

NRO REVIEW COMPLETED

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QUARTERLY PROGRESS REPORT
SATELLITE SYSTEMS

1 July 1968 through 30 September 1968

I. CORONA PROGRAM

A. J-1 System Status

1. J-49 Summary

On 18 September 1968 J-49 (Mission 1048) was successfully launched. This was the first J-1 system to use the 3/4 speed timer with a planned orbit life of 16 days. All systems functioned normally until rev 175; at that time a T/M commutator supplying the major portion of the diagnostic data from the payload ceased to function. On rev 182 (approximately 30% into "B" bucket) the forward-looking instrument failed; an exhaustive investigation of the failure is under way. The aft-looking instrument functioned normally throughout the mission.

2. The CORONA Resident Office plans to use SO-230 film in future J-1 missions. The increased speed of SO-230 over 3404 will permit the use of smaller slits and thus reduce smear.

Mission 1102 (CR-2) used tag ends of SO-230 in both cameras (2000' in one and 2500' in the other). The SO-230 has a grainier appearance than 3404, but close examination shows no degradation of image quality (Itek Report No. BOS-COR-9624-68-70, Evaluation of SO-230 Film for Use with the CORONA System, dated 25 June 1968, contains a detailed analysis). Mission 1046 (J-48) used a full load of SO-230. An out-of-focus condition developed which grew in intensity throughout the mission; the PET report concluded that the cause was emulsion buildup on the rails.

Eastman Kodak and Itek conducted studies to determine if SO-230 was the cause of the anomaly. Eastman Kodak reported that they were unable to

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differentiate between the surface or dusting characteristics of SO-230 and other high definition aerial films.

J-50 successfully completed HIVOS testing with a full load of SO-230; no film problems were noted. J-43 will use a full load of SO-230 during its HIVOS test and will be carefully examined for dusting; however, no Dr. "A" chamber run is scheduled. If no abnormal dusting is noted at the conclusion of the J-43 HIVOS test, the Resident Office will fly SO-230 in Mission 1049 (J-50) in early 1969.

B. J-3 System Status

1. CR-4 Summary

During the period of 7 through 21 August, CR-4 (Mission 1104) was successfully launched, operated, and recovered.

a. The forward-looking instrument used the first third generation lens, producing a maximum ground resolution of 5 feet along track, 8 feet across track, and an MIP of 115 for the mission. This system produced the best photography achieved to date in the CORONA Program.

b. 3404 film was used in the aft-looking instrument (#308). Fifteen thousand two hundred and fifty-seven feet of 3404 type film with a tag end of 800 feet of SO-180 film [redacted] was used in the forward-looking instrument (#309). Twenty-five foot ground resolution was the best obtained with the SO-180 film; however, the SO-180 photography can be used with conjugate B&W photography and provide stereo dimensions. The major portion of the SO-180 photography was affected by corona static markings. This was probably due to a problem in the Pressure Makeup Unit system. However, sufficient unaffected imagery was present to evaluate the intelligence potential of the SO-180 film. There was a slight blue-green cast across the first three and one-half frames of each SO-180 operation. Density of the blue-green cast is proportional to sit-time between ops: it is attributed to loss of [redacted] of the length of off-spooled, unexposed film which is suspended from supply cassette to camera between operations.

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c. FILTERS - Wratten 25, 21, 15 +ND and the SF05 filters were used in the system. The SF05 used during Mission 1104 was noted before the Mission as being of inferior quality. Therefore, only one operation of denied area photography was taken. The photo interpreters reported that the image quality of that portion of the film exposed through the SF05 was poor.

d. Pressure Makeup Unit (PMU) - The CR-4 PMU malfunctioned because of a leaky regulator that permitted excessive gas depletion at random times throughout the Mission. At the end of the Mission (during SO-180 operation), the regulator caused pressures outside the SO-180 corona-free range. This contributed to the static discharge recorded on the SO-180 film.

2. Special Tests

CR-5 was tested in HIVOS [redacted]

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[redacted] This checked for film flatness during camera operation and at altitude conditions. The results of this test confirmed that CR-5 was properly focused and that the UTB in CR-5 was within film flatness specifications.

