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S.N.A.M.E. Arctic Section Spring Meeting

Peter Noble, President, is Founding Chairman of the newly born Arctic Section of the Society of Naval Architects and Marine Engineers based in Calgary.

To mark the first Spring Meeting of the group on Saturday, May 15th, a fine technical program has been drawn together. A morning session will see three papers presented by IHI of Japan, APP and COMINCO on Barge Mounted Processing Plants.

The afternoon session will hopefully provoke interesting discussion with three papers on Ship/Ice Impact Loads from Dome Petroleum, American Bureau of Shipping and ourselves.

The President of SNAME, Mr. John Nachtsheim will be in attendance to present the section with its official banner.

The program which will be held in Calgary's Four Seasons Hotel on 9th Avenue, will commence at 0900 hours and the technical session will end around 1700 hours, followed by cocktails and dinner at 1900 hours.

Why not plan to be at SNAME's latest and active group?

Model Tests of Caisson Islands

A study of the interaction of multi-year ridges and caisson islands was carried out on behalf of Exxon Production Research Company. A model of the island was tested in ARCTEC's Synthetic Ice Basin in Calgary. The unique properties of synthetic ice make it possible to simulate actual ice characteristics and accurately reproduce ice failure modes at relatively small scales. Several model ridges and ice sheets were prepared to represent expected ice dimensions and mechanical properties in the field. Tests were conducted by pushing ice sheets and ridges against the model island. Forces exerted on the island and broken ice shapes and movements were all recorded. The results of this program provide an important guide for safe and economic design of artificial islands that can withstand severe environmental conditions.

Lakehead Harbour Full Scale Trials

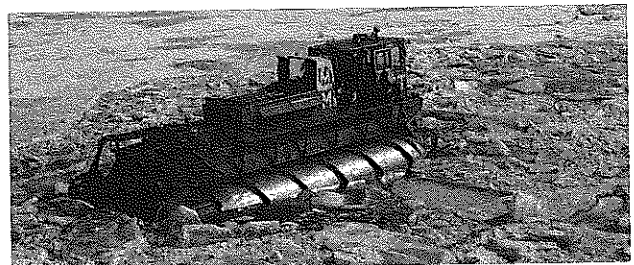
Trials have just been completed by ARCTEC CANADA in Thunder Bay of an amphibious icebreaking craft, the Archimedean Screw Tractor.

The machine, built in Japan by Mitsui, uses large hollow rotors with spiral flights to propel itself in both water and soft materials and on hard standing. These rotors provide the total buoyancy for the 11 tonne craft. The AST-002 breaks ice by climbing onto the edge of an ice sheet and, using the rotors to concentrate most of the machine weight at the edge, fails the ice in a downward motion.

ARCTEC CANADA designed and conducted the test program for the Transportation Development Centre (Government of Canada), Petro-Canada and Mitsui Engineering and Shipbuilding. The objectives of the trials were to evaluate the suitability of the AST for ice management and control in areas where good manoeuvrability and craft control, such as berths at grain terminals are required. This was successfully demonstrated during the trials at the Cargill Grain Co. and at Keefer Terminal berths.

The AST-002 was tested as an amphibious tractor, a personnel carrier, a rescue craft, an icebreaker, and as a tug (in conjunction with Air Cushion Icebreaking Bow trials, carried out in Thunder Bay concurrently). Icebreaking was successfully carried out in ice up to 80 cm (32 in) thick, both in ship-berth areas and in the main harbour.

The Screw Tractor concept is one of several alternative ice management tools which is currently being considered by the Canadian Government for the upgrading of Thunder Bay's port facilities.



AST operating near Thunder Bay

East Coast SLAR/SAR Interpretation

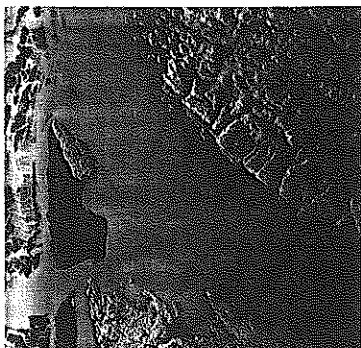
Increasing importance has been placed on the Labrador Sea as a region for petroleum exploration. This has resulted in a need for the collection and analysis of environmental data for these operating regions.

This task is currently being undertaken by our Calgary lab for Petro-Canada Exploration Inc. on behalf of the Labrador group of companies using side looking airborne radar (SLAR) collected by the atmospheric environment service and synthetic aperture radar (SAR) imagery collected by the Canada Center for remote sensing. These are being interpreted to analyze the variability of annual and seasonal spatial patterns of sea ice and icebergs along the Newfoundland — Labrador Continental Shelf.

