



**Special Topic:
STS-121 (ULF1.1)
Contingency Shuttle Crew Support (CSCS)
Capability**

ULF1.1 CSCS Duration Capability General Assumptions

- **ISS consumables on 4/28 were utilized as starting point for this report**
- **Launch dates assumed (changes may impact capability):**
 - **22P: 6/28/06 (6/24/06 launch impact is negligible), ULF1.1: 7/1/06**
 - **Rescue flight (STS-300): 8/21/06 results in 51 days turnaround capability**
 - **There are no Progress launches planned between ULF1.1 launch and the rescue flight launch (Next Progress, 23p: 10/18/06)**
- **Shuttle will remain docked to ISS for 17 days and will provide:**
 - **Water and waste management for its 7 crew and oxygen for all 9 crew**
 - **ISS will provide CO2 removal (except for booster fan DTO LiOH usage)**
 - **All needed Orbiter consumables (water, food, etc) will be transferred, as well as all hardware launched in the MPLM**
- **Total CSCS crew is nine (two female, seven male). No crew will return in the Soyuz.**
- **ISS resources are run to zero**
- **All crewmembers exercise normally**

ULF1.1 CSCS Summary

- **The CSCS Duration is limited by O2 generation**
 - **O2 generation is 81 days, CO2 removal is 128 days, water is 108 days, waste containment is 108 days and food is 96 days**
 - **Duration for all consumables is greater than Shuttle LON turnaround capability of 51 days**
- **Future Reports**
 - **No additional assessments are planned for ULF1.1**
 - **If Orbiter TPS anomaly occurs real time, CSCS duration assessment will be performed if required to calculate predicted capability based on latest real-time conditions**

ULF1.1 CSCS Summary report (as of 4/28/06)

O2 generation is most limiting consumable resulting in 81 days capability

CSCS TPS Duration Report as of 4/28/06		
L-1 Month Report for ULF-1.1, 9 Crew on ISS		
<ul style="list-style-type: none"> - Assumes STS launch date of: 7/1/2006 - Based on current projected ISS consumables and system health - Assumes CSCS TPS duration begins at STS dock - LON rescue flight must dock to ISS by: 9/22/06 		
ISS Failure @ MECO 30 Days (CO2 Removal)	Engineering Estimate 81 Days (O2 Generation)	No ISS Failures 108 Days (Water)
Duration with No Orbiter Support = 56 Days (Water)		
O2 Generation		
Progress O2 tanks: 110.418 lbs STS O2 Xfer: 0 lbs 80% Old SFOG: 32 cartridges New SFOG: 120 cartridges Elektron: FAILED A/L tanks: 332 lbs Total Days: 42+17(STS) = 59 Days	Progress O2 tanks: 110.418 lbs STS O2 Xfer: 0 lbs 80% Old SFOG: 32 cartridges New SFOG: 120 cartridges Elektron: ON-3 crew A/L tanks: 332 lbs Total Days: 64+17(STS) = 81 Days	Progress O2 tanks: 110.418 lbs STS O2 Xfer: 0 lbs 80% Old SFOG: 32 cartridges New SFOG: 120 cartridges Elektron: ON-5 crew A/L tanks: 332 lbs Total Days: 97+17(STS) = 114 Days
Duration with No Orbiter Support = 66 Days		
CO2 Removal		
STS LiOH: 34 cans ISS LiOH: 30 cans RS LiOH: 21 cans Vozdukh: ON-3 crew CDRA: FAILED Total Days: 30 Days	STS LiOH: 34 cans ISS LiOH: 30 cans RS LiOH: 21 cans Vozdukh: ON-3 crew CDRA: Single Bed (5 crew) Total Days: 128 Days	STS LiOH: 34 cans ISS LiOH: 30 cans RS LiOH: 21 cans Vozdukh: ON-3 crew CDRA: Dual Bed (8 crew) Total Days: Unlimited Days
Duration with no Orbiter Support = 83 Days		
Water		
ISS H2O: 1011.6 L STS H2O Xfer: 1075 L Leaking CWCs: 0 CWCs CFU: OFF SRV-K: FAILED Total Days: 71+17(STS) = 88 Days	ISS H2O: 1011.6 L STS H2O Xfer: 1075 L Leaking CWCs: 0 CWCs CFU: ON SRV-K: ON Total Days: 91+17(STS) = 108 Days	ISS H2O: 1011.6 L STS H2O Xfer: 1075 L Leaking CWCs: 0 CWCs CFU: ON SRV-K: ON Total Days: 91+17(STS) = 108 Days
Duration with no Orbiter Support = 56 Days		
Waste Management		
Solid Waste	ASU: 51 Days Back-Up Hardware: 39 Days Total Days: 90 + 17 (STS) = 107 Days	
Liquid Waste	ASU: 87 Days Back-Up Hardware: 6 Days Total Days: 93 + 17 (STS) = 110 Days	
Food		
Total Rations: 695 rations Caloric Intake: 2400 kcal/day Total Days: 81 Days	Total Rations: 695 rations Caloric Intake: 2000 kcal/day Total Days: 96 Days	Total Rations: 695 rations Caloric Intake: 2000/1000 kcal/Day Total Days: 144 Days

