Research in Shortsea Shipping: the State of the Art

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Abstract

There has been an explosive growth in shortsea shipping related research during the last six years. In this period there have been about 80 papers presented at the three European Research Roundtable on Shortsea Shipping conferences to date (1992, 1994, and 1996). In addition, the three FAST international conferences on fast waterborne transport (1991, 1993, and 1995) presented close to 300 papers, of which about 70 directly focus on shortsea shipping. Various projects, national and international, have been also initiated in this area. In the context of the 4th Framework Programme, the European Commission/ Directorate General for Transport (DGVII) has launched in early 1996 several shared cost projects, as well as a concerted action explicitly targeted to shortsea shipping. Other directorates such as DGXII and DGXIII have also launched related projects in early 1996. In view of such a boom of research activity, it becomes imperative to critically survey such work, and also make a taxonomy of it, so that all this work is sorted out, and the baseline for further research becomes clear. Failure to do this will inevitably result in duplication of effort, gaps in research, lack of vision on what is needed, and other negative ramifications. The purpose of this paper is to carry out a critical survey and taxonomy of such work. The survey has involved a European-wide solicitation of input on related work, and also a collection of input from other sources. The paper also presents a software tool developed to assist in information entry, update, and retrieval, and also attempts to identify common trends on research topics. Without claiming that the contents of the paper are encyclopaedic, or that each and every piece of material collected has been reviewed in depth, we can at least claim that the 442 entries catalogued represent an unprecedented compilation of material in this area. Perhaps the most important trend identified within this vast collection the material is a significant degree of “fragmentation” of R&D effort in the SSS field, in the sense that problems that are methodologically similar in many contexts have been typically addressed in isolation. The most obvious consequence of this fragmentation is that the impact of R&D efforts to serve the real needs of European SSS has been so far limited. Commission-sponsored activities such as the SSS Roundtable Conferences, the Concerted Action on SSS, the collaborative R&D projects under way, and other related activities are expected to alleviate this situation in the future.
1. Introduction

Shortsea shipping is one of the least subsidized modes of transport in Europe, at least compared to its land-based competitors, such as road and rail transport. The true costs of the latter (including environmental costs) are not fully internalized, and as a result of this distortion there is severe congestion in the European road and rail freight networks, and severe environmental and social impacts. The Commission's White Paper on the future development of a Common Transport Policy-CTP (COM(92) 494 final) clearly states that the CTP should minimize such distortions by focusing on environment-friendly modes such as shortsea shipping.

Shortsea shipping is thus emerging as an important focal point of the transport policy of the European Union. As intra-European borders are rapidly being dismantled, and Eastern Europe is gradually becoming more open, shortsea shipping's significance gains a prominent role, and its potential in enhancing the EU's competitiveness, economic and social cohesion, and sustained mobility is very real. Developments in information technologies and telecommunications have significantly increased the potential for efficient intermodal transport, which opens new horizons for shortsea shipping.

Addressing the entire spectrum of problems in shortsea shipping is a monumental task. It calls for (among other things) significant R&D to determine policy priorities in this area. Fora such as the Maritime Industries Forum and various conferences deal with many of the relevant issues. Much of the necessary R&D is being sponsored by the Commission. Individual countries are also sponsoring related programs.

It is fair to say that the growth in shortsea shipping related research during the last six years has been explosive. Conferences such as the European Research Roundtable in Shortsea Shipping (1992, 1994, and 1996) and the FAST international conference on fast waterborne transport (1991, 1993, and 1995) have collectively presented about 150 papers directly focusing on shortsea shipping and close to 250 others peripherally related to the subject. In addition, various projects, national and international, have been initiated in this area. In the context of the 4th Framework Programme, the European Commission/Directorate General for Transport (DGVII) has launched in early 1996 several shared cost projects in areas related to shortsea shipping, as well as a concerted action explicitly targeted to shortsea shipping. Other directorates such as DGXII and DGXIII have also launched related projects.

