**2010 Mission Overviews**


STS-130 / ISS 20A
Vehicle: Endeavour - 24th flight
Launch: February 8, 2010 at 4:14 am EDT from Pad 39A, KSC
Landing: February 21, 2010 at 10:20 pm EDT on Runway 15, KSC

Crew
Commander: George Zamka
Pilot: Terry Virts
Mission Specialist 1: Nicholas Patrick
Mission Specialist 2: Robert Behnken
Mission Specialist 3: Stephen Robinson
Mission Specialist 4: Kathryn Hire

ISS Crew
Commander (E22): Jeff Williams
Flight Engineer (E22): Maxim Suraev
Commander (E23): Oleg Kotov
Flight Engineer (E23): Soichi Noguchi
Flight Engineer (E23): T.J. Creamer

Mission Overview
STS-130 delivered and installed the final U.S. module, named Tranquility, to the International Space Station (ISS). Tranquility was the name chosen from thousands of suggestions submitted by participants on NASA's Web site, "Help Name Node 3". This mission also took up the Cupola, a mini control tower attached to the Tranquility node that provides an incredible view of Earth from seven windows.

Three scheduled EVAs, totaling 18 hours and 13 minutes, were completed during STS-130. These were necessary to install the new Node 3 and Cupola modules.

STS-130 was the planned last night launch and the last planned night landing of the Shuttle program.

Pictured are the newly-installed Tranquility node and Cupola, as well as Space Shuttle Endeavour shortly after undocking.

The first image taken through the ISS's new seven-windowed Cupola. Visible below is the Sahara Desert.

**2010 Mission Overviews**

<u>STS-131 / ISS 19A</u>
Vehicle: Discovery - 38th flight
Launch: April 5, 2010 at 6:21 am EDT from Pad 39A, KSC
Landing: April 20, 2010 at 9:08 am EDT on Runway 15, KSC

<u>Crew</u>
Commander: Alan Poindexter
Pilot: James P. Dutton Jr.
Mission Specialist 1: Rick Mastracchio
Mission Specialist 2: Clayton Anderson
Mission Specialist 3: Dorothy Metcalf-Lindenburger
Mission Specialist 4: Stephanie Wilson
Mission Specialist 5: Naoko Yamazaki

<u>ISS Crew</u>
Commander (E23): Oleg Kotov
Flight Engineer (E23): Soichi Noguchi
Flight Engineer (E23): T.J. Creamer
Commander (E24): Alexander Skvortsov
Flight Engineer (E24): Tracy Caldwell Dyson
Flight Engineer (E24): Mikhail Kornienko

<u>Mission Overview</u>
STS-131 delivered supplies and equipment to the station, more than 17,000 pounds of it stowed inside the Italian-built multi-purpose logistics module Leonardo. The payload included new crew sleeping quarters, an ammonia tank, gyroscope and experiments. This mission marked the first time four women were in space at the same time.

Discovery's Ku-band antenna system, a vital link for radar and high-rate data communications from the shuttle to the ground failed to work once in orbit. The station's downlink capability was utilized to work around this issue.

Three scheduled EVAs, totaling 20 hours and 17 minutes, were completed during STS-131. The main task was replacing a depleted ammonia tank with a new one.



Space Shuttle Discovery with the Leonardo Multi-Purpose Logistics Module visible in the payload bay.


Space Shuttle Discovery lifts off at 6:21 a.m. EDT on April 5, 2010.

