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SUMMARY			
<p>The Canadian Marine Hydromechanics and Structures Conferences (CMHSC) have been held approximately every two years since 1991. The success of the CMHSC has been the result on the interest, commitment, and enthusiasm of a small number of people who have maintained the initial vision of the Conference. This leadership role will inevitably pass on to persons who will not have had a long involvement with the CMHSC as participants or organisers. To ensure the continuation of the CMHSC there is a need to document the objectives conference and the unique features of its organisation. This history is intended to meet this need. In addition a draft charter for the CMHSC that describes the structure and responsibilities of the conference organisation in detail is given in the Appendix.</p>			
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HISTORY OF THE CANADIAN MARINE HYDROMECHANICS AND STRUCTURES CONFERENCE

LM-2010-11

David Murdey

October 2010

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HISTORY OF THE CANADIAN MARINE HYDROMECHANICS AND STRUCTURES CONFERENCE

1.0 INTRODUCTION

The Canadian Marine Hydromechanics and Structures Conferences (CMHSC) have been held approximately every two years since 1991. The success of the CMHSC has been the result on the interest, commitment, and enthusiasm of a small number of people who have maintained the initial vision of the Conference. This leadership role will inevitably pass on to persons who will not have had a long involvement with the CMHSC as participants or organisers. To ensure the continuation of the CMHSC there is a need to document the objectives conference and the unique features of its organisation. This history is intended to meet this need. In addition a draft charter for the CMHSC that describes the structure and responsibilities of the conference organisation in detail is given in the Appendix.

2.0 INITIATION, OBJECTIVES AND ORGANISATION

It may be argued that the prime purposes of any scientific conference are to provide a forum for the presentation of ideas and to promote communication and exchanges of information between people working on topics covered by the conference. The areas of marine hydrodynamics and naval architecture are well served by conferences. Some such as, ONR, SNAME, RINA, OMAE, and PRADS cover a wide range of topics, while others such as FAST, MARSIM, STAB and ICETECH offer opportunities for presenting and discussing the results of research in particular areas. Most are international conferences, although some tend to be focused on interests of the country hosting the conference. The comment has often been made that there are too many conferences, and that this leads to reduced participation and potential dilution of technical content. Why then, in 1990, was the decision made to create yet another conference? And who made that decision?

This decision was made jointly by three people: N. E. Jeffrey, the Director General of the NRC Institute for Marine Dynamics (IMD, now Institute for Ocean Technology, IOT) in St. John's, NL, Prof. C.C. Hsuing of the Technical University of Nova Scotia (TUNS, now Dalhousie University, DAL) in Halifax, NS and Prof. S. M. Calisal of the University of British Columbia (UBC) in Vancouver, BC. In this history, these three are called "The Founders". The Founders met during a joint meeting of the American Society of Mechanical Engineers and the Canadian Society of Mechanical Engineers at the University of Toronto in 1990. The meeting had included a symposium on in Ship and Offshore Dynamics. Prof. Hsuing had organised that symposium and arranged for participation from academic and research groups throughout Canada. As Professor Hsuing recalls "One evening, after dinner together, the three of us walked through the University

of Toronto campus. We stopped by a courtyard, sat on one of the cement benches and started a serious discussion on: if we, the Canadian marine dynamics academic and research groups, should have a marine dynamics conference for our own?" The answer to this question was "Yes" and the Canadian Marine Hydrodynamic Conference was born.

The objectives for the conference and its organisation followed directly from this discussion.

The majority of marine hydrodynamics research in Canada was then (and still is) carried out at three locations across the country, St. John's, NL, Halifax/Dartmouth, NS and Vancouver, BC. Researchers working in one location had only a vague idea of work being carried out in their field in other areas of the country and it often took a long time for information to reach those who could benefit from it. The Founders were concerned that in many cases Canadian researchers only learned about Canadian research in marine hydrodynamics carried out outside their own centre at conferences abroad. The Founders felt there was need for a forum for the presentation of Canadian research to Canadians. They hoped that such a forum would help researchers from across the country get to know one another that this would lead to research cooperation. Only through cooperating to carry out research targeted at issues of importance to Canada, could the Canadian marine dynamics community hope to compete with larger foreign research communities.