In view of such a boom of research activity, and in view of ambitious plans for further research in this area (5th Framework Programme, to state one example) it was felt that the time was ripe to take stock and critically survey such work, and the baseline for further research becomes clear. Failure to do this would inevitably result in lack of knowledge on where one stands, duplication of effort, gaps in research, lack of vision on what is needed, and other negative ramifications.

In that context, the purpose of this paper has been to carry out a survey and taxonomy of such work.

The goal of compiling a comprehensive “inventory” of shortsea shipping related research presents a number of significant difficulties. These following two are the most important:

1) Lack of an unambiguous delineation of the field: Does a paper or a project on the hydrodynamic or structural analysis of fast catamarans belong to shortsea shipping? Is a project on risk analysis in coastal waters a shortsea shipping project? What about projects on integrated ship control, marine propulsion performance, or the analysis of maritime law? Even though shortsea shipping is a multi-disciplinary field, there are no unique answers to these questions, much of which are matters of subjective judgment. This paper is no exception. As in all surveys, the composition of material in this paper is in many ways (although by no means exclusively) a product of our judgment call on what should be included in it and what not.

2) Lack of information on every conceivable project, paper, or related work: Much of the material in this paper has been provided to the authors by individuals who undertook the task of collecting such information either for a specific country (eg, Finland or Italy), or for a specific discipline related to shortsea shipping (eg, telematics or ship design). In either case, there is absolutely no way to guarantee that information collected is absolutely complete and up to date. In this paper, this has been manifested by a lack of complete homogeneity of the collected material, some of which is very detailed, and some is very general.
In spite of the above two main difficulties (which will be further elaborated upon in the sections that follow) we feel that the results of this paper are interesting and significant, for at least the following reasons:

a) They represent, to our knowledge, the most extensive array of information on shortsea related work that has been compiled to date. This information can form the baseline for further research in this area.

b) A concrete methodology for indexing, classifying, and further updating this information has been developed, including a user-friendly software package that can be used for entry, retrieval, update, and searches of related material.

c) The material collected shows, in our opinion, a significant degree of “fragmentation” of R&D effort in the SSS field, in the sense that problems that are methodologically similar in many contexts have been typically addressed in isolation. This situation can only be remedied by aggressive dissemination of research results (including those of this paper) and by common fora of discussion of issues among all involved players.

The rest of this paper is organized as follows: Section 2 presents the approach that was followed. Section 3 gives an overview of collected material, broken down by source. Section 4 describes the software. Section 5 draws conclusions. Finally section 6 is a bibliographical list of all collected material.

2. Approach

Work that has been surveyed has focused primarily (but not exclusively) on Europe, and has fallen into at least the following categories:

1. National research programmes or studies, either privately or publicly funded.
2. EU research programmes or studies.
3. Demonstration projects.
4. Technology development projects in related areas (vessel traffic management, telematics, shipbuilding, ship design, cargo handling, etc).
5. Policy studies.
6. Regulatory studies.
7. Any related publication.
8. Other

2.1 Sources of information

Sources of information for this survey have been the following:

1) Proceedings of European Research Roundtable Conferences on Shortsea Shipping

Since 1992, these biennial conferences have been the main scientific forum for dissemination of SSS-related research results. All papers presented at these conferences (1992, 1994, and 1996) have been catalogued.

2) Proceedings of International Conferences on Fast Sea Transportation (FAST)

Since 1991, these biennial conferences have been the main forum on all aspects of fast waterborne transport. By contrast to the SSS conferences (which are European in focus and have a roundtable format), the FAST conference have a worldwide scope and have the traditional parallel session format. This is perhaps the reason that the three FAST conferences to date number close to 300 papers. However, not all of these papers have been catalogued here, since many (in fact most) approach the subject from specific engineering disciplines such as computational fluid dynamics, structural analysis, etc. Although all of these papers have merit, we felt it would serve no meaningful purpose to include them in our survey (in fact, doing so could very well shift the focus away from important issues in SSS). By exercising some judgment, we have identified a number of papers that can be considered to fall into the SSS mainstream, and we have included these papers into our database.
We note here that even though the above two conferences (European SSS and FAST) were the only two conferences that were specifically targeted as sources for this survey, material in other related conferences has also been included, so long as it was brought to our attention. The main vehicle for doing so has been through the concerted action on shortsea shipping, as described below.

