

# Briefly . . .

## Space arm update

When the U.S. Space Shuttle blasts off on its second launch some 18 months from now, what is arguably the most sophisticated single device on Earth—or off it—will be aboard. It is the RMS, or Remote Manipulator System, designed to load and unload the cargo of the huge NASA orbiter and permit its astronauts unprecedented freedom to manipulate objects in space.

The RMS is entirely Canadian, this country's contribution to the multi-billion-dollar Shuttle. In the years of its development it has kept a crack Canadian aerospace team together, while guaranteeing a place for Canadian payloads in American spaceships over the next decade.

The RMS was designed and built by a team of Canadian industrial contractors under a co-operative arrangement between NASA and the National Research Council. This fall, NASA representatives will travel to Canada to formally review the RMS' performance. At the Toronto facilities of Spar Aerospace (the industry coordinators for the NRC-funded project) the articulated arm will be demonstrated on an air-cushioned "frictionless floor". After ceremonies officially transferring ownership to the American space agency, the hardware will be crated and shipped to the Kennedy Space Center in Florida for further tests, this time with an instrument which permits limited three-dimensional movement (the manipulator arm is designed for full operation only in zero-gravity). After full-system tests of computer software and electronics as well as mechanical hardware, the entire RMS will then be stored to await the return of the Shuttle orbiter from its first test flight, sometime next spring. Following a turnaround refit, the Remote Manipulator System will then go into space and start to work.

## Wave energy

NRC's Division of Mechanical Engineering carried out a series of wave tank tests to measure the efficiency of a new type of wave-energy device in cooperation with Professor Christopher Watts of the Mechanical Engineering Department, Nova Scotia Technical College, Halifax, N.S. Designed by Professor Watts and his colleagues, the 1/12 scale device is an articulated raft made of two platforms hinged together with a hydraulic rotary actuator mounted near the hinge to extract the energy. (The efficiency of extraction is up

to 50 per cent). Under the wave tank conditions in the Division's Hydraulics Laboratory, the model develops a maximum energy output of 80 W, and professor Watts estimates that a full-scale device anchored offshore could extract up to 12 kW of wave energy per metre of wave front under suitable conditions. The wave-energy device was built a year-and-a-half ago with financial assistance from a \$50,000 a year, three-year Strategic Grant from the Natural Sciences and Engineering Research Council (NSERC).

## Pumping heat

When you are seeking a snack in your refrigerator, listen for the click and hum of the motor starting. You have just set in operation one of the more promising energy conservation devices—the heat pump. Heat pumps are one of the leading contenders in the search for alternatives to dwindling fossil fuels. Their operation is simple, inexpensive, and very efficient. Heat pumps simply transfer heat from one place to another through a circulating liquid; they can remove heat from air, water or the ground, to warm the rooms of your house. On hot days, reversing the flow of the liquid can provide air conditioning. Heat pumps as commercial heating units have been available for a number of years, especially in the southern United States where the two-way operation has proven particularly effective. Canadian conditions have limited their application, but rising fuel costs are now making them more attractive.

NRC's Division of Building Research recently completed a cost-effectiveness study in locations across Canada. Owning and operating costs for nine cities over a range of energy demands were calculated to give consumers some basis for choosing the system most efficient for home heating, either in new construction or retrofitting existing homes. All electric or combination "add-on" systems are discussed in the report, which advises that, when available, natural gas should receive first consideration in heating new houses. Most other areas should turn to electric heating in combination with a heat pump for new construction. Heat pumps retrofitted to existing oil heaters should be seriously considered for units having at least a decade of useful life remaining. Consumers, the report stresses, should carefully investigate local costs for installation before making a decision.

## Gonorrhea test kit

The treatment of gonorrhea, a social disease that has reached epidemic proportions throughout the world, has always been hampered by the difficulty in diagnosing it. Not only are there countless strains of the disease bacterium, *Neisseria gonorrhoeae*, but many people, particularly women, can carry the disease without demonstrating overt symptoms. During the last year, a Toronto firm, MDS Health Group Ltd, has marketed a highly sensitive, reliable diagnostic technique based on a method developed at NRC's Division of Biological

Sciences. Not only does the new technique fit in well with the standard operational procedures in VD clinics, but the fact that it provides on-the-spot results solves the problem of a more rapid method of detecting the disease.

The method derives from an NRC research project involving a study of the structures of complex molecules on the outer walls of bacteria called antigens. A so-called lipopolysaccharide or LPS structure was found to be common among all tested strains of *N. gonorrhoeae* and, when injected into laboratory hens, it produced a

powerful antigenic response; in other words, large numbers of very specific antibodies to LPS were generated in the blood of the test animals. This hen antiserum, when mixed with vanishingly small numbers of gonorrhea bacteria—the count found in many "invisible" carriers—causes a clumping or agglutination to occur, which is readily detectable. MDS is currently negotiating with one of the largest British pharmaceutical firms to begin sales of their test kit internationally.