ASTRONAUT CHRIS HADFIELD



Canadian Space Agency, 2008, Image Gallery: Chris Hadfield. Retrieved March 2, 2008, from http://www.espace.gc.ca/asc/app/gallery/results1.asp?session=&search=0&ListAbsolutePage=8&root_categories=0&categories_0=0&keywords=Chris|Hadfield&images=ON

Figure D-1 Astronaut Chris Hadfield

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ASTRONAUT CHRIS HADFIELD

In June 1992, Chris Hadfield was selected to become one of four new Canadian astronauts from a field of 5 330 applicants. He was assigned by the CSA to the NASA Johnson Space Center in Houston, Texas, in August of the same year where he addressed technical and safety issues for Shuttle Operations Development, contributed to the development of the glass shuttle cockpit, and supported shuttle launches at the Kennedy Space Center in Florida. In addition, Hadfield was NASA's Chief CapCom, the voice of mission control to astronauts in orbit, for 25 space shuttle missions. From 1996 to 2000, he represented CSA astronauts and coordinated their activities as the Chief Astronaut for the CSA.

From 2001 to 2003, Hadfield was the Director of Operations for NASA at the Yuri Gagarin Cosmonaut Training Centre (GCTC) in Star City, Russia. His work included coordination and direction of all ISS crew activities in Russia and oversight of training and crew support staff, as well as policy negotiation with the Russian Space Program and other international partners. He also trained and became fully qualified as a flight engineer cosmonaut in the Soyuz TMA spacecraft to perform spacewalks in the Russian Orlan spacesuit.

Hadfield is a civilian CSA astronaut, having retired as a Colonel from the Canadian Forces in 2003 after 25 years of military service. He was Chief of Robotics for the NASA Astronaut Office at the Johnson Space Center in Houston, Texas from 2003 to 2006, and then Chief of International Space Station Operations.

MISSIONS

STS-74

Mission: Second Shuttle-Mir Docking.

Space Shuttle: Atlantis.

Launched: November 12, 1995 at 7:30:43 a.m. EST.

Landed: November 20, 1995 at 12:01:27 p.m. EST.

Mission Duration: 8 days.

Orbit Altitude: 213 nautical miles.

This mission illustrated the international flavour of the space station effort in both the hardware and the crew. Hardware in the payload bay included:

- Canadian built Remote Manipulator System (RMS) arm,
- U.S. built Orbiter Docking System (ODS),
- Russian-Built Docking Module (DM) and solar array, and
- US/Russian built solar array.

Chris Hadfield was the fourth Canadian to fly on a shuttle but the first Canadian mission specialist. Awaiting Atlantis aboard Mir, were two Russian cosmonauts and a German cosmonaut, along with Russian and European Space Agency research samples and equipment.

On flight day three, Hadfield operated the Canadarm RMS to lift the DM from its stowed position and moved it to within five inches above the ODS in the forward part of the bay. ODS was flown on all Shuttle-Mir docking flights and served as a passageway between two spacecraft. Steering jets were then fired to push Atlantis against the DM. Once mating was confirmed, the Canadarm ungrappled from the DM and hatches between the DM and the ODS were opened.

The manual phase of rendezvous began when Atlantis was about 800 m from Mir. At 51.8 m from Mir, the approach was halted while Mir was manoeuvred into alignment for docking. After permission from flight directors in Moscow and Houston, Atlantis was moved to 9.1 m from Mir and then halted momentarily again to

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make final adjustments. The key camera for final approach was an elbow camera on the shuttle's Canadarm RMS.

Hatches between Mir and Atlantis were opened at 4:02 a.m. EST, November 15. Control of the DM was transferred to the Mir 20 crew. During mated operations, nearly 453.6 kg of water was transferred to Mir. Numerous experiment samples, including blood, urine and saliva, were moved to the orbiter for return to earth. The shuttle crew also brought gifts, including Canadian maple sugar candies and a guitar (second guitar on Mir). Lithium hydroxide canisters – a late addition – were transferred to Mir in case the faulty environmental control system failed again and the station's air needed to be "scrubbed" clean. The two spacecraft separated on November 18 and Atlantis began the journey home.

STS-100

Mission: International Space Station Assembly Flight 6A.

Space Shuttle: *Endeavour*.

Launched: April 19, 2001, 2:40:42 p.m. EDT.

Landed: May 1, 2001, 9:10:42 p.m. PDT.

Mission Duration: 12 days.

Docking with the ISS occurred at 9:59 a.m. EDT April 21. The advanced robotic arm, called Canadarm2, was attached to a pallet on the outside of the U.S. Destiny Lab. It was later directed to walk off the pallet and grab onto an electrical grapple fixture on Destiny that would provide data, power and telemetry to the arm. Days later the arm was used to hand off the cradle, on which it rested inside Endeavour's payload bay during launch, to the orbiter's arm. The exchange of the cradle from the station's Mobile Servicing System (MMS) Canadarm2 to the shuttle's RMS Canadarm marked the first ever robotic-to-robotic transfer in space.

