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STS Flight Experiments Database

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STS FLIGHT EXPERIMENTS DATA BASE

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ABSTRACT

In response to a request of the Space Station Task Force, a data base has been developed, utilizing experiment definitions from all NASA Centers, with emphasis on candidate STS flight experiments that relate to the development and operation of initial and growth versions of a Space Station. Experiments are also included for Shuttle enhancement, for servicing and operations of advanced vehicles such as OMV and OTV, for generic technology such as large structures, control and pointing, heat rejection, for life sciences and for physical sciences and applications. Criteria for selection activity are defined.

INTRODUCTION

MSFC has supported the Space Station Task Force by developing a data base of Shuttle flight experiments from all NASA Centers that may be desired to support the development of Space Station. The data base has been developed, reviewed and updated from time to time by all Centers. Participation has been solicited through the Space Station Planning Review Committee (PRC) and the Space Station Technology Steering Committee (SSTSC). The data base has been distributed to all NASA Headquarters offices and all NASA Centers. Flight selection criteria have been generated and preliminary priority recommendations developed in a like manner. The necessity of a coordinated proposal and selection process has been illustrated and the procedures used by the Manned Space Flight Experiments Board during the Apollo/Skylab Program have been reviewed.

DATA BASE

The data base includes all experiments proposed. They are not limited to those that have a Headquarters sponsor, although most have been submitted to one or more program offices for consideration. Each experiment is described by a one page data sheet which includes brief descriptive data, but the proposer is identified along with his telephone number so further information may be quickly obtained. Approximately 170 experiments are included to date. Figure 1 is a sample data sheet from the data base. The experiments have been grouped according to discipline area, i.e., power, GN&C, thermal, structures/materials, propulsion, communications and data management, contamination, systems and operations/servicing, crew and life support and others. A summary listing of experiments has been compiled that provides a quick overview of the complete experiment set identifying the development category, potential carrier, flight date, estimated experiment cost, appropriate sponsoring or supporting headquarters office and the proposing center.

SELECTION CRITERIA

Selection criteria were defined to allow a qualitative assessment of experiments as they relate to Space Station. Figure 2 is a sample sheet that illustrates the basis for initial evaluation.

OBSERVATIONS

The proposed experiments cover most, if not all, areas necessary to support development of the systems and sub-

systems of the initial and growth Space Station. Many of the experiments are high on priority lists of the discipline working groups that support the Space Station Technology Steering Committee. Some need to be grouped with others proposed within the same discipline or performed in conjunction with experiments in other disciplines where common structures or support equipment may be utilized to reduce the cost of meeting the objectives of the set of experiments. The data base has resulted in a greater degree of coordination between discipline sponsors of similar or related experiments from different centers.

SELECTION PROCESS

The selection process must provide for consideration of Space Station experiments in the context of all other experiments to be flown by NASA, the responsibilities of the various headquarters offices as they relate to Space Station, flight experiment funding constraints and the lead time from experiment conception to flight approval. Figure 3 illustrates a selection process patterned after the Apollo/Skylab Manned Space Flight Experiment Board (MSFEB). This represents a very lengthy process. Presently, an alternative of selection and sponsorship by individual Headquarters offices, OSF, OSSA, OAST, etc. is being followed. Coordination is effected via working groups with members from each of the Headquarters offices.

CONCLUSIONS

The data base has been developed to maintain a record of all proposed Space

Station related Shuttle Flight Experiments. It is intended as a reference for people developing new experiment concepts, as a source of people with a common interest for a particular type experiment and as a basis for initial evaluation and prioritization of experiments for flight. New experiments may be added by universities or industry by contacting a NASA Center or appropriate NASA Headquarters Office. Copies of the Data Base are available from Lott W. Brantley, PD14, Marshall Space Flight Center 35812.

PROPOSED SHUTTLE FLIGHT EXPERIMENTS

<u>CENTER</u>	<u>RESPONSIBLE INDIVIDUAL</u>	<u>PHONE</u>	<u>DATE</u>
MSFC/LeRC	Ralph Carruth	FTS 872-4275	8/8/83

TITLE: Voltage Operating Limit Tests-2 (VOLT-2) DISCIPLINE: Power

OBJECTIVE/JUSTIFICATION: The objectives of this experiment is to obtain fundamental information required to design a high-voltage power system for Space Station. Specifically, VOLT-2 objectives are: (a) to determine the impact of the interaction on large planar array with self-generated voltages; (b) determine floating potentials for true distributed voltage arrays; (c) measure power loss and arcing impact on operation directly; and (d) validate system level model predictions.

