

Scientists at Suffield Experimental Station (SES), Ralston, Alberta, have been busy this year designing and constructing complex measuring equipment for next summer's 500-ton TNT detonation, a major experiment in the SES shock and blast research programme. Two detonations of 20 tons each and two of five tons each were conducted to confirm the results of previous similar experiments and to obtain data required for 1964's massive chemical detonation.

NEW RESEARCH VESSEL

Scientists of the Board's Pacific Naval Laboratory (PNL) at Esquimalt, British Columbia, watched with satisfaction the keel-laying of AGOR 171, to be named CNAV "Endeavour" a specially-designed research ship to be operated by the RCN for the Esquimalt defence-research scientists who specialize in maritime investigations.

The "Endeavour" will be the first Canadian ship specifically designed, built and equipped as a floating laboratory for maritime defence research. The research programme will centre primarily on underwater acoustic and anti-submarine warfare investigations in support of RCN operations.

The ship's overall length will be 235 feet, its breadth 38 feet six inches and its displacement 1,564 tons. It will be capable of cruising 10,000 miles. A bulbous-shaped bow and stabilization tanks will reduce pitching and minimize roll, to facilitate the work of the sea-going scientists. Two large marine-research laboratories will be staffed by 14 PNL scientists, and two helicopter crew members will assist a ship's crew of 36 in supporting the scientists. Special provision is being made for carrying a Naval helicopter aboard.

ARCTIC STUDIES

During the past year, PNL continued studying the behaviour of underwater sound in the ice-covered waters of the Canadian Arctic, as part of its anti-submarine warfare research programme.

Another PNL activity that has taken scientists into Arctic areas is the investigation of low-frequency electromagnetic phenomena. This involves the measurement of small variations of the earth's magnetic field known as "micropulsations", and promises to be of increasing military importance.

Supported by the RCN and the Royal Canadian Air Force, PNL scientists during the year studied natural magnetic phenomena from a station on the ice covering Barrow Strait near Resolute on Cornwallis Island. Records of natural electromagnetic "noise" and its variations from point to point are expected to prove valuable in the design and use of future magnetic detection systems.

In space research, Defence Research Medical Laboratories (DRML) at Downsview near Toronto are contributing usefully to one aspect of the U.S. "man-on-the-moon" programme. The Downsview laboratories were invited to participate in this particular space project, because two of their scientists, Dr. Walter Johnson and Dr. Kenneth Money, have extensive experience in the field of high-altitude physiology.

The DRML scientists are exposing monkeys to various laboratory tests preparatory to flights into space by the animals, varying in time from a fortnight to four weeks. The monkeys will be employed to study the effects of weightlessness and other physiological phenomena encountered by astronauts circling the earth in spacecraft and will be studied on their return to earth by scientists from the Downsview laboratory and from the U.S. Naval School of Aviation at Pensacola, Florida, on behalf of the U.S. National Aeronautics and Space Administration (NASA).

SATELLITE PROGRAMME

In another programme jointly undertaken with NASA, Defence Research Telecommunications Establishment (DRTE) scientists, in association with others interested in studying the ionosphere in efforts to improve long-range radio communications, are continuing to analyse scientific data transmitted to earth stations by DRB's "Alouette" topside-sounder satellite, which celebrated its first birthday in space on September 30. The spacecraft has exceeded in every way the technical performance hoped for by the DRTE scientists and engineers who designed and constructed it. In addition, "Alouette" is adding substantially to man's understanding of the atmospheric envelope called the *ionosphere* that surrounds the earth.

As of December 1, after 14 months of operations, "Alouette" has shown no signs of failure, apart from the normal and expected decrease in solar-cell efficiency from tiny micrometeorites that are gradually etching the glass covering the cells and from damage resulting from man-made upper atmospheric radiations.

It has been unnecessary to switch on any of the satellite's spare components, and the scientists plan further operations for about another 12 months. During its 14 months of operation, the spacecraft has orbited the earth 5,837 times and, in so doing, has travelled 168 million miles. It executed 15,143 commands and provided 2,406 hours of telemetry transmissions, which have resulted in the production of 3,150 miles of magnetic tape containing scientific data.

ADDITIONAL SATELLITES

The usefulness of "Alouette" in providing new information about the upper atmosphere resulted in an invitation from NASA for the design and construction of a series of four additional satellites to be called "Alouette 2" and ISIS A, B and C. Their primary experiments will continue to investigate the ionosphere, and Canadian industry will participate actively in their design and construction. Detailed discussions about the experiments to be carried in the new satellites are now taking place between DRTE and NASA.

A substantial share of the Defence Research Board's resources continued during 1963 to be devoted to operational research, a modern technique of applying scientific methodology to problems

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