The idea was to have a national conference that would bring Canadian researchers together. Although not written down, the objectives of the Conference may be summarized as follows:

- 1) To provide a forum for exchanging information on current Canadian marine hydrodynamics research.
- 2) To provide opportunities for communication leading to research cooperation in areas of importance to Canada.

The conference was at first named the Canadian Marine Dynamics Conference. Marine structural mechanics was included from the third conference and the name then became the Canadian Marine Hydromechanics and Structures Conference, usually known by its acronym CMHSC. Marine dynamics was not closely defined, but the name was chosen deliberately to reflect the mandate of IMD at the time. This has been interpreted flexibly, and the technical content of the Conference has been determined by the current Canadian research in marine hydromechanics and structures.

It was also agreed that the Conference should be held in turn at each of the three major locations where research in marine dynamics was carried out: Vancouver, BC, Halifax/Dartmouth, NS and St. John's, NL. N. E. Jeffrey offered to host the

first conference in St. John's in the following year, 1991. Conferences have taken place generally at two-year intervals since then. This has been found to be long enough for new information to become available but not so long so as to lose the momentum generated by the conferences. Eight Conferences have been held between 1991 and 2007.

A conference organization has evolved which comprises a steering committee and a local organizing committee. The organization is informal, with no terms of reference for either committee. The steering committee generally comprises representatives from organizations in each of the locations where the conference is usually held. It decides on the venue and date for Conference, and acts in an advisory capacity to the local organizing committee on issues relating to the conference program. The local organizing committee, as its name suggests, looks after all the arrangements for the conference itself, including issuing the call for papers and publishing the proceedings.

The biggest change in technical program came in 1995, when structures were added. Up until 1993 ship structures had been covered in the Department of National Defence (DND) Ship Structures Workshops that had been held since 1985. These two-day workshops were organized by the Chief Research and Development (CRAD, now Defence Research and Development Canada, DRDC) and were part of the DND project oversight and planning process. They were well attended (30 to 40 people) and were held at various venues, with participation from several groups in DND, industry and universities. In 1993 the format for defining the DND research program changed to the Thrust based system with Thrust Advisory Group meetings and there was no longer a formal requirement for the Structures Workshops. It was decided to combine the Structures Workshop activities with the Canadian Marine Dynamics Conference to give the structures work a home for exchanging information.

The emphasis on the communication between Canadian researchers, resulted in two key differences between the CMHSC and other conferences. This first is that the presentation of on-going work, including papers written by students, is encouraged. Second, papers could be included in the program that had been previously presented abroad, but never to a Canadian audience. Abstracts are reviewed to ensure the technical content is appropriate for the CMHSC, but papers are not subjected to a peer review process.

Keynote speakers have been a feature of several conferences. Prof. J. V. Wehausen from the University of California accepted the invitation to be the keynote speaker to the first conference. He gave a lecture on the contributions of Euler to naval architecture. In 1993 Robert Allan of Robert Allan Ltd, spoke about the requirements of Canadian ship designers and builders for research and new technologies. There were no keynote speakers at the next three conferences but at the sixth conference in 2001 Prof. M. Isaacson of UBC presented a lecture on wave effects on Large Structures and in 2005 Glenn Ashe

of ABS Americas spoke on Naval Ship Rules and the application of the classification process to naval surface combatants. There was no keynote speaker in 2007.

3.0 CONFERENCE PARTICIPATION

The statistics on conference participation give an indication of the development of the conference since the first one in 1991 and the degree to which the initial objectives have been achieved. The dates and locations of the eight conferences carried out to date are given in Table 1.

