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NRO APPROVED FOR RELEASE
DECLASSIFIED BY: CIA/RT
DECLASSIFIED ON: 10 JANUARY 2013

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PRIORITY [REDACTED] INFO PRIORITY DITTO [REDACTED]
HANDLE VIA BYEMAN CHANNELS ONLY
GAMBIT

[REDACTED] FOR D. RASPET; INFO DITTO FOR [REDACTED]
[REDACTED] CROSS

FROM: L.S. MC CHRISTIAN [REDACTED]
REFERENCE: [REDACTED] 1559/RASPET 262001ZDEC78

1. THE FOLLOWING DATA IS PROVIDED AS REQUESTED IN YOUR TWX.
A. THE GAMBIT DUAL MODE HARDWARE IS RESTRICTED TO A MAXIMUM SEARCH ONLY MISSION ALTITUDE OF 470 NAUTICAL MILES (NM) WITHOUT CONSTRAINING THE OBLIQUITY RANGE (PLUS/MINUS 45 DEGREES ROLL). HOWEVER, THE OPERATIONALLY ADVERTISED MAXIMUM ALTITUDE IS DEFINED AS 450 NM TO PROTECT AGAINST WORST CASE HIGH THRUST LEVELS DURING INJECTION AND CIRCULARIZATION. WHEN FLYING HIGH RESOLUTION SEGMENTS, THE ORBIT ADJUST PROPELLANT LIMITATIONS WILL REDUCE THE MAXIMUM SEARCH ALTITUDE AS A FUNCTION OF THE FLY LOW DURATION AND ALTITUDE PROFILE. FOR EXAMPLE, A FLY LOW SEGMENT OF 33 DAYS AT 75 NM BY 200 NM WILL RESTRICT THE FLY HIGH SEGMENT TO APPROXIMATELY 350 NM CIRCULAR.

2. A. WE HAVE STUDIED SEVERAL STRATEGIES TO DETERMINE GAMBIT PERFORMANCE AGAINST THE CURRENT STANDING SEARCH REQUIREMENTS. ONE STRATEGY WOULD BE TO USE A GAMBIT VEHICLE TO PERFORM A SEARCH MISSION IMMEDIATELY FOLLOWING THE COMPLETION OF A HEXAGON MISSION, I.E., PROVIDE UP TO 10 MONTHS OF CONTINUOUS SEARCH COLLECTION (CASE A). A SECOND ALTERNATIVE WOULD BE THE USE OF A GAMBIT AS A BACKUP FOR A HEXAGON FAILURE (CASE B). IN THE LATTER CASE, THERE WOULD NOMINALLY BE A SIX MONTH GAP AFTER THE END OF THE LAST HEXAGON MISSION.

3. GAMBIT SIMULATIONS WERE ACCOMPLISHED FOR THE ABOVE TWO CASES USING A 450 NM ORBIT, 120 DAY MISSION, AND THE HEXAGON 1214 GENERIC STANDING SEARCH ONLY MOB FILE; I.E., 2,4,6, AND 9 MONTH CELLS REQUIRED IN STEREO, AND THE 12, 18, AND 24 MONTH CELLS, WERE ACCEPTABLE. NO ATTEMPT WAS MADE TO OVERLAY ADJUC REQUIREMENTS ON THE STANDING SEARCH MOD, E.G. 20 DAY COVERAGE

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PERIODS FOR MOST OF THE 2 MONTH SEARCH.

C. FOR CASE A, GAMBIT CAN COMPLETELY SATISFY THE STANDING SEARCH PROBLEM SET OBJECTIVES WITH THE 9 INCH CAMERA, EXCEPT FOR A 15 PERCENT SHORT FALL FOR THE 4 MONTH REQUIREMENTS (OBJECTIVE IS DEFINED BELOW). FILM IS AVAILABLE FROM THE 5 INCH CAMERA TO SATISFY SOME OF THE SPECIAL PROBLEM SETS, DEPENDING ON THE NUMBER OF SPECIAL REQUIREMENTS LEVIED, THERE MAY BE SOME FILM AVAILABLE TO WORK MINIMAL MCEG PROBLEM SETS.

D. FOR CASE B, GAMBIT CAN ACCOMPLISH ALL OF THE 2 MONTH OBJECTIVE, 80 PERCENT OF THE 4 MONTH, 58 PERCENT OF THE 6 MONTH, 33 PERCENT OF THE 9 MONTH, ALL IN STEREO; 100 PERCENT OF THE 12 MONTH OBJECTIVE, 63 PERCENT OF THE 18 MONTH, AND NONE OF THE 24 MONTH IN MONO. THE OBJECTIVE FOR BOTH CASES IS DEFINED AS HAVING IMAGED 80 PERCENT OF THE POPULATION WITHIN THE COVERAGE PERIOD, WITH 80 PERCENT VERIFIED WEATHER OR BETTER. THE 5 INCH CAMERA IS AVAILABLE FOR SPECIAL AND MCEG REQUIREMENTS AS IN CASE A.

E. A THIRD SIMULATION WAS RUN USING CASE B WITH THE 2 MONTH PROBLEM SETS IN STEREO AND THE 4 THROUGH 24 MONTH PROBLEM SET IN MONO, TO DETERMINE IF AT LEAST MARGINAL COVERAGE COULD BE PROVIDED TO MAKE UP FOR THE STEREO SHORT FALL IN THE 4 THROUGH 9 MONTH PROBLEM SETS. THE 2 MONTH PROBLEM SETS WERE AGAIN TOTALLY SATISFIED IN STEREO. THE 4-9 MONTH PROBLEM SETS ALL MET THE OBJECTIVE IN MONO; 100 PERCENT OF THE 12 MONTH AND 75 PERCENT OF THE 18 MONTH OBJECTIVES WERE MET IN MONO; NONE OF THE 24 MONTH OBJECTIVE WAS MET. AGAIN, THERE IS FILM AVAILABLE IN THE 5 INCH CAMERA TO WORK SOME OF THE SPECIAL AND MCEG REQUIREMENTS.

