gladkaya. Also photographed were the missile test centers at Sary Shagan and Kapustin Yar.

Mission 1027-J, flown 10 December (see Footnote 1), covered three of the 25 deployed ICBM complexes and the Makat field launch R&D point.

Mission 1028-J, flown from 25 December 1965 to 2 January 1966, covered 15 of the 25 deployed ICBM complexes. This mission revealed new large single silos at the Kartaly and Dombarovskiy complexes, and new small single silo groups at the Perm and Olovyannaya complexes. Also, three AMM/SAM launch complexes, similar to those at Tallinn and Cherepovets, were discovered in the Zverdlovsk region.

Mission 1029-J, flown 3 to 12 February, was very productive, especially the first bucket, with highlights as follow:

a. Covered 19 of the 25 deployed ICBM complexes;

b. Revealed three new, large, single silos at Zhangiz Tobe and Imeni Gastello;

c. Revealed a large unexplained crater near D2 in complex D at Tyura Tam;

d. At Plesetsk identified a new area of construction activity;

e. At Kimry, near Moscow, an AMM/SAM launch facility was discovered which was similar to the Cherepovets complex except that the Kimry site was composed of only three launch areas.

f. BLINDERS were observed at Nezhin airfield for the first time;

g. Dismantling of the HEN ROOST facility at Sary Shagan was continuing;

h. Semipalatinsk was covered on 6 and 10 February but no evidence of preparations for the 13 February underground test was observed.

FOOTNOTES: Cause of CORONA mission degradation, due to on-orbit malfunctions, were:

1. Mission 1027, launched 10 December, failed to change from high to low pressure gas system after injection and all control gas was expended by rev 9. Thus, photography was obtained only during these nine orbits -- and on only one capsule. Since the control gas supply was low, recovery required use of the back-up "Lifeboat" recovery system. Normally, this system can be used only once during a mission;

however, in this instance, both capsules were returned (one with 9 revs of exposed film -- the other containing no usable film).

2. A camera malfunction occurred during the second phase of Mission 1031, launched 8 April, and only monoscopic (instead of stereo) photography was obtained for this portion of the mission.

GAMBIT (Photographic Spotting): Five GAMBIT missions were flown during this reporting period. Four of these missions were complete successes and included the most successful, in terms of number of priority targets covered, of any GAMBIT mission to date.

GAMBIT Highlights

Mission 4023-G, flown on 9 November, covered parts of the Tyura Tam missile test center and the ICBM complex at Imeni Gastello. Due to on-orbit malfunction (see Footnote 3) only three photographic passes were accomplished over the USSR and European Satellites.

Mission 4024-G, flown 20 to 24 January, covered portions of 15 of 25 deployed ICBM complexes and revealed a new type of single silo under construction in complex M at Tyura Tam. In addition, six large single silos at Uzhur appeared to be complete, as were six small silos in group L of Tyura Tam.

Mission 4025-G, 16 to 20 February, covered 10 of 25 deployed ICBM complexes, Tyura Tam, Sary Shagan launch complex 1, and three major submarine bases. A new launch area was identified in the Dombarovskiy ICBM complex and the Ugoinyy missile facility was determined to be a possible dual MRBM/IRBM site.

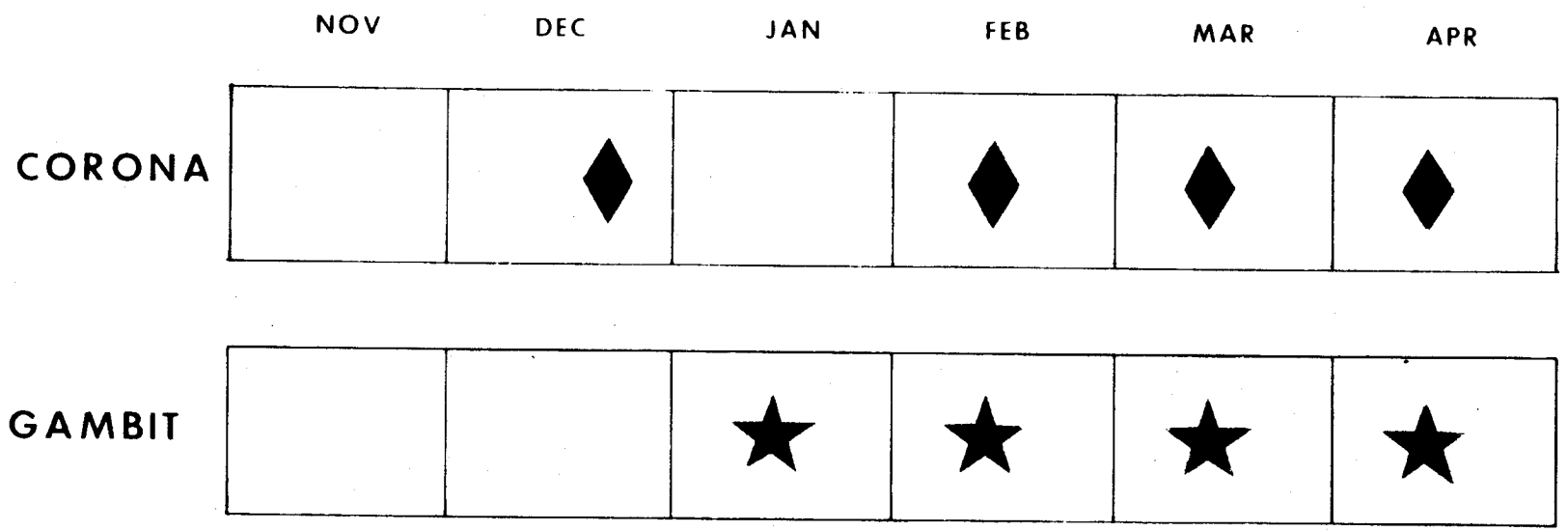
Mission 4026-G, 19 to 24 March, covered portions of eight of the 25 deployed ICBM complexes and Tyura Tam, nine Soviet submarine bases, five sensitive operations complexes, the Kapustin Yar and Emba missile test facilities, and the Volsk/Shikhany CW proving grounds. Highlights of the mission included discovery of a new group of single silo launch sites (small) at Tatishchevo and extensive new construction activity in the Volsk/Shikhany CW complex operations support area.

Mission 4027-G, in April 1966, was the most productive GAMBIT mission to date. Previously, the two most productive GAMBIT missions (4018 and 4026) covered, respectively, 585 and 491 targets. Mission 4027 covered 834 COMOR targets due to two factors: approximately 20 percent of the increase may be attributed to improved programming and the remainder to the high inclination angle (117°) used on this mission. Each pass of the 117° orbit goes across the long dimension of the Sino-Soviet Bloc, thus providing more time for photography per pass.

FOOTNOTE 3: 4023-G, launched on 9 November, lost control gas pressure and accomplished little productive photography.

NRP photographic satellite performance (CORONA and GAMBIT) and key areas of the globe which have been photographed by these systems are depicted on the charts which follow.

NRP PHOTOGRAPHIC SATELLITE PERFORMANCE



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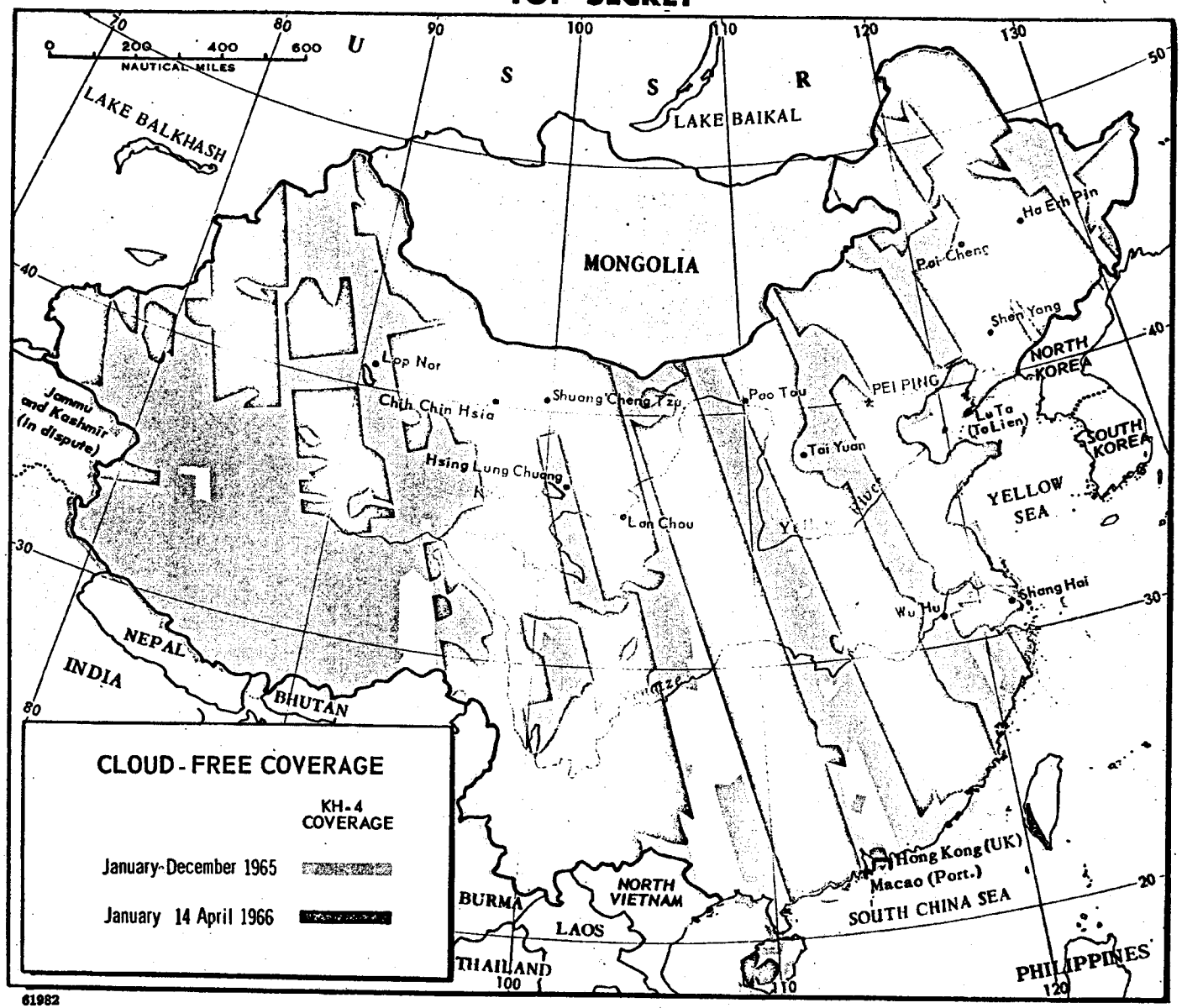