The radar return is analyzed on the basis of object size, shape, texture and tone. An interpretation key devised by Arctec Canada including typical characteristics of radar imagery for ice types and sea ice features, is used as a guide for analysis in conjunction with information from alternate sensors and general knowledge of ice conditions within the area.

The analysis show very promising results in terms of the detection of the spatial distribution and movement patterns of various ice types and features.

Imagery from different times, sensors and scales in regions also provides useful comparisons of the A.E.S. Ice Patrol SLAR and C.C.R.S. SAR Systems.



SLAR Image of Strait of Belle Isle showing pack ice, icebergs and open water Feb. 16, 1978

A Real Snow Job!

An unusual experiment recently completed in our Cold Room for, of all things, a California based company involved evaluation of a more efficient system for making snow — yes skiers — making snow. Additions to the compressed air/water mix were aimed at improving snow production under a variety of air temperature and humidity conditions. The constant shrill hiss of snow making equipment and compressors and the occasional emergence from the cold room of an 'abominable laboratoryman' was only marginally more acceptable than the smell of heavy oil and the hum of oil pumps in the succeeding cold room test of cold weather oil pumps!

Our Cold Room has been in constant use recently and it is gratifying and challenging as almost every experiment is unique, and specially designed for the job.

Ice Induced Vibrations in Icebreakers

During the winter of 1980-81 ARCTEC CANADA LIMITED in conjunction with ARCTEC Incorporated conducted extensive full scale trials off the coast of Alaska aboard the USCGC POLAR SEA to assess among other things, the vibratory response of the icebreaker to ice induced loads. These trials were jointly sponsored by the U.S. Coast Guard and the Canadian Transportation Development Centre. A vast array of instrumentation was installed within the ship and some of the parameters measured were accelerations and strains at various locations on the ship's structure, thrust and torque measurements of the propellers, measurement of ship's speed through the ice and ice thickness by means of video cameras, etc.

The large amount of data collected by ARCTEC CANADA LIMITED has been catalogued and is stored on magnetic and video tapes.

This data has been used to predict the natural hull vibration characteristics of the ship, as well as the longitudinal vibration characteristics of the three propeller shafts. It has also been used to study the vibrations resulting from interaction between the ship and the ice.

Perhaps the most important outcome of this trial has been the development of a mathematical model that derives a first order value of the force experienced by the ship which created the accelerations measured.



USCGC POLAR SEA

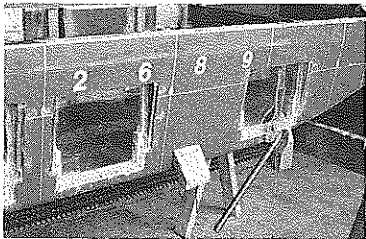
Cruisin' The Gulf

A team of engineers from Mitsubishi Heavy Industries' Hiroshima Shipyard were recently conducted aboard CCGS Icebreaker JOHN A. MACDONALD to witness icebreaking operations and familiarize themselves with shipboard systems. During the cruise our man onboard was able to make detailed studies of level ice cusp breaking patterns to assist him in development of our latest and greatest level ice resistance predictor.

We are indebted to Captain Ivan Green and his staff in Dartmouth for their cooperation in organizing this event, particularly in the face of the reorganization and extra effort which was necessitated by the fire on board the 'LOUIS'.

Super Dredge Model Tests Completed

A series of model tests using Mitsubishi Heavy Industries' 1/60 scale super dredger were recently completed at the Calgary synthetic ice basin. The objective of the tests was to optimize the location of the dredge arms to minimize ice loadings. The dredge arms were instrumented with strain gauges to provide information on the frequency and magnitude of ice impacts. The model was then towed through various ice conditions. The underwater video camera, along with the strain gauge data, made it possible to observe which dredge arm locations are best for avoiding ice loadings. Now that the best dredge arm location has been identified, further tests are planned to study the ice loadings in more detail and to evaluate designs for ice guards around the dredge arms.



Mitsubishi Arctic Super Dredger

Tarsiut Ice Tests

Ice samples from Tarsiut were tested in the Cold Room in Kanata for Dome Petroleum. Tests were conducted at constant strain rates using a closed loop press. This system eliminates much of the problems associated with flexibility of testing machines. Mechanical ice properties were measured under a wide range of conditions in the well controlled environment of the Cold Room. Meanwhile, in-situ testing of ice continues in the field. Both laboratory and field data will contribute to a better understanding of ice characteristics in the Beaufort Sea.

MV ARCTIC

The Class 2 ore carrier continues to ply its summer trade between Europe and Nanisivik, and this year ARCTEC was engaged by the Transportation Development Centre to operate the onboard data acquisition system.



MV ARCTIC

The season was not uneventful; the vessel saw some extremely heavy seas during one of its Atlantic crossings with tragic consequences; she damaged her bow against the dock and required repairs; and during the final run out of the North, just one day before the season closed, encounters with multi-year ice resulted in some significant impacts on the hull. This vessel is proving an excellent test bed for studying dynamic response of ships in ice, and Transport Canada has a significant program involving many agencies working on her.

