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Space Shuttle Operations

**Endeavour's
delivery
restored the
Shuttle fleet
to four
Orbiters**

At right is the newest addition to the Space Shuttle fleet, the Orbiter *Endeavour*, which was rolled out of its construction facility at Palmdale California and formally delivered to NASA on April 25, 1991. Built by Rockwell International's Space Systems Division, *Endeavour* was mated to NASA's Boeing 747 Shuttle Carrier Aircraft and flown to Kennedy Space Center for installation of its main engines and orbital maneuvering system.

Endeavour's delivery restored the Shuttle fleet to four Orbiters. The new Orbiter is scheduled for its initial flight in May 1992.

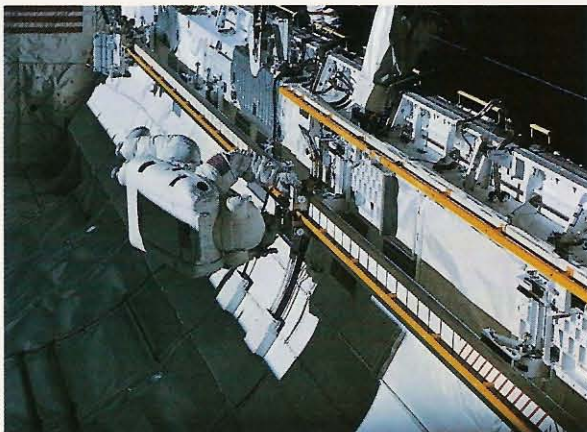
Earlier in April, NASA marked 10 years of Space Shuttle Operations with the April 11 completion of Flight STS-37, flown by the Orbiter *Atlantis*. The Shuttle flight program began with the STS-1, Orbiter *Columbia*, on April 12, 1981.

The *Atlantis* flight, the 39th Shuttle flight, was a highly successful six-day mission whose primary assignment was deployment of the 17-ton Gamma Ray Observatory, or GRO. The crew also accomplished several secondary objectives, including the first extravehicular activity (EVA) in five years. The initial spacewalk was an



unscheduled event, necessitated when the GRO high-gain antenna boom became stuck during the deployment sequence. Astronauts Jerry Ross and Jerome (Jay) Apt donned EVA suits, managed to free the stuck boom and maneuver the antenna into place, demonstrating the extra insurance of human-aided satellite deployments.

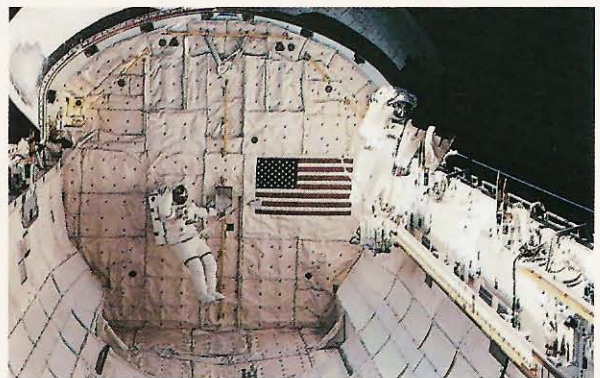
A second, planned EVA involved a test of personnel carts and equipment-moving devices known as Crew and Equipment Translation Aids. Apt and Ross tested three carts, one manually moved, one powered by a mechanical pump, and the third an electrically-powered cart driven by a hand-cranked generator; the carts were run along a 47-foot track in *Atlantis'* open payload bay. At left Apt moves along the rail on one of the carts; at far right, Ross (in center photo) and Apt wave at their fellow crew members in *Atlantis'* cabin on completion of the 6 1/2 hour evaluation of the devices' suitability for use on Space Station *Freedom*.





STS-37 was the first Shuttle flight of 1991. The second, STS-39, came on April 28 with the launch of Orbiter *Discovery* carrying multiple Department of Defense experiments associated with the Strategic Defense Initiative. On the first unclassified Shuttle defense mission, *Discovery* carried two primary payloads: the Infrared Background Signature Survey (IBSS) and an instrument package designated Air Force Program 675.

