

Since its beginning, the fleet has carried out icebreaking as one of its important undertakings. In its earliest years, such work was done mainly to aid shipping in eastern port areas and in the St. Lawrence for whatever winter period was allowed by weather conditions and the limitations of ships of that area. Icebreaking has also been carried out through the years at Montreal to prevent floods caused by ice jams in the river. When the development of the sea route from Churchill, Man., to Europe became a factor in the country's maritime economy, icebreaker assistance was extended to commercial shipping using that route. Since 1954, as a result of the opening up of the Canadian Arctic, the Department has handled all icebreaking requirements in these waters, extending to within a few hundred miles of the North Pole.

Arctic operations necessitate ice reconnaissance services, which are carried out by fixed wing aircraft flying out of such ports as Churchill, Man., and Frobisher Bay and Resolute Bay in the High Arctic. These flights are under the direction of the Department's Meteorological Branch and provide information on ice conditions in the sea lanes in all areas where the convoys operate. Helicopters, based aboard the icebreakers, are used for close-range reconnaissance. They carry trained observers provided by the Meteorological Branch and their ability to spot leads through the ice, which cannot be seen from the ship, has resulted in tremendous savings in time for the convoys. The helicopters are also very useful for ship-to-shore personnel movements and for carrying light freight.

As an indication of the growth of Arctic re-supply operations handled by the Canadian Coast Guard, the cargo handled, which was approximately 8,000 tons in 1954, had increased to almost 100,000 tons in 1964.

A Canadian Coast Guard Officer Training College, established in 1965 by the Department of Transport at Sydney, N.S., will provide a four-year course for students who will graduate with certificates as either Marine Engineer, First Class, or Master Mariner. The first class comprised forty cadets from all across Canada.

**Aids to Navigation.**—The Canadian system of aids to navigation is similar to that of other North American countries. Such aids maintained by the Department of Transport for Canadian and contiguous waters consist of buoys, lightships, lighthouses, day beacons, radio beacons and two electronic networks operating on the hyperbolic principle—Loran and Decca. The numbers of danger signals maintained during the years ended Mar. 31, 1964 and 1965 were:—

<u>Type of Signal</u>	<u>1963-64</u>	<u>1964-65</u>	<u>Type of Signal</u>	<u>1963-64</u>	<u>1964-65</u>
	No.	No.		No.	No.
Lights.....	3,374	3,447	Hand fog horns and bells.....	60	81
Lightships.....	2	2	Lighted and combination lighted		
Light-keepers.....	893	915	whistling and bell buoys.....	1,598	1,582
Fog whistles and sirens.....	51	54	Unlighted bell and whistling buoys.	57	43
Diaphones and tyfons.....	268	271	Explosive signals.....	1	—
Mechanical bells and gongs..	18	10	Unlighted beacons and buoys.....	12,614	12,786

All aids incorporating light or sound devices are listed in the Department of Transport annual publication *List of Lights and Fog Signals*. Information on the radio beacons and on Loran and Decca is published in *Radio Aids to Marine Navigation*.

Navigable waters have been improved greatly by dredging in channels and harbours, by the removal of obstructions, and by the building of remedial works to maintain or control water levels. Incidental to these developments of navigable waters are works to guard shorelines and prevent erosion, and for the control of roads and bridges that cross navigable channels. Icebreaking operations are continuous throughout the winter.

**St. Lawrence Ship Channel.**—This channel extends from about 40 miles below Quebec City to the foot of the Lachine Canal at Montreal, a distance of 200 miles. About 130 miles of this distance is dredged channel.