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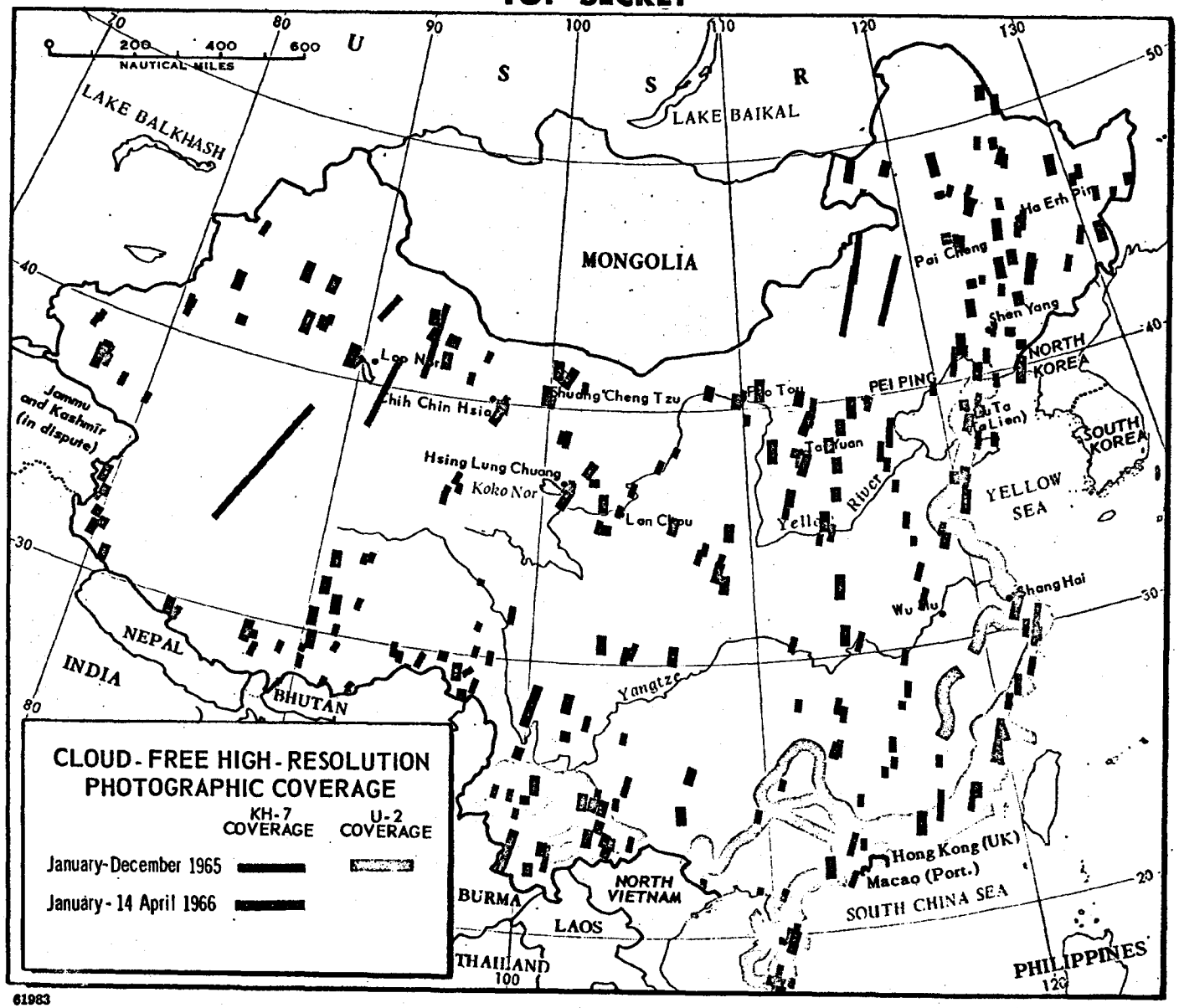

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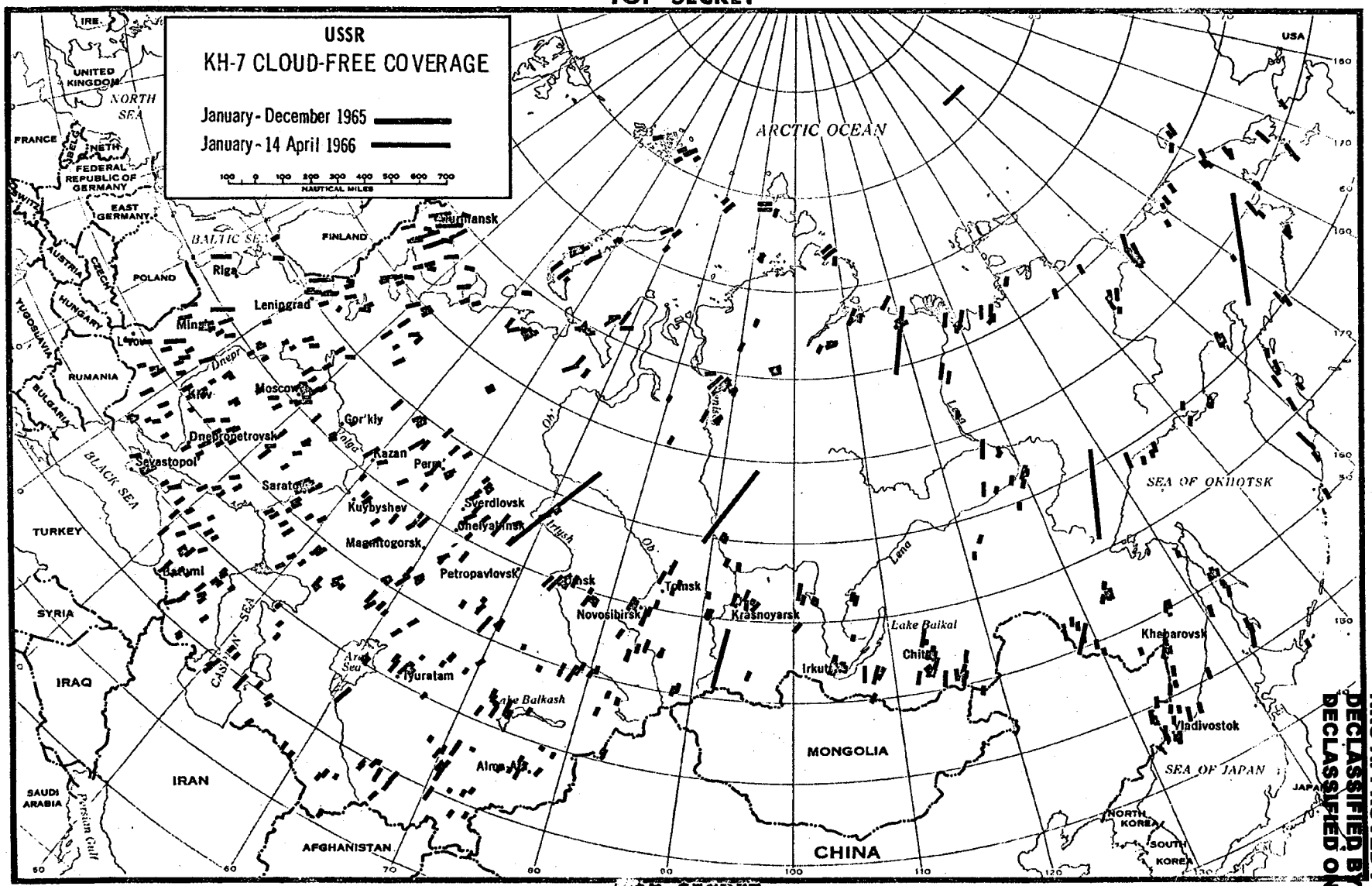

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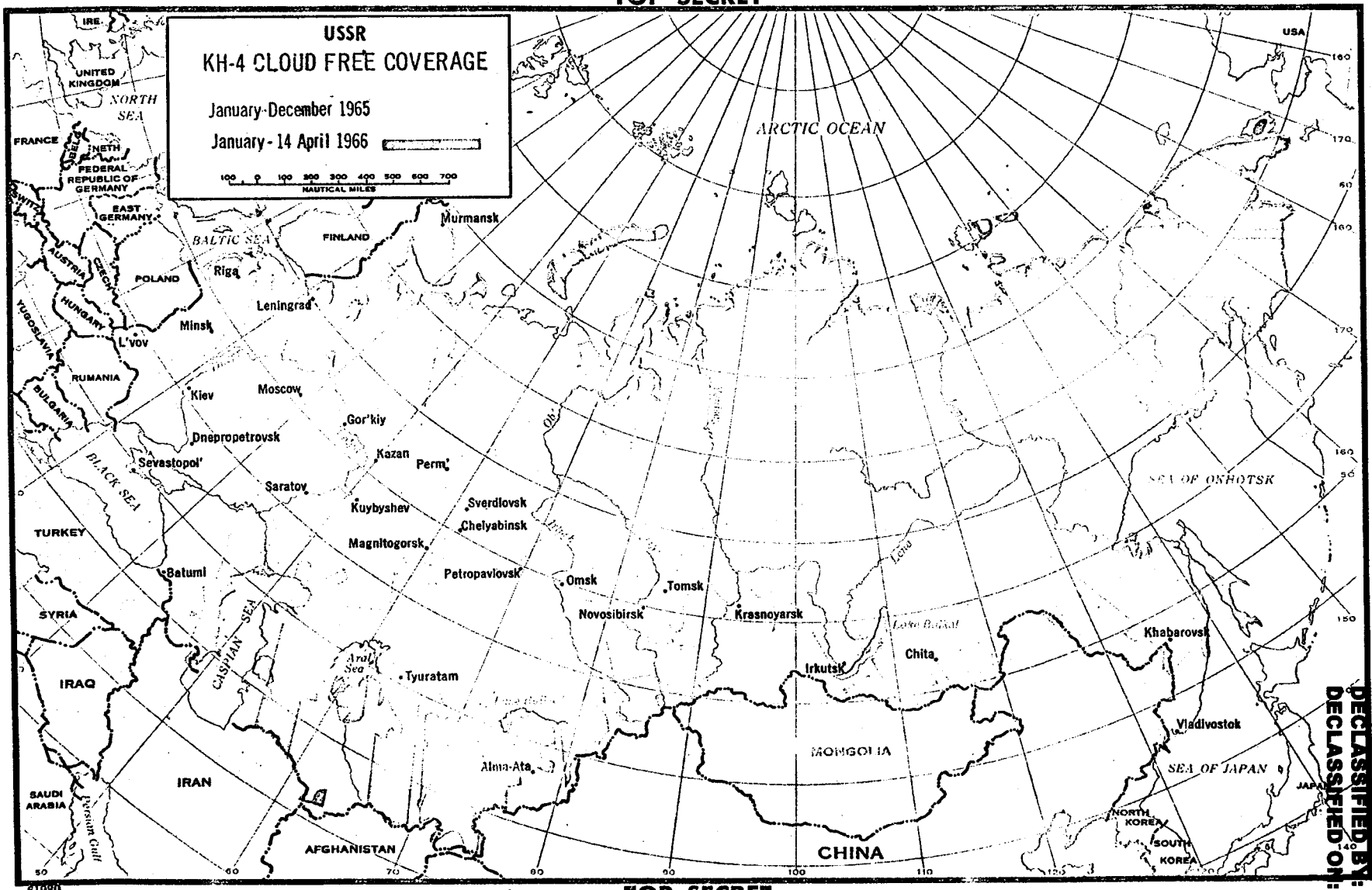

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B. Satellite SIGINT Reconnaissance

SIGINT payloads employed by the National Reconnaissance Program are designed primarily to satisfy general search, electronics order of battle (EOB), or directed coverage of specific areas. Following are brief program descriptions and summary highlight SIGINT achievements during this reporting period.

POPPY - Mission [redacted]:

The objective of this mission is to conduct General Search for new and unusual signals in the [redacted] A secondary mission is to locate selected radars for updating the EOB. The [redacted] were placed into orbit by a THOR/AGENA booster combination on 9 March 1965, to an altitude of 500 n. m.

A POPPY payload consists of [redacted] simple fixed bandwidth crystal video receivers. A separate pulse is transmitted by the payload whenever a receiver intercepts a radar pulse. The payload transmitted pulses are received by strategically placed friendly ground stations around the periphery of the USSR.

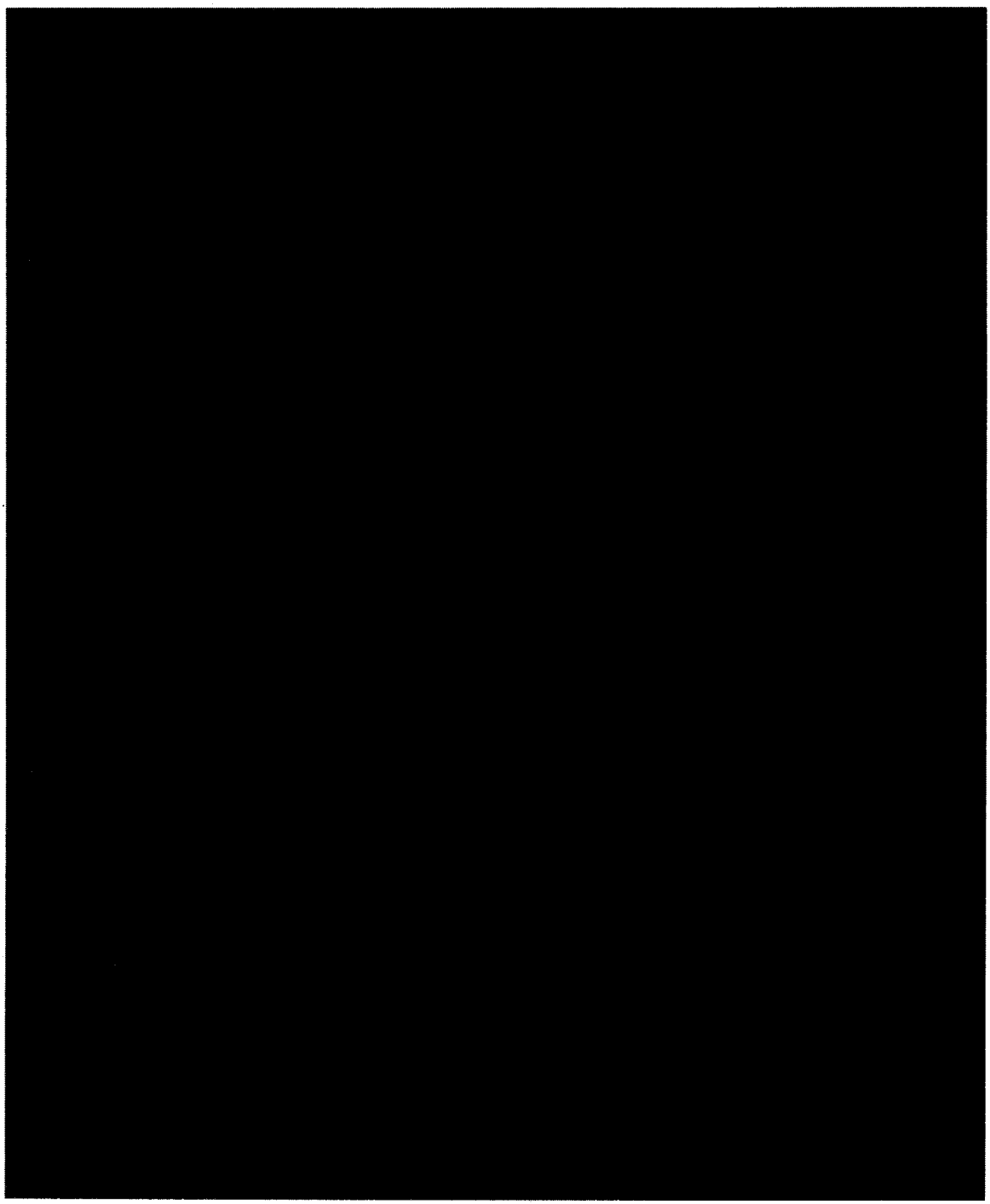
Using a processing program devised by NSA, locations to less than [redacted] accuracy can be derived for some types of emitters. This EOB by-product of the POPPY General Search mission uses an [redacted]

