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5 of 8

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AUG 78 REVISED BUDGET SUBMISSION

SHUTTLE PHOTOGRAPHIC PALLET

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SHUTTLE IMAGING PALLET PROGRAMS

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WIDE AREA SEARCH PAYLOAD

(WASP)

The purpose of the WASP Program is to design, develop, and procure a reuseable photoreconnaissance payload utilizing the Space Shuttle as the host vehicle. It shall be capable of performing the wide area search and MC&G roles during any shuttle mission and meet the community needs with a long term cost reduction over the continuation of the current search acquisition system. The technical approach to achieve a low life cycle cost would be as follows:

(1) The WASP Program would be comprised of three payloads. Two would be used operationally with the third one (no lens assembly) used for spares. The program can be readily expanded by the additional purchase of payloads for approximately $12M per unit.

(2) The payloads would be specifically designed to take advantage of the inherent capabilities of the shuttle as a host vehicle.

(3) Built-in diagnostic and self-test sensors and modularized electro/mechanical boxes will substantially reduce acceptance and recertification test complexities.

(4) Routine maintenance can be limited to IRAN (Inspect and Repair As Necessary) with periodic overhauls during the 10-year life of the program.

(5) Community requirements will be satisfied during shuttle missions of 7 to 30 days duration on flights that may be dedicated to NRP payloads only, or jointly sponsored by NASA, DOD or other government agencies.

(6) Multiple payloads and minimum recertification time between flights will result in a Crises Reaction capability limited only by the shuttle status.

The WASP Program costs, when amortized over the 10-year service life, will reflect a significant cost reduction without compromising the needs of the Intelligence Community.

a. Stand Alone Satisfaction of Search Requirements

(1) Three WASP missions per year with 4-month launch centers and 30-day durations flown in 130 nautical mile polar orbits can meet and maintain status of all the standing search requirements (with the exception of 2-month ground) at or above the 80 percent level. With a film load of 70,000 ft, each mission can be expected to return approximately 15 million square nautical miles gross in stereo.

(2) The following chart depicts status at the end of each of the first 5 WASP missions. (Status was assumed to be zero in all categories at the start of Mission 1.)

COVERAGE PERIOD (IN MONTHS)	END OF MISSION STATUS (%) 1	2	3	4	5
2	69	69	69	69	69
4	80	80	80	80	80
6	66	88	76	85	82
9	55	80	91	84	87
18	35	58	73	82	88
24	37	61	71	85	90

(3) Once search status has reached steady state (approximately 1 year after first WASP mission), it can be maintained with one 21-day and two 30-day missions per year.

b. Unique Supplemental Search

[redacted] (b)(1) (b)(3)

WASP, on the other hand, is a synoptic coverage vehicle and has no problems with high conflict areas. By including various film types (color, IR, etc.) in the film load, it can easily perform multi-spectral collection. Its capabilities in all of the above mentioned categories are equal to those of HEXAGON.

WASP

	FY 79	FY 80	FY 81	FY 82	FY 83	FY 84	TOTAL
Concept Definition	2.0	-0-	-0-	-0-	-0-	-0-	2.0
Pallet Systems and Integration	-0-	20.0	27.0	33.0	21.0	11.0	112.0
Subtotal	2.0	20.0	27.0	33.0	21.0	11.0	114.0
Recurring STS Flights*	-0-	-0-	-0-	13.0	51.0	63.0	127.0
Subtotal	-0-	-0-	-0-	13.0	51.0	63.0	127.0
Total	2.0	20.0	27.0	46.0	72.0	74.0	241.0

* Based on assumption of 20% share of flight costs.

HEXAGON AREA SEARCH PALLET

(HASP)

The purpose of the HASP Program is to design, develop, and procure a reuseable wide area search and surveillance photographic reconnaissance payload utilizing the Space Shuttle as the host vehicle. This pallet payload will incorporate the existing HEXAGON two camera sensor system design, and utilize available HEXAGON manpower and spare components. The costs shown below support procurement of one system and provide an early-1980's demonstration of a shuttle search and surveillance capability.

Because the HASP system could be available for use in the shuttle operational phase, the payload will be used in a "pathfinder" role to provide information to other programs which will be transitioning to the shuttle at a later time. The program will also feed information directly into the design and development of the Wide Area Search Payload (WASP) in order to correct any problems early in the development phase. The information provided in the "pathfinder" role would include actual experience in the integration of a payload into the NASA Space Shuttle; ground testing requirements and flow; security requirements; facilities available for testing, loading and unloading a spacecraft; etc.