3. Proposals and Future Changes

a. Glass Filters - CR-14 and up will use glass filters. (Glass filters will provide more uniform and predictable results).

b. Film

(1) SO-205: The CORONA Resident Office plans to use SO-205 film for systems CR-7 and up. SO-205 is an SO-230 type emulsion on an ultra thin base film.

(2) SO-121: Five hundred feet of SO-121 will fly in the aft-looking camera of CR-5. The aft-looking camera was selected because color correction of its lens (2nd generation) is more compatible with SO-121 than the forward-looking (3rd generation lens); also the aft-looking camera angle (with the sun rather than into the sun) is preferable

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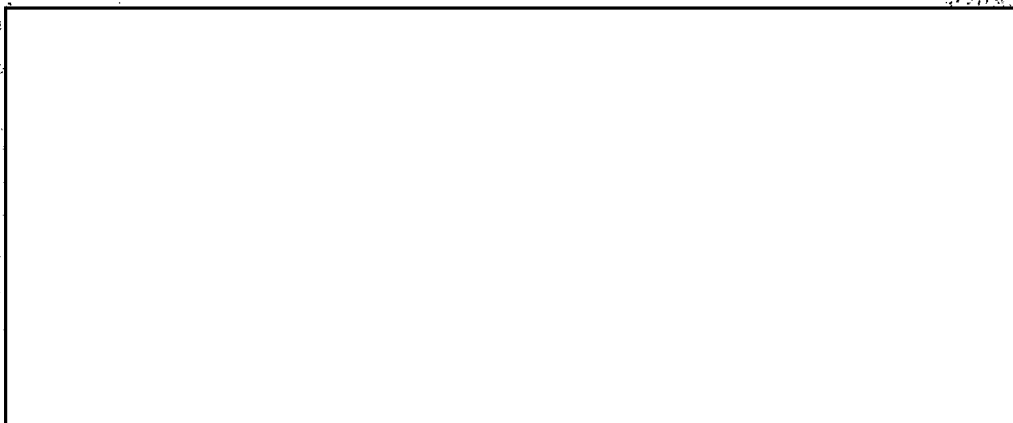
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photographically. The theoretical resolving power is approximately 1/4 of 3404 and has an aerial exposure index of 12 (compared to 2.4 for 3404). The greatest reduction in resolution would be from various filters needed for color correction. Eastman Kodak is developing a method of color correction and processing which would produce approximately a 20% increase in resolving power of SO-121. Operationally the resolving power of SO-121 should be approximately 60 lines/mm. Using Kodak's new technique, resolutions of 70 to 80 lines/mm can be achieved.



C. Deliveries To A/P

1. Instrument Deliveries

Nos. 316/317 - September 1968
 " 318/319 - September 1968

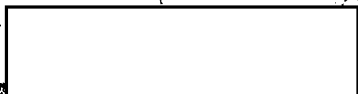
2. SRV Deliveries

737	738	July 1968
816	820	August 1968
817	818	September 1968

D. Missions Completed During This Quarter

Mission No.	1104	1048
Booster No.	515	524
Agena No.	1644	1647
Payload No.	CR-4	J-49
Instrument No.	308/309	222/223
SI No.	--	D116/121
DISIC No.	S/N-7	--


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D. Missions Completed During This Quarter

DRCG No.	618	605
Flight Date	7 August 1968	18 September 1968
Feet Payload Flown	31787	32000
Feet Payload Recovered	31787	27337
Recovery Dates	14, 22 August 1968	27 September 1968 - 2 October 1968

E. Missions Planned For Next Quarter

Date	30 October 1968	11 December 1968
Mission	1105	1106
Payload	CR-5	CR-6

F. Meetings and Briefings

1. PET Meeting for Mission 1047 was held at NPIC on 23 and 24 July 1968.

2. PET Meeting for Mission 1104 was held at NPIC on 10 and 11 September 1968.

3. CORONA Photographic Experiments Evaluation Committee (Ad Hoc Committee) met on 13 September 1968 at NPIC. The following topics were discussed at the meeting:

- a. Review of SO-380 analysis.
- b. Status of bi-color.
- c. Planning for SO-121 on CR-5.
- d. Review of SO-180.