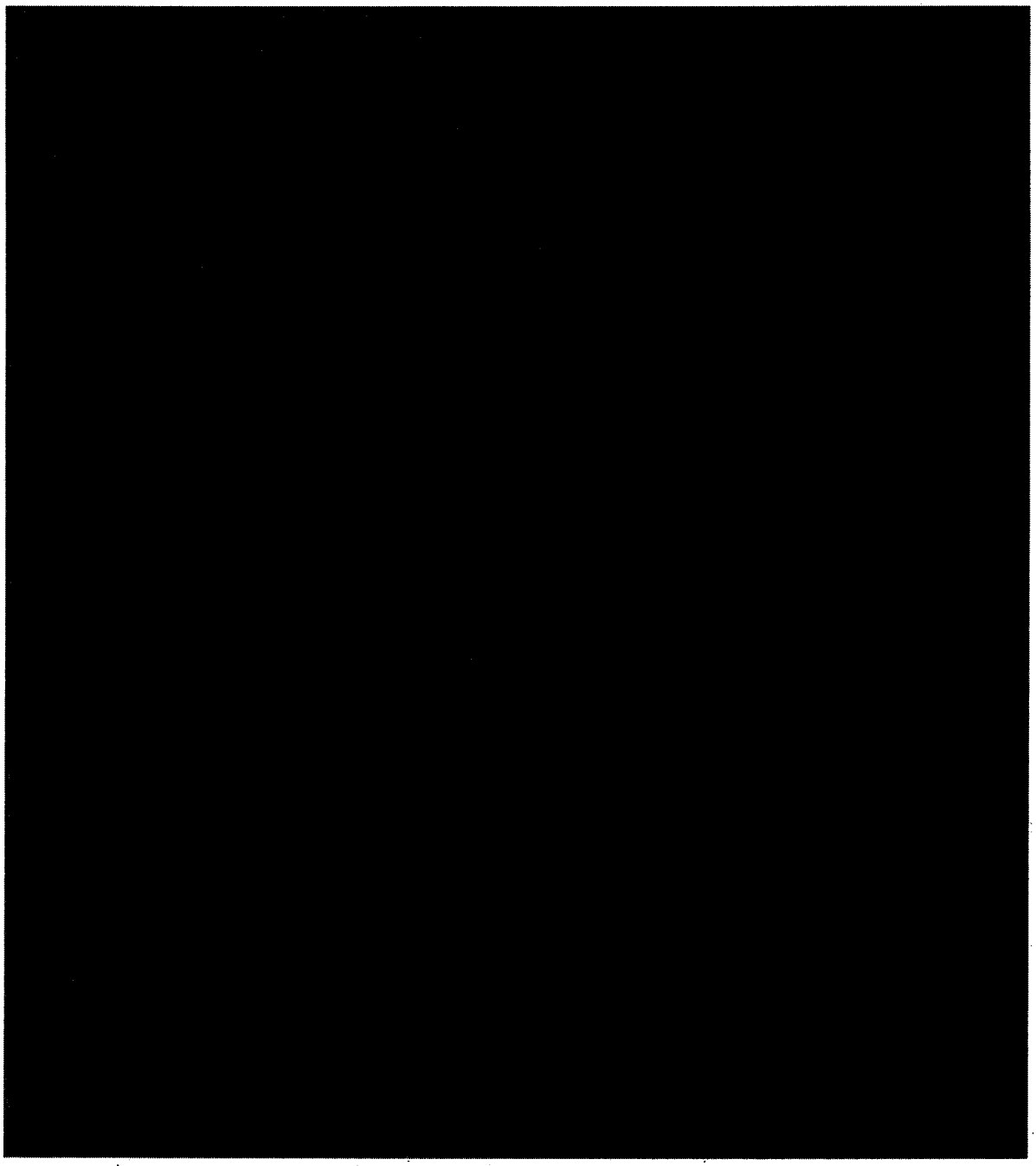
[redacted]

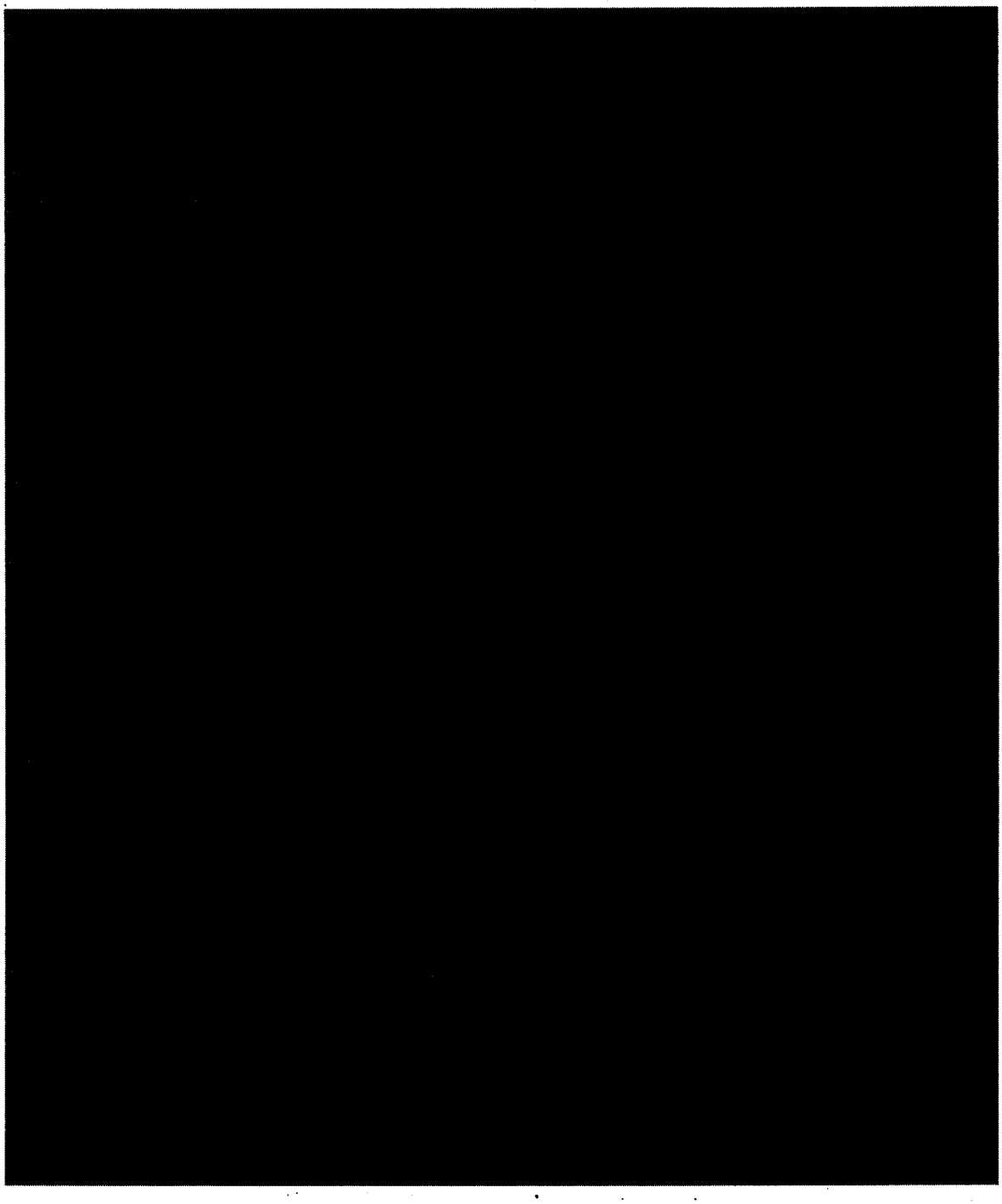
Current Status: [redacted] POPPY receivers [redacted] have failed to date. The other receivers are still operating normally. [redacted] one must now be tasked at a reduced level due to power supply degradation. The next POPPY launch is scheduled for the fall of this year.

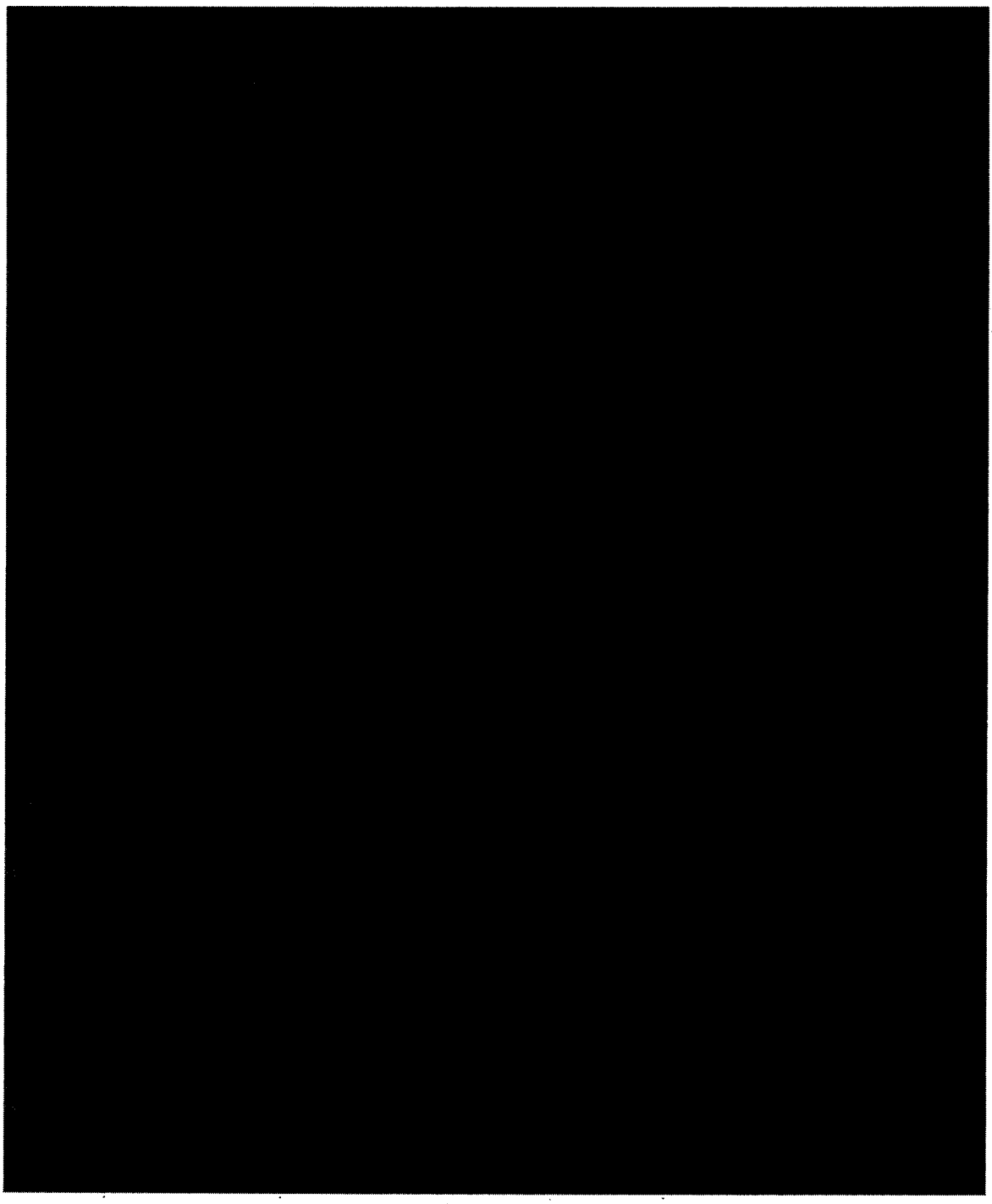
Intelligence Highlights: POPPY has intercepted [redacted] signals on numerous occasions. [redacted] has tracked the POPPY payloads. POPPY has [redacted] intercepts of these two signals. POPPY's unique contribution has been to define the [redacted]. Additional POPPY intercepts have detected several unknown signals, [redacted] and, as an EOB by-product, several [redacted] and [redacted]