**2010 Mission Overviews**

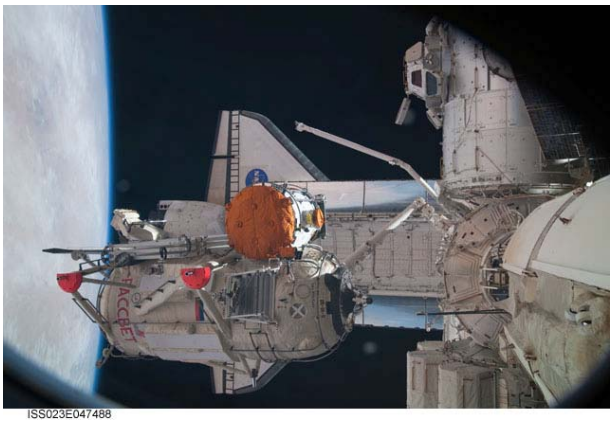

STS-132 / ISS ULF4
Vehicle: Atlantis - 32nd flight
Launch: May 14, 2010 at 2:20 pm EDT from Pad 39A, KSC
Landing: May 26, 2010 at 8:48 am EDT on Runway 15, KSC

Crew
Commander: Ken Ham
Pilot: Tony Antonelli
Mission Specialist 1: Garrett Reisman
Mission Specialist 2: Michael Good
Mission Specialist 3: Steve Bowen
Mission Specialist 4: Piers Sellers

ISS Crew
Commander (E23): Oleg Kotov
Flight Engineer (E23): Soichi Noguchi
Flight Engineer (E23): T.J. Creamer
Commander (E24): Alexander Skvortsov
Flight Engineer (E24): Tracy Caldwell Dyson
Flight Engineer (E24): Mikhail Kornienko

Mission Overview
STS-132 launched an Integrated Cargo Carrier and a Russian-built Mini Research Module (MRM-1). MRM-1 is also known as Rassvet, which is Russian for "dawn". The new MRM-1 module was installed on the ISS Zarya module. This and the Integrated Cargo Carrier were positioned using Canadarm2. The cargo carrier provided a worksite for spacewalkers to store tools and gear.

Three spacewalks were conducted, totaling 21 hours and 20 minutes. During the first spacewalk a spare antenna and stowage platform were installed. On the second spacewalk batteries on the P6 Truss were replaced. The final spacewalk replaced the last of the P6 Truss batteries and retrieved a power data grapple fixture for installation at a later date.




MRM-1, held by Canadarm2, is moved for permanent attachment to the ISS.

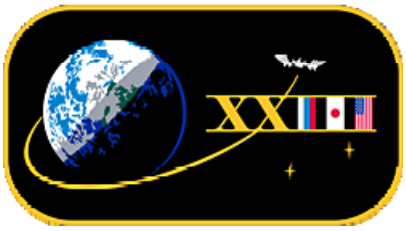
Atlantis on final approach with MRM-1 visible in the payload bay.

**2010 Mission Overviews**

## International Space Station Overview


Major Milestones for 2010

The final US module, Node 3, was delivered and installed during the STS-130 / ISS 20A mission early in the year. The station was expanded later in the year by the addition of the Russian MRM-1 module. A major failure of the station's cooling system occurred on July 31, 2010 when the External Thermal Cooling System ammonia pump module failed off. This required three unscheduled US EVAs to safe the failed pump and install a new one. Without these repairs several modules would have been without cooling, threatening science and avionics. The ultimate consequence could have been a reduction in crew size or a full demanning of the station. The three EVAs were fully successful and cooling was restored.




ISS Crew Members for 2010

Expeditions 22, 23, 24, 25 and 26 flew in 2010. Listed below are those crew members who spent time on the ISS during the 2010 calendar year, and some highlights from their Expeditions.


**Expedition 22 Crew**: Jeffrey Williams (NASA), Maxim Suraev (RUS), Oleg Kotov (RUS), Soichi Noguchi (JAXA), T.J. Creamer (NASA)
**Milestones**: RS EVA #24 - January 14th 2010, Progress 36P launch - February 3rd, 2010

**Expedition 23**: Oleg Kotov (RUS), Soichi Noguchi (JAXA), T.J. Creamer (NASA), Alexander Skvortsov (RUS), Mikhail Kornienko (RUS), Tracy Caldwell Dyson (NASA)
**Milestones**: Soyuz 22S launch - April 2nd, 2010, Progress 37P launch - April 28th, 2010