4. Program Managers' Meeting was held at A/P on 6 August 1968. The following topics were discussed:

- a. Preliminary 1969-1971 flight schedule.
- b. Cam and filter delivery schedules for future J-3 missions.
- c. AO filters and aperture changes.
- d. Glass filters.
- e. Focus optimization.
- f. Power supply distortion.
- g. HIVOS temperature control.

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TAB A, Section 1.

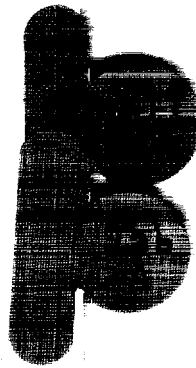
OX CART

DEVELOPMENT SUMMARY AND PROGRESS

(1 July 1968 - 30 September 1968)

I. GENERAL

Due to SCOPE COTTON Decision 20 (Phase-out OXCART effective 30 June 1968), OXCART development actions have been discontinued. Distribution and storage of OXCART assets is being completed through project SCOPE COTTON.



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TAB A, Section 2

OXCART

OPERATIONAL SUMMARY AND PROGRESS

1 July 1968 - 30 September 1968

I. GENERAL

Due to SCOPE COTTON Decision 20 (Phase out OXCART effective 30 June 1968), OXCART operations have been discontinued.

II. PILOT AND A-12 AIRCRAFT LOCATIONS

(As of 30 September 1968)

	[Redacted]	Palmdale, California (storage)
Pilots	[Redacted]	--
A-12 Aircraft	[Redacted]	8*

*Includes one trainer (#124), two flight test (#121 and #122) and five operational aircraft (#127, #128, #130, #131, #132).

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[Redacted]

IDEALISTDEVELOPMENT SUMMARY AND PROGRESS

(1 July 1968 - 30 September 1968)

I. AIRFRAME

A. A U-2R technical meeting was held at LAC, Burbank, to review the status of significant problems affecting the U-2R progress as well as the status of the aircraft performance as affected by excessive weight and drag and engine thrust deficiencies. A detailed report (IDEA 0746-68) has been written summarizing the significant results of this meeting.

 B. U-2R FLIGHT TEST AND OPERATIONAL TRAINING
 SUMMARY (THRU 30 SEPTEMBER 1968)

	<u>J. A. S</u> <u>FLTS</u>	<u>TIME</u> <u>J. A. S</u>	<u>TOTAL</u> <u>FLTS</u>	<u>TOTAL</u> <u>TIME</u>
1 - 051	14	43.5	82	264.4
2 - 052	17	65.1	47	174.1
3 - 053	22	80.2	58	174.8
4 - 054	27	75.8	48	149.0
5 - 055	19	64.1	33	99.6
6 - 056	8	14.1	21	47.1
7 - 057	15	51.3	15	51.3
8 - 058	16	55.9	16	55.9
9 - 059	<u>6</u>	<u>11.0</u>	<u>6</u>	<u>11.0</u>
TOTAL	144	461.0	326	1027.2

II. PROPULSION

Operation of a J75 engine on the East Hartford test stand has resulted in the development of an apparent fix to the engine oil pressure fluctuation problem. This involved the installation of a specially designed orifice in the pressure regulation sense line between the main oil pump and the boost pump. It was apparently a pressure interaction between the two pumps which acted through the sense line to cause the oil pressure fluctuations. Two of these orifices have been utilized in installed engines on a trial basis. More than 56 flight hours have been accumulated to date with no report of oil pressure fluctuations.

III. PAYLOAD

Flight verification tests were conducted during this period with A-1 and A-2 camera systems as well as with the H camera, B-1 and B-2 cameras, DELTA III and T-35 tracker. The IRIS I COMPASS ARROW, rotating optical bar camera, borrowed from USAF assets has been flight demonstrated in the U-2R. An "H" hatch was used to confirm compatibility requirements and design characteristics for the IRIS II configuration scheduled for delivery in December 1968. Camera production is on schedule. Flight tests conducted under high humidity conditions at McCoy AFB, Florida with a B-2 configuration yielded satisfactory results.

