LARGE SPACE STRUCTURES CONTROLS RESEARCH AND DEVELOPMENT AT MARSHALL SPACE FLIGHT CENTER - STATUS AND FUTURE PLANS

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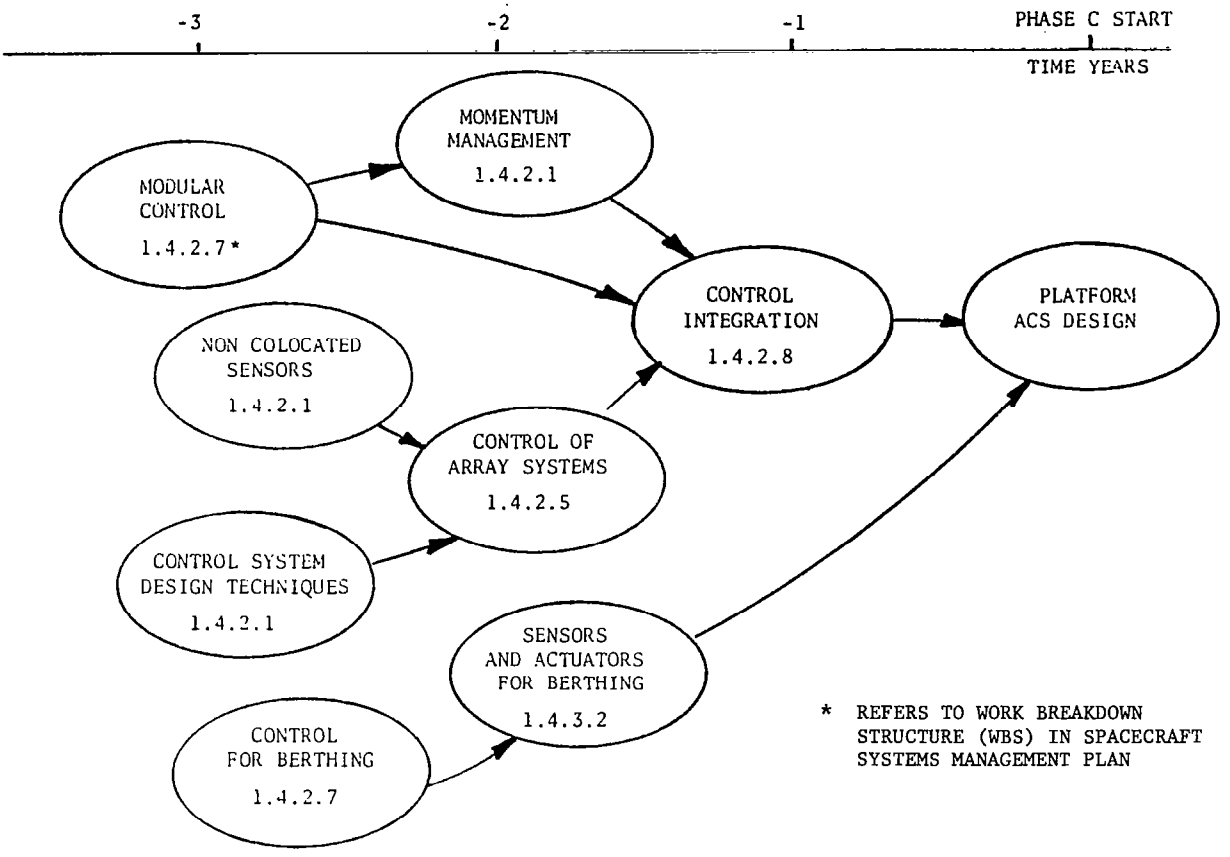


OBJECTIVE I: STABILITY AND MODAL CONTROL

DEMONSTRATE THAT THE FIRST NINE MODES (THREE RIGID + SIX FLEX) OF THE SEPS TEST ARTICLE CAN BE ACTIVELY CONTROLLED.

FEATURES:

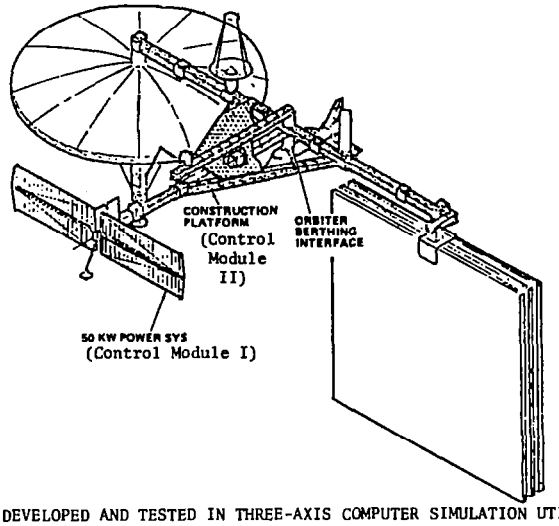
- **LOW FREQUENCY (f < 1 Hz).**
- **ACTIVE MODAL DAMPING – EXPERIMENT GOAL OF 10%.**
- **CONTROL OF ASYMMETRIC STRUCTURE WITH COUPLED MODES.**
- **INVESTIGATE EFFECT OF CONTROLLER SATURATION ON DYNAMICS.**