NASA plans for the future include development and emplacement of high-power space systems in earth orbit. Such systems require higher voltage power systems than have previously been flown. Operating voltages of 400, 500 volts and higher are being considered. Space flights are required because: (1) the need to correlate the behavior of self-generated high-voltage arrays in space with that of bias arrays as in VOLT-1; (2) ground test environments are incomplete in simulating the space plasma conditions as verified by the PIX flights; (3) it is necessary to test a self-generating high-voltage array in both the ram and wake of a spacecraft; and (4) to determine how large bodies in space affect self-generating high-voltage arrays.

DESCRIPTION: The Solar Array Flight Experiment (SAFE) is scheduled to fly on STS-14. VOLT-2 is a reflight of this hardware with some modifications. The experiment hardware consists of a full scale solar cell array wing with wind extension mast, wing support structure, an instrumentation and data acquisition system, and plasma sources. In its fully deployed state, the wing measures 4m by 32m. The solar array will generate about 500 watts, and the self-generated array voltage can be varied from about 90 volts to over 500 volts.

CARRIER: MPES CATEGORY: Technology

NEED DATE: Before Space Station Phase C/D COST RANGE: \$5,100K*

SCHEDULE: Start - 10/83
Ready for Integration - 6/86
Launch - 10/86

<u>FUNDS*:</u>	<u>FY84</u>	<u>FY85</u>	<u>FY86</u>	<u>FY87</u>	<u>FY88</u>	<u>Total</u>
\$K	500	2400	2000	200	0	5,100

* Estimated Funds and Cost Range do not include Shuttle integration costs

Figure 1. Sample Data Sheet from Data Base

SPACE STATION RELATED
SHUTTLE FLIGHT EXPERIMENTS

EXPERIMENTS	PRIORITY	NEED FOR SPACE ENVIRONMENT	REF. TO S. C/D DURING AC/D ORBITRY LIFECYCLE/STATION	METHOD FOR INITIAL INVESTIGATION	BENEFIT/COST TO INITIAL STATION	COMMONALITY TO SPACE EVOLUTION PROGRAM	ELAPSE'S	READINESS/DATE CONSISTANT WITH NEED	REMARKS
	REQUIRED	DESIRED	QUESTIONABLE	✓	✓	HIGH MEDIUM LOW UNKNOWN	SS, OMV, PLTs OTV	YES CLOSE LATE	
1. POWER									
VOLT 1	✓			✓		MEDIUM	SS, PLTs	YES	PARTIAL ANS. TO CRIT. DSGN QUESTION. ANSWERS CRIT. DSGN. REQ. QUESTION.
VOLT 2/SAFE H	✓			✓		HIGH	SS, PLTs	YES	
VOLT 3	✓			✓		LOW	SS, PLTs	YES	
VOLT 4	✓			✓		HIGH	SS, PLTs	CLOSE	
POWER SYS AUTO DEMO			✓		✓	MEDIUM	SS, PLTs	YES	ADDRESSES FUNDAMENTAL PHYSICS QUES. ESTABLISHES FLT. EXPER. FOR CRT SUBSYSTEMS
∇ x B POWER GEN	✓				✓	LOW	SS, PLTs	YES	
FTB FOR RFC		✓		✓		HIGH	SS, PLTs	CLOSE	
SOLAR HEAT RECEIVE TEST		✓			✓	LOW	SS, PLTs	YES	AH. PAWR. SYS COMPONENTS SHOULD BE ACCEL. COMPLETES W/RFEC
INTEGRATED POWER ACS TECH. EXP		✓		✓		HIGH	SS, PLTs	LATE	

Figure 2. Criteria for Experiment Priority

SHUTTLE FLIGHT EXPERIMENT SELECTION PROCESS

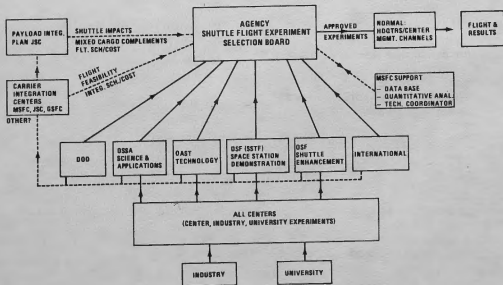


Figure 3. A Selection Process Patterned After the Apollo/Skylab Manned Space Flight Experiment Board (MSFEB)