PHOTOS: COVER, NASA; PAGES TWO AND THREE, NATIONAL RESEARCH COUNCIL CANADA

Canada in the Air

In 1908 James Fraser, a Maritimer, designed a plane that would flap its wings like a bird. It was an idea that never got off the ground.

In the next seventy-three years, however, a great many Canadian ideas did, and so did a great many Canadians.

In 1909 John A.D. McCurdy, in conjunction with a couple of other Canadians and a couple of Americans, flew his Silver Dart a mile and a half in Cape Breton.

In 1922 W.R. Turnbull, of New Brunswick, invented the variable pitch propellor, and just last March the Canadian-built Space Shuttle Remote Manipulator System—the long, flexible arm—reached out from NASA's Columbia Space Shuttle. In the air, as in so many places, Canadians and Americans have often achieved together.

In this issue of CANADA TODAY/ D'AUJOURD'HUI we look at past and present aerial achievements and the people and organizations that made them possible.

Alouette and Music from the Stars

Canada, with essential help from NASA, the U.S. National Aeronautics and Space Administration, was the third country in the world to have a satellite in space. It was called Alouette I and it went up in 1962, circled in orbit 1,000 kilometres above the earth, charted the ionosphere from the top down and sent data home for ten years. Since then eight other satellites have gone up, and five more will be added by 1986.

Here's the score and the schedule:

Isis I went up in 1969, Isis II in 1971. The latter took pictures of the aurora borealis, a jaunty halo over the polar cap.

Telesat Canada set the specifications for Anik I in 1972, followed by Anik II and Anik III, the first domestic communications satellites. From the ground the Aniks appear stationary since they are 22,300 miles (35,900 kilometres) above the equator and move at the same pace as the earth revolves.

Hermes, which has a Superhigh Frequency Band enabling it to avoid transmission interference from other satellites, went up in 1976 for a two-year run and performed for almost four.

Anik B went up in 1978, Anik D is scheduled to go up this August, Anik D2 is scheduled for 1984 and three Anik Cs will be launched between now and 1985.

The Space Shuttle Remote Manipulator System

Spar Ltd. of Toronto delivered the first space arm to NASA on February 11, 1981. It has three more in the works.

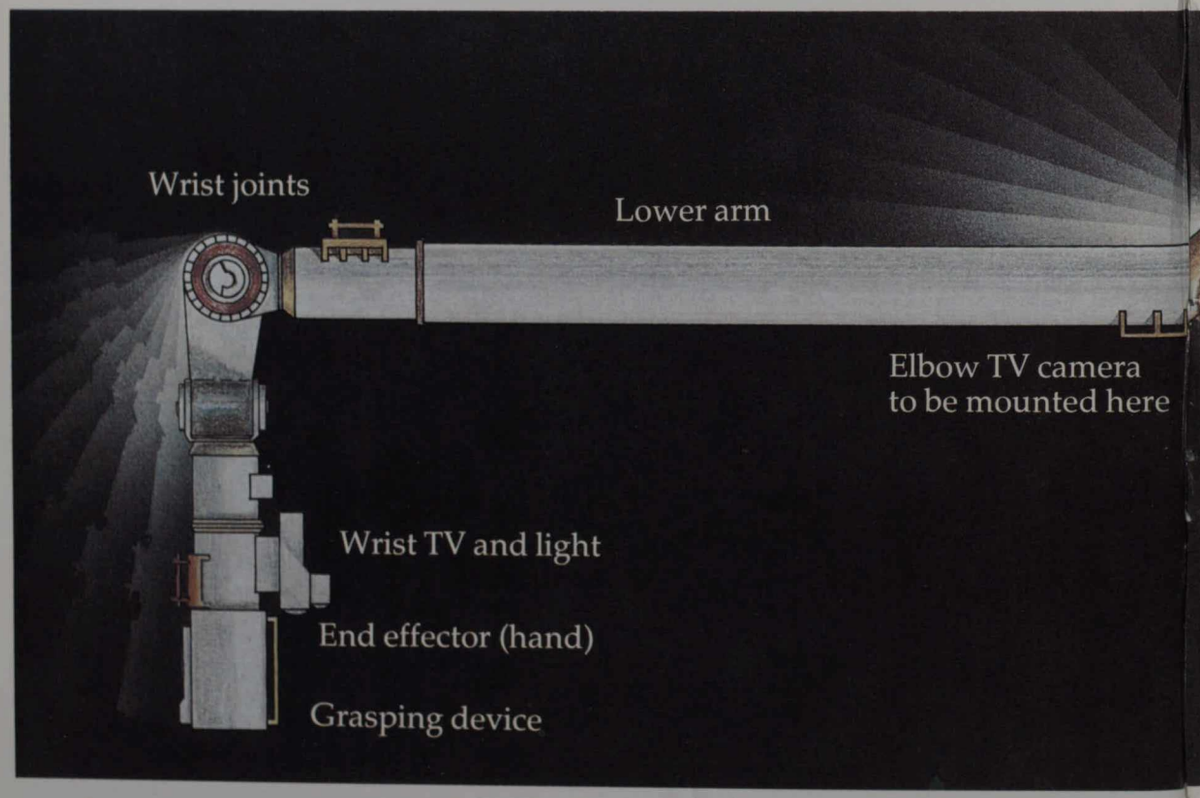
The first one reached out successfully during the third flight of the Columbia shuttle last March. In future flights it will place satellites, a space telescope and scientific experimental packages into orbital positions. (This careful language is necessary. The arm is designed to avoid giving the object any additional motion or spin when it lets go.) It was developed at Canada's National Research Council and it faintly resembles two telephone poles, end to end. It is fifty feet long, joined to form shoulder, elbow and wrist. On earth it would buckle under its own weight if it tried to reach up, but in the near vacuum of space it can move 65,000 pounds, the equivalent of a loaded tractor trailer, and place it daintily and precisely into appropriate position.