IV. LIFE SUPPORT

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B. U-2R Life Support System

1. S-1010 PPA Fittings/Altitude Chamber

Indoctrinations - The following individuals were fitted and given indoctrination:

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2. Parasail Evaluations

The S-1010 PPA/U-2R Seat Kit were evaluated with respect to their protective and safety features related to parachute descent, water entry, parachute canopy release and suit flotation during parasail evaluations conducted [redacted] during 8-10 July 1968. Results were very satisfactory.

3. U-2R Air Conditioning

A meeting was held on 6 August 1968 to review and discuss the U-2R air conditioning system deficiencies, modifications and test data. The deficiencies have apparently been resolved by the latest modifications, no further problems are anticipated.

4. Underwater Escape Evaluations

An evaluation program was conducted at Miramar NAS, San Diego, California, on 7-8 August 1968 to evaluate and develop procedures for emergency egress from a submerged U-2R cockpit, to evaluate the S-1010 PPA and U-2R seat kit under submerged conditions, and to evaluate the training value of such an exercise for project pilots involved in U-2R carrier operations. Specific escape procedures were developed and U-2R life support equipment proved to provide excellent protection under such emergency conditions. A training program will be established for all project pilots.

5. S-1010 PPA Refit and Evaluation Program

A series of problems regarding comfort and possible safety of the S-1010 PPA were noted during July and August 1968 by the Detachment G commander. A meeting was held at Detachment G on 5 August 1968 to outline a course of action to resolve such problems. A suit refitting effort was undertaken by Detachment G life support personnel,

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followed by cockpit and/or inflight evaluations. These efforts did not yield completely satisfactory results, and additional efforts and evaluations were conducted during the period 26-30 August 1968. All project pilots, [redacted] now have completely safe assemblies and the majority of comfort problems have been resolved.

g. Developmental Efforts

The David Clark Company is presently working on the development of several modifications/changes to the S-1010 PPA to improve comfort, reliability, safety and ease of maintenance. Included are the following:

1. Incorporation of a full-size sunshade.
2. Improved helmet microphone mounting.
3. New antisuffocation valve which can be manually closed.
4. Methods for reducing lateral torque of neck ring subassembly.
5. Insulation pads for suit vent system for protection from frostbite due to aircraft air conditioning modifications.

V. GENERAL RESEARCH AND DEVELOPMENT

A. Drag Reduction Program

1. The wind tunnel program has demonstrated clear gains in drag reduction and the necessity for an appropriate analytical model to provide specific design criteria for the diffusers to obtain further drag reductions. Development of the analytical model is underway.

2. The DD/S&T, D/NRO, Dr. Jones and Dr. Allen of NASA, Ames, and LAC personnel were all

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briefed on the drag reduction program. NASA will schedule wind tunnel test time during the next quarter to test a larger scale model at higher Reynolds numbers and Mach numbers.



C. PROPULSION

1. High Altitude Engine Relight Program

A program has been initiated with Pratt & Whitney and Lockheed to develop a system for improving the altitude relight envelope of the J75-P-13B engine in the U-2R aircraft through use of oxygen injection. The program at Pratt & Whitney is progressing well. All hardware is to be delivered by early October with engine endurance testing beginning two weeks after delivery of hardware. A fuel control has been modified by Hamilton Standard and bench tests began in September. Some delay may occur in the scheduled date for delivery of hardware to Lockheed due to an aircraft interference problem with some of the oxygen supply lines. The date of delivery of hardware to Lockheed will be revised when the interference problem has been resolved. The target date for resolution of this interference problem has been set for 1 October 1968.