**Expedition 24**: Alexander Skvortsov (RUS), Mikhail Kornienko (RUS), Tracy Caldwell Dyson (NASA), Doug Wheelock (NASA), Fyodor Yurchikin (RUS), Shannon Walker (NASA)
**Milestones:** Soyuz 23S launch - June 15th, 2010, Progress 38P launch - June 30th, 2010, RS EVA #25 - July 27th, 2010, US EVA #15 - August 7th, 2010, US EVA #16 - August 11th, 2010, US EVA #17 - August 16th, 2010, Progress 39P launch - September 8th, 2010

**Expedition 25**: Doug Wheelock (NASA), Fyodor Yurchikin (RUS), Shannon Walker (NASA), Scott Kelly (NASA), Alexander Kaleri (RUS), Oleg Skripochka (RUS)
**Milestones:** Soyuz 24S launch - October 7th, 2010, Progress 40P launch - October 28th, 2010,
RS EVA #26 - November 15th, 2010


**Expedition 26**: Scott Kelly (NASA), Alexander Kaleri (RUS), Oleg Skripochka (RUS), Dmitry Kondratyev (RUS), Paolo Nespoli (ESA), Catherine Coleman (NASA)
**Milestones**: Soyuz 25S launch - December 15th, 2010

**2010 Mission Overviews**

**Pad Abort 1 Flight Test**

Vehicle: Orion crew module simulator, Launch Abort System
Launch: 9:00 a.m. EDT May 6th, 2010 at White Sands Missile Range
Length of mission: ~135 seconds from launch until crew module touchdown
Max Altitude: ~1.2 miles (~1.9 km)

Mission Overview

NASA's Pad Abort 1 flight test, a launch of the abort system designed for the Orion crew vehicle, lifted off at 9 a.m. EDT May 6 at the U.S. Army's White Sands Missile Range (WSMR) near Las Cruces, N.M. The flight lasted about 135 seconds from launch until the crew module touchdown about a mile north of the launch pad.

The flight was the first fully-integrated test of this launch abort system design. The information gathered from the test will help refine design and analysis for future launch abort systems, resulting in safer and more reliable crew escape capability during rocket launch emergencies.

The test involved three motors. An abort motor produced a momentary half-million pounds of thrust to propel the crew module away from the pad. It burned for approximately six seconds, with the highest impulse in the first 2.5 seconds. The crew module reached a speed of approximately 445 mph in the first three seconds, with a maximum velocity of 539 mph, in its upward trajectory to about 1.2 miles high.

The attitude control motor fired simultaneously with the abort motor and steered the vehicle using eight thrusters producing up to 7,000 pounds of thrust. It provided adjustable thrust to keep the crew module on a controlled flight path and reorient the vehicle as the abort system burned out.

The jettison motor, the only motor of the three that would be used in all nominal rocket launches, pulled the entire launch abort system away from the crew module and cleared the way for parachute deployment and landing. After explosive bolts fired and the jettison motor separated the system from the crew module, the recovery parachute system deployed. The parachutes guided the crew module to touchdown at 16.2 mph (24 feet per second), about one mile from the launch pad.

The Orion launch abort system lifts off during the PA-1 flight test at the White Sands Missile Range.

Crew Module and Main Parachutes

**2010 Mission Overviews**

**SpaceX Falcon 9 Inaugural Test Flight**

Vehicle: Falcon 9, Dragon Spacecraft Qualification Unit
Launch: 2:45 p.m. EDT June 4th, 2010 from the SpaceX launch pad at Launch Complex 40, Cape Canaveral

Mission Overview:
Falcon 9 is a spaceflight launch system that uses rocket engines designed and manufactured by SpaceX. Both stages of the two-stage-to-orbit vehicles use liquid oxygen (LOS) and rocket-grade kerosene (RP-1) propellants. On January 2, 2010, the second stage of the Falcon 9 Flight 1 vehicle was test fired for the full duration required for orbital insertion, 345 seconds. On March 13, 2010, the first stage engines successfully underwent a 3.5 second static test firing, having failed a previous attempt the day before. Falcon 9 lifted off on the inaugural test flight at 2:45 pm. EDT on June 4th, 2010 and successfully entered into a 250 km orbit. The rocket made more than 300 orbits before reentering the Earth's atmosphere and burning up on June 29th after its orbit had decayed.