As the astronauts rewired power and data connections for the arm, the backup power circuit failed to respond to commands from station flight engineer Susan Helms, who was operating from a workstation inside Destiny. Disconnecting and reconnecting the cables at the base of the arm resolved the situation and the redundant power path to the arm was then completed.

Other crew activities during the mission included attaching a UHF antenna on the outside of the station and inside, calibrating the Space Vision System – an alignment aid for operating the robotic arm – plus helping repair the space station's treadmill and also filming for IMAX.

ISS Trouble in Space

Computer problems surfaced late on April 24 when flight controllers for the station experienced a loss of command and control computer No. 1, one of three computers on board for systems management. The result was a loss of communication and data transfer between the space station Flight Control Room in Houston and the station.

Communication was routed through *Endeavour*, which enabled the station crew and flight controllers to talk to one another. No computer problems were encountered on *Endeavour*. Activities involving the Canadarm2 RMS were postponed.

Station flight engineer Susan Helms, using a laptop computer, was able to restore the ground's ability to monitor and send commands to the station's US systems. Through the laptop, data from the station computers could be transmitted to the ground for analysis and investigation of the problems.

Computer restoration continued successfully, especially C&C number three. C&C number one was found to have a failed hard drive. It was replaced by a backup payload computer.

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Ground controllers successfully synchronized timers on all on-board computers and investigated an error in the software load that might have caused the computer problem. With one operational C&C computer in Destiny and a back-up laptop in Unity, the undocking procedure for Raffaello was given the go-ahead.

Endeavour undocked from the space station April 29, fired a separation burn and headed for home.

PLACE AND DATE OF BIRTH

Born August 29, 1959, in Sarnia and raised in Milton, Ont.

EDUCATION

Chris Hadfield's education includes:

- Graduate as an Ontario Scholar from Milton District High School,
- Bachelor degree in mechanical engineering (with honours) from RMC,
- Post-graduate research at the University of Waterloo, and
- Master of Science (aviation systems) from the University of Tennessee.

PROFESSIONAL EXPERIENCE

In total, Chris Hadfield has flown over 70 different types of aircraft. Raised on a corn farm in southern Ontario, he became interested in flying at a young age. As an air cadet, he won a glider pilot scholarship at age 15 and a power scholarship at age 16. He also taught skiing and ski racing part- and full-time for 10 years.

Hadfield underwent basic flight training in Portage La Prairie, Man., for which he was named top pilot in 1980. In 1983, he took honours as the overall top graduate from Basic Jet Training in Moose Jaw, Sask. and, in 1984–1985, he trained as a fighter pilot in Cold Lake, Alta. on CF-5s and CF-18s. For the next three years Hadfield flew CF-18s for the North American Aerospace Defence Command (NORAD) with 425 Squadron, during which time he flew the first CF-18 intercept of a Soviet "Bear" aircraft. He attended the United States Air Force (USAF) Test Pilot School at Edwards Air Force Base, in California and, upon graduation, served as an exchange officer with the US Navy at Strike Test Directorate at the Patuxent River Naval Air Station.

Colonel Hadfield's military accomplishments from 1989 to 1992 included:

- testing the F/A-18 and A-7 aircraft;
- completing the first military flight of F/A-18 enhanced performance engines;
- developing a new handling qualities rating scale for high angle-of-attack test;
- participating in the F/A-18 out-of-control recovery test program;
- performing research with NASA on pitch control margin simulation and flight; and
- piloting the first flight test of the National Aerospace Plane external-burning hydrogen propulsion engine.

SPECIAL HONOURS

Chris Hadfield's special honours include:

- recipient of Liethen-Tittle Award 1988 (top pilot graduate of the USAF Test Pilot School),
- recipient of U.S. Navy Test Pilot of the Year (1991),
- recipient of honorary Doctorate of Engineering from the Royal Military College (1996),
- recipient of Member of the Order of Ontario (1996),
- recipient of honorary Doctorate of Laws from Trent University (1999),

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- recipient of Vanier Award (2001),
- recipient of Meritorious Service Cross (2001),
- recipient of NASA Exceptional Service Medal (2002),
- recipient of Queen Elizabeth II Golden Jubilee Medal (2003),
- inducted into Canada's Aviation Hall of Fame (2005), and
- commemorated on Royal Canadian Mint silver and gold coins for his spacewalk to install Canadarm2 on the ISS (2006).

AFFILIATIONS

Chris Hadfield's affiliations include:

- Royal Military College Club,
- Society of Experimental Test Pilots,
- Canadian Aeronautics and Space Institute,
- Honourary Patron of Lambton College,
- Trustee of Lakefield College School,
- Board member of the International Space School Foundation, and
- Executive with the Association of Space Explorers.

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