3) Concerted action on shortsea shipping

The “Concerted Action on Shortsea Shipping” (task 6.1.2/4) is expected to play an important role in the Commission's Waterborne Transport Research Programme (4th FP). It will do so by setting out the following goals:

- compiling the state of the art in this (broadly defined) area,
- synthesizing all relevant research and other related work,
- monitoring related projects,
- defining relevant pilot projects and demonstrators,
- defining criteria for interoperability and SSS logistical efficiency,
- identifying the key focal points for shortsea shipping future development, and
- providing the widest possible exposure and dissemination of the results of the action.

Representation is open to all EU countries and other countries associated with the research programme (according to the association protocol). As many as 13 meetings are envisaged for the action in the period 1995-1998. The Technical Secretariat of the action is managed by a 4-partner consortium, with the National Technical University of Athens as Coordinator, and with the Alliance of Maritime Regional Interests in Europe (AMRIE), the Institute of Shipping Economics and Logistics (ISL Bremen) and the WEGEMT Association as partners.

Participants of this concerted action (which has held four meetings since June 1995 and plans to hold a workshop in Bergen immediately after the SSS conference) have provided significant input regarding SSS-related research in their countries.

4) Additional sources

The Commission services (DGVII) have provided additional information on related projects. Also, ISL Bremen and WEGEMT have collected additional information related to telematics and ship design aspects. All of this information has been catalogued.

2.2 A two-level taxonomy

In classifying all this material, a two-level taxonomy was used, with the first level providing the “indexing format” by which each entry was catalogued, and the second level providing some additional information on each entry.

First level: The indexing format for each entry is [ABCYRXn], where:

ABC are the first three letters of the first author, in case of a published entry, or the first three letters of the organization responsible for the entry if the latter is a project or study (see also index X below);

YR are the last two digits of the year in which the work represented by the entry was finished (for ongoing projects or for entries for which no year is supplied YR is set to 96);

X is an index defining the type of work, and taking on the following values:

A for a magazine article;
B for a book or proceedings volume;
H for a research or pilot project;
P for a published paper (in a journal or in a conference);
S for a study;
and T for a technical report, working paper, or thesis;
and finally n is an index that is present only in case there are two or more entries for which all other indices 
[ABCYRX] are the same (in which case these entries are distinguished by n=1, n=2, etc).

Examples:


It should be realized of course that there might be more than one entry catalogued for a specific piece of work: for instance, one for the project under which the work was done (research project or study), and one or more for publications related to this project. At the same time, not all entries referring to each and every piece of work have been received (or catalogued). Also, the way a specific entry could be classified is not necessarily unique (for instance a research project could be classified as a study, or as a report). We followed the designations submitted to us by the contributors of the material, or in their absence, our own judgment.

The indexing scheme described above is the basis of the bibliographical section (6) of this paper. It is also used in the database management software developed (see section 4).

Second level: This level provides additional information on the entries submitted by the concerted action participants, although it can be extended to all other entries eventually. It is also one of the main features of the database software. The scheme provides a matrix representation of each entry, with rows indicating methodological disciplines, and columns indicating SSS objects under study. One or more boxes that apply can be checked, and the designation of “other” is clarified as appropriate:

<table>
<thead>
<tr>
<th></th>
<th>Ships</th>
<th>Other technology</th>
<th>Ports</th>
<th>Networks</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Economics/ logistics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business/ management</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Regulatory/ policy</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Due to space limitations, it was impossible to reproduce in this paper the matrices of the material received. However, this information is included in the database software, and we attempt to give an overview of some parts of it in the section that follows.

