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DAMP 639, ANGLD 023
DAMP PASS [] LAGOON
ANGLD PASS ETHER

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~~TOP SECRET~~ 231700Z JUN 80 CITE BISON 6365
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DAMON/HEXAGON

TO: [] J. HILL, INFO: ETHER/[] : LAGOON/L. CRESS
FM: BISON/D. HUTCHISON/[]
SUBJ: DAMON METRIC EXPERIMENT
REF: A. BISON 5665, 3 JUN 80
B. [] 0771, 11 JUN 80

THE FOLLOWING DESCRIPTION OF THE DAMON METRIC EXPERIMENT ARE PROVIDED AS PER YOUR REQUEST IN REFERENCE B.

A. OBJECTIVE (AND DESCRIPTION OF THE EXPERIMENT):

(1) BACKGROUND. HARDWARE STUDIES IN SUPPORT OF THE NOW DEFUNCT "Z" PROGRAM SHOWED THAT THE CAPITAL INVESTMENT FOR A MEDIUM RESOLUTION WIDE AREA IMAGING SYSTEM AS MUCH (SEVERAL HUNDRED MILLION DOLLARS) LESS FOR A SHUTTLE PALLET THAN FOR A FREE FLYER, BECAUSE THE PALLET HAD NO NEED FOR PROPULSION SYSTEMS, REACTION CONTROL SYSTEMS, ETC., AND BOTH HAD TO BE INTEGRATED INTO THE SPACE SHUTTLE. OPERATIONS COSTS WERE ANOTHER MATTER, DEPENDING ON RIDE-SHARING OPPORTUNITIES FOR THE PALLET, METHOD AND FREQUENCY OF FILM RETRIEVAL, REFUELING/REFURBISHMENT SCHEDULES, NUMBER OF MISSIONS/DAYS ON ORBIT PER YEAR REQUIRED TO MEET ANY SET OF REQUIREMENTS, ETC.) PUTTING OPERATIONS COSTS ASIDE (THEY ARE BEING ADDRESSED IN ANOTHER KWBISON STUDY) ONE SHOULD DETERMINE THE TECHNICAL SUITABILITY OF THE SHUTTLE AS AN MC&G PLATFORM. WHETHER AND OTHERS HAVE THE FOLLOWING CONCERNS: (A) POINTING ACCURACY AND STABILITY. THE SHUTTLE HAS NO ATTITUDE SENSOR ACCURATE ENOUGH TO RECOVER MC&G ACCURACIES (A FEW ARC-SECONDS). THE SHUTTLE WILL NOT DOG. THE SHUTTLE'S INU-DEAD BANDS ARE NOT LIKE HX, NEITHER ARE ITS AERODYNAMICS. HOW DOES ALL OF THIS AFFECT THE ABILITY TO RECOVER POINTING?

(B) THERMAL EFFECTS. THE HX METRIC PAN CAPABILITY IS HIGHLY DEPENDENT ON A DETAILED HX THERMAL DISTORTION MODEL FOR POINTING FOR THE TWO-CAMERA ASSEMBLY (TCA). WILL THE TCA THERMAL MODEL WORK IN THE SHUTTLE BAY? WILL THE S-CUBED (SOLID-STATE STELLAR SENSOR) PACKAGE WORK IN THE BAY?

(C) ORBIT DETERMINATION ACCURACY. WILL THE SHUTTLE ORBIT BE STABLE ENOUGH TO MODEL BETWEEN FIXES? WHAT ABOUT THE NON-COUPLED REACTION CONTROL SYSTEM WHICH MAY CAUSE UNPREDICTABLE DISPLACEMENTS? WHAT ABOUT GRAVITY GRADIENT AND AERODYNAMICS EFFECTS? HOW WELL MODELLED ARE ORBIT ADJUSTS? WILL THE HX EXPERIENCE (TRANSLATE TO THE SHUTTLE)? ARE OPS RECEIVERS NEEDED?

(D) CONTAMINATION, ACOUSTIC AND ACCELERATION ENVIRONMENTS. WILL TCA TO S-CUBED CALIBRATION BE STABLE? WILL S-CUBED SURVIVE. BE OS-

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GRADED, OR WHAT?