The IBSS experiment involved deployment (and later retrieval) of a free-flying Shuttle Pallet Satellite (SPAS-2) built by the German firm Messerschmitt-Boelkow-Blohm. The pallet was released from the Orbiter and the Orbiter moved away so that the instruments on SPAS-2 could observe the rocket plumes from firings of the Orbiter's maneuvering and re-entry engines. At distances up to 10 kilometers, the SPAS instruments recorded images of the plumes in ultraviolet, infrared and visible wavelengths, obtaining data that will be used to enhance computer simulations of attacking nuclear missiles. In another



series of experiments, SPAS-2 observed and recorded data from chemical and gas clouds created by canisters released from the Orbiter.

The Air Force Program 675 experiment included five instruments that remained in the Orbiter's payload bay. The instruments made infrared, ultraviolet and x-ray measurements of the Earth, stars and the Orbiter *Discovery*, providing both scientific data and information applicable to strategic defense research.

On the year's third shuttle flight, STS-40, Orbiter *Columbia* was launched June 5 for a 10-day life sciences investigation designated SLS-1, the first of several Spacelab Life Sciences missions planned for the 1990s. SLS-1 involved study of the effects of microgravity on human, animal, and plant life; the living subjects were the human science crew, 29 rats and 2,478 jellyfish.

Water Conditioner

IQ-1030-B incorporating Ionics' exclusive EPA-registered bacteriostatic media. Ionics water conditioners are proudly on display at the NASA Space Station Exhibit in Huntsville, Al.

**A home-use
water
treatment
system
incorporates
technology
developed to
purify the
water aboard
the Space
Shuttle
Orbiters**

At right is the General Ionics Model IQ Bacteriostatic Water Softener, a home use system that not only softens municipally treated water but also inhibits the growth of bacteria within the filtering unit. It was developed by Ionics, Incorporated, Bridgeville, Pennsylvania, international water consultants and manufacturer of water treatment equipment for municipal, industrial and consumer use.

The bacteria growth arresting feature of the Model IQ is based on NASA silver ion technology developed to purify the water aboard the Space Shuttle Orbiters. In Shuttle use, an electrolytic water filter generates silver ions in the water flow; the silver serves as an effective bacteria inhibitor and deodorizer.

The NASA technology has been used in several water purification products, among them a line of home water filters developed by Ray Ward, president of Bon Del, Chula Vista, California. Ward was assisted in his development effort by Ionics, Incorporated. The latter company helped him design his equipment to make the most efficient usage of silver impregnated carbon (activated carbon helps remove objectionable tastes and odors).

Some time later, Ionics vice president Walter J. Polens learned that some countries in Europe were considering a ban on water softeners that breed bacteria. It occurred to Polens that the silver ion technology, on which he had worked with Ward, might be the answer to a water softener that would not breed bacteria.



Ionics used the NASA technology as a departure point for company development of a silver carbon of such density that it would remain on the top of the water softening resin bed where, Ionics' research indicated, the greatest bacterial growth occurs. After extensive company testing, the Environmental Protection Agency evaluated the process and found Ionics' silver carbon to be an effective bacterial growth inhibitor.



...the National Aeronautics and Space Administration, is synonymous with state-of-the-art technology. This NASA resource technology is a significant national asset with an impressive potential payback from the investment in tomorrow's national competitiveness, economy and lifestyle.

Ionics, Incorporated is also respected for its pioneering in water technology. Currently more than 50 countries use Ionics water conditioning equipment.

Ionics equipment is also worthy of being part of the Nuclear Navy: the U.S.S. Nautilus, the Polaris class of submarines, and the supercarrier U.S.S. Enterprise.

Today, Ionics markets the only EPA-registered bacteriostatic water conditioner for residential and commercial use. It is considered by many as the leading edge in point-of-entry water science.

CONTAMINANTS OR OTHER SUBSTANCES WHICH CAN BE REMOVED BY IONICS PRODUCTS ARE NOT NECESSARILY IN YOUR WATER. OPERATIONAL MAINTENANCE AND REPLACEMENT REQUIREMENTS ARE ESSENTIAL FOR THE PRODUCT TO PERFORM AS ADVERTISED. ACTUAL SAVINGS ACHIEVED ARE DEPENDENT ON YOUR PARTICULAR SPENDING HABITS AND USAGE LEVELS.



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