Further, the HASP system would carry at least 37,500 feet of film and would have basically the same stereo photographic capability of the current HEXAGON sensor system. With this film load and a seven-day shuttle flight, the system is capable of collecting approximately seven million square nautical miles of coverage (approximately three million square nautical miles of cloud-free photography). The HASP system could also be used for crisis search requirements, earth resources and economic intelligence collection. Further MC&G requirements could be collected if attitude sensors are added.

The significant elements of the development of this pallet follow:

a. Investigate the launch, operating and landing environments of the shuttle bay, and develop a test plan to demonstrate capability

b. Assemble the panoramic camera sensor system using available HEXAGON components, where possible

c. Design and fabricate a film supply and take-up assembly from existing HEXAGON resources

d. Design and fabricate a truss to support the sensor system in the shuttle bay

e. Design and fabricate a shroud to enclose the sensor, provide thermal control, and acoustic and contamination protection

f. Perform detailed integration tasks to develop total operational, test, and security plans

HEXAGON PALLET

	FY 79	FY 80	FY 81	FY 82	FY 83	FY 84	TOTAL
Demonstration Unit & STS Integration	8.0	11.0	2.0	1.0	1.0	1.0	24.0
Demonstration Flights*	-0-	8.0	-0-	13.0	-0-	-0-	21.0
Total	8.0	19.0	2.0	14.0	1.0	1.0	45.0

* Based on a 20% share of flight costs.

approach will require a field crew of only 15 to 20 people to perform the maintenance, replenishment and flight certifications of operations systems; thus greatly reducing the cost of sustaining support.

The system configuration will consist of a gimballed 72-inch cassegrain telescope which will operate in a push-button mode. It can be slewed for cross-track operations up to $\pm$ 45° from nadir and can be pointed $\pm$ 20° in-track for overscanning. The focal planes will consist of cryogenically cooled, solid state arrays with selectable filters for narrow band imaging. The analog signal from the arrays will be converted to digital signals and recorded on magnetic tape.

The concept for development, fabrication and operation is typified by the term "skunk work." This means the program has:

(1) Minimum interfaces

(2) A small, dedicated cadre of engineers and technicians

(3) Minimum quantity of end items for test and certification

(4) Simplified maintenance

(5) Maximum use of off-the-shelf technology

The plan is to perform system definition and critical component development studies in FY 1979, and start the detailed design of the system in FY 1980. This plan results in the first STS Flight Unit being delivered to the launch site in the second quarter of FY 1983.

GAMBIT SHUTTLE SORTIE PAYLOAD

The purpose of the GAMBIT Sortie Program is to develop the capability to palletize selected portions of the present GAMBIT Photographic Satellite Vehicle (PSV) for use on the Space Shuttle. The system would be capable of providing high resolution, color, and color infrared imagery from the shuttle cargo bay during orbital flight. This approach would allow multiple uses of a GAMBIT payload without having to expend hardware as would be required for a Titan launched payload. Further, the sustaining level of manpower to support the palletized payload would be much lower than required to support the current program. Thus, the program could be continued, if necessary, beyond the mid-1980's at a lower level of funding than would be required to maintain the Titan launch capability for the backup system.

The technical feasibility of implementing a GAMBIT Sortie Payload looks very good. Preliminary evaluation of all major interfaces indicates that those portions of the current GAMBIT PSV under consideration for use in a sortie payload can withstand the physical environments of the Space Shuttle. However, further study should be accomplished to more fully assess whether there are major technical problems which would preclude development of this capability.

For the next fiscal year, we recommend that further study be accomplished in the following areas:

(1) Evaluate various pallet designs with the goal of arriving at a recommended design.

(2) Evaluate integration of the GAMBIT Sortie Payload into the Space Shuttle.

(3) Identify a technically sound payload configuration which maximizes use of existing GAMBIT hardware, including spares and some development structures.

(4) Identify and perform preliminary evaluation of interfaces between the Space Shuttle orbiter and the GAMBIT Sortie Payload.

(5) Investigate hardware and test flow at the contractors' facilities and at the launch sites. Also, identify any support functions or facilities that may be needed.

Continuation of this low level concept definition phase during FY-1979 will allow completion of the current Imaging Mix studies at no cost (assuming approval of a GAMBIT reprogramming of FY-1978 funds).

$ in Millions

	FY 79	FY 80	FY 81	FY 82	FY 83	FY 84	TOTAL
Integration	2.0*	3.0	3.0	2.0	1.0	1.0	12.0

* This requirement may be reduced to zero if GAMBIT FY 1978 reprogramming request is approved.