~~TOP SECRET~~

HANDLE VIA BYEMAN CONTROL SYSTEM

NATIONAL RECONNAISSANCE PROGRAM
Washington, D. C.

January 27, 1971

NRP EXECUTIVE COMMITTEE

AGENDA

Office of Deputy Secretary of Defense
Room 3E 928, The Pentagon
Friday. January 29, 1971
2 - 5 p.m.

1. ZAMAN Phase II Issue

   A. Scenarios
   B. Results of Source Selection
   C. Status of Film Readout and Tape Storage Camera Systems Studies

If time permits, the following will be discussed:

2. PINE RIDGE Drone

3. GAMBIT Evasive Maneuver Capability

4. HEXAGON Status

F. Robert Naka
Secretary
NRP Executive Committee

Attachments
Background Material: EOI, Film Readout and TSC, SPIN SCAN, FASTBACK, AXUMITE, Radar, CORONA (R -1), GAMBIT HEXAGON

BYE-12562/71

~~CORONA GAMBIT HEXAGON~~

HANDLE VIA BYEMAN CONTROL SYSTEM

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ELECTRO-OPTICAL IMAGING

The Electro-Optical Imaging (EOI) system initial system definition effort was completed in December 1970. The final part (Phase II) of system definition is scheduled to begin in February 1971 and last through early FY-1972. The following comments and description refer to the system design resulting from the Phase I definition effort as recommended by the EOI program office.

The system is configured to return imagery in [redacted] via relay satellite to a [redacted]. Some of this imagery is to be available for viewing within [redacted] acquisition. The imaging satellite near-polar orbits are to be elliptical with a perigee altitude of 188 NM and an apogee altitude, yet to be selected, of 283 to 424 NM. The ground sampled distance (GSD) varies with altitude, with the best value being [redacted]. The nadir frame size varies similarly with the smallest frame, about 2 NM on a side, corresponding to the [redacted] GSD.

[redacted] imaging satellite system can obtain 800 frames per day total with some stereo coverage. Imaging satellite design life is three years with an expected useful life of 2.6 years. Availability is presently planned to be April-June 1975.

ELECTRO-OPTICAL IMAGING

Cycle Times:	
Tasking Decision Through Target Acquisition	<1 hr to one day
Data Acquisition Through Imagery Viewing	<1 hr
Operational Lifetime	2-3 years
Representative Orbit	188 X 283 to 424 NM elliptical
Frame Size (Minimum)	2 X 2 NM
Capacity: Per day	800 frames (some stereo)
Earliest Availability	April 1975

FILM READOUT AND TAPE STORAGE CAMERA

The Film Readout System (FRO) and the Tape Storage Camera (TSC), presently under study by the NRO, are being designed to use the GAMBIT-3 R-5 (175 inch focal length) optical subsystem. With the FRO approach imagery would be recorded on film, developed on-board, stored, and later scanned by a laser to produce a video output signal. With the TSC approach, a somewhat more advanced concept, the camera would convert a photon image to an electron image which would be stored on tape and later read out by a scanning electron beam to produce the video output signal.

Earliest availability of an FRO system would be approximately three years from contract initiation. The TSC system could be available approximately three years after camera demonstration (anticipated during late CY 1971).

FILM READOUT AND TAPE STORAGE CAMERA

Cycle Time:	
Tasking Decision through Target Acquisition	1 hr to 1 day
Data Acquisition through Imagery Viewing	1-12 hours
Operational Lifetime	2 years
Representative Orbit	170 nm circular
Ground Resolved Distance	2 ft (nadir)
Swath Width	
FRO	3 or 5.8 nm
TSC	3 or 8.75 nm
Swath Length	Variable
Capacity: Per Day	400 frames (two-satellite systems)
Earliest Availability	
FRO	3 yrs
TSC	4 yrs

SPIN SCAN

The proposed SPIN SCAN system was the subject of four studies (two funded) which were completed in mid-1969. Due to lack of interest at that time, the SPIN SCAN concept was not funded for system definition.

The term "SPIN SCAN" presently is used to describe a family of satellite designs characterized by spin stabilization and a panoramic mode of image acquisition resulting from this spin. In a typical design the spacecraft would be orbited as a piggyback payload. [redacted]

Imagery would be acquired on film which would be processed and stored on board the satellite. [redacted] Tasking (including initial call-up) through imagery-availability-times would vary between about four hours and 36 hours with a probable mean cycle time of less than one day. Active satellite life after call-up would range from about three weeks upward depending on the orbit, and the rate of film use.

Monoscopic ground resolved distance would vary between 2.4 and five feet at nadir, depending upon the orbit selected. The camera would acquire imagery between plus and minus 45 degree obliquity limits, or any combination of the four 22.5 degree segments therein. Using the maximum obliquity limits, a swath 180 nautical miles wide could be accessed from a height

1. A probable range of operational perigee altitudes would be 72 to 150 nautical miles.

of 90 nautical miles. The data link is sized to transmit about 14,000 square nautical miles of imagery per day from this altitude to a single ground station.

Earliest system availability from go-ahead would be approximately 24 months.