As may be seen from the conference dates, no conference was held in 2003, which resulted in an interval of 4 years between conferences six and seven. At the time of writing (October 2010) the ninth conference has not been scheduled. With these exceptions the two-year interval has been followed. The planned rotation of the conference location between the three major research centres, St. John's, Halifax and Vancouver, has been maintained, except for the fourth conference, which was held in Ottawa, organized by Fleet Technology (Now BMT Fleet). The reason for this change was to give a greater opportunity for the government sponsors of research, such as DND, Transport Canada and Fisheries and Oceans, which are located in Ottawa to participate. It was hoped that this would lead a better appreciation by the research community of the most pressing issues requiring research in Canada and by the research sponsors of the strengths of Canadian research. It turned out that the attendance by these agencies was small and the experiment has not been repeated.

The usual measure of conference participation is the number of persons registered. Unfortunately for the CMHSC this information, shown in Table 1, is only available for the 2005 and 2007 Conferences. In order to gain an insight into the level of activity associated with the conference it is necessary to resort to other correlated measures.

The number of papers is one such measure and is also included in Table 1. The number of attendees is expected to be greater than the number of papers because many papers have more than one author, several of whom may attend and people who are not authors also register. The number of persons registered and the number of authors in 2005 and 2007 are in line with this expectation. Although there has been considerable variation from year to year, the average number of 28 papers confirms the qualitative perception of the conference size.

Another measure related to participation is the number of organisations represented by the authors of the papers. In this review, an organisation is represented when at least one member of the staff of the organization is listed as an author. The number of organisations defined in this way is given in Table 1. Although not all organisations involved with the conference would be represented

in person at a Conference, this number does give an indication of the reach and awareness of the conference throughout the community.

Table 2 shows how the papers from participating organisations are divided between government, universities and industry in Canada. The table also lists the number of papers with authors from organizations outside of the country. The participation by Government organizations and universities is about the same, both being much greater than that from industry. This is to be expected since for universities and government research organizations such as IOT and DRDC carrying out research and publishing the results is part of their mandate.

International participation, although welcomed, has not been solicited. Most of the international papers published in the proceedings have been written by students who had studied in Canada and who had returned to their home country before the Conference took place. This reason only partially explains the very high international participation at the 2001 conference in Vancouver, which remains an anomaly.

Table 2 also shows the number of papers with authors from more than one organization. This has never been less than 27% of all the papers, and has increased over the years to a high of 62% in 2007. Although there are many reasons why representatives from more than one organization might be listed together as authors, these numbers provides a measure of the increase in cooperation and collaboration between organizations since 1991. It is not possible to ascribe the increase to the CMHSC, but the conference does provide evidence of progress.

The lists of authors and their affiliations published in the proceedings of the conferences also show the extent to which the Canadian marine research community is concentrated in a few organisations. Table 3 gives the names of organizations with authors named on papers at at least two conferences. Not surprisingly, most authors are associated with DRDC and TUNS in Halifax, IOT and MUN in St. John's and UBC in Vancouver. There has been valuable industrial participation over many years from Martec, Halifax, BMT (Fleet), Kanata, Oceanic, St. John's and ISE in BC.

4.0 TECHNICAL CONTENT

The proceedings of the CMHSC provide a window on the research in Marine Hydrodynamics carried out in Canada since the early 1990s. The titles of the papers give an indication of the areas of research that have been most active during this period and changes in the number of papers dealing with specific topics give some idea of how the emphasis may have shifted over the last 20 years. It is not the intention of this brief history to review progress in marine hydrodynamics and structures research in Canada since 1991. To so would require a study of research published in many journals and presented at

international conferences. This review is limited to the information in CMHSC proceedings.

To identify these trends, the papers have been classified into the following fairly wide categories:

Ice and Arctic navigation

Resistance, propulsion and propellers

Ship motions and wave loads (Seakeeping and manoeuvring)

Structural design

Offshore engineering (including wave energy)

Underwater vehicles

Computational fluid dynamics (CFD)

Other topics

Other topics includes review papers and descriptions of test equipment which has a wide application.