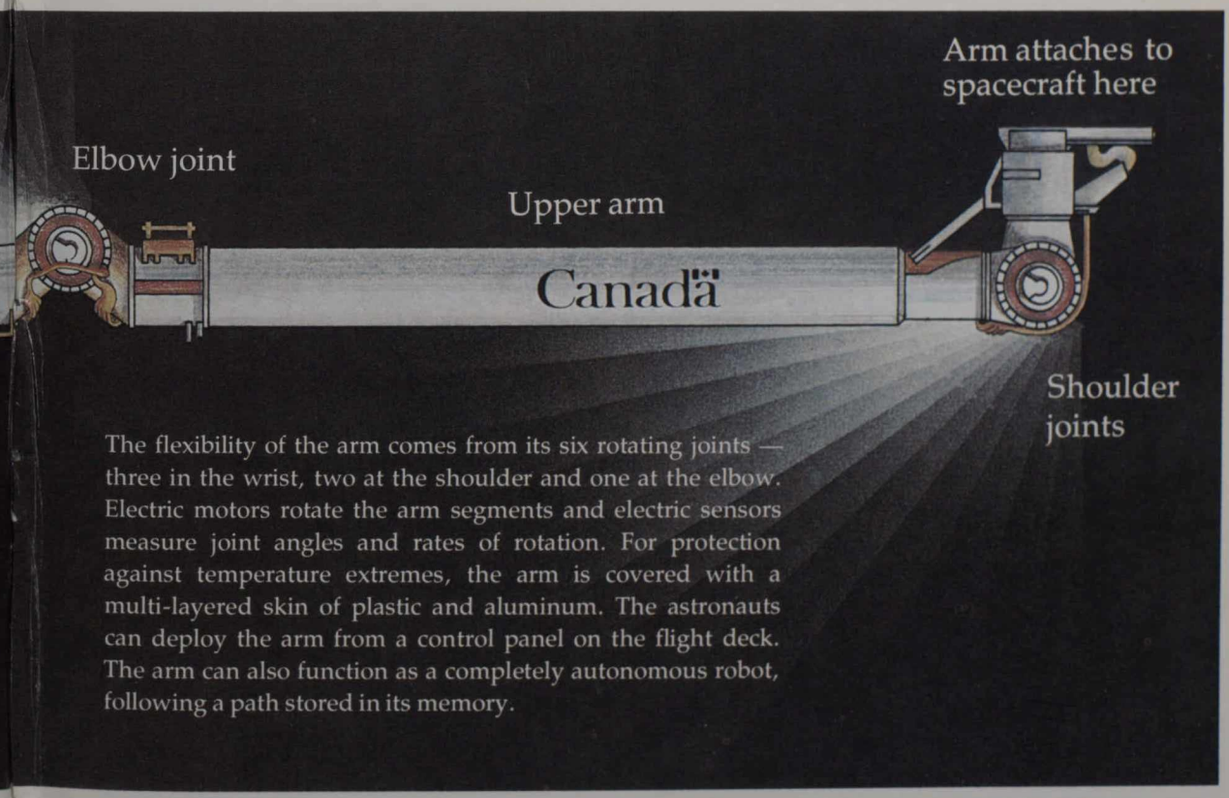
It has TV eyes at elbow and wrist and is made of a lightweight carbon composite, with the joints and some other parts made of stainless steel and aluminum.

It can pick up payloads from the cargo bay and put them in their proper places, and it can retrieve satellites or payload packages, including photographic film. It can rescue occupants of disabled spacecraft, assemble structures in space and replace parts in malfunctioning satellites.

It can even inspect the ceramic tiles on its own ship's belly. It can, in fact, reach any point that is within the circle described by its own length. It could scratch its own armpit if it had one. Its wrist can turn completely around, as well as move up and down and sideways. It has a grasping device made of snare wires which take hold easily of the special projections that will be on all future satellites and payloads. It has another substitute hand which can grasp older satellites that lack the projections.

It has 300 wires which are the equivalent of the nerves that run up and down the human arm, relaying information among sensors, motor drives and heating units. The heating units keep the joints from freezing when the shadow of the earth or the spaceship falls on the arm. It has insulation and highly reflective surfaces to keep it from overheating in the sunlight. It cost Canada about $100 million, and it is called, with perhaps justifiable Canadian pride, "Canadarm."





The flexibility of the arm comes from its six rotating joints — three in the wrist, two at the shoulder and one at the elbow. Electric motors rotate the arm segments and electric sensors measure joint angles and rates of rotation. For protection against temperature extremes, the arm is covered with a multi-layered skin of plastic and aluminum. The astronauts can deploy the arm from a control panel on the flight deck. The arm can also function as a completely autonomous robot, following a path stored in its memory.

Cover Photo:
Astronauts Joe Engle and Richard Truly took this photo during the testing of the Canadarm on its first flight in November.