3. Overview of collected material

As of May 10, 1996, the general tally from the collected material is as follows.
<table>
<thead>
<tr>
<th>Source</th>
<th>Number of entries</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSS and FAST conferences</td>
<td>147</td>
</tr>
<tr>
<td>Concerted action participants (by country)</td>
<td>176</td>
</tr>
<tr>
<td>Commission projects</td>
<td>29</td>
</tr>
<tr>
<td>Additional input from WEGEMT (by country)</td>
<td>90</td>
</tr>
<tr>
<td><strong>TOTAL ENTRIES</strong></td>
<td><strong>442</strong></td>
</tr>
</tbody>
</table>

All collected material is listed in Section 6. Here we attempt to highlight some important features of this material, realizing that presenting a detailed analysis of such a large number of entries is an impossible task (suffice it to realize that presenting the matrix representation of the entries collected would entail increasing the size of this paper to more than 200 pages!). Equally difficult is any attempt to sort out the forest from the trees, identify trends, methodological gaps, or possible research overlaps within this vast collection. Therefore we stress that the material of this section is, by necessity, imperfect.

### 3.1 SSS and FAST conferences

We have little to add to the results of the two previous European Roundtable SSS conferences (references [WIJ93B] and [WIJ95B]), and, a fortiori, to the results of the current one. Collectively, about 80 papers have been presented, spanning the entire spectrum of SSS related topics. Reference [PEE94P] does a good job of reviewing the previous two conferences from the perspective of a European SSS policy. The active participation of the European Commission (DGVII) and the mix of maritime researchers and maritime policy makers in these events contributed to a sharp focus on relevance of research as regards actual implementation of technologies, practices and policies.

The material of the three FAST conferences is far more extensive. In spite of (or maybe because of) a rather specific focus on the object of study (the fast ship), the perspective of these conferences has not been very helpful in sorting out the strategic ramifications of these technologies, both in general terms, and as regards shortsea shipping in particular. The (about 70) references we selected for inclusion in this survey are representative of papers that are (in our judgment) mostly SSS-related. Many of them are from outside Europe. In fact, it is interesting to note that the Yokohama conference (FAST’93) contributed about 30 of these papers, which is more than its expected share. Whether this difference is “statistically significant” or whether it is due to a different attitude of non-Europeans on the subject of fast ships is subject to speculation.

### 3.2 Input from concerted action participating countries

The contributions of the fourteen (14) countries participating in the concerted action merit some more extensive discussion. These are all EU member states except Luxembourg and Austria, plus Norway. A first feature of the collected material has been its volume. At the time of the writing of this paper, 176 entries had been received, not counting some entries that had to be suppressed (for reasons see below).

A second feature of the material was lack of complete homogeneity. In spite of a standardized solicitation for input, the following have been observed:

- Some countries submitted many more entries than others.
- Some countries provided detailed information on their entries, whereas others provided much fewer details.
- Some countries submitted entries in their own language (other than English). Such entries have been temporarily suppressed from our database (and will remain so until an English translation can be obtained).
- Some countries submitted as entries mostly studies or projects, others submitted mostly publications, and others submitted a mix.

The UK joined the concerted action in the spring of 1996 and no “official” contribution from it has been received. However, the UK section is not empty, representing input submitted by WEGEMT (see section 6.7.10).
Finally, some countries submitted some entries that fall on the periphery of SSS, addressing detailed technical problems, such as ship resistance, seakeeping, etc. These entries are similar to some of the entries of the FAST conferences that we decided to suppress. However, and by contrast to conference material, we decided not to suppress on the basis of subject any of the entries submitted by individual countries. All of these entries are part of our database.

Other than feedback to the contributors for clarifications (eg “please translate” or “please provide this again in the appropriate format”), it has been outside the scope of our own work to fill out possible gaps of information that exist in the submissions, extensively reformat them, translate them, or generally undertake a deeper search of information about the material. A reasonable assumption has been that ensuring an appropriate representation of a country within the European state of the art in SSS research falls within the responsibility of the nominated representatives of that country.