Falcon 9 launches with the Dragon Spacecraft Qualification Unit. *Image credit: SpaceX.*

**SpaceX NASA COTS - Demo 1**

Vehicle: Falcon 9, Dragon
Launch: December 8th, 2010 from the SpaceX launch pad at Launch Complex 40, Cape Canaveral
Length of mission: 3 hours 19 minutes 52 seconds

Mission Overview:
On December 8, SpaceX became the first commercial company in history to re-enter a spacecraft from Earth orbit. SpaceX launched its Dragon spacecraft into orbit atop a Falcon 9 rocket at 10:43 AM EST from Launch Complex 40 at the Cape Canaveral Air Force Station in Florida. As the very first flight under the Commercial Orbital Transportation Services (COTS) program, COTS Demo 1 followed a nominal flight profile that included a roughly 9.5-minute ascent. The Dragon spacecraft orbited the Earth at speeds greater than 7,600 meters per second (17,000 miles per hour), reentered the Earth's atmosphere, and landed just after 2:00 PM EST less than one mile from the center of the targeted landing zone in the Pacific Ocean.


The Dragon spacecraft landed in the Pacific Ocean 3 hours, 19 minutes and 52 seconds after liftoff. *Image credit: SpaceX.*

References:

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http://www.nasa.gov/mission_pages/shuttle/shuttlemissions/list_2010.html

http://www.nasa.gov/mission_pages/station/expeditions/crews_past_crews.html

http://www.nasa.gov/mission_pages/constellation/orion/pad_abort1_success.html

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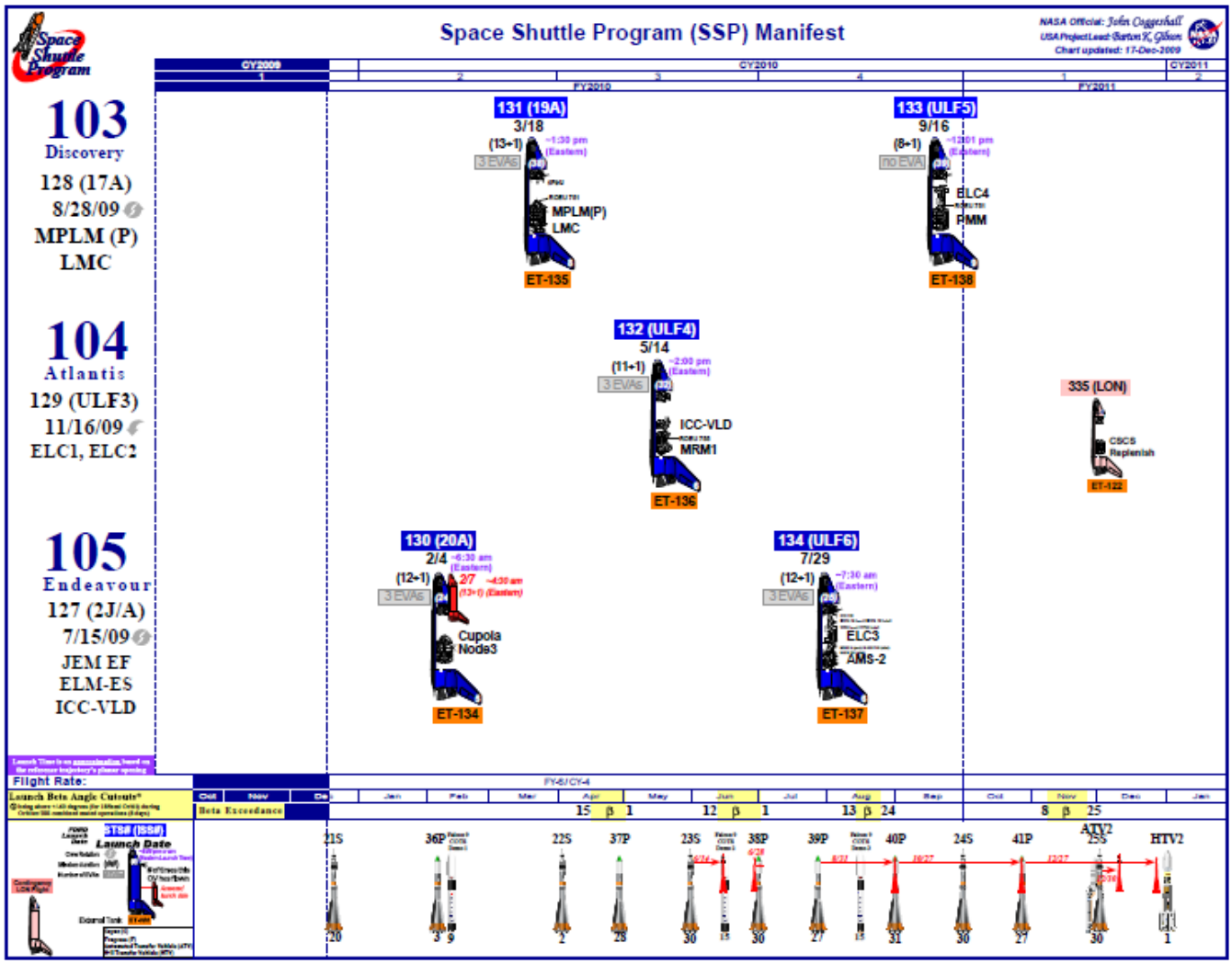
http://www.spacex.com