SPIN SCAN

Cycle Time:	
Tasking through Target Acquisition	3 hrs to 1 day
Data Acquisition through Imagery Viewing	$<$ 1 hr to 12 hours
Operational Lifetime:	
Dormant	1 year
Active	3 weeks and up
Representative Orbit:	
Dormant	200 nm circular
Active	72-150 nm perigee (elliptical)
Ground Resolved Distance (mono)	2.4 ft (nadir-72 nm alt) 3.0 ft (nadir-90 nm alt) 5.0 ft (nadir-150nm alt)
Swath Width/Length	12 x 180 nm (90 nm alt)
Capacity: Per Day	14,000 nm^2 (90 nm alt) 40,000 nm^2 (150 nm alt)
Per Mission	180,000 nm^2 (90 nm alt) 505,000 nm^2 (150nm alt)
Earliest Availability	24 months

FASTBACK

The FASTBACK concept was developed independently by a contractor and was submitted to the NRO for evaluation. This proposed system is based on recoverable, reusable panoramic photo payloads launched with surplus refurbished MINUTEMAN I boosters. A typical mission would involve launch warning (at least 4.5 hours prior to launch), final target selection (at least three hours prior to launch), launch from Johnston Island, nine to ten hours in orbit, East Coast recovery and film processed and ready for viewing - all within a cycle of less than 24 hours. The system would be capable of four to nine revolutions per mission flying in an elliptical orbit of 65 x 300 nautical miles. Targets could be overflown on three to seven of these revolutions and orbits could be optimized to obtain double coverage of 10-15 target groups. The system would be capable of approximately 3.5 foot ground resolved distance at nadir and could provide stereoscopic coverage[1] of 10,000 nautical miles along track with a swath width of 130 nautical miles. Earliest availability would be approximately 24 months from go-ahead.

1. An alternative approach using a heavier camera together with a higher energy injection motor could produce 2.5 foot monoscopic coverage at nadir.

FASTBACK

Cycle Time: Launch Warning through Imagery Viewing	19-24 hours
Operational Lifetime	6-15 hours (on orbit)
Representative Orbit	65 x 300 nm
Ground Resolved Distance (stereo)	3.5 ft (nadir)
Swath Width/Length	130 x 10,000 nm (max)
Capacity: Per Day/Msn	1,300,000 nm^2
Earliest Availability	24 months

AXUMITE

The AXUMITE concept was developed independently by a contractor and was submitted to the NRO for evaluation. The proposed system consists of a panoramic photo satellite payload and associated boosters. The entire vehicle would be launched from an F-4 aircraft, and the film capsule could be recovered in the Atlantic or Pacific with tasking through imagery-availability times ranging between 15 and 24 hours. The vehicle would fly between three and nine elliptical orbits with a perigee of approximately 85 nm. The maximum imaging run would be about 1000 nautical miles long with from five to seven foot monoscopic ground resolved distance (nadir) at 85 nautical miles. Cross-track coverage would be approximately 150 nm. Earliest availability would be approximately 24 months from go-ahead.

AXUMITE

Cycle Time:	
Tasking through Imagery Availability	15-24 hours
Operational Lifetime	6-15 hours (on orbit)
Representative Orbit	85 nm perigee (elliptical)
Ground Resolved Distance (mono)	5-7 ft (nadir)
Swath Width/Length	150 x 1000 nm (max)
Capacity: Per Day/Msn	150,000 nm^2
Earliest Availability	24 months

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CORONA (R-1)

The CORONA system, which consists of a panoramic photo satellite with two recovery vehicles, is being phased out as an operational search system. The capability exists to procure additional hardware and maintain a CORONA at an R-1 status. This would involve hiring another launch crew and reopening a second launch pad. The R-1 status would be alternatively maintained at each launch site on about a three week cycle. Mission times could vary from a minimum of three days to a maximum of 21 days based on the assumption of one day (R-1) on pad, one day on orbit to include recovery, and one day for processing and interpretation. The average operational life of 19 days could provide a second recovery vehicle as soon as the second day after launch or as late as 19 days after launch. The system provides a 6 foot stereoscopic ground resolved distance (nadir) and a swath of 8.0 x 124 nautical miles while flying an elliptical orbit with an 85 nautical mile perigee. Total mission capacity at this altitude is about 7,000,000 nm^2 gross coverage. Orbits with perigees between 80 and 120 nautical miles can be flown with resulting variations in resolution and coverage. Earliest availability involving new procurements would be approximately 20 to 24 months.

CORONA (R-1)

Cycle Time: Launch Warning through Imagery Viewing	3-21 days
Operational Lifetime	1-19 days
Representative Orbit	85 nm perigee (elliptical)
Ground Resolved Distance (stereo)	6 ft (nadir)
Swath Width/Length	8.0 x 124 nm
Capacity: Per Msn	7,000,000 nm^2 (gross)
Earliest Availability	20-24 months (new procurements)

GAMBIT

Operational Lifetime		18-30[1] days
Recovery Vehicles		2
Representative Orbit		75 x 240 nm (Elliptical)
Ground Resolved Distance: (Stereo)	160"FL	[redacted] 12" (nadir-96 nm alt)
	175"FL[2]	[redacted] 12" (nadir-124 nm alt)
Swath Width:	160"FL	3.7 nm (72 nm alt)
	175"FL[2]	3.4 nm (72 nm alt)
Swath Length		Arbitrary
Capacity:	CY 70 Ave. Per Msn	17,000 tgts 10,000 frames

1. Present mission lifetime is 18 days. Thirty day life is programmed for late 1972.

2. Present missions utilize a 160 inch focal length optics. A 175 inch focal length optical system will be introduced in mission number 4332 scheduled for the summer of 1971.

HEXAGON

Operational Lifetime	30 days
Recovery Vehicles	4
Representative Orbit	82 x 144 nm (Elliptical)
Ground Resolved Distance (Stereo)	2.5' (nadir-82 nm alt)
Swath Length	8.4 nm (82 nm alt)
Swath Width[1]	44-294 nm (82 nm alt)
Capacity Per Msn (Stereo)	20×10^6 sq nm gross

1. Swath widths across track vary dependent on the scan sectors which vary from 30 to 120 degrees.