With these clarifications, the following can be said very briefly about the country-by-country submissions:

**Belgium**
Most Belgian submissions are in the economics, logistics and policy areas, and mainly study ships, cargoes, and ports. Among them, we highlight a study of the connection between Zeebrugge and Leixões (Portugal) by [AHL95S], a research project on cargo tracing [WES95H], and some policy studies on ports [POL96S] and logistics [POL95S].

**Denmark**
A list of published reports on shipping was submitted by Denmark, mainly covering topics such as deregulation [DER95T] and transport policy [TRA93T, DTP93T, EUT93T]. A report on the future of the coaster [FUT91T] is also included.

**Finland**
Some papers on ship resistance [LAH91P, HAN95P] and seakeeping [KAR95P] are identified. There are also many entries on economics and logistics [VAI90H, VAI94T, VAI92T], and several entries on innovative ship designs [NII91P, NII94P]. Some papers that are included in FAST conference entries [LEV92P, LEV93P] are not included in this list.

**France**
France submitted a general discussion paper on a new approach to SSS [FRA95T], and two proposed studies/projects, one on the concept of Sea/River Road [SRR95S] (an extension of the all-Road and Sea/Road transport), and another on the impact of time delays due to road congestion and restrictions [ITD95T]. The main view in these documents seems to be that inland waterway shipping should be promoted as a means to alleviate congestion and aid SSS. Some entries on the “Arc Atlantique” project have also been submitted.

**Germany**
Entries refer to the SUMO study (scenario investigation of maritime transport systems in the Baltic) [ATL94P], and to some economics/logistics studies related to SSS [ZAC91S, HAD95S, KRA95S]. A large number of entries submitted in German (computerized list from Ministry of Transport) were suppressed as it was impossible to obtain a translation in spite of several solicitations to that effect.

**Greece**
As expected, studies or projects on Greece’s coastal system [IMP95S, PRA95S, DRO93S, NTU94S, PSA94A] are predominant. Some of this work, including a modal split analysis for 2004, the year of cabotage deregulation, has been presented at the SSS conferences (and is not repeated in this list). Also studied heavily is the connection with Italy [COM94H, TRA93S, SCH95T].

**Ireland**
Ireland’s submissions are diverse, spanning areas that include unitized cargoes [TRA94S], ship design [TRA95H, KEN92T], vessel traffic services [RVT95S], casualty database [TRA95H2], passenger transport [COL91S], and ports [COL91H].
Italy
Two large-scale “umbrella” projects stand out in Italy’s list. The first is a multi-year national project on transport, all modes included [BIA92H]. The second is BRITE-EURAM’s “Targeted Research Action” on new ship concepts in shortsea shipping, also known as TRA-NESS, which is coordinated by Italy [TAR95H]. It consists of several multinational projects spanning a spectrum of advanced engineering problems related to fast surface-effect ships/SES.

Netherlands
The spectrum of projects considered is very broad, covering subjects such as intermodal transport [SSS93S1], feeders [DG93S, ROT91H], shift of cargo from road to sea [HOO91H, DG90H], ports [BUC94T1], policy issues [BAG94T], and telematics [DG95T1, T2, T3].

Norway
These include a multiyear national programme on SSS [MAR98H], programmes on fast marine vehicles and ships of the future [MAR97H, KVA96H], a programme on “green” ships [DNV94H], and an umbrella programme on maritime information technology (the so-called MiTS system) [MAR93H]. Some entries in the economics and logistics area were also submitted ([NOR95P, STR94P, WER95T], among others).

Portugal
Transport between Leixões and Zeebrugge [POR93H], and between mainland Portugal and the Azores [MAU91S, CAR92S1, S2] are included in the Portuguese list. Some port navigation systems are also listed [GAM95S, IHN95H].

Spain
Of particular emphasis are studies on maritime cabotage [PEE93S, CAR92S, MER94S, CON93S1], and ports [CON93S3, GOM95P]. Some “engineering” entries have been also submitted, on topics such as ship design [SIE95P, SIE93P, MOR93P] and (interestingly enough) propeller performance [PIR94P1, ZAT92A].