Space Shuttle Program (SSP) Manifest
NASA Official: John Coggeshall
USA Project Lead: Barton K. Gibson
Chart updated: 17-Dec-2009
CY2009
CY2010
CY2011
FY2010
FY2011
103
Discovery
128 (17A)
8/28/09
MPLM (P)
LMC
131 (19A)
3/18
(13+1)
~1:30 pm (Eastern)
3 EVAs
MPLM(P)
LMC
ET-135
133 (ULF5)
9/16
(8+1)
~12:01 pm (Eastern)
no EVA
ELC4
PMM
ET-138
104
Atlantis
129 (ULF3)
11/16/09
ELC1, ELC2
132 (ULF4)
5/14
(11+1)
~2:00 pm (Eastern)
3 EVAs
ICC-VLD
MRM1
ET-136
33S (LON)
CSCS Replenish
ET-132
105
Endeavour
127 (2J/A)
7/15/09
JEM EF
ELM-ES
ICC-VLD
130 (20A)
2/4
~6:30 am (Eastern)
(12+1)
27
~4:30 am (13+1) (Eastern)
3 EVAs
Cupola
Node3
ET-134
134 (ULF6)
7/29
(12+1)
~7:30 am (Eastern)
3 EVAs
ELC3
AMS-2
ET-137
Launch Time is an approximation, based on the reference trajectory's planar window
Flight Rate:
FY4Q/CY4
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Launch Beta Angle Cutouts*
Beta Exceedance
15 β 1
12 β 1
13 β 24
8 β 25