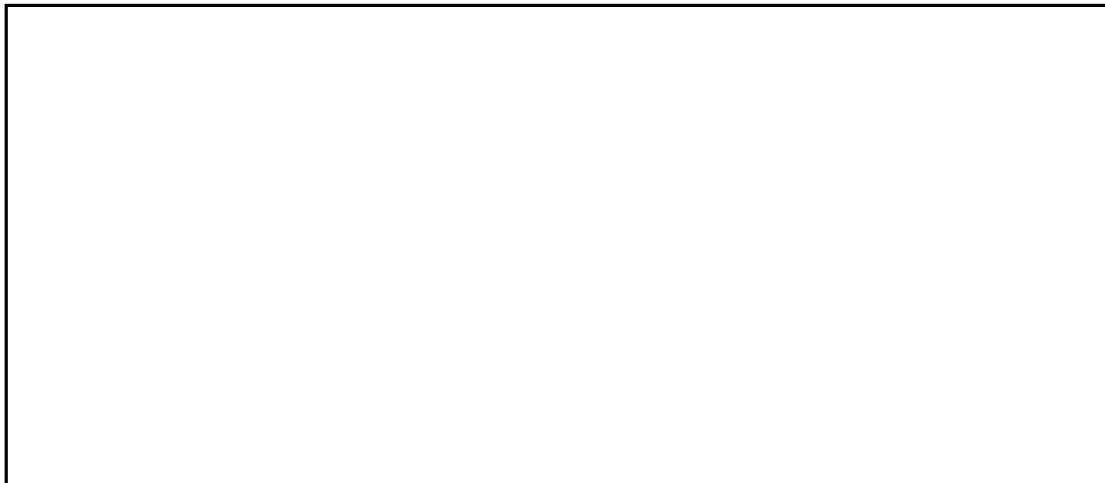
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D. HAZE ATTENUATION STUDY

During September, four flight tests were conducted at Albuquerque, New Mexico with S0121, S0230, and 3400 films using various combinations of polarizing and haze filters. Results of these tests will be analyzed by NPIC to determine the value of the polarizing filter for operational use.

VI. MISCELLANEOUS

A. Methane Fuel Technology

A briefing by [redacted] of R&D was held with Mr. Joe Jones (Assistant Secretary of the Air Force for R&D) on 13 September 1968 on methane fuel technology for airbreathing engines. The program which R&D had originally proposed to NRO for FY-68 and FY-69 was reviewed with Mr. Jones. This involved a four phase effort leading up to test operation of a complete engine using methane fuel. Mr. Jones indicated interest in NRO funding for a limited portion of this effort. After a visit by PSD to P&W (FRDC) during October for an updating of the overall P&W Methane effort, a briefing will be assembled for presentation to NRO by OSA, outlining a proposed program.

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B. U-2R Problem Areas

Late in the quarter, problems were encountered in the U-2R development effort of the Constant Speed Drive Alternator, the Alternating Current Generator and the

[redacted] At the time of this report, these problem areas are being evaluated, and will be corrected as rapidly as possible.

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IDEALIST

OPERATIONAL SUMMARY AND STATUS

(1 July 1968 - 30 September 1968)

I. OVERFLIGHT SUMMARY

The IDEALIST/TACKLE flights which were formerly placed (See 303 Committee Minutes dated 21 March 1968) on a mission-by-mission approval basis were suspended by Secretary of State in the July 1968 [redacted] Reconnaissance Forecast. As of 30 September 1968, the IDEALIST/TACKLE mission involving overflights of China continues to be stood-down.

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II. GENERAL

A. [redacted]

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A deployment exercise to McCoy AFB, Florida was conducted by Detachment "G" during the period 16 September 1968 through 27 September 1968. The purpose of the exercise was to evaluate and validate the U-2R (test vehicle: Article 058) while operating in an environment of high-humidity. Minor problem areas associated with operations conducted in high-humidity conditions were noted, and appropriate corrective actions have been taken to eliminate the operating problems. Overall results of the tests conducted by the U-2R during this exercise are satisfactory and it can be concluded that the U-2R [redacted] is capable of satisfactory operations in a high-humidity environment.

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III. U-2R DELIVERY STATUS (ALL DATES 1968)

<u>DELIVERY</u>	<u>ROLLOUT</u>	<u>FIRST FLIGHT</u>	<u>ACCEPTED</u>
Aircraft 3	12 January	17 February	29 April
Aircraft 4	13 February	29 March	12 June
Aircraft 5	27 March	8 May	29 May
Aircraft 6	29 April	18 May	11 June
Aircraft 7	17 July	29 July	29 August
Aircraft 8	5 August	20 August	5 September
Aircraft 9	21 August	9 September	21 September

IV PILOT AND AIRCRAFT STATUS (AS OF 30 SEPTEMBER 1968)

DETACHMENT "G" (EDWARDS AFB)

Pilots



Aircraft

2 U-2G
6 U-2R

DETACHMENT "H"

Pilots



Aircraft

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