(1) ALTITUDE. HOW IMPORTANT WILL SHUTTLE ALTITUDE BE TO METRIC ACCURACY AND IMAGE QUALITY?

(2) OBJECTIVE: THE DAMON METRIC EXPERIMENT IS DESIGNED TO ANSWER THE ABOVE CONCERNS BY EVALUATING THE SHUTTLE AS A METRIC COLLECTION PLATFORM. THE DATA WILL ENABLE ANY REQUIRED MODIFICATIONS TO THE SHUTTLE TO BE DETERMINED WITH HIGH CONFIDENCE. THE RESULTS WILL BE MUCH MORE CREDIBLE AND LESS EXPENSIVE TO OBTAIN THAN ANY COMPARABLE ANALYSIS. THE EXPERIMENT IS A JOINT EFFORT BETWEEN KWETHER AND KWIBISON. KNOWN, SPACE QUALIFIED HARDWARE WILL BE ADDED TO THE DAMON SYSTEM TO ALLOW EVALUATION OF METRICITY:

- STELLAR REFERENCE (S-CUBED) FOR POINTING
- DOPPLER BEACON (DBS) FOR ORBIT DETERMINATION
- MESA (MINIATURIZED ELECTROSTATIC ACCELEROMETER) FOR ORBIT MODELLING.
- DBS AND ECS (EXTENDED COMMAND SYSTEM) MODS FOR PRECISION TIMING.
- HEXAGON METRIC PAN HARDWARE, SOFTWARE, ANALYSES AND EXPERIENCE ARE ESSENTIAL.

B. EQUIPMENT TO BE USED. THE DAMON METRIC EXPERIMENT WILL USE HEXAGON RESOURCES TO THE MAXIMUM EXTENT POSSIBLE. HEXAGON QUALIFICATION MODEL AND SPARE SOLID-STATE STELLAR CAMERA AND THEIR ASSOCIATED ELECTRONICS WILL BE USED, ON A NON-INTERFERENCE BASIS, FOR ATTITUDE REFERENCE. NAVIGATIONAL AIDS (DOPPLER BEACON SYSTEM AND ACCELEROMETERS) WILL BE PROVIDED BY KWETHER AND USED TO PROVIDE ORBITAL POSITION.

C. COST. ESTIMATES FOR THE METRIC EXPERIMENT INCLUDE \$2M FOR THE KWIBISON TASKS OF EXPERIMENT INTEGRATION, FLIGHT PLANNING, S-CUBED HARDWARE INTEGRATION, AND TEST, AND \$2M FOR THE KWETHER TASKS FOR EXPERIMENTAL PLANNING, ANY GROUND DATA HANDLING SYSTEM SOFTWARE MODIFICATIONS, DOPPLER BEACON AND MESA HARDWARE, AND EXPERIMENT DATA REDUCTION. KWIBISON COSTS CAN BE BORNE IN THE CURRENT PROGRAM BY ACCEPTING RISK APPROPRIATE TO AN EXPERIMENT. THE DAMON PROGRAM WILL BE RESTRUCTURED LATER IF REQUIRED TO STAY WITHIN BUDGETARY CONSTRAINTS SHOULD UNEXPECTED COSTS PROBLEMS DEVELOP. A GROUND RULE FOR DAMON IS TO MAINTAIN THE BUDGET BASELINE SET WITH CONGRESS IN FY 80.

D. SCHEDULE. THE METRIC EXPERIMENT IS TO FLY ON THE FIRST DAMON FLIGHT IN MAY 1982.

E. SUPPORT BY KWETHER. ACTIVITIES OF KWETHER WERE DELINEATED BY REF 1. BASICALLY, KWETHER WILL PROVIDE: THE NAVIGATIONAL AIDS; AID IN DEFINING AND PLANNING THE EXPERIMENT; IMAGERY EXPLOITATION; REDUCTION AND ANALYSIS OF THE DATA; AND DOCUMENTATION OF THE RESULTS OF THE EXPERIMENT.

REVW 20 JUN 80

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