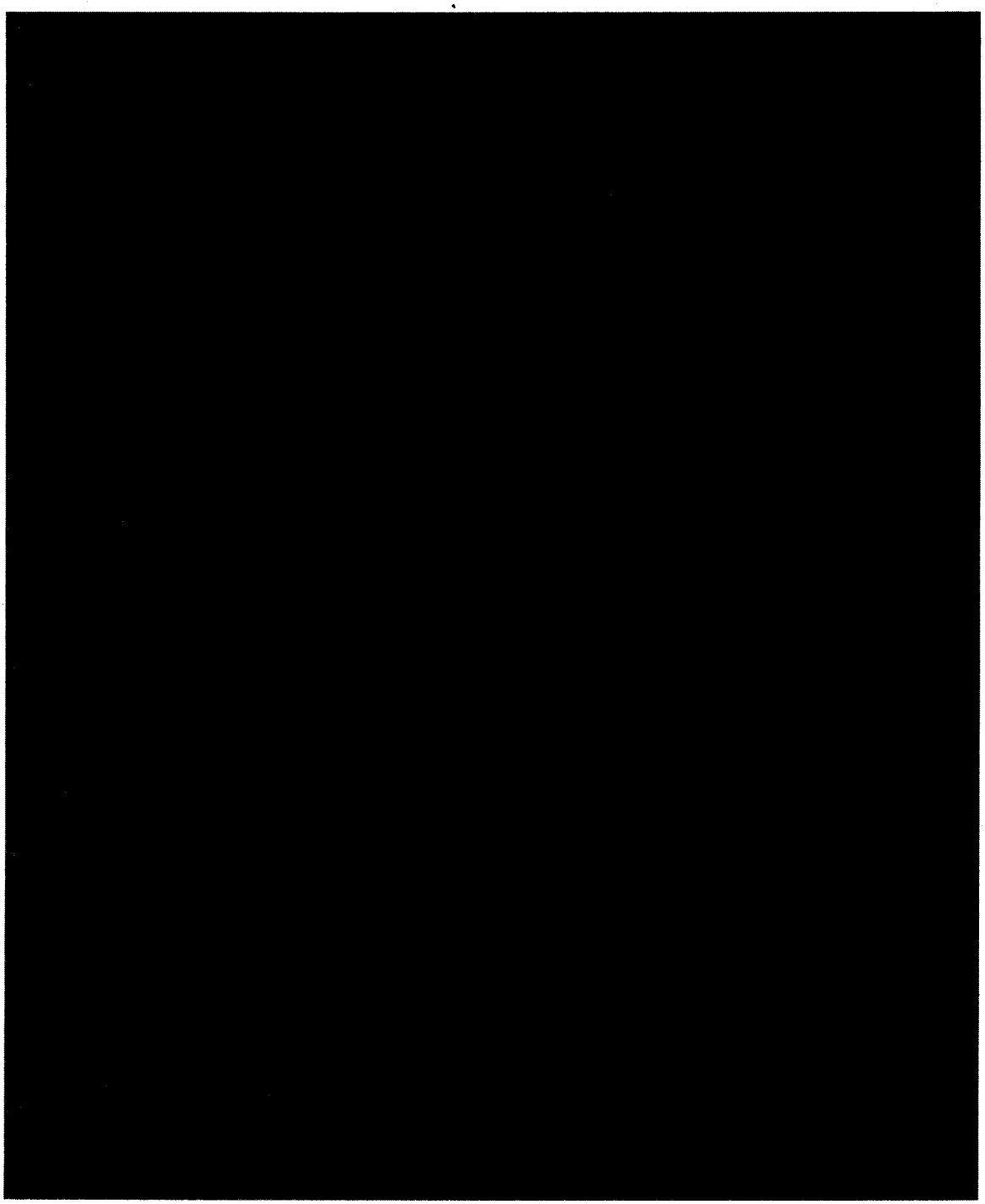
[redacted]

