CANADIAN FORCES MARITIME EXPERIMENTAL AND TEST RANGES

BY

COMMANDER D. P. MCVICAR, C.D., B.ENG., M.SC., M.ENG., C. F.
(*Commanding Officer, CFMETR*)

ABSTRACT

CFMETR operates two uninstrumented and one instrumented three-dimensional tracking ranges. Many ship system trials are performed in addition to torpedo testing. CFMETR also does proof testing and evaluation of sonobuoys and the factory overhaul and repair of the AN/AQS-502 helicopter sonar.

Introduction

The Canadian Forces Maritime Experimental and Test Ranges (CFMETR) are located in Nanoose Bay, British Columbia, Canada (FIG. 1). CFMETR, a National Defence Headquarters (NDHQ) field unit, has operated continuously in the area since 1965.

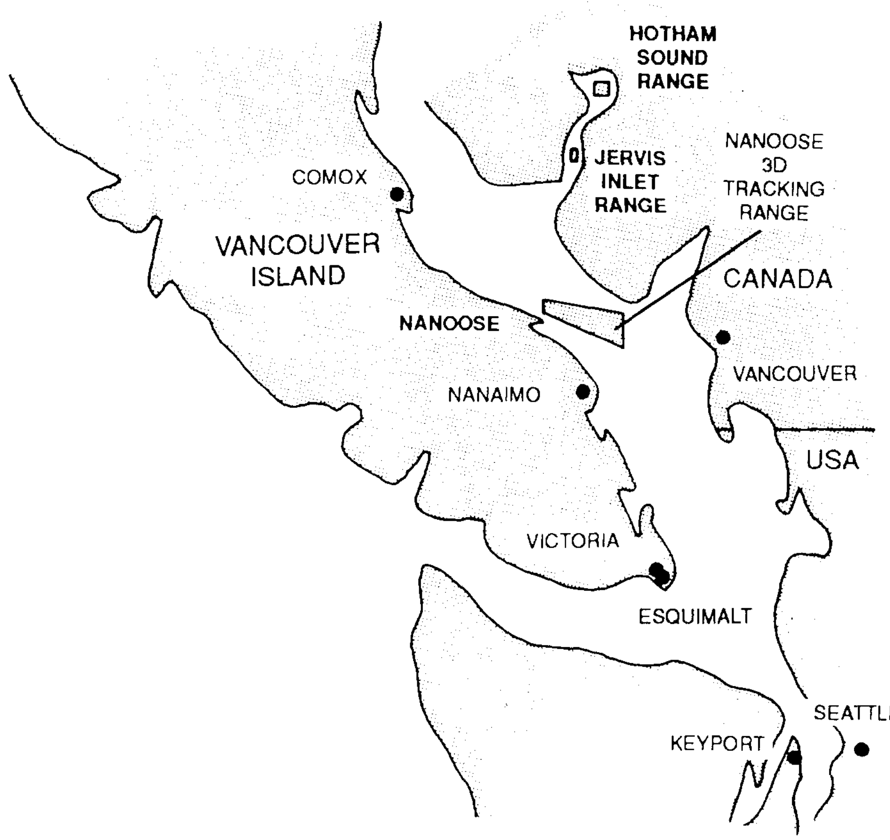

FIG. 1—THE CANADIAN FORCES MARITIME EXPERIMENTAL AND TEST RANGES OPERATE RANGES IN NANOOSE BAY, JERVIS INLET AND HOTHAM SOUND

The functions performed by CFMETR are:

(*a*) Operation and maintenance of the joint Canadian/U.S. Nanoose three-dimenstional underwater tracking range, and the Jervis Inlet range. This includes conducting and analyzing Canadian ship system trials and exercise torpedo firings.

(*b*) Operating the Hotham Sound Acoustic Test Area.

(*c*) Proof testing and evaluation of sonobuoys. CFMETR is the only facility in Canada that does this.

(*d*) Factory overhaul and repair of the AN/AQS-502 ASW helicopter dipping sonar.

There are 20 military personnel (16 Canadian, 4 U.S.N.) and 112 civilians (92 Canadian, 20 American) permanently assigned to CFMETR. In addition, there are 30 to 60 U.S.N. personnel and 10 to 20 U.S. civilians who are temporarily assigned in support of operations at the Nanoose Range.

Background

As torpedoes became more sophisticated during the early 1960s Canada and the United States were faced with the problem of finding a suitable area in which torpedoes could be run and tested to their design limits. An area between Vancouver Island and the British Columbia mainland in Canada seemed ideally suited for such activities. It was sheltered from the open ocean, relatively deep, and had a soft mud bottom which would allow for recovery of torpedoes that sank.