Many papers can be assigned more than one category; these have been placed in the category given most emphasis in the paper. For example papers on submarine propulsion have been placed in the Underwater Vehicles category, and papers concerned with propeller interaction with ice placed in the Ice and Arctic navigation category. While there is a degree of subjectivity in these classifications they should be sufficient to show any broad trends.

Papers classified CFD have been treated slightly differently. Many of the papers classified as CFD are concerned with the development and application of numerical methods for the solution of problems in the other areas. For example there are several papers concerned with computation of wave resistance of ships or ship motions in waves. Such papers have been classified both under CFD and under the area in which the work most closely applies. For this reason, the total number of papers does not equal the sum of the number of papers in each category

The results of this classification exercise are shown in Table 4. The total number of papers in each category and the average number per conference are given at the foot of the table.

On the basis of the papers presented at the CMHSC, ship motions and wave loads has seen most research activity. CFD provided the second largest number of papers. The interest in CFD is in line with trends seen worldwide over the past 20 years. Many of the computational methods relate to simulation of ship motions and to ship resistance. Others are of a fundamental nature, with no

immediate application identified in the papers. The third largest group is structures, a topic that was specifically added to the conference program from 1995, and has always been a large part of the DND contribution.

Perhaps surprising is the very small number of papers describing work in relation to offshore engineering. The six papers in 2007 include three concerned with wave energy. Also surprising, given its importance to Canada, is the small number of papers relating to ice and arctic navigation. This may be due to the publication of Canadian research at ICETECH, an international conference that has always had a very strong Canadian following. (ICETECH is organized by the Arctic Section of SNAME. It has been held five times since the initiation of CMHSC, in Canada in 1994, 2006 and 2000 in Russia in 2000 and Alaska in 2010).

In view of the continuing interest of Canadian researchers in ship motions and wave loads, it is perhaps worthwhile to break down this category into more detail.

The following are included in the ship motions category:

Seakeeping (prediction and measurement of ships motions in waves)

Stabilization including safety and habitability

Wave loads

Hull form design for performance in waves

Waves and wave propagation

Manoeuvring and control

Other

Each of these sub-categories includes research using or developing model experiments, theoretical or computational methods or full-scale trials.

Table 5 shows that 70% of the papers which presented research related to ship motions were concerned with the three sub-topics related to seakeeping (the prediction and measurement of ship motions), motion stabilization, and wave loading on a hull. The interest in motions and motions stabilization has been maintained at a fairly steady level throughout the period of the Conference. In the case of wave loads, although the average number of papers is similar to motions and stability, most of these were presented at the second and fifth conferences. Up until 1999 there were one or two papers on hull form design for seakeeping at each conference. These papers present information on the behaviour of specific hulls or series of hulls and provide data that could be of direct benefit to a designer. Perhaps the decline in Canadian shipbuilding and ship design has resulted in fewer researchers carrying out work, which could lead such practical papers.

In contrast to the effects of waves, there have only been three papers presented since 1991 concerning manoeuvring. This is surprising, given the potential for pollution as a result of collisions or grounding in Canadian coastal waters.

It is emphasized that this review is a review of the topics covered by papers presented at the CMHSC, not a review of all Canadian research in marine hydrodynamics and structures over this period.

5.0 SUMMARY

Since 1991 the CMHSC had been held 8 times and provided for the presentation of 221 papers, the vast majority with Canadian authors. The CMHSC is evidently fulfilling the need, foreseen by the Founders, for a Canadian forum for the presentation of Canadian research. The papers published at the CMHSC have authors from across the country, from industry, Government and Universities, which shows that the Conference is achieving the objective of bringing Canadian researchers together and providing for technical and social interaction. The number of papers with authors from more than one organization has increased from 27% at the first conference to 62% in 2007. Although it cannot be demonstrated that this is due to the conference, it is a finding that supports the objectives of CMHSC.

Overall it seems to the author that the CMHSC has been worthwhile and there seems no reason why it should not continue bring benefits to Canadian marine technology research.