SEPS SOLAR ARRAY FLIGHT TEST MODES

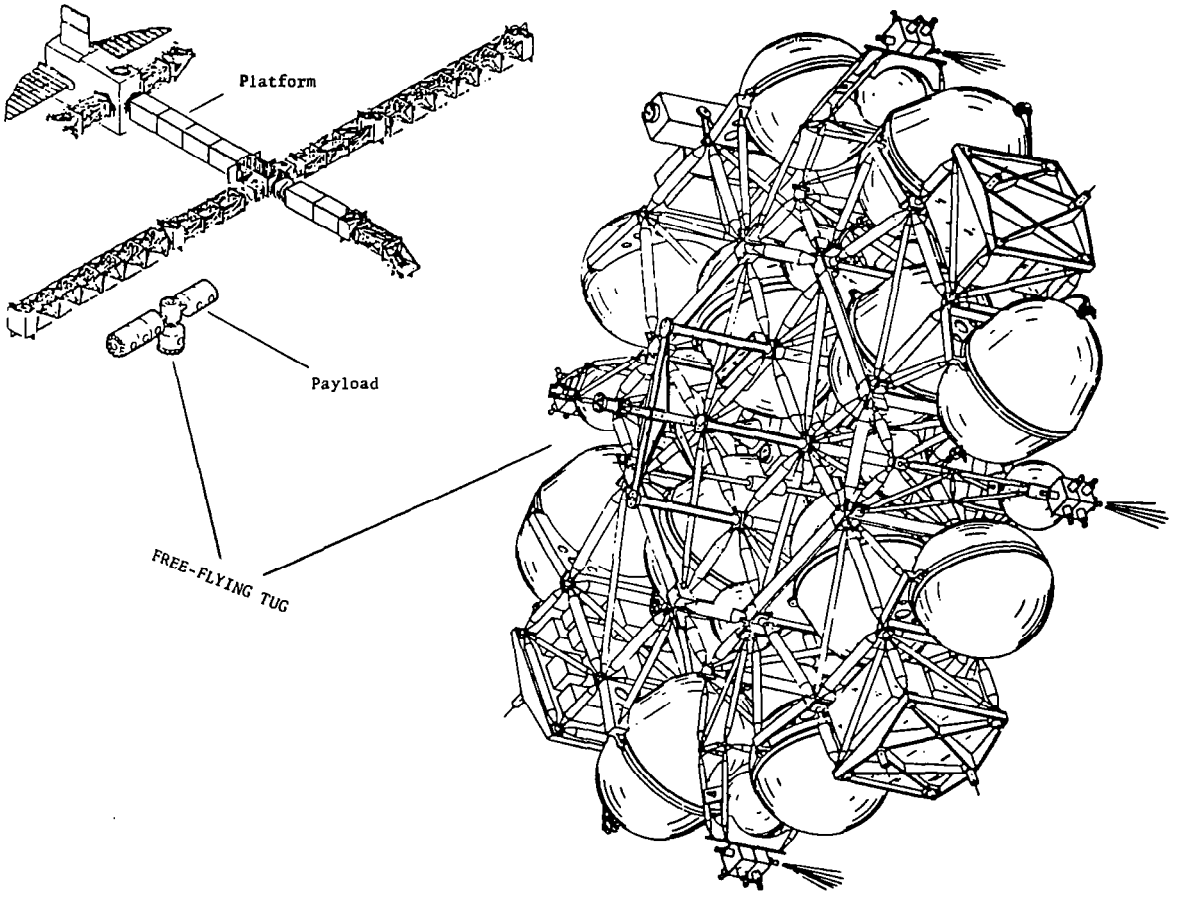
FREQUENCY Hz	DESCRIPTION
0	RIGID BODY
0	RIGID BODY
0	RIGID BODY
.032	OUT OF PLANE* BENDING
.035	IN PLANE BENDING + TORSION**
.059	IN PLANE BENDING + TORSION
.096	OUT OF PLANE BENDING
.117	IN PLANE BENDING + TORSION
.165	OUT OF PLANE BENDING