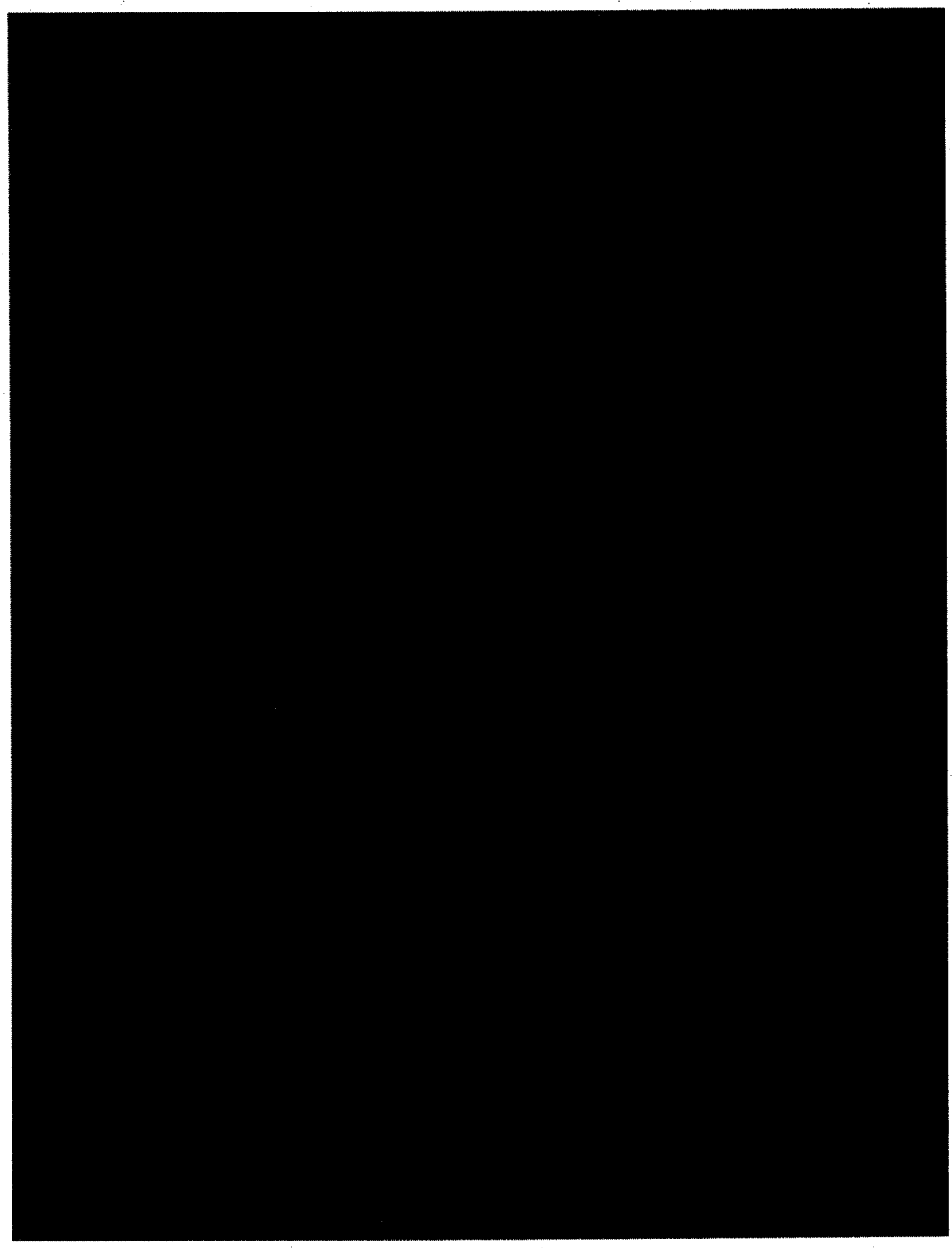


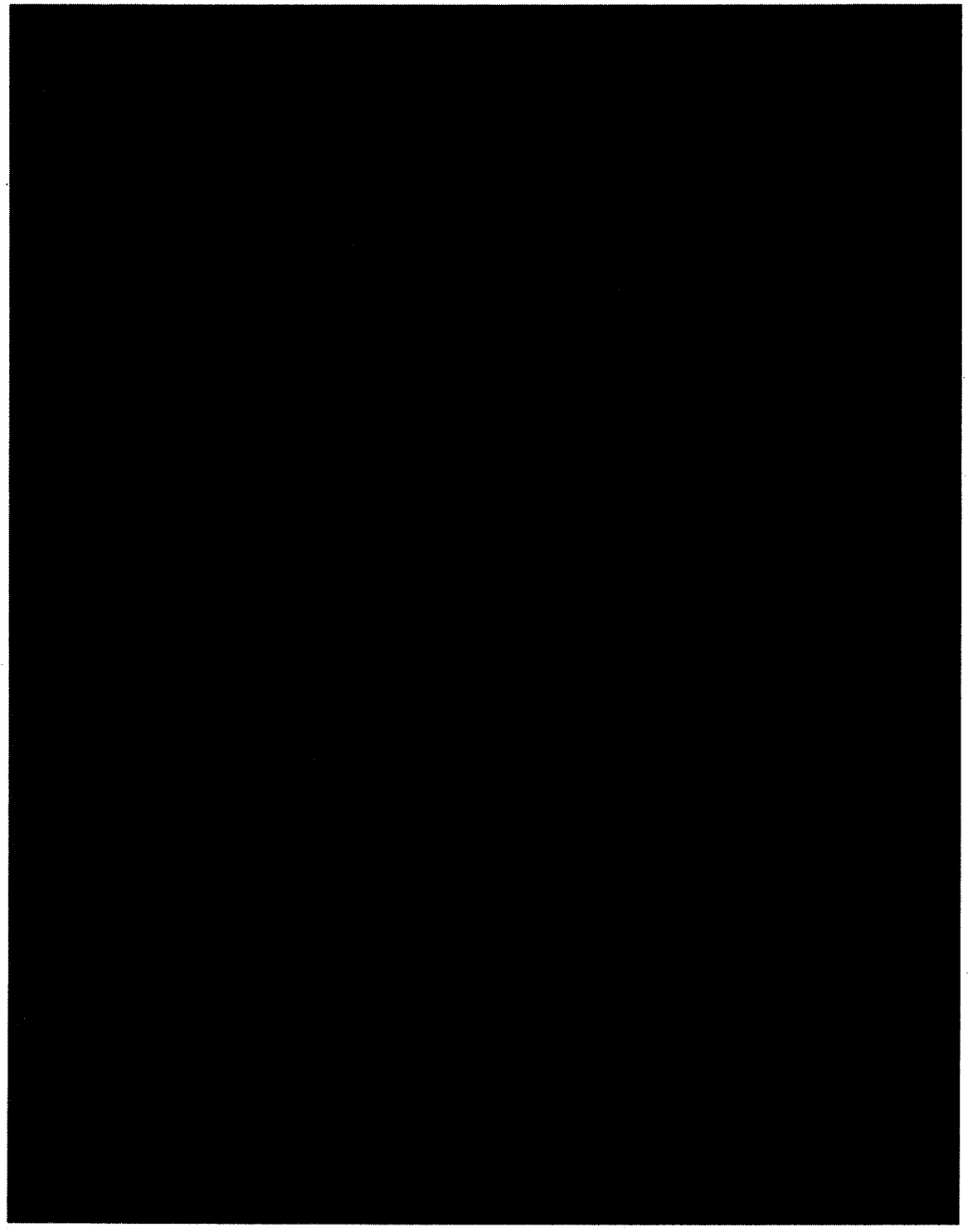


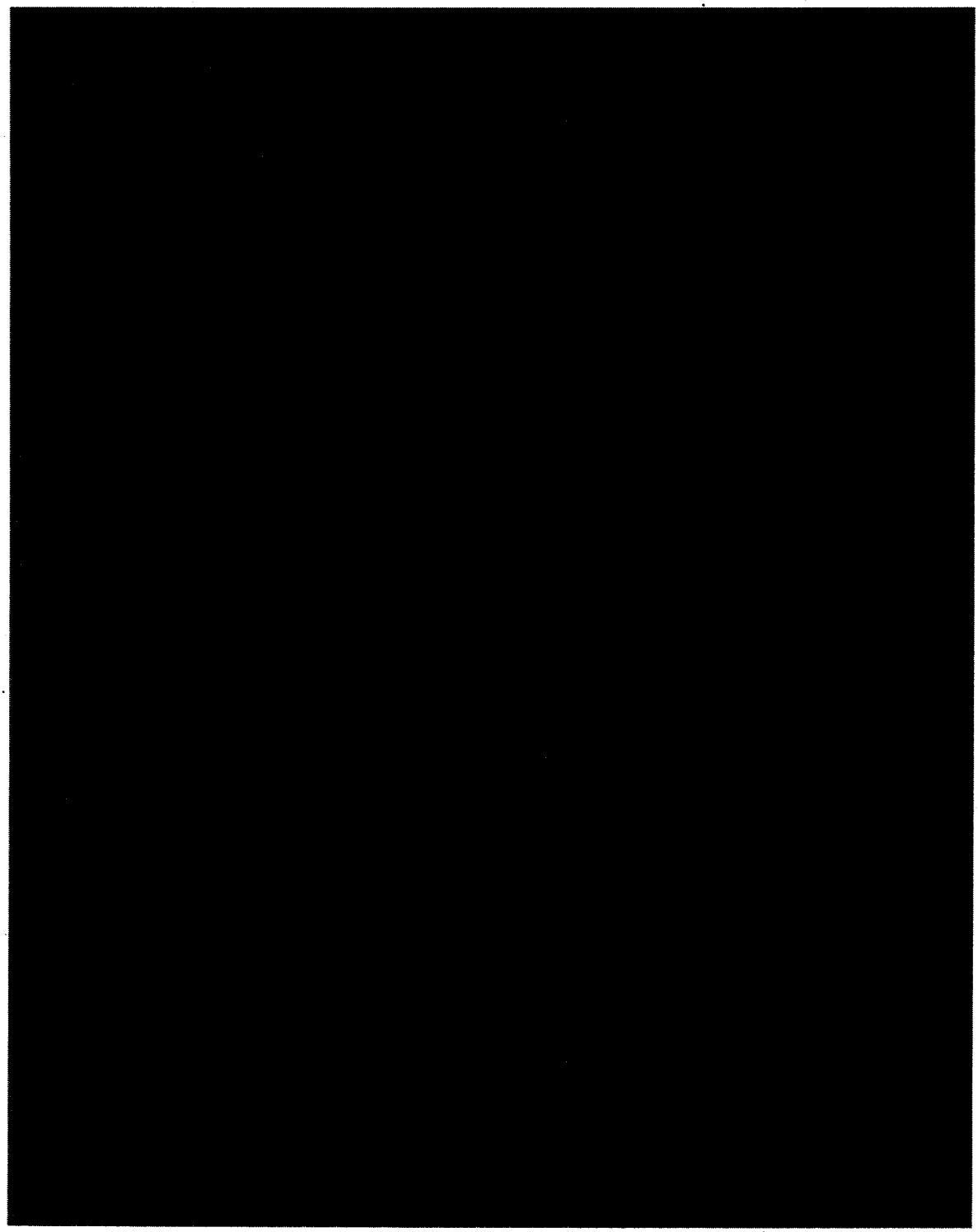


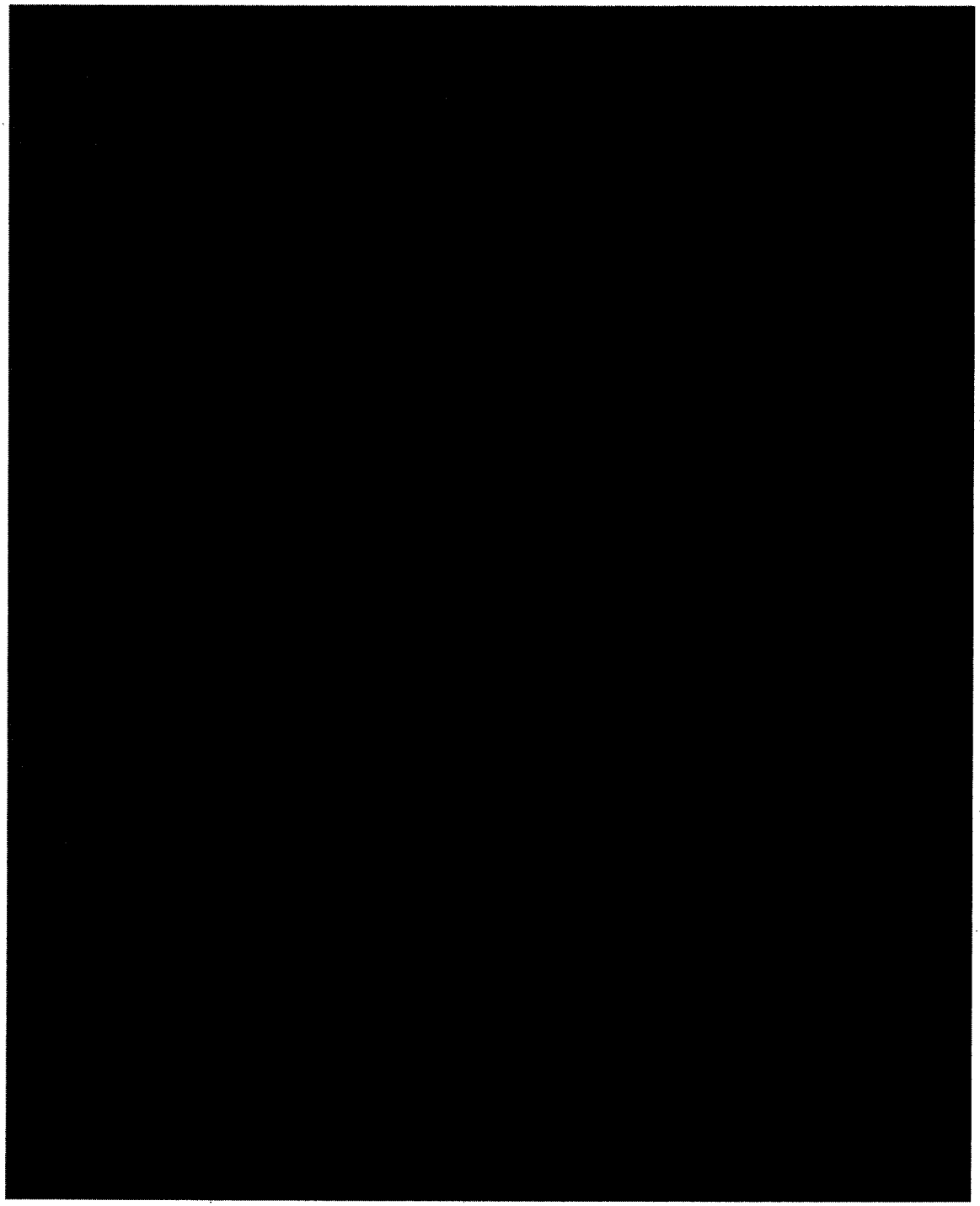


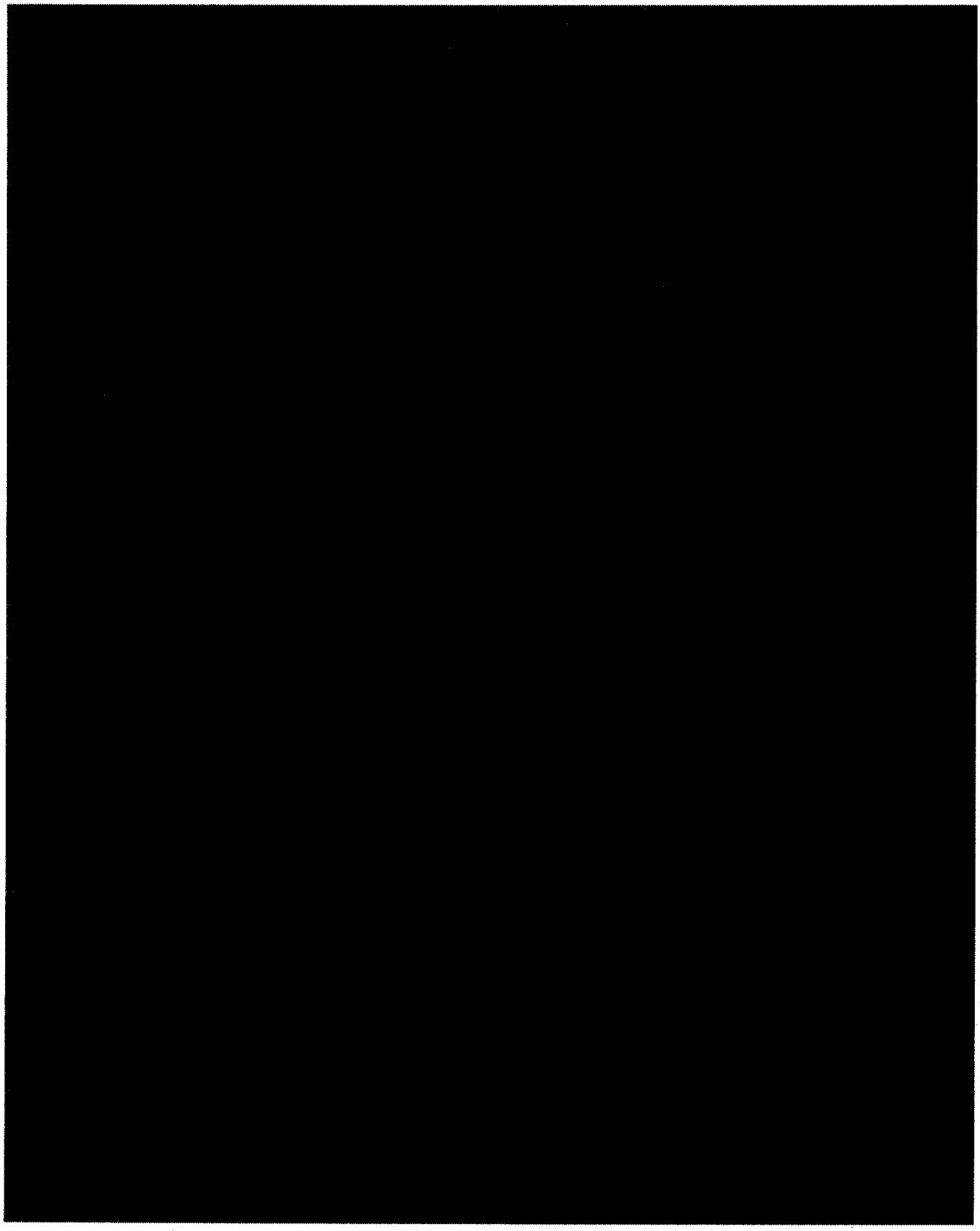












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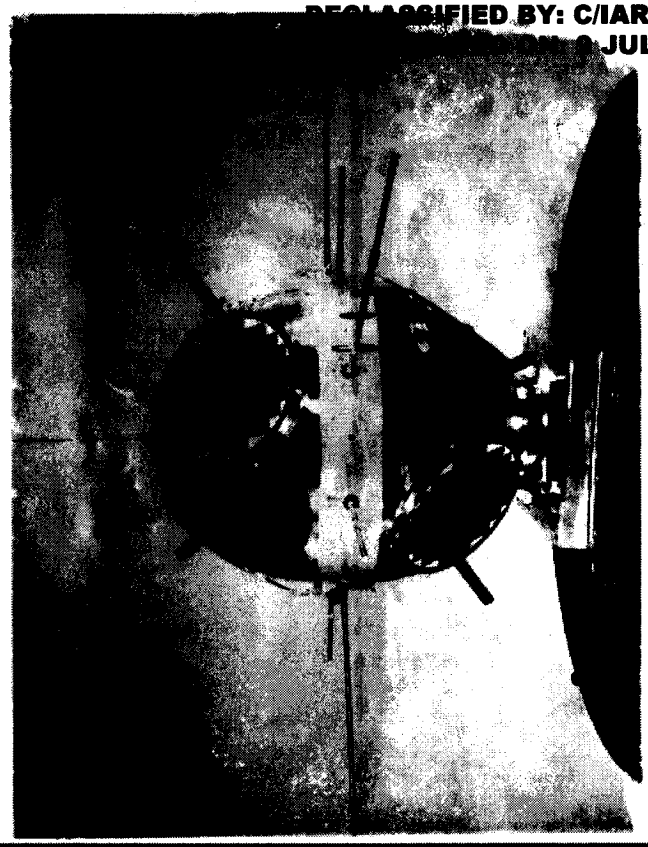