On May 12, 1965 Canada and the United States signed an International Agreement which established a three-dimensional tracking range at Nanoose for a period of 10 years with options for renewal. The Range was first operational in January of 1966 and the Agreement was renewed in 1976 and 1986 for consecutive 10-year terms. An uninstrumented test area in Jervis Inlet, B.C. was established under the Agreement in 1976.

Nanoose 3-D Range

The Nanoose Range is located in the Strait of Georgia. Its position 130 km north of Esquimalt and 210 km north-west of Keyport, Washington state, gives it the advantage of being in reasonable proximity to Canadian and American operational and support facilities. These facilities include, for Canada: Canadian Forces Base Esquimalt, HMC Dockyard, Canadian Forces Ammunition Depot Rocky Point, and Canadian Forces Base Comox; and, for the United States: Naval Undersea Warfare Engineering Station in Keyport, Bremerton Shipyard, and Naval Air Station Whidbey Island.

By the terms of the joint International Agreement Canada is responsible for the:

(*a*) construction and maintenance of all fixed facilities (including buildings, roads, jetties, power, water, etc.); and

(*b*) administration, security, and operational control of the Nanoose 3-D Range and Jervis Inlet Range.

The United States is responsible for:

(*a*) providing, installing, and the maintenance of all technical equipment for operating the 3-D Range; and

(*b*) provision of technical training.

Both countries provide range vessels, crews, technicians, and personnel to operate the facilities.

The available operating time on the 3-D Range is allotted equally between Canada and the United States. Canada historically has not used all of its allotted share of range time, and presently uses the range approximately 20% of the available time. The U.S.N. may utilize available range time in excess of its share in return for financial recompense.

The Range covers an effective area 22 km long and varies in width from 3 to 8 km, giving a total instrumented area of approximately 140 km². The instrumented area is contained in a large mud bottom trough providing water depths of 300 to 450 m.

Tracking

On the Range, specially instrumented objects may be tracked in three dimensions throughout the instrumented portion of the region. Tracking is implemented through the use of a complex system of transducers, receivers, and computers. Evenly spaced about the sea bed under the range are 24 arrays (FIG. 2) each holding four acoustic hydrophones. Acoustic pulses from the object being tracked are received by this bottom-mounted array, amplified, multiplexed and relayed to the computer site on Winchelsea Island which also serves as the range operations control centre. The computer then demultiplexes the information and analyses it to provide to the displays an accurate picture of the tracks of torpedoes, submarines, surface ships, aircraft, and mobile targets for test control. All processed information is also stored for post-run detailed analyses.

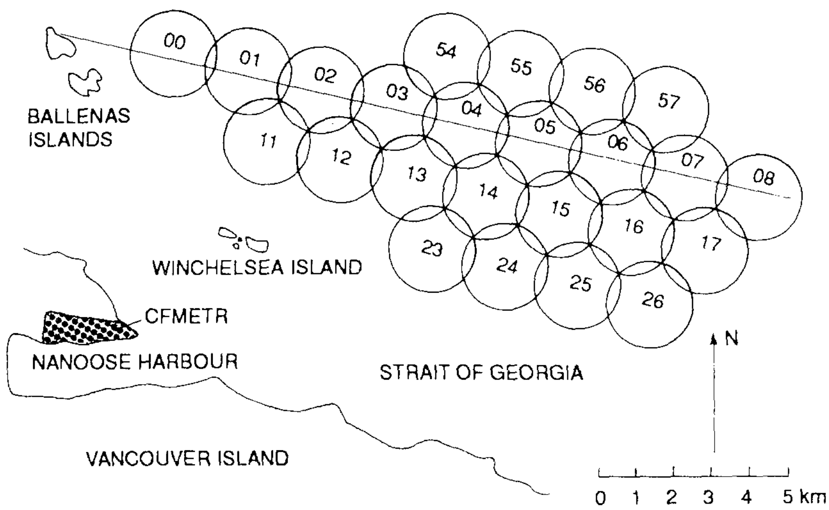

FIG. 2—NANOOSE 3-D TRACKING RANGE

In addition to underwater tracking, surface and air units can be tracked using either a tracking radar, one of two cine sextant cameras (FIG. 3) or a Motorola Mini-Ranger radio ranging system, extending the effective surface and air tracking area out to about 55 km from Winchelsea Island.