*PLANE OF SOLAR BLANKET
**TORSION OF MAST

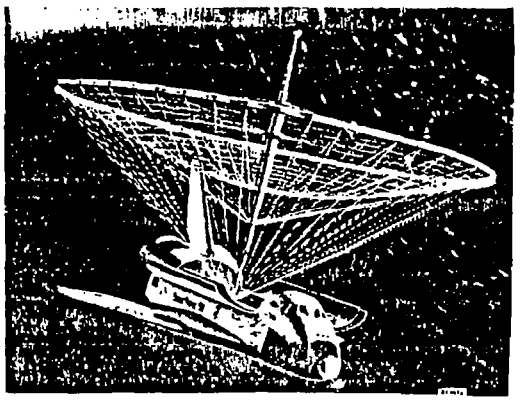
OBJECTIVE: TO DEVELOP A MULTILEVEL CONTROL APPROACH WHICH SUPPORTS A MODULAR OR BUILDING BLOCK APPROACH TO THE BUILDUP OF SPACE PLATFORMS.



OUTLOOK: CONCEPT HAS BEEN DEVELOPED AND TESTED IN THREE-AXIS COMPUTER SIMULATION UTILIZING A FIVE-BODY MODEL OF A BASIC SPACE PLATFORM MODULE. ANALYTICAL EFFORTS HAVE CONTINUED TO FOCUS ON EXTENSION OF THE BASIC THEORY AND SUBSEQUENT APPLICATION.



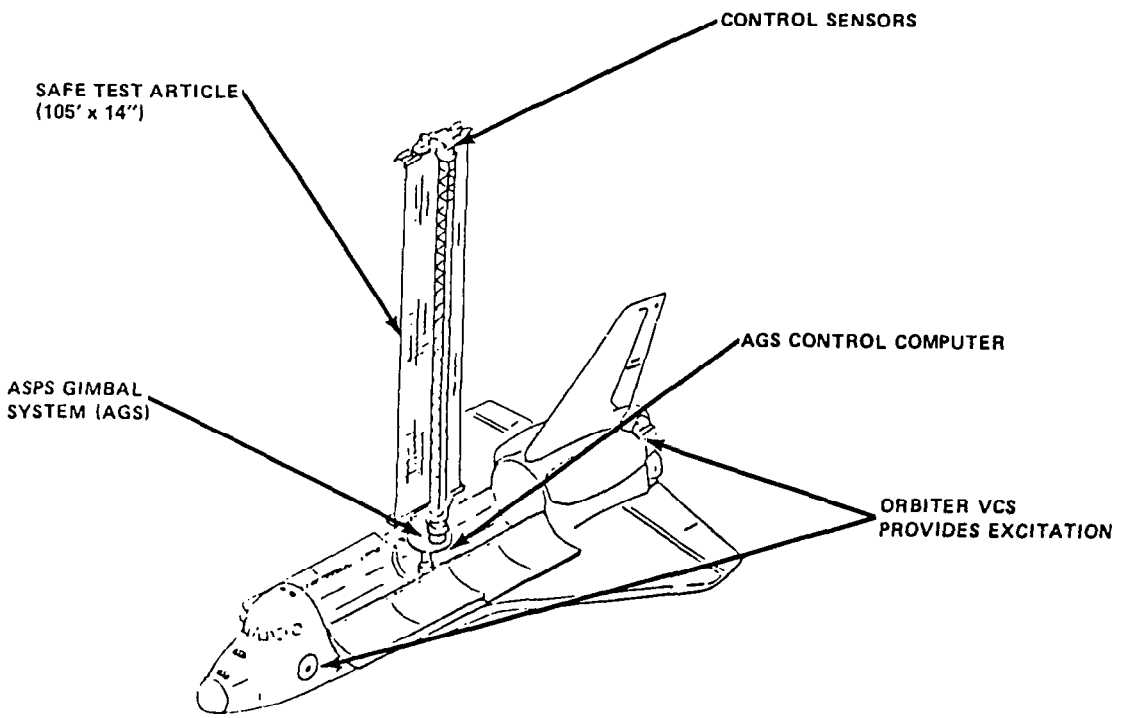
DEPLOYABLE ANTENNA SURFACE SHAPE CONTROL



- OBJECTIVE - DEVELOP PRELIMINARY SPECIFICATIONS FOR A FLIGHT EXPERIMENT TO EVALUATE SEVERAL ALGORITHMS FOR CONTROLLING THE SHAPE OF LSS.

- STATEMENT OF WORK SUMMARY
  - DEMONSTRATE ANALYTICALLY THE FEASIBILITY FOR SUCH AN EXPERIMENT.
  - SPECIFY HARDWARE AND SOFTWARE REQUIREMENTS.
  - IDENTIFY REQUIREMENTS WHICH WOULD IMPACT CURRENT DESIGN.
  - DEFINE A FLIGHT TEST PLAN.

