

Space Arm's Lucky Seven

Canadarm's seventh flight into space proved the lucky one for an ailing satellite called Solar Max. The Solar Maximum Mission had been launched in 1980 to study the upcoming period of maximum sunspot activity. Only eight months in orbit had passed, however, when fuses blew in the spacecraft's attitude control system. Four of the observatory's instruments which required precise positioning were rendered all but useless. Only when the spacecraft happened to point to the sun (about once in six minutes) was it possible to collect data. But Solar Max was the first of the new generation of orbiters. Many of its components were "modular" — package systems that could be replaced either while in orbit or by returning the spacecraft to Earth.

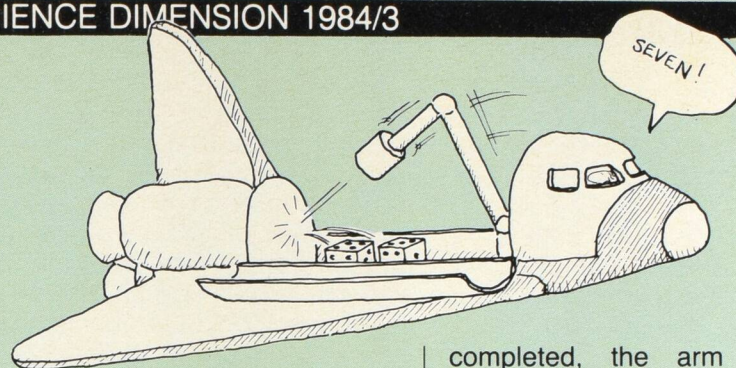
Anticipating the repair activity, NASA modified the astronauts' "jet pack", the Manned Maneuvering Unit, with a grapple. The program called for an astronaut to grasp the satellite and stop its spin before pull-

ing it into the shuttle's cargo bay for repairs. But, when the shuttle Challenger arrived at the satellite early last April, the jet pack's grapple couldn't grip Solar Max to stop its spin. This gave Canadarm the opportunity to flex its muscles and demonstrate the delicacy of its touch. After some fine maneuvering by the shuttle, Canadarm stretched out and seized the satellite, drawing it into the cargo bay.

Once the satellite was recovered, the arm was used as a "cherry picker", (like those that lift telephone linemen), transporting the repair crew with tools and replacement parts as they restored Solar Max to operating condition. Once the repairs were

completed, the arm hefted the observatory out of the shuttle's bay and returned it to space, and hardly a moment too soon. Only two weeks later, Solar Max captured the outburst of one of the strongest solar flares ever observed, returning immense amounts of new data on the phenomenon.

The successful capture and repair has brought numerous inquiries from owners of impaired spacecraft, such as Indonesia's Palapa communications satellite and the National Oceanic and Atmospheric Administration's Landsat 4, for future restoration flights. Canadarm will play a significant role in many of these efforts, more than fulfilling its original design concept.



Cancer Protein

Researchers at the NRC have discovered a protein that could help detect the presence of cancer. Oncomodulin (the word means "regulator from cancer tissue") was found in 85 per cent of the human and rodent tumours that Dr. John MacManus and a team of cell physiologists examined.

They found oncomodulin in tumours from various tissues, including the bladder, cervix, kidney, liver, mus-

cle and skin. So far, no oncomodulin has been detected in normal adult tissue.

In the future these findings could have two concrete applications. First, they could help determine the link between cancer and suspected environmental carcinogens (cancer causing agents). Right now the process is time consuming and usually involves the use of laboratory animals. Using the presence of oncomodulin as an early indication of cancer, scientists may be able to develop a much simpler test. For example, they could take a cell culture (a group of healthy cells grown in the laboratory) and add the suspected carcinogen. If oncomodulin showed up in the culture after a time, then they could have strong evidence for a correlation between the suspected carcinogen and the onset of cancer.

Second, oncomodulin could one day serve as a diagnostic tool. After being exposed to suspected carcinogens, laboratory animals can take years to exhibit visible signs of cancer. Using the presence of oncomodulin as an early warning signal, scientists could know sooner which animals had contracted the disease.

This could save months of waiting, and given the number of experiments, millions of dollars.

Taking this process one step further, oncomodulin could eventually serve as a similar tool in the case of humans.

Oncomodulin is a member of the same family as calmodulin, a calcium binding protein found in all cells more complex than bacteria. Calmodulin (the word means "calcium regulator") is one of the on-off switches in the cell. It activates biological processes, such as the synthesis and duplication of DNA.

MacManus was looking for calmodulin at the internal receptor sites in cancerous cells when he discovered oncomodulin (see *Science Dimension* 1983/3). Two years ago the discovery of this protein, and the fact that 85 percent of the tumours studied contained it, was enough to attract the attention of the United States Cancer Institute. They provided MacManus and his colleagues with financial support, and today they continue trying to unravel the secrets of oncomodulin.