Three-dimensional underwater range tracking accuracy is 0.9 to 2.5 m, the Motorola Mini-Ranger radio tracking system accuracy is 4.6 m, and the tracking radar accuracy is 10 m.

The Range has the capability to measure and record a number of acoustic and oceanographic conditions using probes and hydrophones either deployed from range craft or permanently mounted on the sea bed. These include:

(*a*) A probe deployed from a range craft which measures and records conductivity, temperature, and depth in order to determine the sound velocity correction and effective sound ray paths for the day.

(*b*) A bottom-mounted Ambient Noise Measurement System, and a vessel deployed Noise Recording System which record ambient noise, torpedo radiated noise, and other noise signatures.

(*c*) A Doppler Current Profiler which can be deployed from a range craft.

Underwater communication is possible using the sonar communication set AN/WQC-2.

FIG. 3—THE CINE-SEXTANT OPTICAL TRACKING SYSTEM ON WINCHELSEA ISLAND

Trials

Torpedoes are normally recovered by specialized surface craft; however sometimes a test unit will be designed to sink to the sea floor to simulate the real world tactical situation. In these cases specialized remote controlled underwater work vehicles utilizing sonar, underwater television, and other sensing devices will be deployed to recover sunken ordnance.

Trials conducted on the 3-D Range are sub-surface, air, and surface torpedo launches, gyro compass accuracy, electromagnetic log, turning, acceleration/deceleration, radar accuracy, sonar sensitivity and direction, VDS body performance, live and dry ASROC (FIG. 4), inflight characteristics of air-launched payloads, and tactical ship/maritime patrol aircraft operations. Canada uses the range primarily for ASW training exercises for operational units and confirming the reliability of war stock torpedoes. For the U.S.N., the Nanoose 3-D Range is the primary test facility for the development and production proofing of ASW weapons such as the Mk. 50 lightweight torpedo and the Mk. 49 heavyweight torpedo (this used to be referred to as Mk. 48 ADCAP). There were approximately 700 range exercises of various types conducted in 1989.

All trials conducted by Canada on the Range are analysed by the CFMETR Weapons Systems Data Analysis Center. This section also reports on exercises conducted by Canada on other ranges throughout the world.