Sweden
Innovative loading and intermodal systems [WIJ94S, LUM93S, SJO90S2], feasibility studies [SJO93S], and general SSS studies [ALE94H, SJO95H] are highlighted.

3.3 European Commission projects
The projects catalogued fall into 4 categories: DGVII 4th FP projects, DGVII studies (sponsored by Directorate D and generally dealing with policy issues), DGXIII (telematics) 4th FP projects, and DGXII (BRITE-EURAM) projects. The 29 entries included here span a diverse spectrum, from “hard-core” engineering research all the way to “policy/regulatory” studies.

It is interesting to note that projects examining problems that appear, at least at first glance, very similar, have been launched in parallel in different DG’s (some port projects in DGVII and DGXIII are examples). The official position of the Commission is that such projects are complementary, with each Directorate General looking at a problem from its own perspective (for instance, the DGXIII mostly focusing on the telematics infrastructure of a port, whereas the DGVII is mostly focusing on policy implications).

However, it is still not clear to what extent this will be followed strictly, or what overlaps may exist within such projects. Most of these projects are just under way in the context of the 4th FP, so it is still early to make an assessment of them. The concerted action on SSS will monitor these projects and try to identify overlaps, gaps, or other synergies among these projects.

3.4 Input from WEGEMT
WEGEMT, one of the 4 partners of the consortium managing the concerted action on SSS, submitted an impressive collection of material, broken down by country, on projects and publications focusing on the engineering side of SSS. All of this material has been catalogued, and in a sense should be viewed as complementary to the material of section 3.2. However, a word of caution is necessary. It is our opinion that some of these entries are outside the mainstream of SSS, addressing detailed technical problems, such as ship resistance, seakeeping, hydrodynamics, ship structural analysis, etc. This is particularly true for
entries submitted by Italy and the UK. Still, as some of the other entries (eg, those of Germany) fall clearly within the realm of SSS, following our policy to avoid suppressing material directly supplied, we included all entries in this paper for the sake of competeness. Finally, it is interesting to note that all of Norway’s WEGEMT entries are covered in the list submitted by Norway’s representatives in the concerted action.

4. Software model

As soon as this extensive material started coming in, we quickly realized that there was a need to find an easy way to handle all this available information. The creation of an integrated dBase program became indispensable, in order to enter, update, and retrieve easily the collected data and extract statistics and reports fast and securely.

It was not an easy task to choose the most suitable package among all the available in the software market. We decided that the package should fulfill the following criteria:

- compatibility with as many as possible other software packages, and capability of data interchange among several software environments;
- friendly and smart interface between the user and the machine;
- capability of upgrade from time to time, so all this information can be useful in the future.

Based on the above, we decided to use Microsoft’s FoxPro v2.6™ because of previous experience with this package and FoxPro’s ability to provide communication with all major operating environments: Windows, DOS, UNIX and Macintosh. The database is formatted and constructed in a way that allows the user to import data of another format and retrieve it via its own interfaces. It is a usual practice to input data with a "drag and drop" way.

A typical screen is shown in Fig. 1. It contains buttons which allow the user to enter, preview, and edit data, and print ready-to-use reports. There is an effort underway to create popup menus so there will be less buttons in the screen and also an effort to create new queries and report types.

Figure 1: Typical user interface screen

5. Concluding remarks
This paper described an effort to compile and classify material related to shortsea shipping research. A two level taxonomy and a software model were developed, with the purpose to facilitate information entry, update, retrieval, and search. We believe that this scheme can form the infrastructure for a permanent update of knowledge on the status of research activity in this area. It can also form the baseline for further research, by helping identify what has been done, what gaps exist, and what possible overlaps can be avoided. Last but not least, it can facilitate the critical activity of dissemination of research results, a process that is recognized to be far less perfect than desirable.

Toward that end, we believe that the taxonomy developed in this paper, as well as the observations made in it, can be useful to a number of players in the field, such as:

- the SSS and waterborne transport research community;
- the waterborne transport industry;
- maritime policy makers;
- national R&D agencies;
- the European Commission.