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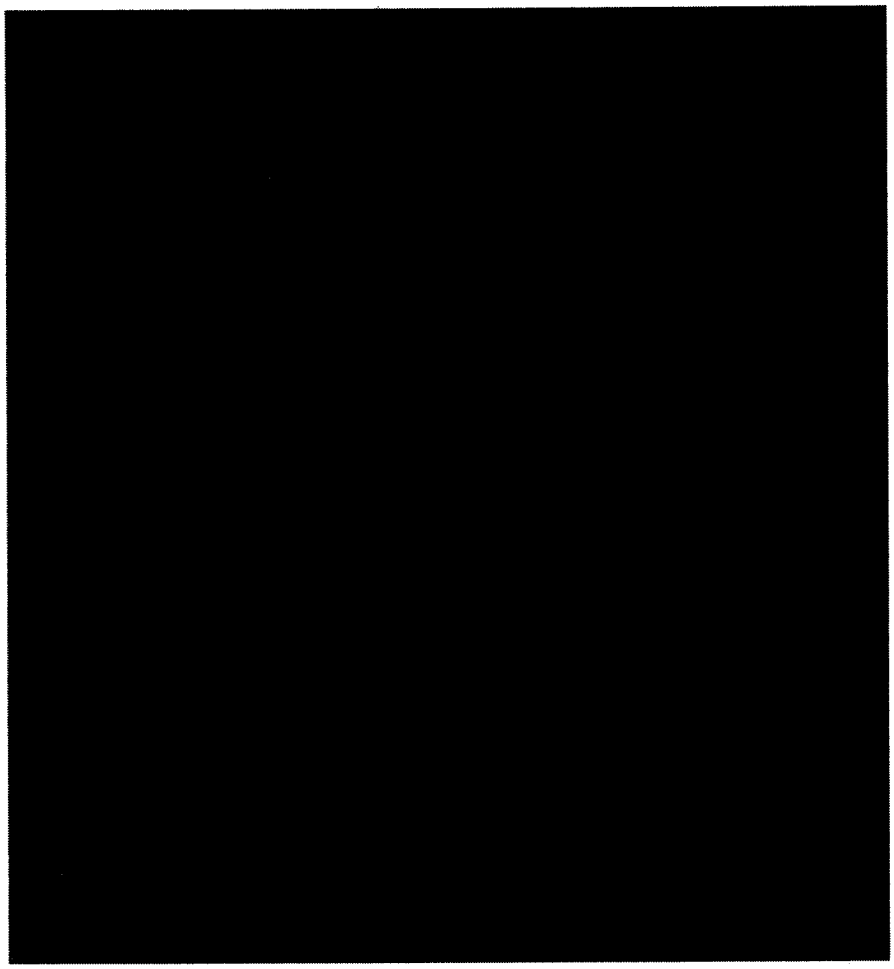

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C. Aircraft Reconnaissance

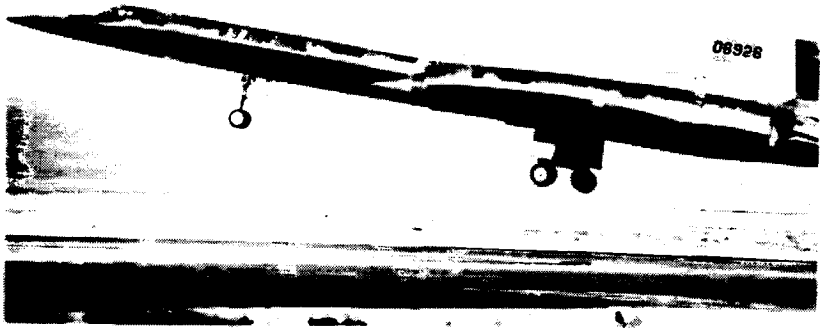
U-2

The Lockheed U-2 is the first aircraft designed and built solely for the purpose of reconnaissance. Powered by the J-75 engine, the aircraft cruises at approximately 70,000 feet for 3200 n. m. at a speed of 410 knots. The aircraft is capable of covering worldwide reconnaissance targets; two aircraft are modified for aircraft carrier operations to increase mission flexibility. The primary payload is the "B" camera but SIGINT and IR camera payloads have been developed to increase the aircraft utilization against specific targets. The U-2 is used by both CIA and SAC for reconnaissance operations.

During the past six months, there have been [redacted] U-2 flights against high priority reconnaissance targets. The [redacted] detachment of the IDEALIST program made [redacted]. The SAC detachment in South Vietnam made 118 flights against targets in North Vietnam, Laos, and along the Cambodian border. Operating from Barksdale Air Force Base, Louisiana, SAC flew 38 missions over Cuba during this six-month period.

Two U-2s were lost due to crashes during the previous six months. The total inventory now stands at 17 aircraft; 7 assigned to CIA, 10 assigned to SAC. A program has been initiated to update all of the SAC aircraft with the J-75 engine, and the latest camera and defensive systems.

A-12 TAKEOFF

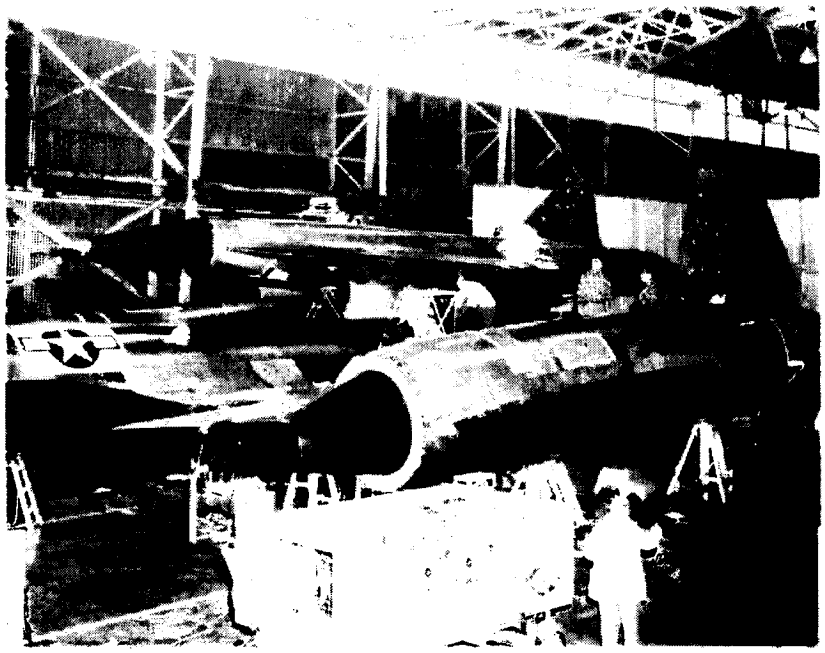


A-12

The Lockheed A-12 (OXCART) aircraft was designed in 1958 as a "follow-on" reconnaissance aircraft to replace the U-2. The aircraft cruises at Mach 3.2 at an altitude of approximately 80,000 ft. It has an unrefueled range capability of over 2500 n.m. The SAC SR-71 (Multi-Sensor Reconnaissance) and ADC YF-12A (Fighter) aircraft were developed from the basic A-12 airframe and advanced technology.

Since the last report to the Board, the OXCART A-12 aircraft has been declared operational ready. Facilities have been provided at Kadena Air Force Base, Okinawa, for an advanced base. Permission has been requested to deploy to Kadena for operations against high priority targets in North Vietnam and, if necessary, in South China. To date, the deployment and operational approval has not been given, and we are rapidly approaching the time period of the summer monsoon; which will inhibit reconnaissance operations.

On 28 December 1965, aircraft #126 crashed immediately after take-off. The pilot was not injured. The cause of the crash was determined to be an erroneous connection between the yaw and pitch sensors of the stability augmentation system. There are ten A-12 aircraft remaining. One of these is a two-seat trainer; two are reserved for testing. The remaining seven are of the operational configuration. To date, the A-12's have flown 1908 flights for a total of 2877:45 hours. Of this total, 656:20 hours have been flown above Mach 2.0 and 171:00 hours above Mach 3.0.



TAGBOARD

The Lockheed TAGBOARD drone is a supersonic, high altitude, photo-reconnaissance drone launched from a modified A-12 airplane. Powered by a Marquardt ramjet, the drone cruises at Mach 3.3 and over 85,000 feet for 3000 n.m. Photographic coverage 28 miles wide for the entire drone range is obtained from the Hycon camera. Still in the test and development phase, the drone is expected to be operational in December 1966.

Significant progress has been made in the TAGBOARD drone feasibility demonstration. Since the last report on this program, two launches of the drone have been accomplished. The first launch, 5 March 1966, resulted in only four minutes of flight, but proved that separation between the vehicle was possible and that the stability of the drone passing through the complex shock wave pattern was adequate to maintain engine ignition. The second launch, 27 April 1966, resulted in a 35 minute flight of some 1100 n. m. The drone exceeded the performance goals of Mach 3. 3 and 95, 000 feet; it actually flew at Mach 3. 35 and over 97, 000 feet; the drone also made a programmed 30° turn at a point 550 miles along the flight path. There are 17 drones remaining of which 5 to 7 are expected to be used on future test missions. The next test launch is scheduled for the week of 23 May 1966.

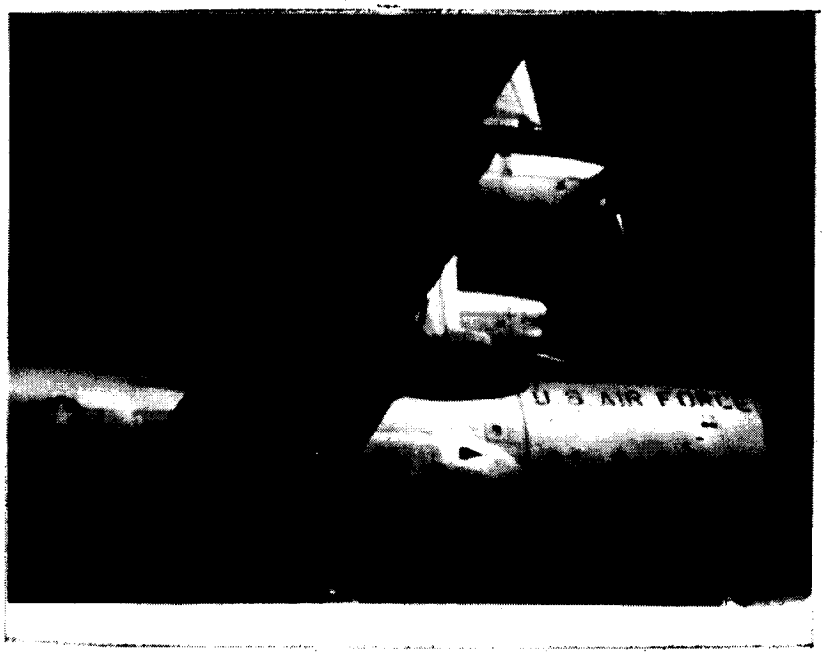
147-G

To avoid the political constraints attendant to manned overflights, the Ryan Q2C target drone was modified into a photographic drone. The drone is launched from a DC-130 aircraft at an altitude of approximately 15,000 feet. The latest available model, the 147G, cruises at an altitude of 65,000 feet for 1600 n. m. at a speed of 450 knots. The reconnaissance camera provides 320 linear miles of 3 to 5 ft ground resolution photography. A modified G, the 147-J, flies a low altitude mission profile at 1500 feet above the ground. The 147-J, equipped with two panoramic cameras, flies approximately 125 miles at the low altitude before climbing to optimum range altitude of 65,000 feet. The total range is approximately 850 miles. Upon return of the drone to the recovery area, the drone is retrieved with a newly developed Helicopter Mid-Air Retrieval System.

