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Mississauga's MacNaughton key in space shuttle success

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John D. MacNaughton enjoys being in the "space business".

In a world punctuated with phrases like STEM (Storable Tubular Extendible Member) and RMS (Remote Manipulator System) it is refreshing to hear him turn from the technical description of the telescoping and grasping arm he is supervising for the Enterprise Space Shuttle vehicle to a discussion of the hit movie Star Wars.

"The movie was just great because it's all going to happen," he says.

MacNaughton, a Mississauga resident for the past 10 years, is the vice-president of the RMS Division of Spar Aerospace Products Ltd. He is responsible for the work being done by Spar's RMS Division on behalf of the National Research Council of Canada for NASA.

That work involves overall systems engineering responsibility and the design and manufacture of the huge, 50-foot long manipulator arm which the space shuttle will use deploying and retrieving satellites and other space hardware.

Born in western Canada, he graduated in aeronautical engineering in 1954 while attending the de Havilland Aeronautical Technical School and Hatfield College in England. He returned to Canada as an engineering supervisor in de Havilland's Guided Missile Division. He then joined the Garrett Corporation in 1958 and became chief engineer of Garrett Manufacturing Ltd. in 1961. The following year he rejoined the Special Products and Applied Research Division of de Havilland and became responsible for the STEM line of products. These are used on many of the world's spacecraft in the form of antenna, gravity gradient booms and experimental carrying masts. Incidentally, he was also de Havilland project manager on the Alouette 11 satellite.

MacNaughton came away from Garrett after Spar Aerospace Products Ltd. purchased de Havilland's SPAR Division. In 1969, he was appointed a vice-president. He is currently vice-president of the RMS Division which was formed in 1974 at the behest of the National Research Council. He is a fellow of the Canadian Aeronautics and Space Institute, winner of the Institute's Casey Baldwon Award, and a recipient of the Professional Engineers of Ontario Engineering Medal. He is past vice-chairman of the Board of Directors of the Air Industries Association of Canada.

Although the acquisition of the contract by RMS Division for the space shuttle remote manipulator system is in itself a coup for all of Canada, the greatest single achievement which resulted was the solution to the mathematical equations necessary in order to even begin construction of the manipulator for the very fine tolerances needed in space. NASA tried to do so but couldn't so they turned to RMS Division. "And we did it," MacNaughton says with a smile on his face.

RMS Division has a full working prototype of the manipulator. The heart of the system is the working simulator and the operator's station, a duplicate of what will be aboard space shuttle vehicles.

The station is converted from a DC-9 aircraft simulator.

The astronauts, themselves, will be coming to RMS Division to learn to operate the manipulator as NASA's will not be completed for some time yet.

One sits facing the rear of the simulator and at windows configured to appear to look out on the cargo hold of space shuttle. To the right are two television screens. They give a line drawing picture called vector graphics in perspective of the arm and the cargo bay. Using the left control for lateral motion, and the right control for rotational motion, and watching the TV display, one can actually lift a satellite out of the cargo hold and into space, or pluck one from the heavens as it glides by. Mind you, it takes a lot of practice.

The entire manipulator is state-of-the-art technology. The materials and alloys, the gears, the joints, everything was pioneered by RMS Division. The manipulator only weighs 700 pounds but it must be able to arrest in motion or put into motion 65,000 pounds of mass, be it a satellite, space telescope, or part of a space station.

In addition, RMS plans to hook up a full working prototype of the manipulator to the simulator. To move the pieces in a 'space' atmosphere, the floor of the massive area has been sanded down to almost perfect smoothness and levelled so the parts can move on air cushions.

The company has grown from 300 to more than 800 employees. The total SPAR employee list tops 1,800. Profits from 1968 have gone from $3-million to more than $40-million.

But the most exciting part for us here on earth is the application of the new technology to earth-bound problems.

RMS is currently studying the application of space shuttle manipulator lessons to the construction of a special chair for the severely handicapped with only limited nerve movement in the arms. He believes it is possible to utilize these small nerve movements, hooked to the chair, to produce a fully moveable arm.

"Yes", he said, "it could lead to a bionic arm; after all, the manipulator is similar in actuation to the arm."

Another area of application is with submarines. Currently, he says, there is no manipulator anywhere which can handle a cutting torch underwater. It has to be done by man. Testing is now underway on a manipulator designed for submersibles.

RMS realizes that the manipulators, vector graphic equipment, and all hardware will need maintenance, in a field only they know. As a result much new business can be expected.

From a hunch of aeronautical engineers with a dark future in 1957 when de Havilland and Avro Canada were beginning to disband, has come Spar and its RMS Division, truly world leaders in the conquest of space.

John MacNaughton, vice-president of the RMS Division of Spar Aerospace Products Ltd., points out the minipulator arm which was developed by RMS though the National Research Council for NASA's space shuttle program. The manipulator technology will result in many new products for the benefit including, some day, a bionic arm.

(Staff photo by Fred Loek)