

A photograph of the Space Shuttle Columbia in orbit above Earth. The shuttle is positioned in the center of the frame, with its solar panels extended. The Earth's surface is visible below, showing a mix of blue oceans and white clouds. The curvature of the planet is clearly visible against the blackness of space.

OVERVIEW OF HST SERVICING MISSION 4

Carl Biagetti

MUG

18 JULY 2008

- **STS 125 – Shuttle Atlantis (OV-104)**
 - Launch = Oct. 8, 2008, Pad 39-A
 - Mission Duration = 11 days
 - 28.5 degrees/320 nautical miles
 - Crew = Altman (Cmd), Johnson, Grunsfeld, Massimino, Feustel, Good, McArthur
 - Shuttle Endeavor is contingency back-up (CSCS)
 - Scheduled as STS-126 for launch on Nov. 10
 - Rollout to Pad 39-B prior to STS-125 launch
- **SM4 is last non-ISS flight by Space Shuttle**

STS-125 Astronauts

Scott D. Altman (4) - Commander
Gregory C. Johnson (1) - Pilot
John M. Grunsfeld (5) - Mission Specialist 3
K. Megan McArthur (1) - Mission Specialist 2
Michael J. Massimino (2) - Mission Specialist 4
Andrew J. Feustel (1) - Mission Specialist 5
Michael T. Good (1) - Mission Specialist 1

Number in parentheses indicates number of spaceflights by each individual prior to, and including this mission.