During the six-month period since 1 November 1965, there have been 40 drone missions against reconnaissance targets in North Vietnam and South China. Of these, 20 were successful, 3 were shot down by MIG aircraft, 7 were shot down by SA-2 missiles, and 10 failed to return for unknown reasons. Eight of the missions were low-level; 32 were high altitude flights.

On 10 April, the first operational mid-air retrieval of the drone using the CH-3C helicopter was made. This newly developed air recovery system will minimize recovery damage and expedite turn-around time on the drones.

SEQUENCE OF
DRONE RECOVERY BY HELICOPTER



DRONE MOUNTED UNDER WING OF C-130 LAUNCH
AIRCRAFT

IV. RESEARCH AND DEVELOPMENT

This section describes the major research and development activities including study projects, being conducted by the National Reconnaissance Office.

HEXAGON - This name has been selected as the BYEMAN system codeword for the new search and surveillance system.

The preparations for system development culminated in a proposed management approach, a statement of the system operational requirements and a request for proposal for the sensor subsystem. These key system documents and the supporting rationale were reviewed in detail by the CIA, the NRO Directorate of Special Projects and members of the Reconnaissance Panel of the President's Scientific Advisory Committee. They were then submitted for approval to the Executive Committee of the National Reconnaissance Program, which considered the HEXAGON proposal on 26 April, and approved it as submitted. Necessary implementing directives were issued by the Director, NRO on 30 April 1966.

The system configuration is shown in Figure 1. Key system design characteristics and capabilities include a ground resolution of 2.7 ft or

better at nadir, a mission life of at least 25 days on orbit, and periodic recovery of film in at least two recovery vehicles. Sufficient film will be carried to photograph in stereo approximately 700,000 square miles per day.

The approved management arrangement is shown in Figure 2.

The immediate program objective is to complete source selection and system definition activities. It is estimated that the first launch will occur in late 1968 or early 1969.

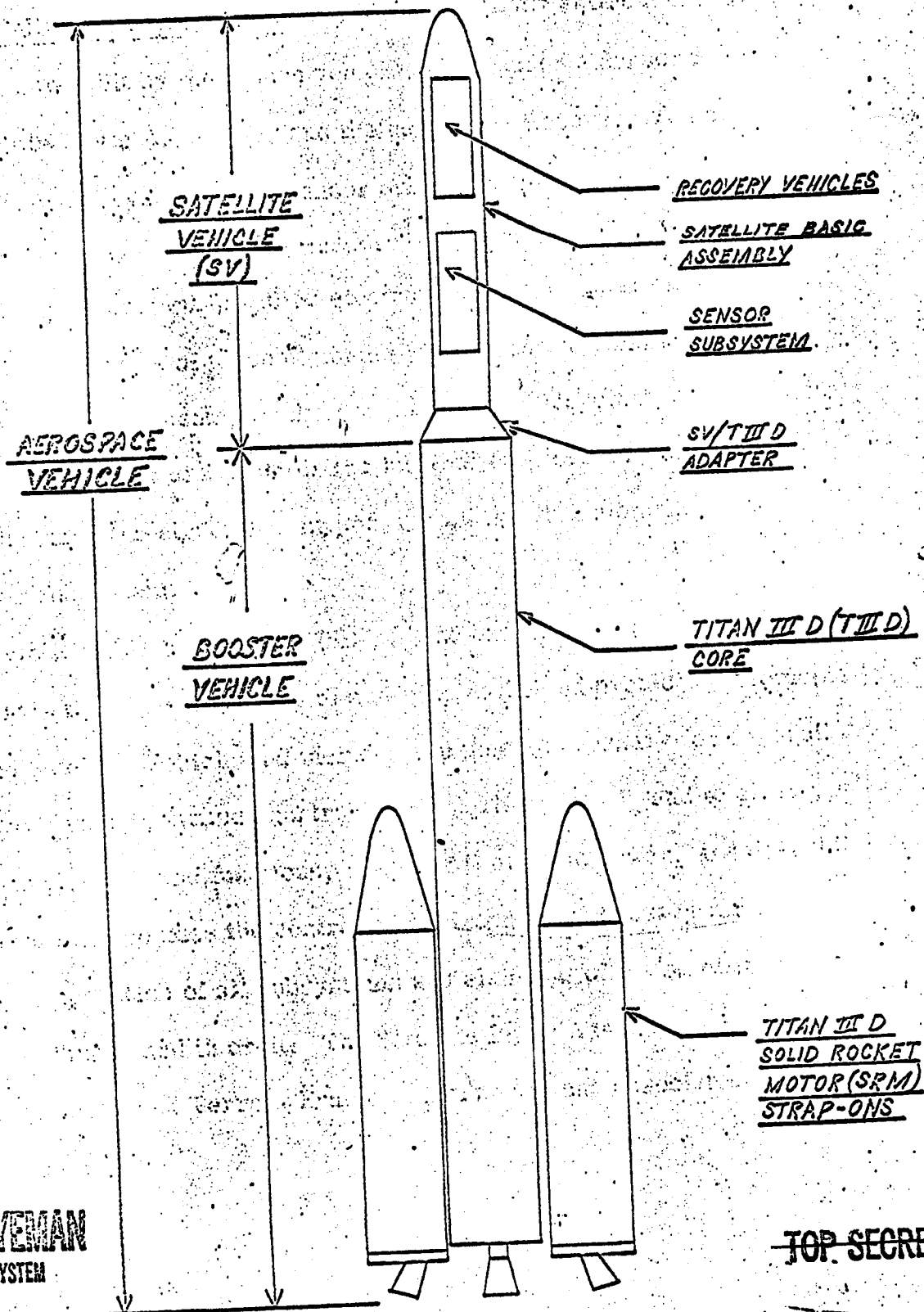
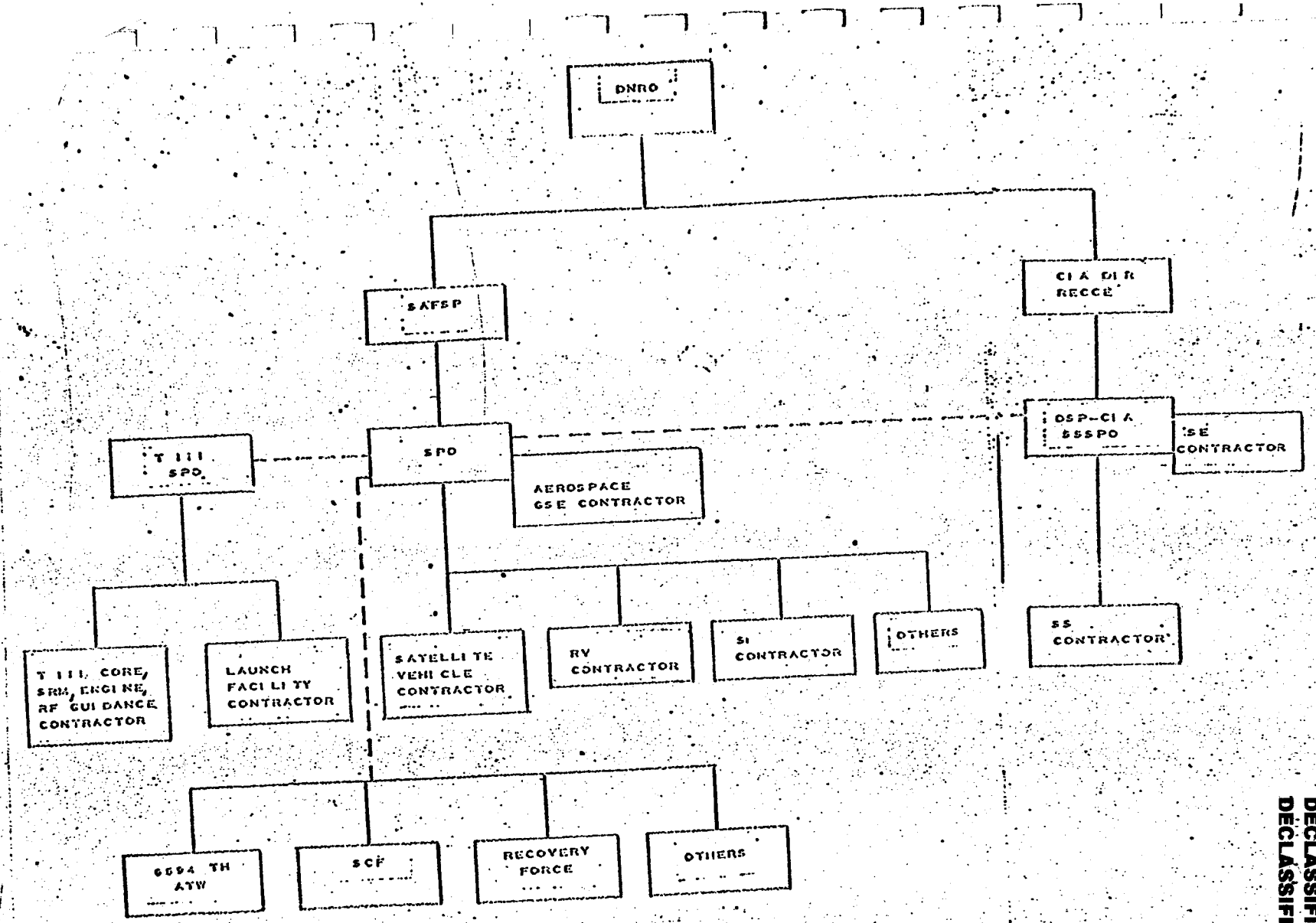


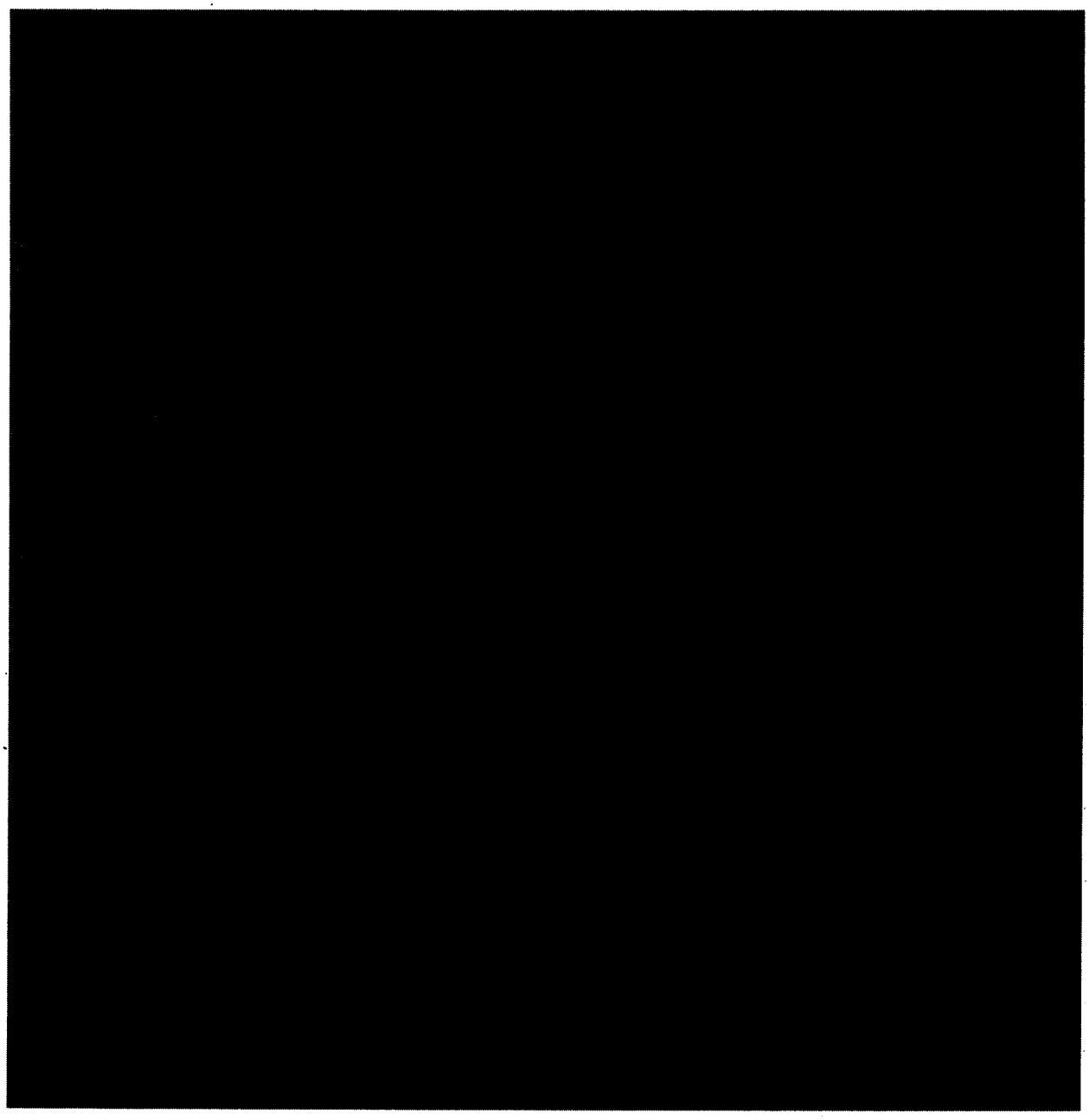
FIG. 1 - AEROSPACE VEHICLE OUTBOARD PROFILE