SAFE CONTROL EXPERIMENT



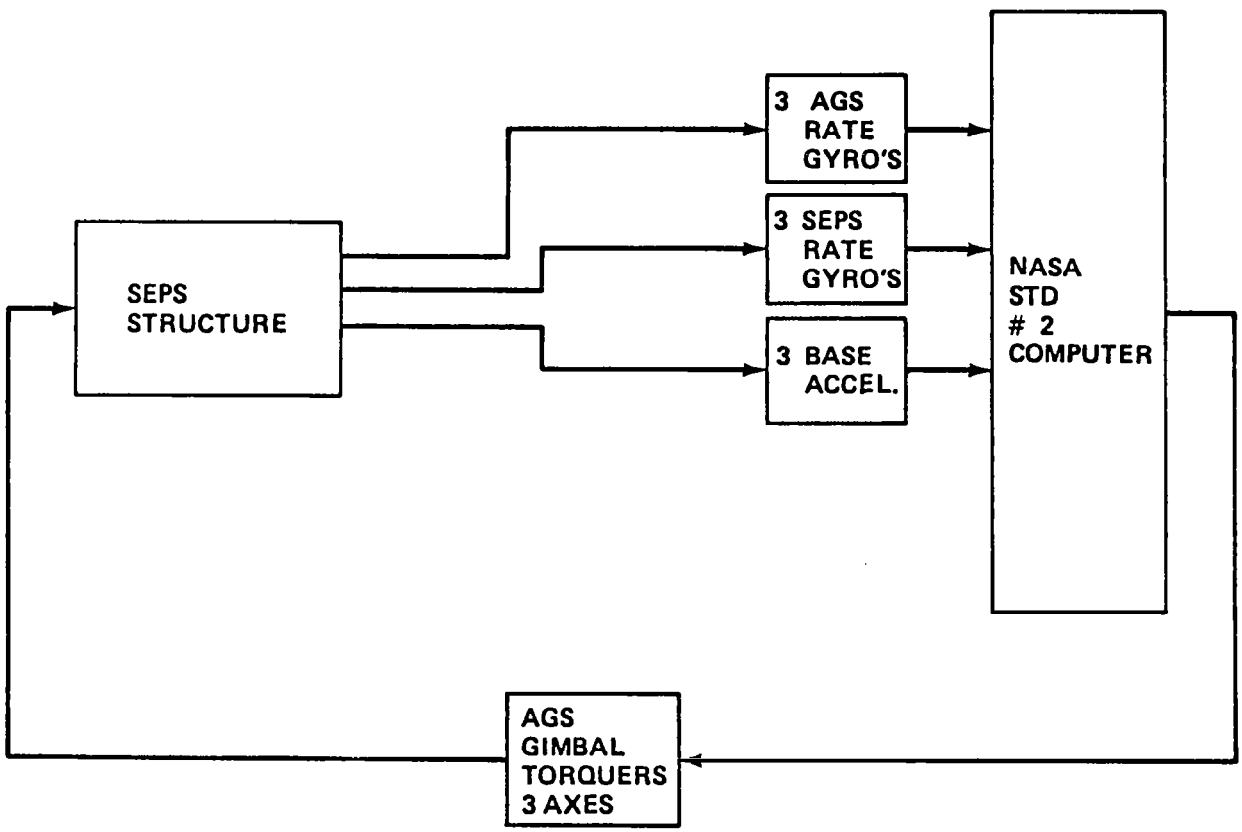
OBJECTIVE II: DISTURBANCE ISOLATION AND LOAD ALLEVIATION DURING MANEUVERS

DEMONSTRATE THAT DISTURBANCES ORIGINATING IN THE ORBITER (VCS FIRINGS AND CREW MOTION) CAN BE EFFECTIVELY ISOLATED FROM THE TEST ARTICLE BY MEANS OF SOFTWARE AND ACTIVE CONTROL. IN A SIMILAR MANNER LOADS IMPOSED ON THE STRUCTURE BY MANEUVERING WILL BE ALLEVIATED.

- 1×10^{-3} g DISTURBANCE LEVEL.
- 33 NM TORQUE ALLEVIATION.

OBJECTIVE III: POINTING

DEMONSTRATE CONTROLLER CAN POINT BASE OF APPENDAGE TO 1 $\widehat{\text{sec}}$ ACCURACY (EXPERIMENT GOAL). NO STAR TRACKER SUN SENSOR INPUT WILL BE USED AND PERIOD OF PERFORMANCE WILL BE SHORT TO MINIMIZE RATE GYRO DRIFT.



CONTROL GROUND TEST SCHEMATIC