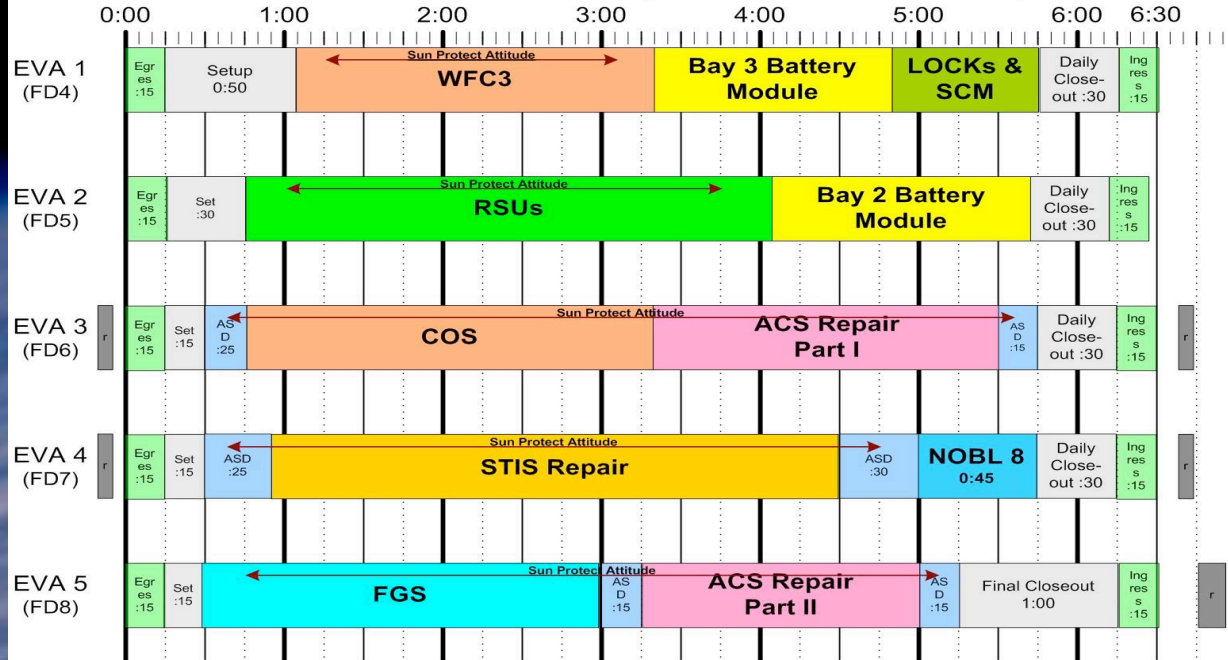
Current SM4 Plans, cont'd

- **Current Official Manifest**
 - WFC3 is installed (in place of WFPC2)
 - COS is installed (in place of COSTAR)
 - FGS2R2 replaces FGS2R
 - STIS is repaired
 - ACS is repaired
 - All six gyros are replaced (revert to 3-gyro ops post-SM4)
 - All six batteries are replaced
 - NOBL (thermal blanket) is installed on Bays 5, 7, 8
 - Soft-Capture Mechanism (SCM) is installed
 - EVA not required
 - Reboost

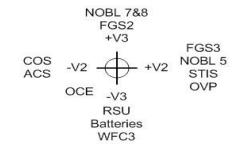
SM4 EVA TIMELINE

EVA Timeline as of May 8, 2008

(From official time estimates from JSC)



| Priority | Task Times |
|----------|-------------------------|
| 1. | RSUs (3) 3:20 |
| 2. | WFC3 2:15 |
| 3. | COS 2:35 |
| 4. | Bay 3 Battery Mod. 1:30 |
| | Bay 2 Battery Mod. 1:35 |
| 5. | FGS 2 2:30 |
| 6. | STIS Repair 3:35 |
| 7. | ACS - part I 2:10 |
| | - part II 1:45 |
| 8. | NOBL 8 0:45 |
| 9. | NOBL 5 |
| 10. | NOBL 7 |
| 11. | SCM 0:15 |
| 12. | Reboost |



Note:
 indicates a sun protect attitude is required from start of opening aft shroud door to closing of aft shroud door. The length of the arrow is not to scale of task time between door opening and closing

- 5/80/08 Notes:
- At the end of ACS Part I, two cards have been removed.
 - Aft shroud door open/close for -V2 doors is shorter than the other doors due to LOCKs being installed.
 - An additional 55-60 min will be required to complete ACS during EVA 3, with LOCKs installed.