STS# (ISS#)
Launch Date
21S
36P
22S
37P
23S
38P
39P
40P
24S
41P
25S
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HTV2
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15
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30
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30
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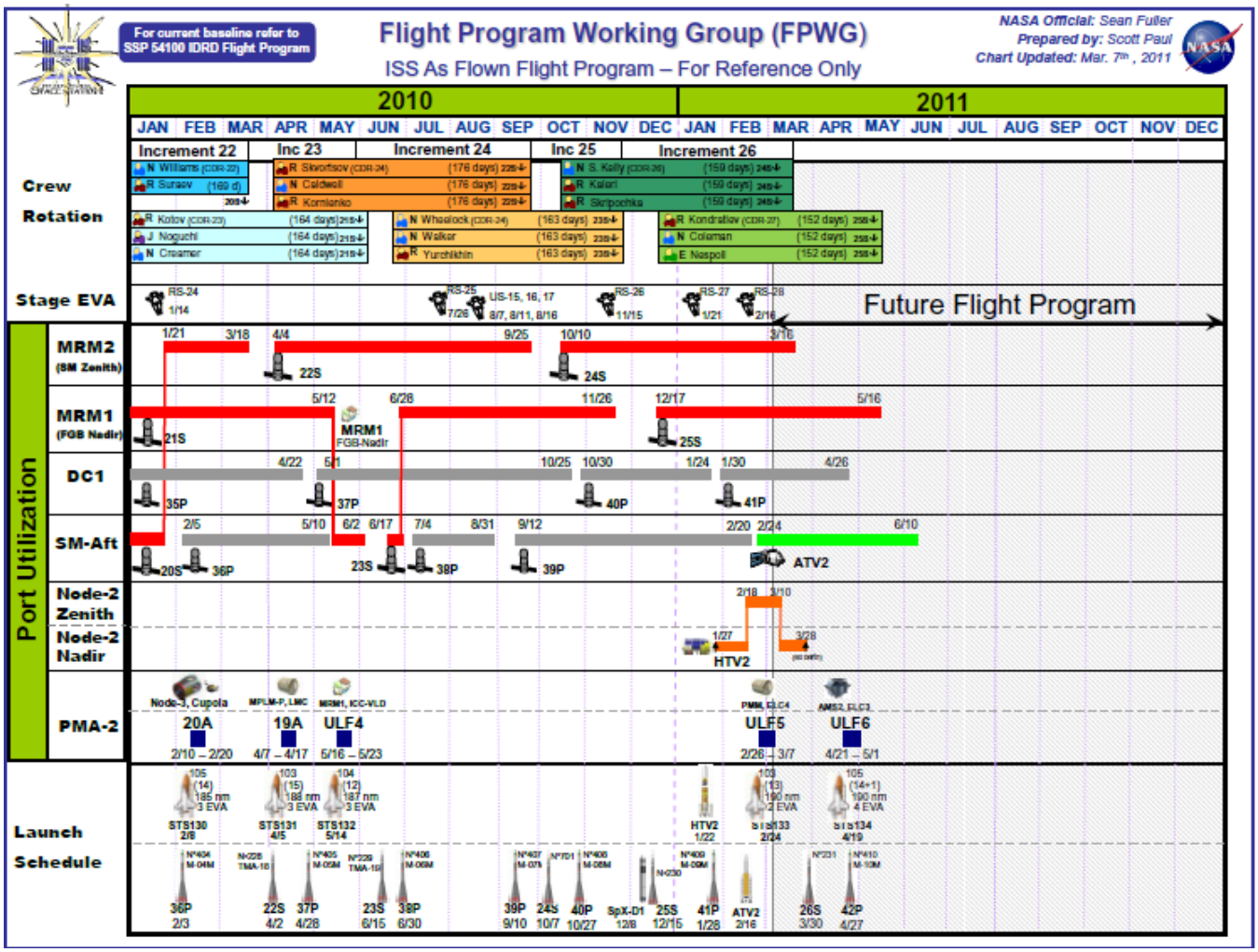
For current baseline refer to SSP 54100 IDRD Flight Program
Flight Program Working Group (FPWG)
ISS As Flown Flight Program – For Reference Only
NASA Official: Sean Fuller
Prepared by: Scott Paul
Chart Updated: Mar. 7th , 2011
2010
2011
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC
Increment 22
Inc 23
Increment 24
Inc 25
Increment 26
Crew Rotation
Stage EVA
Future Flight Program
Port Utilization
MRM2 (SM Zenith)
MRM1 (FGB Nadir)
DC1
SM-Aft
Node-2 Zenith
Node-2 Nadir
PMA-2
Launch Schedule
20A
19A
ULF4
ULF5
ULF6
HTV2
ATV2
MRM1 FGB-Nadir