3.A. THE PHOTOGRAPHIC SIMULATION OF HIGH ALTITUDE GAMBIT IMAGERY HAS BEEN COMPLETED BY [REDACTED] THE SIMULATIONS WERE LIMITED TO A FOXBAT AIRCRAFT IMAGED ONTO SO-209 FILM AT A 34 DEGREE SOLAR ALTITUDE AND 18 DEGREE COMPOUND LOOK ANGLE AND ALSO SO-112 FILM, 19 DEGREE SOLAR ALTITUDE AND 18 DEGREE LOOK ANGLE. YOU ARE AWARE OF THE GAMBIT STATUS CHANGES SUCH AS GOING FROM L-45 TO L-20 READINESS, STANDARD FILM LOAD VERSUS SUMMER/WINTER LOADS, ETC. WHICH WERE NOT KNOWN AT THE TIME THE SCALE STUDY WAS MUTUALLY AGREED TO LAST YEAR. FOR EXAMPLE, THE TWO FILM-SUN ANGLE COMBINATIONS WERE TAILORED ONE FOR A SUMMER MISSION, THE OTHER WINTER. THE RESULTS ARE 4 NIIRS ~~5~~ ON SO-209 AND NIIRS ~~4~~ ON SO-112 AT A SCALE CORRESPONDING TO AN ALTITUDE OF 450 NM AND A COMPOUND LOOK ANGLE OF 18 DEGREES. THESE RATINGS INCLUDED SYSTEM SMEAR DYNAMICS (ON AXIS) AND AN AVERAGE ATMOSPHERIC TRANSMITTANCE OF 0.6. MISSION STATISTICS ARE EXPECTED TO BE BETTER BECAUSE OF HIGHER SUN ANGLES OVER THE TARGET/WAC DISTRIBUTION.

3. THE EVALUATION OF THE DATA FROM THE FILM RADIATION EXPERIMENTS ARE BEGINNING TO PROVIDE QUANTITATIVE RESULTS TO ASSESS EXPECTED DEGRADATION FROM HIGH ALTITUDES FOR EXTENDED MISSIONS. THE SO-255/130 MATERIALS ARE THE MOST SUSCEPTIBLE TO RADIATION DEGRADATION BECAUSE OF THE EXTREME SENSITIVITY OF THE BLUE SENSITIVE LAYER PRESENT IN BOTH FILMS. IT IS ESSENTIAL TO MAINTAIN AS GOOD A COLOR BALANCE AS POSSIBLE WITH THESE MATERIALS FOR THEM TO HAVE ANY UTILITY. THE CURRENT CRITERIA USED IS 0.5 DENSITY UNITS OF COLOR SEPARA-

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TION UNTIL SPECIFIC EXPERIMENTS CAN BE DEFINED AND EVALUATED AS TO A MORE ACCEPTABLE THRESHOLD. THUS, THE COLOR/IR FILMS HAVE A QUESTIONABLE UTILITY AT THIS TIME AT ALTITUDES GREATER THAN 200-250 NM FOR EXTENDED MISSIONS OF 50-120 DAYS. THE BW MATERIALS ARE MUCH LESS SENSITIVE TO RADIATION DEGRADATION THAN THE COLOR/IR FILMS AND THE EXPECTED NIIRS LOSS IN THE BW MATERIALS WILL PROBABLY BE LOST IN THE OVERALL MISSION STATISTICS. FOR A WORST CASE OF 470 NM OF MAX DURATION OF 120 DAYS, THE EXPECTED NIIRS LOSSES ARE AT THE 50 AND 120 DAY RECOVERY POINTS 0.3 AND 0.5 FOR 50-209 AND 0.1 AND 0.3 FOR 50-112. COMBINATIONS OF SPLIT MISSIONS AND SUBSEQUENT LOWER ALTITUDES FURTHER REDUCE THE RADIATION DEGRADATION.

C. THE GAMBIT/DUAL MODE DEMONSTRATION FLIGHT IS CURRENTLY PLANNED AS A SPLIT ALTITUDE MISSION. AS SUCH, FOR A REASONABLE TIME AT A LOW ALTITUDE MISSION (SEE PARAGRAPH 1), THE RESULTING HIGH MISSION IS LIMITED TO APPROXIMATELY 350 NM FOR THE REMAINDER. THE PROPELLANT EFFICIENT METHOD IS TO FLY THE LOW MISSION FIRST. RADIATION EXPERIMENT PACKETS, IDENTICAL TO THOSE USED IN THE LABORATORY TESTING, ARE INSTALLED IN THE SRV'S TO BE USED ON THE DEMONSTRATION FLIGHT TO BENCHMARK THE EXPERIMENTAL ASSESSMENTS. FOR ALL MISSION ALTITUDE SCENARIOS, PROPELLANT HAS BEEN RESERVED FOR DEBOOST.

4. ANY FURTHER QUESTIONS MAY BE DIRECTED TO [REDACTED] OR [REDACTED] FOR PARAGRAPHS 1, 2, AND 3 RESPECTIVELY.

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