Ground Testing

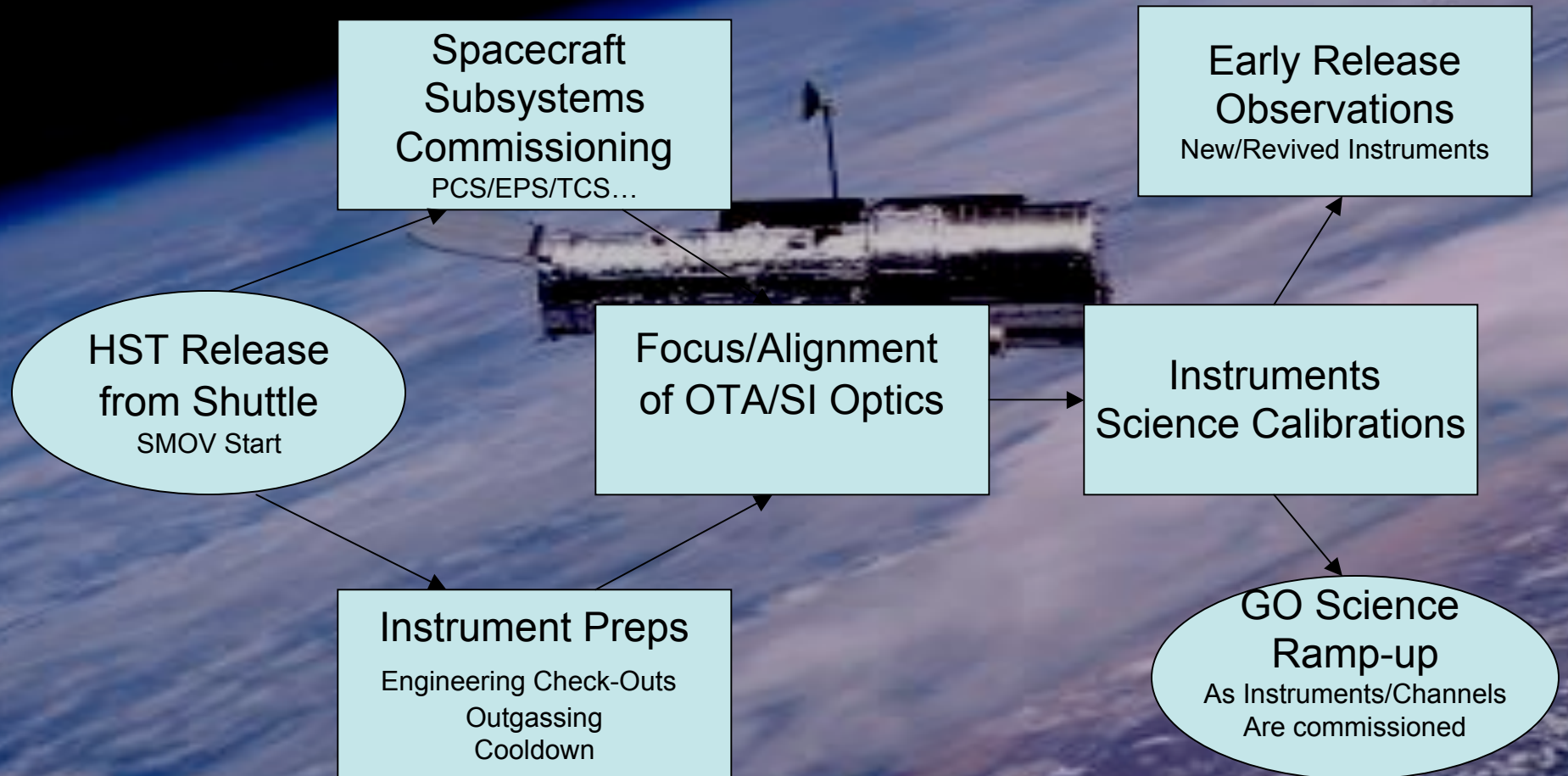
A photograph of a Space Shuttle in orbit above Earth's atmosphere, showing the planet's curvature and cloud patterns. The shuttle is positioned in the center of the frame, with its external tank and solid rocket boosters visible.

- Servicing Mission Ground Tests (SMGTTs)
 - Have been conducted for all SIs
- Mission Simulations (Sims & JISs)
 - ongoing through Aug 2008
- SM4 Ops Readiness and Project Flight Readiness Review = Aug. 2008
- STScI SM4/SMOV Readiness Review = Sep. 9-10, 2008

Servicing Mission Observatory Verification (SMOV)

- **A SMOV program** is associated with each servicing mission
 - Starts immediately upon release of the Observatory from the Shuttle
- **Generic SMOV goals**
 - Timely recommissioning of the Observatory for science operations
 - Commission newly installed science instruments
 - Recommission existing science instruments
 - Recommission Observatory systems for normal operations
 - Validation of other on-orbit replacements & installations
 - Early Release Observations
 - Demonstrate upgraded science capabilities to astronomical community and general public

GENERIC SMOV PROCESS



SMOV4 Timeline

A satellite, identified as SMOV4, is shown in orbit above the Earth's surface. The satellite is a rectangular box with various instruments and antennas. The background is a view of the Earth from space, showing the blue atmosphere and white clouds.

- Driven by
 - New-SI outgassing times
 - Observatory Bright Earth Avoidance Requirement
 - Early Release Observations (EROs)
 - Observations in early Dec. for Jan. AAS presentation
- Constrained by
 - Number of orbits/day of “external” pointings
 - Possibly data volumes at particular points in SMOV
- Science is enabled channel-by-channel
 - Nov. – Dec.
 - Full Cycle 17 GO science by first week of January

Some SM4 Archive Implications

- Full complement of SIs implies significant data volume increases
 - 27 Gb/day downlinked, per HST MO data volume study
 - Assumes full use of parallels
 - Implies corresponding increase in archived data
- SMOV timeline requires special management of data access rights
 - Engineering data, EROs, GO science all have differing rules for accessibility in early SMOV
 - Rules to be finalized at the STScI SM4 Readiness Review