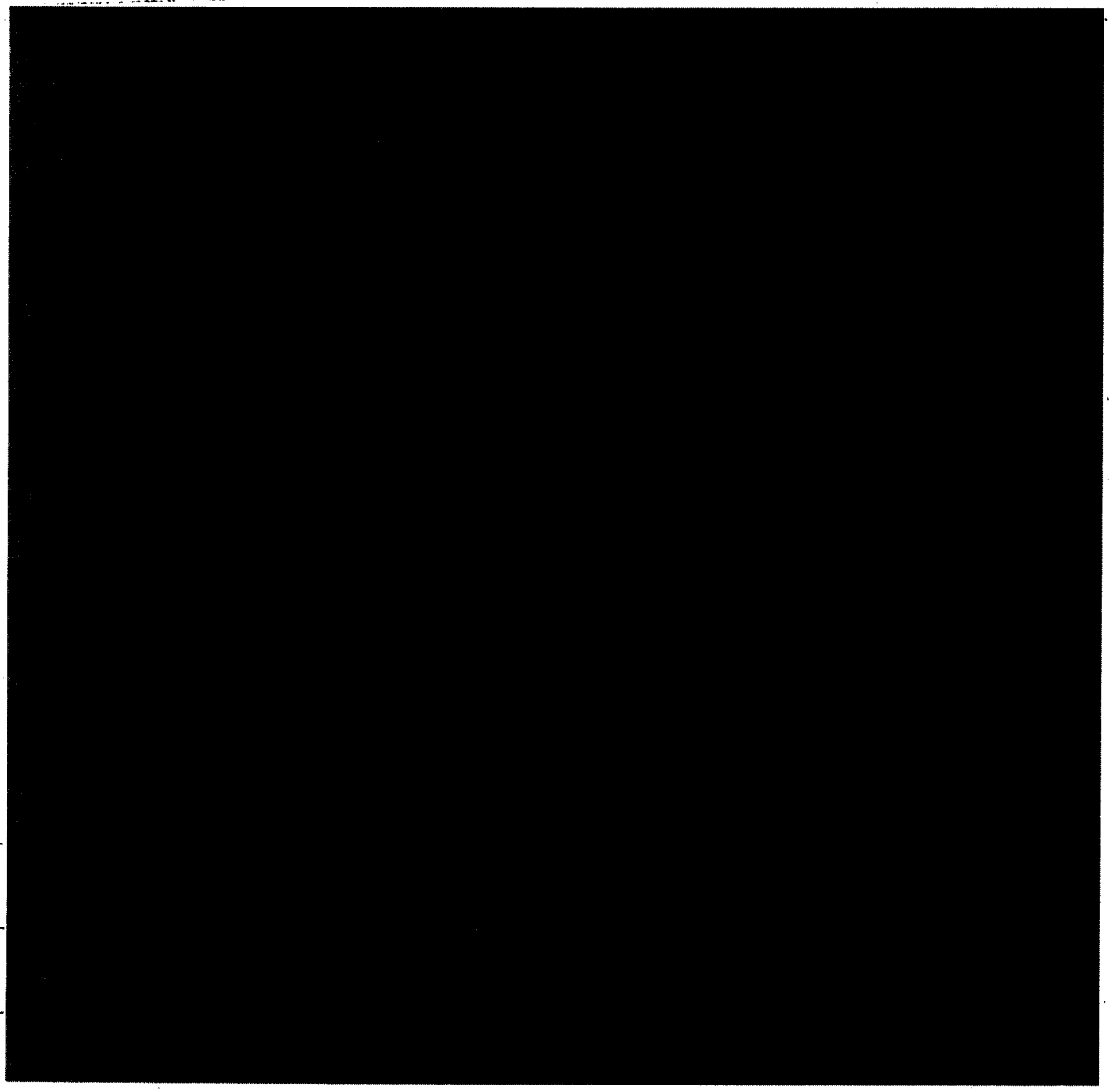


HANDLE VIA BYEMAN CONTROL SYSTEM

~~SECRET~~

ORGANIZATION - GENERAL SEARCH AND SURVEILLANCE SATELLITE SYSTEM





CORONA Improvement

Two additional capabilities will be incorporated into the CORONA program in July and August: a panoramic geometry modification and the use of a large tank THOR (THORAD). The panoramic geometry modification will permit accurate measurements of the internal geometry of the camera and the film position to permit compilation of more accurate maps from the photography. The THORAD will increase mission life from (the present) 10 days to 14 days.

Future improvements also include a three-inch focal length terrain camera and a constantly rotating lens for the panoramic cameras. These modifications will provide an improved mapping capability and will permit flying at lower altitudes. Both of these improved capabilities are scheduled to be available in July 1967.

GAMBIT-3 (Very High Resolution Spotting System)

Development of the GAMBIT-3 spotting system, which is designed to obtain photography [redacted] ground resolution from 90 n. m., is proceeding on schedule toward a launch on 28 July 1966. The first Satellite Flight Control Section (SCS) is now in system test. The pad modification to support the TITAN III-B is completed and the flight TITAN III-B is at Vandenberg Air Force Base ready to move to the launch pad.

The first flight payload has begun its initial testing and will complete systems test in June.

QUILL - The successful QUILL feasibility demonstration in December 1964 established that there is nothing unique in the operation of a relatively high powered radar in a space environment. The subsequent evaluation by a National Photographic Interpretation Center team of the potential of a satellite radar for reconnaissance identified missions where such a system could be of definite value, both as a supplement to photographic coverage and as a separate sensor. These included use in Crisis Indications and Strike Effectiveness Assessment missions.

During the period of this report, the National Reconnaissance Office has been conducting several studies related to further definition of possible operational satellite radars. Testing the remaining QUILL subsystems has been completed. The data obtained are expected to be of value in design and fabrication of any future radar systems. Related design studies for state-of-the-art spacecraft wide band magnetic tape recorders have been completed.

Additional studies still underway and expected to be completed by September 1966 include:

1. Two system studies for long lifetime, variable mode (high resolution/small swath and low resolution/wide swath) satellite radars.

2. Testing of critical experimental subsystems and components.

3. Investigations for readout techniques to overcome some of the limitations in state-of-the-art spacecraft tape recorders.

4. Target signature studies.

This summer, imagery typical of targets for Crisis Indications and Strike Effectiveness Assessment missions will be obtained by an aircraft. (The QUILL feasibility demonstration has shown that aircraft data should not differ from comparable quality imagery obtained from satellites.) This imagery will have various ground resolutions, look angles, signal to noise ratios and dynamic ranges and will be provided to NPIC for determination of the effects of the various parameters on image interpretability. This study activity will continue through September of this year.

DORIAN - Contract definition phase (Phase I) effort for the Manned Orbital Laboratory (MOL) continued with Douglas Aircraft for the Lab Module, the General Electric Company for the Mission Module, McDonnell Aircraft Corporation for the GEMINI B capsule, the Eastman Kodak Company for the optical payload and the TITAN III booster contractors for the up-rated TITAN III vehicle. Submission of firm Phase II (hardware acquisition phase) contractor proposals is scheduled for May and June 1966 with Phase II initiation planned for September 1966. Contracts for long-lead items of hardware and for facility construction at Eastman Kodak, which are required to protect the scheduled launch of an "all-up" manned laboratory in late 1969, were issued in March and April.

Selection of the launch site at Point Arguello, Air Force Western Test Range (WTR) was completed in March 1965. Site preparation and design of the launch facilities have been initiated.

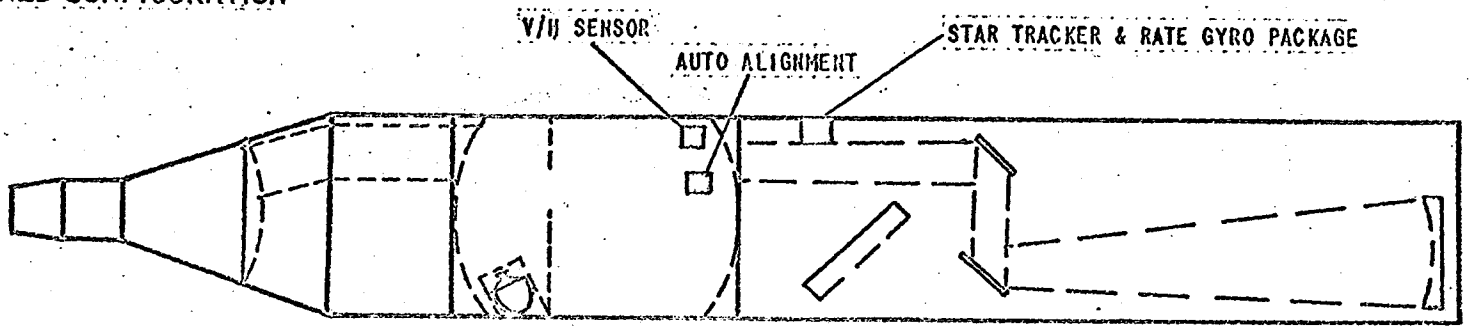
Announcement was made in November 1965 of the selection of eight MOL astronauts. Two Navy and six Air Force officers were chosen. All are experienced pilots and graduates of the Air Force Aerospace Test Pilot School.

Pursuant to the November 1965 direction of the President's Scientific Advisory Committee, the MOL design configuration was altered to permit operation in the unmanned as well as in the manned mode. For unmanned operation the GEMINI B will be replaced by a module containing multiple (probably 6) re-entry vehicles.

Firm definition and selection of the primary optical system was completed in February 1965. Studies revealed that a 70-inch aperture lens would be required (vice the 60-inch previously thought adequate) to provide the desired [redacted] ground resolution.

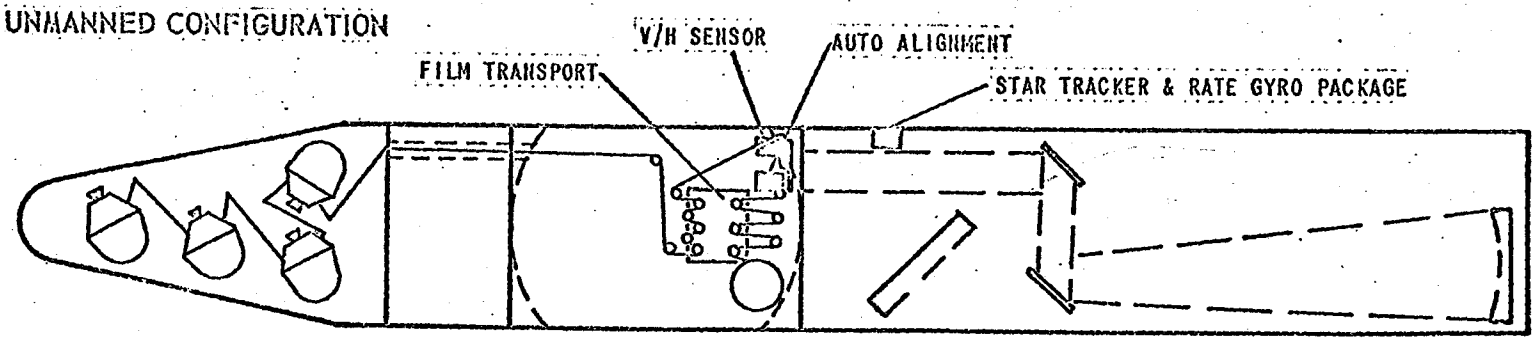
MANNED/UNMANNED SYSTEM

MANNED CONFIGURATION



/ Add Automated Capability to Laboratory and Payload

UNMANNED CONFIGURATION



/ Remove Gemini B
/ Remove Crew Segment and Portable Crew Segment Equipment
/ Add Nose Cone and Data Recovery Capsules
/ Add Auto Film Transport

DORIAN CAMERA SYSTEMS