6.0 ACKNOWLEDGEMENTS

The Author wishes to thank Prof. C. C. Hsuing and Prof. S. M. Calisal for passing on their memories of the meeting 20 years ago which initiated the Conferences and Dr. N. Pegg for information on how ship structures became incorporated into the Canadian Marine Hydromechanics Conference.

Table 1
Conference Participation

	<u>Date</u>	<u>Location</u>	<u>Number of persons registered</u>	<u>Total number of papers</u>	<u>Number of organizations represented</u>
<u>Canadian Marine Dynamics Conference</u>					
1	Aug 5-6 1991	St. John's	-	15	11
2	Aug 9-11 1993	Vancouver	-	40	18
<u>Canadian Marine Hydromechanics and Structures Conference</u>					
3	Aug 14-16 1995	Halifax	-	26	19
4	Jun 25-27 1997	Ottawa	-	24	19
5	Jul 8-9 1999	St. John's	-	16	13
6	May 23-26 2001	Vancouver	-	33	21
7	Sep 21-22 2005	Halifax	36	30	12
8	Oct 16-17 2007	St. John's	52	37	14
		Average		28	16

Table 2

Types of organizations involved with CMHSC

<u>Date</u>	<u>Location</u>	Papers with authors from				<u>Papers with authors from more than one organization</u>	
		Government	Universities	Industry	International		
1991	St. John's	6	9	4	1	4	27%
1993	Vancouver	26	14	10	3	11	28%
1995	Halifax	13	13	12	1	10	39%
1997	Ottawa	15	13	9	2	10	42%
1999	St. John's	9	8	5	2	8	50%
2001	Vancouver	15	11	11	11	12	36%
2005	Halifax	19	23	7	0	16	53%
2007	St. John's	25	26	8	5	23	62%

Table 3

Organizations that have authors named on papers at at least two conferences

<u>Date</u>	<u>Location</u>	<u>Government organizations</u>						<u>Universities</u>				<u>Companies</u>					
		<u>CCG</u>	<u>DRDC (DREA)</u>	<u>DRDC (DREP)</u>	<u>DRDC (DRES)</u>	<u>IOT (IMD)</u>	<u>DND Ottawa</u>	<u>Carleton</u>	<u>MUN</u>	<u>DAL (TUNS)</u>	<u>UBC</u>	<u>BMT Fleet ON</u>	<u>Martec NS</u>	<u>Oceanic NL</u>	<u>ISE BC</u>	<u>Kaeverna Masa BC</u>	<u>Fleetway NS</u>
1991	St. John's		1	1		4		5	2	2							
1993	Vancouver		10	1	1	11	3	3	3	8	1	3		2			
1995	Halifax	1	7	1	1	1		1	3	4	3	2	5				
1997	Ottawa		7			6	1	2	6	3	2		1	1	1		
1999	St. John's		8			3	1		3	2	4	1		1			
2001	Vancouver		4			6	1		5	2	7	2	3		3	3	
2005	Halifax		5		2	12		2	15	2	3		3			1	
2007	St. John's	1	9			14	1		21		1		4			2	
	Total	2	51	3	4	57	7	5	61	18	30	6	15	6	6	4	3

Table 4
Research Topics

<u>Date</u>	<u>Location</u>	<u>Total number of papers</u>	<u>Ice and Arctic Navigation</u>	<u>Resistance, propulsion and propellers</u>	<u>Ship motions and wave loads</u>	<u>Structural design</u>	<u>Offshore Eng.</u>	<u>Under water vehicles</u>	<u>Other</u>	<u>CFD</u>
1991	St. John's	15	2	1	6	1	2	1	0	4
1993	Vancouver	40	3	4	9	11	2	5	1	10
1995	Halifax	26	2	5	6	6	0	2	1	8
1997	Ottawa	24	2	2	12	4	0	1	3	3
1999	St. John's	16	1	2	7	3	0	2	0	4
2001	Vancouver	33	4	6	3	6	0	6	3	6
2005	Halifax	30	1	8	9	6	3	0	3	5
2007	St. John's	37	3	7	7	4	6	5	4	6
		Total	18	35	59	41	13	22	15	46
		Average	2.3	4.4	7.4	5.1	1.6	2.8	1.9	5.8

