

interest coupled with a recollection of our two countries' history of co-operation in the wider world," said Mr. Gotlieb.

"Above all, Americans should not make the mistake of thinking that Canada's development policies reflect political expediency. Canadian economic development policies have their roots in the country's history and geography and have a momentum and a continuity which are central features of Canadian life. There is no doubt in my mind that after ourselves, the country that will gain most from a strong, united Canada is the United States. Canadians hope that Americans will understand that," concluded Mr. Gotlieb.

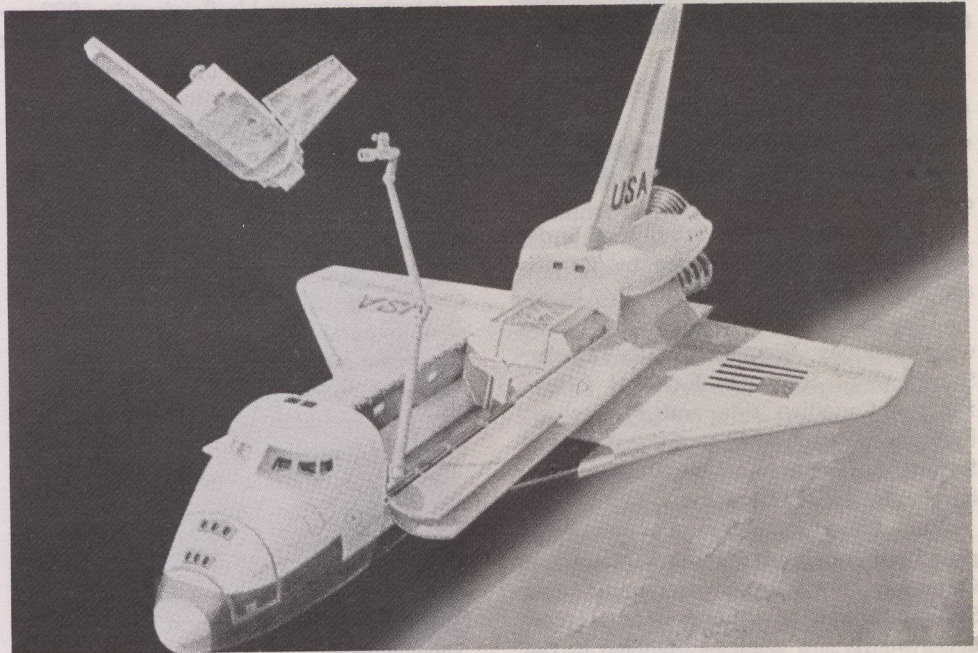
Canadarm excels in space tests

Canada's space arm, the remote manipulator system, completed a series of tests with flying colours during the recent flight of the United States' space shuttle, *Columbia*.

Astronauts Joe Engle and Dick Truly put the arm through its paces during the shuttle's two-day mission. The tests culminated more than eight years of work on the \$100-million Canadarm, which was designed by the National Research Council of Canada (NRC) and built by Spar Aerospace Limited of Toronto.

NRC is delighted

"It was lovely, just lovely. We're obviously delighted that it went so well," said Dr. Art Hunter, project director for NRC. Because the space shuttle's mission was cut short, a number of tests on the arm had to be cancelled. Dr. Hunter said the



The arm is designed to lift payloads in and out of the space shuttle.

cancelled tests were not "terribly important".

The arm did pass the priority tests successfully, including one in which it was extended and flicked back and forth like a fishing pole to see whether it could adjust to abrupt movements in space.

The arm, which is jointed like a human arm with shoulder, elbow and wrist-like joints, was freed of latches that held it in place on the starboard side of the shuttle bay during takeoff and landing. It appeared to come to life slowly and rose out of its cradle with all joints locked. Then each joint was flicked and the arm moved from side to side.

Because it is built out of lightweight

materials the Canadarm cannot support its own weight on earth. The tests, done in conditions of near-weightlessness, proved that it had been designed correctly.

Hand movements replicated

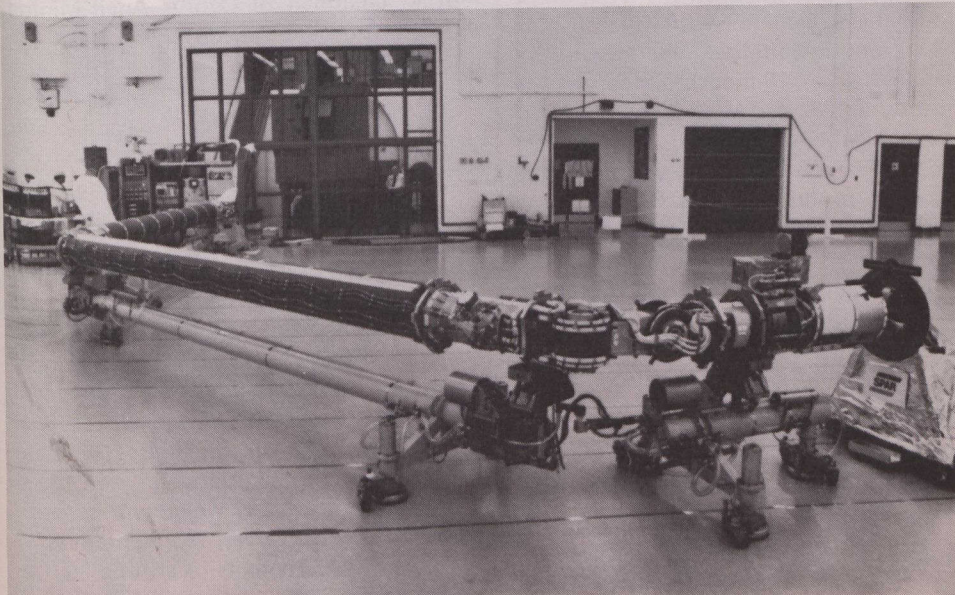
The arm's components include a controller that translates subtle hand movements through a computer into up, down or sideways motions and a servo-motor system connected with miles of wires to operate the arm through gears. At the end of the arm is a grappling fixture that serves as a hand.

The switches, controllers and displays for the arm are as complex as the instruments on an airline and the astronauts spent many hours in Toronto practising in a simulator.

Toggle switches control lighting of the arm for best viewing by the cameras on each joint. Push buttons control camera angles and pictures are displayed on two split-screen television monitors marked with concentric circles to indicate precise alignment of the arms with its target-object. The controller itself is a sophisticated version of an airplane's joystick.

United States National Aeronautical and Space Administration officials said that some of the arm's testing will be moved to the next shuttle flight scheduled for March 1982. At that time, the arm will lift an object out of the hold.

Three more copies of the arm will be built and purchased by NASA for \$20 million each and will be installed in *Columbia's* sister ships as they are built between now and 1985.



The Canadarm being built at Spar Aerospace in Toronto.