Venturing a first observation from the material collected, it is fair to say that research in this area has been growing at a very strong rate, at least within the last 6 years or so. It is interesting to note that most of the research being done is still at the national level. However, an important trend seems to be taking place: this is the inclusion of SSS-related research into European Commission R&D programmes (mainly that of the DGVII, but also those of the DGXII and DGXIII). This trend is only recent, and mainly concerns the 4th Framework Programme. It is undoubtedly a reflection of the priority the Commission attaches to SSS, as a tool for the development of the Common Transport Policy. It is clear that events such as the Roundtable Conferences have played a key role in identifying the need for more research in this area.

Some related European Commission initiatives, such as the “Task Forces” on topics such as “Transport Intermodality” and “Maritime Systems of the Future” are expected to further add to the momentum in this area.

Since most of these activities are just starting, it is too early to make an assessment of their potential impact on real world SSS technology, practice, and policy. However, one of their potential contributions is worthy of discussion.

Looking at the material collected, one can observe that, with few exceptions, a significant degree of fragmentation exists, and this is essentially across country lines. As one example (and there can be many others), topics such as cabotage that have been studied mostly in Spain and Greece have been studied essentially in isolation, even though it is clear that much in common exists. The same can be said about other topics, such as ports. Lack of aggressive dissemination of research results, or of common fora in which such results are presented are the main causes for such a state of affairs. Although such fora do exist, clearly more can and should be done, particularly at the end-user level, which where the greatest degree of fragmentation exists.

The most obvious consequence of this fragmentation is that the impact of R&D efforts to serve the real needs of European SSS has been so far limited. There is certainly significant room for improvement in that regard, but as long as this fragmentation continues, the potential impact will likely continue to be low and diluted.

It is precisely one of the roles of collaborative R&D efforts such as those sponsored by the European Commission to help alleviate this situation. These collaborative projects are expected to reduce the risk of further fragmentation, by bringing together partners from several countries and by cross-fertilizing ideas both from the research end and from the maritime industry end.

An implicit assumption is of course that fragmentation does not spread to the EU projects too. In our opinion, a risk that is clearly present is that each Directorate General of the Commission that deals with Transport Research proceeds independently of what the others are doing. As at this point in time there are several DG’s dealing with Transport Research, either directly, or indirectly (DGVII, DGXII, DGXIII,
DGIII, among others), there is a clear need for internal Commission coordination of such R&D activities.

Although from an SSS researcher’s viewpoint the funds allocated to SSS (as a percentage of the Commission’s total transport R&D budget) can still be considered low, the fact that such funds practically did not exist a few years ago is certainly encouraging. Activities such as the Roundtable Conferences, the Concerted Action on SSS, and others, are expected to further maintain the focus on this important topic, so that SSS obtains a share equivalent to its overall importance in European transport.2

6. Bibliography

The bibliographical section is organized in the following way:

6.1 Conferences
6.2 Input from concerted action participating countries
6.3 DGVII 4th FP projects
6.4 DGVII/D studies
6.5 Telematics projects
6.6 BRITE-EURAM projects
6.7 Other input from WEGEMT (listed by country)

6.1 Conferences

Catalogued below are all papers from the European Research Roundtable Conferences on Shorsea Shipping (1992, 1994, and 19963) and SSS-related papers from the FAST conferences (1991, 1993, and 1995).

Further to the indexing scheme [ABCYRXn] defined earlier, the following acronyms are used:

ESSS’96: Third European Research Roundtable Conference on Shortsea Shipping (Shortsea’96), Bergen, Norway, 1996.