ULF1.1 CSCS “Engineering Assessment” Assumptions/Results

- **O2 Generation and Supply (81 days, was 88 days)**
 - **Elektron assumed on from now until rescue flight arrives (32 amps after ULF1.1 Orbiter undocks)**
 - Elektron launched on 19P and 20P
 - **22.2 kg O2 launched on 21P and 28 kg O2 on 22P**
 - Both docked to ISS during ULF1.1
 - 50.2 kg assumed available at ULF1.1 docking beginning of window
 - These predicted numbers are based on assumptions of Progress usage for three ISS crew post ULF1.1
 - **32 Old SFOGs projected available at ULF1.1 docking**
 - 40 available with 20% failure rate
 - Assume No SFOGs burned between now and ULF1.1
 - **120 new SFOGs available at ULF1.1 docking**
 - **No planned O2 transfer on ULF1.1**
 - **Assumed use of ROOBA for Shuttle docked ISS A/L EVAs which results in no ISS O2 impact**
 - **Assumes one ISS A/L EVA with Orbiter undocked for 48 hours to perform undocked ORM EVA (25 lbs O2)**

- **Engineering estimate at end of launch window (7/19) is 81 days**

ULF1.1 CSCS “Engineering Assessment” Assumptions/Results

- **CO2 Control and Disposal (128 days, was 98 days)**
 - **Vozdukh operational & supporting 3 crew, CDRA operational (single bed) and supporting 5 crew**
 - Includes maintenance down time (3 days Vozdukh and 5 days CDRA)
 - **ISS LiOH replenished on LF1 (30 cans)**
 - **41 US LiOH cans launched on ULF1.1 (10 in MPLM)**
 - 7 used prior to docking, 3 used for TPS repair EVA
 - 17 used during docking due to booster fan bypass DTO
 - **21 RS LIOH cans on ISS**
 - **Dual bed CDRA fail is most limiting failure case resulting in 30 days CO2 removal capability**
- Engineering estimate at end of launch window (7/19) is 128 days**

ULF1.1 CSCS “Engineering Assessment” Assumptions/Results

- **Food Container manifests (96 days, was 85 days)**
 - 56 food containers launched on 22P, 82 in ULF1.1 MPLM, and 28 equivalent containers of Shuttle food in middeck
 - Engineering estimate based on all nine crewmembers consuming 2000 kcal/day

→ Engineering estimate at end of launch window (7/19) is 91 days
- **Waste Management (107 days solid waste, was 76 days), (110 days liquid waste, was 102 days)**
 - Launching 366 Apollo bags in MPLM for CSCS (provides 33 additional days fecal containment for 9 crew)
 - Assumes 9 EDVs and 13 KTOs on 22P

→ Engineering estimate at end of launch window (7/19) is 104 days

ULF1.1 CSCS “Engineering Assessment” Assumptions/Results

- **Water Supply and Recovery (108 days, was 91 days)**
 - SRV-K assumed operational, CFU assumed operational
 - Available water on ISS at launch: 1011.6 L
 - 25 CWCs (1075 L) transferred on ULF1.1
 - E12/E13 Usage Rate: 2.2 L/person-day
 - Assumed Elektron operating at 50 amps (16 amps while Shuttle docked)
- Engineering estimate at end of launch window (7/19) is 104 days

ULF1.1 CSCS Margins

No MPLM

- **The CSCS Duration is limited by Food**
 - **O2 Generation and Supply (81 days)**
 - **CO2 Control and Disposal (108 days)**
 - **Food Container manifests (62 days)**
 - **Waste Management (74 days solid waste), 108 days liquid waste)**
 - **Water Supply and Recovery (108 days)**
- **Duration for all consumables is greater than Shuttle LON turnaround capability of 51 days**

ULF1.1 CSCS Scenario Overview

Durations from STS-121 dock:

- ISS CSCS capability 81 days (O₂ limited)
- Shuttle Rescue Flight 51 days (Final number to be provided at FRR)

