and Steven MacLean, provided technical support on the ground at the Johnson Space Centre. Commander Garneau transmitted information to them through an elaborate system of communications.

Space vision experiments

Two highly successful major space technology experiments conducted by Marc Garneau were the space vision system experiment development tests (VISET) and an advanced composite materials experiment (ACOMEX).

A special "space vision" system for the Canadian-built robot arm that is being developed by NRC, is expected to be ready for the shuttle mission in early 1986. As a prelude, Marc Garneau helped operate six on-board cameras measuring the location and distance of the satellite, ERBS, launched during the mission. He filmed the targets as the satellite moved away from the shuttle and transmitted the data to the Johnson Space Centre, where the distance between the satellite and the craft was computed every 30 seconds. The computer program is expected to be invaluable for helping the robot arm grab objects in space quickly on future flights and it could also result in a new generation of factory robots able to see parts and assemble products.

ACOMEX involved testing samples of composite materials attached to Canadarm and measuring any deterioration while exposed to the conditions of space. The experiment showed that space is an extremely harsh place in which to build permanent structures such as space stations. A tube plated with gold and then coated with an extremely thin layer of carbon developed visible rings where the gold showed through, proving that even the few molecules of oxygen in space can quickly erode surfaces.

"It is very clear that we're seeing a very aggressive environment in space," said David Zimick, principal investigator of the materials experiment. Light building materials of the future will probably be made of a carbon-composite material and several samples were carried on the Canadarm cargo arm.

Mr. Zimick said he believes the composite materials will show some microscopic erosion from just a few hours' exposure to space. Similar material samples are being flown on the side of a satellite to be brought back to earth after over a year in space.

The success of most of Commander Garneau's experiments will only be determined after weeks or months of study. But the investigators promised to publish most of the findings within a year.

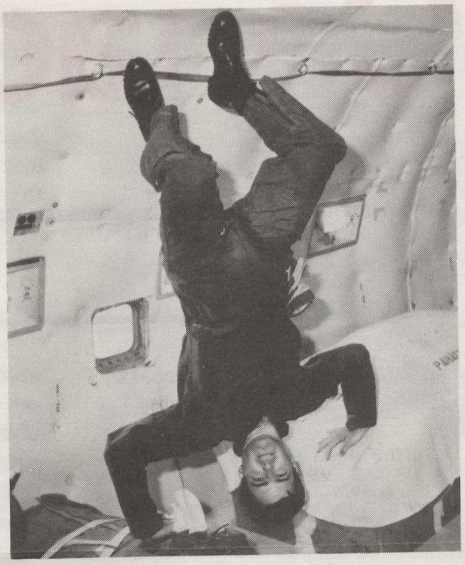
Space science tests

The conditions were not as ideal as expected for the two space science experiments conducted by Marc Garneau.

In the sunphotometer earth atmospheric measurements (SPEAM), Marc Garneau pointed a hand-held sunphotometer directly at the sun to help determine how much sunlight is scattered or blocked in the earth's atmosphere by dust, pollution or moisture.

The experiment to measure the amount of volcanic dust and pollution in the atmosphere at sunrise and sunset was difficult because the orbiter was usually in the wrong position at sunrise to get good results, said principal investigator Douglas Wardle.

Members of the space shuttle Challenger *crew,* (bottom row, left to right) *Jon A. McBride, pilot; Sally K. Ride, Kathryn D. Sullivan and David C. Leestma, mission specialists;* (top row) *Paul D. Scully-Power, oceanographer; Robert L. Cripper, crew commander; and Marc Garneau, Canada's payload specialist.*



Marc Garneau experiences weightlessness in NASA KC 135 jet flying parabolic curves.

Commander Garneau got fewer readings than planned in the experiment to measure the reddish electrical glow that appears around the shuttle in orbit, OGLOW. The best view of the glow occurs when a shuttle is manoeuvred sideways and charged particles in space hit the broad sides of the orbiter. A severe space storm on October 8, however, triggered "phenomenal" auroral displays over both poles, giving Marc Garneau a chance to take what scientists expect to be some of the best-ever pictures of the aurora.

Medical experiments

Six other experiments, space adaptation syndrome supplemental experiments (SASSE), dealt with the problems astronauts have encountered in adapting to living in zero-gravity environment. Space makes some astronauts sick, changes the sensation of taste and leaves them disoriented about the movement of their own arms and legs. Marc Garneau did a series of experiments to measure these effects. The medical experiments were immediately followed up with further tests on the ground. The results of some of these tests will not be made public.

Because of the restricted space aboard the space shuttle, the equipment for the experiment had to fit in a locker only 60 centimetres square. Mr. Garneau's personal effects had to fit in a space about the size of a large shoe box. He also took a few souvenirs into space, including the flags of Quebec City and Canada's provinces and a National Hockey League puck which will be used in the opening face-off at the all-star game in Calgary next February before being donated to the Hockey Hall of Fame.