Table 5
Ship motions and wave Loads

<u>Date</u>	<u>Location</u>	<u>Total number of papers</u>	<u>Number of papers on ship motions</u>	<u>Seakeeping</u>	<u>Stabilization, Safety</u>	<u>Wave loads</u>	<u>Hull form design</u>	<u>Waves</u>	<u>Manoeuvring</u>	<u>Other</u>
1991	St. John's	15	6	2	1	0	2	0	1	0
1993	Vancouver	40	9	2	1	5	1	0	0	0
1995	Halifax	26	6	1	2	1	2	0	0	0
1997	Ottawa	24	12	2	4	1	1	1	1	2
1999	St. John's	16	7	0	2	4	1	0	0	0
2001	Vancouver	33	3	2	0	0	0	1	0	0
2005	Halifax	30	9	3	3	1	0	1	0	1
2007	St. John's	37	7	2	2	1	0	1	1	0
	Total	221	59	14	15	13	7	4	3	3
	Average	27.6	7.4	1.8	1.9	1.6	0.9	0.5	0.4	0.4

ANNEX A

DRAFT CHARTER FOR THE CANADIAN MARINE HYDROMECHANICS AND STRUCTURES CONFERENCE

1. Objectives

The objectives of the Canadian Marine Hydromechanics and Structures Conference (CMHSC) are:

- (a) To provide a forum for exchanging information on current Canadian marine hydromechanics and structures research;
- (b) To provide opportunities for communication leading to research cooperation in areas of importance to Canada.

2. Conferences

2.1 Time between Conferences

The Conference shall be held at two-year intervals.

2.2 Conference location

The Conference shall be held in turn at each of the three major locations where research in marine dynamics is carried out in Canada: Vancouver, BC, Halifax/Dartmouth, NS and St. John's, NL.

The Steering Committee may change the location and interval between Conferences to meet changes in the Canadian marine technology research environment.

2.3 Conference arrangements

The Conference shall comprise technical sessions for the presentation and discussion of research papers. The sessions may also include workshops to address special topics or any other format to achieve the aims of the Conference.

2.4 Keynote speaker

A keynote speaker may be invited to address the Conference. The speaker should be highly regarded in the profession and the topic should highlight an area of concern for Canada or international developments which may be expected to impact on Canadian research.

3. Papers

3.1 Topics

Papers should describe research in marine hydromechanics or structures carried out in Canada or by Canadian organizations working abroad. International participation although welcomed, is not solicited

3.2 On-going work and student papers

Presentation of on-going work, including papers written by students, shall be encouraged.

3.3 Research previously published

Papers may be included in the program that have been previously presented abroad, but never to a Canadian audience.

3.4 Abstracts

Abstracts of papers proposed for presentation shall be reviewed to ensure the technical content is appropriate for the CMHSC, but papers are not subjected to a peer review process.

4. Organization

4.1 Steering Committee

The Steering Committee decides the venue and date for Conference and the scope of topics to be covered.

The Steering Committee shall comprise a representative from each organization that has hosted the conference. At least one organization from each of the three major locations where research in marine hydromechanics is carried out shall be represented. The Chairman of the Steering Committee shall be the representative of the organization that is host of the next Conference. The new Chairman of the Steering Committee shall take on the role at the end of the Conference.

The Steering Committee shall meet during the Conference. Electronic communication shall be used for communication between Conferences.

4.2 Local Organizing Committee

The Local Organizing Committee is responsible all the arrangements for the Conference itself, including the Conference program, arranging financing, issuing the call for papers, reviewing abstracts and publishing the proceedings.

The Chairman of the Organizing Committee shall be a representative of the organization that will to host of the next conference, and may also be Chairman of the Steering Committee. The Chairman shall appoint members to the Organizing Committee as required.