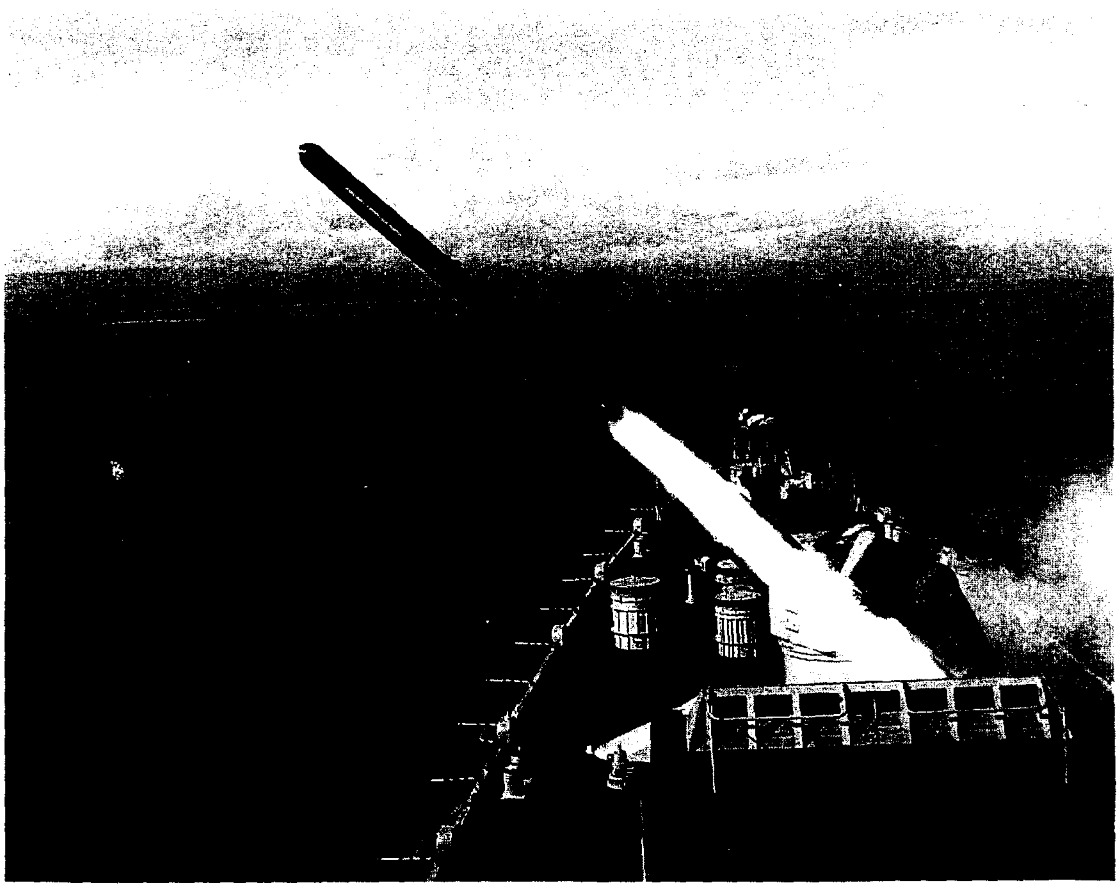

FIG. 4—ASROC LAUNCH OF A MK.46 ROCKET THROWN TORPEDO (RTT) ON THE NANOOSE RANGE

Jervis Inlet Range

The Jervis Inlet Range located approximately 70 km north of Nanoose Bay is uninstrumented, has a depth of 750 m, and is used for testing platforms at greater depths. The Canada/U.S. International Agreement that governs the use of the Nanoose Range also applies to the Jervis Inlet Range. It is normally used about one month during the summer.

Hotham Sound Acoustic Range

CFMETR's acoustic range at Hotham Sound, B.C., is generally acknowledged as the quietest test area of its kind in North America. It is approximately 80 km north of Nanoose Bay. Its combination of depth, accessibility, shelter and acoustic properties provides an ideal environment for evaluating sonobuoy system performance under a wide range of artificially generated shear currents and sea state conditions. The Hotham Sound Acoustic Range is non-instrumented.

The acoustic range functions as an extension to CFMETR's sonobuoy test range at Nanoose. In addition, CFMETR oversees the intermittent operation of a U.S. Department of Defense moored barge acoustic facility under the terms of a Project Arrangement pursuant to the Joint CANUS Test and Evaluation (T&E) umbrella agreement. Under this arrangement, the Department of National Defence provides logistic support on a cost recovery basis, maintains operational control and monitors test results. The site has proven to be of great value to Canadian and American sonobuoy development programmes since its inaugural use in 1984.

Sonobuoy Testing

CFMETR is tasked by NDHQ to conduct all sample proofing, testing and evaluation of sonobuoys procured for the Canadian Forces and (occasionally) foreign governments. Testing can be conducted in any one of four areas: Nanoose Bay, the Nanoose 3-D Range, Jervis Inlet, or Hotham Sound.

The proofing and testing of sonobuoys in Nanoose Bay and on the 3-D Range are concerned with the units manufactured by Sparton of London, Ontario, and Hermes of Dartmouth, Nova Scotia. In a typical test a sample of 34 sonobuoys is selected from each 1,000 production lot by a DND representative and shipped to CFMETR. From this sample, 32 are air-launched from a civilian-operated, locally contracted Beaver aircraft, and the remaining two are kept as spares. Performance is monitored by the shore-based facility and the laboratory vessel *Nimpkish*, and all drops are video-taped for trajectory and drop analysis.

Thanks to the extensive work done on the range, Canada has become a world leader in sonobuoy testing.

AN/AQS-502 Repair and Overhaul

CFMETR is also the repair and overhaul facility for the hydrophones and projectors of the AN/AQS-502 helicopter-borne sonar used by the C.F. Sea King squadrons. This involvement dates back to 1972 with the first in-house overhaul of the AQS-13, the predecessor to the AQS-502. The development and evaluation of modifications to this equipment also take place here.

Today's facility consists of an acoustic test barge and a large workshop area where a chargehand and six technicians perform all electronic and mechanical repairs. This facility has been instrumental in the development and evaluation of modifications that have enhanced the operations of the AQS-502. The operation is geared to support an annual workload of 60 hydrophones and 20 projectors.

CFMETR's broad experience in the specialized field of underwater acoustics, and its year-round, protected ocean test facility make it ideally suited for this type of work.

Conclusion

CFMETR provides a valuable contribution to Canada's defence programme. Its three-dimensional underwater tracking range at Nanoose not only serves as a good example of a successful joint international facility, but it is also one of the finest underwater ranges of its type in the free world.

As acoustics become more important in underwater detection and research, so too will the resources and technical expertise that reside within the facility.