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National Aeronautics and
Space Administration

**JOINT OSF/OSS STUDY:
ELVs IN THE SPACE STATION
LOGISTICS OPERATIONS**

STUDY DRIVERS

RECOMMENDATIONS FOR STUDY FROM

- **NASA SPACE STATION TRANSPORTATION REPORT TO CONGRESS (JAN. 1988)**
 - “..IT IS ALSO RECOGNIZED THAT SOME OF THE EXISTING ELVs ARE SUITED TO SATISFY LIMITED STATION OPERATIONS REQUIREMENTS. IT IS ANTICIPATED THAT THEY WILL BE USED IN SUPPORTING THE LONG-TERM SPACE STATION OPERATIONS PHASE.”
 - “A DETAILED STUDY OF THE SPACE STATION HARDWARE AND OPERATIONS CHANGES REQUIRED TO ACCOMMODATE ELVs WILL BE UNDERTAKEN THIS YEAR.”
 - “THE SPACE STATION PROGRAM IS CONDUCTING A DETAILED STUDY OF THE CAPABILITY TO ACCOMMODATE UNMANNED LAUNCH VEHICLES...”
- **NRC REPORT ON SPACE STATION (SEPT. 1987)**
 - “NASA SHOULD MAKE PLANS FOR EVENTUAL LOGISTIC SUPPORT OF THE SPACE STATION WITH EXPENDABLE LAUNCH VEHICLES, AS WELL AS WITH THE SHUTTLE.”
- **NASA ADVISORY COUNCIL RECOMMENDATIONS TO DR. FLETCHER (MAR. 15, 1988)**
 - “THE POTENTIAL FOR USE OF EXPENDABLE LAUNCH VEHICLES FOR SPACE STATION LOGISTICS SUPPORT STILL DOES NOT APPEAR TO HAVE BEEN EXPLORED ADEQUATELY. WITH NO ASSURANCE OF SHUTTLE FLIGHT RATES GREATER THAN 3 OR 4 PER ORBITER PER YEAR, OFFLOADING SOME SPACE STATION RESUPPLY MISSIONS TO ELVs REQUIRES SERIOUS STUDY.”

BACKGROUND

- FIVE STS FLIGHTS/YEAR AUTHORIZED
- CURRENT MODEL ENVISAGES CREW SIZE OF 8 PERSONNEL WITH STAY TIME OF 180 DAYS. THIS YIELDS 5 CREW ROTATION/LOGISTICS FLIGHTS PER YEAR.
- THE CURRENT MODEL GIVES AN ANNUAL "UP" DEFICIT AND "DOWN" SURPLUS. THE EVOLUTION OF THESE VALUES IS AS FOLLOWS:

	<u>UP DELTA (LB)</u>	<u>DOWN DELTA (LB)</u>
TRANSPORTATION STUDY (SEPT 8, 1987)	- 25461	- 57327
IMPROVED DOWN COMMITMENT (DEC 3, 1987)	- 25461	+ 28723 *
REFINED OPERATIONS ASSESSMENT	- 5300 *	+ 28723 *
INCLUDE NASA ESTIMATES OF INTERNATIONAL SPARES	- 17180 *	+ 16842 *

* ESTIMATE, PENDING LOGISTICS MODULE MANIFESTING

- THIS IMPLIES EITHER ADDITIONAL CARGO-ONLY SHUTTLE FLIGHTS OR USE OF ELVs TO CARRY UP THE EXCESS CARGO.

BACKGROUND (CONTINUED)

- **PARALLEL STUDIES ARE UNDERWAY BY ESA (ARIANE 5) AND NASDA (H II) TO EXAMINE THEIR POTENTIAL FOR SPACE STATION LOGISTICS SUPPLY**
- **U.S. SPACE POLICY DIRECTS "FEDERAL AGENCIES TO PROCURE REQUIRED EXPENDABLE LAUNCH SERVICES DIRECTLY FROM THE PRIVATE SECTOR TO THE FULLEST EXTENT POSSIBLE"**
- **PSN/ITALIAN GOVERNMENT HAS PROPOSED TO SUPPLY THE SPACE STATION PROGRAM WITH ELV LOGISTICS MODULES**
- **COMMERCIAL INTERESTS ARE EXAMINING "LOGISTICS SERVICE CONTRACT" PROPOSALS**

OBJECTIVES AND APPROACH

- OBJECTIVES

- ESTABLISH THE DESIRABILITY, IMPLICATIONS AND BENEFITS OF USING A MIXED FLEET FOR SPACE STATION LOGISTICS
 - REVIEW STATION LOGISTICS REQUIREMENTS FOR THE USE OF ELVs
 - REVIEW STATION LOGISTICS MODULE DESIGN CONSISTENT WITH USE OF ELVs
 - REVIEW STATION MODIFICATIONS REQUIRED TO ACCOMMODATE ELVs
 - INITIATE STATION PROX OPS PLANNING CONSISTENT WITH USE OF ELVs

- APPROACH

- STUDY WILL BE CONDUCTED JOINTLY BY CODES S AND M
- STUDY WILL BE CO-CHAIRER BY CODES S AND M
- STUDY WILL CONSIDER ONLY NOMINAL STATION OPERATIONS USING ELVs
- INTERNATIONAL STUDIES WILL BE COORDINATED THROUGH SSX