Developing the Lines of Canada's POLAR VIII Icebreaker

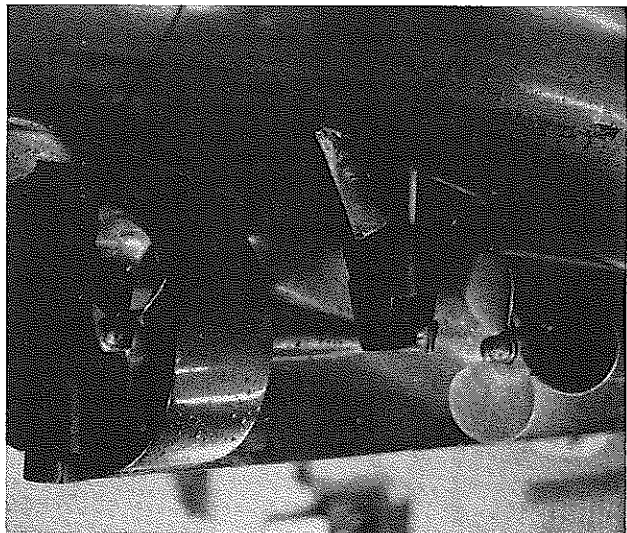
We have recently completed two series of model tests in our Kanata Laboratory designed to investigate hull form options for the POLAR VIII Icebreaker. The Canadian design agent for this vessel is German and Milne Inc. of Montreal and Ottawa, who placed the contract with us.

The first series of tests explored the manoeuvrability of the POLAR VIII with a proposed rudder and propulsion configuration. The stern configuration consisted of a triple-screw, triple-rudder arrangement representing a full-scale 100,000 HP plant. The hull form used for these tests was the modified 1/40th scale model of the POLAR VII (NRC hull form series #299). The modification included the addition of a Type 37 Kort nozzle around the center propeller with an appropriate fairing and ice horn. The next addition was two semi-balanced wing rudders on ice horns. This was only the second time that turning tests had been performed in the model ice basin. The tests consisted of partial 'zig-zags' with a radio controlled free running self propelled model from which initial turning rates, overshoots, etc. were established and captive towed tests in which both turning moments and loads on the rudders were examined. Runs were performed in level and broken ice, and underwater video was made of the ice interaction with the stern features.

This limited test series resulted in a considerable amount of data concerning ship performance and appendage vulnerability. It would have been advantageous however to have had a slightly wider basin.

The second series of tests examined three variants of the bow design for the POLAR VIII. This involved sawing models in half and adding new bow sections, as well as 'on the spot' modifications using body filler. Resistance and ice flow visualization were the main objectives of these tests. As usual there were some surprises in store and not all the results were intuitively obvious, which goes to show that a few hours of 'hands-on' testing in the laboratory can give you many of the answers that pouring over lines and computer programs cannot!

We hope there will be further development of the hull for Canada's newest and biggest icebreaker — but that may have to await the outcome of the APP's NEB Hearings!!



One of the stern options tested for the Polar Icebreaker

Oceanology International Trip

ARCTEC CANADA participated as part of the Canadian delegation to Oceanology International during March. Oceanology International is a trade show and conference held annually in Brighton, England, with emphasis on North sea production. ARCTEC CANADA was unique at the show with its emphasis on Arctic and Cold Regions technology, and its model testing facilities.

Welcome Aboard to Two New V-Ps

Peter Noble, President of ARCTEC CANADA LIMITED, was pleased to welcome two new executives to our Calgary Laboratory. Dusty Miller is well known to most people in the icebreaking and ice engineering business. Dusty — of the Naval Architecture cloth — joins us from Esso's Beaufort Sea Development Group. Before joining Esso Dusty held key positions in the Arctic Pilot Project and Ringas Project for Petro Can, and also spent a number of years in Coast Guard Headquarters in Ottawa.

Alex Semeniuk, having spent some years running a business covering his first love — cabinet making — hails from Petro Can's Frontier Systems Development Group and Esso. Alex has a Ph.D. in Mechanical Engineering and a background in offshore production and modelling of ice loads on structures, including operation of Esso's outdoor ice basin.



Alex Semeniuk



Dusty Miller

MAIL TO:

Back Issues

A number of enthusiastic recipients of 'Ice News Canada' are concerned lest they have missed issues. This belief is fostered by our proclamation that Ice News is published quarterly — that may have been our target publication frequency, but we have fallen a little short. If you wish to check your copies here is a full list of those that have been published. Since some of you may also receive Ice News from ARCTEC Incorporated, Maryland, we are also listing issues of that magazine.

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