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3 Included are all papers as listed in the preliminary programme of the conference. Revisions of the programme after May 10, 1996 are not included.
<table>
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<tr>
<th>Ref</th>
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<tr>
<td>ARE93P</td>
<td>Arena, G., V. Farinetti</td>
<td>1993</td>
<td>Introducing Eurofast</td>
<td>Vol2, pp 1179-1192</td>
<td>Proc. FAST'93</td>
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<td>BAG92P</td>
<td>Bagchus, R.C., B. Kuipers</td>
<td>1992</td>
<td>Autotrade Del Mare</td>
<td>pp 52-65</td>
<td>Proc. ESSS'92</td>
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<td>BOO95P</td>
<td>Boote, D., M. Ragone, A. Sculati</td>
<td>1995</td>
<td>Seaworthiness of Aquastrada Class of Ships</td>
<td>Vol1, pp 165-178</td>
<td>Proc. FAST'95</td>
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<td>CHE92P</td>
<td>Cheetham, C., P. Hornby, R. Papenhuijzen</td>
<td>1992</td>
<td>Recent Developments in Feeder Transport by Coasters</td>
<td>pp 364-378</td>
<td>Proc. ESSS'92</td>
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<td>CHL96P</td>
<td>Chlomoudis, C., A. Pallis</td>
<td>1996</td>
<td>Investment policies in ports’ infrastructure in the perspective of the European Shortsea Shipping Networks: The case of Greece</td>
<td>Proc. ESSS'96</td>
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<td>DEW92P</td>
<td>deWulf, B., H. Meersman, E. van de Voorde</td>
<td>1992</td>
<td>The Demand for Sea Transport in Smaller Sea Ports: An Application to the Port of Brussels</td>
<td>pp 333-345</td>
<td>Proc. ESSS'92</td>
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<td>EVE96P</td>
<td>Evers, J.</td>
<td>1996</td>
<td>Container Terminal of the Future</td>
<td>Proc. ESSS'96</td>
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<td>FOS91P</td>
<td>Foss, B.</td>
<td>1991</td>
<td>Economy and Speed in Commercial Operations</td>
<td>Vol1, pp 259-276</td>
<td>Proc. FAST'91</td>
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6.2 Concerted action participating countries

The list of entries, broken down by source, follows (contributors are in parentheses).

6.2.1 Belgium (C. Peeters, H. Smitz)


6.2.2 Denmark (E. Styhr Petersen)


6.2.3 Finland (J. Vainio, J. Sukselainen)


[VAI90H] Vainio J., (1990), Knowledge Based Methodology for Simulation of Intermodal Transport Terminals, Research, University of Turku, Center for Maritime Studies.

[VAI93H] Vainio J., (1993), MULTIMOD: the system for Simulation Modelling of Seaports and terminals as logistics centers in Intermodal freight transportsimulation in logistic planning, Research, University of Turku, Center for Maritime Studies.


6.2.4 France (M. Abeille, G. Tourret, E-L. Melene)

[ITD95S] Impact of idle time and delays due to road congestions and restrictions, (1995), proposed study in the context of SSS promotion.
[LEC95S] Lecoq S., Chevance A., (1995), Prospective Study into the development of dry bulk traffics to, from and within the Atlantic Arc of Europe, Study
[SRR95S] SeaRiver Road as an alternative and an extension to all Road or SeaRoad Transport, (1995), proposed study in the context of SSS promotion.

6.2.5 Germany (I. Harre, V. Speidel)

[KRA96S] Kramer, H., (1996), A feasibility study for a market-supply-concept in SSS on identified relations within Northern Europe/Germany/Western Europe with the concideration of shift potentials. Study for the German Transport Ministry.
[ZAC96S] Zachcial, M., (1996), Simulation-project with a transport modelling on shifting effects in SSS. Study for for the German Transport Ministry.

6.2.6 Greece (S. Papadimitriou, H. Psaraftis)

[COM94H] Combimare, ADK Consulting Engineers, and Triton Consulting Engineers (1994), Greece - Italy - Germany Multimodal FreightTransportation Corridor. Pilot Project, sponsored by CEC.
[FRE95S] Frederic Harris, (1995), Short -Sea Shipping / Greek Case Study. Sponsor: CEC DGVII.


[TRA93S] Trademco Consultants, (1993), Pilot Action for a Pilot Operation of RoRo ships between NAVIPE (Gr) and Italy. Study sponsored by the Hellenic Industrial Development Bank (ETBA).

6.2.7 Ireland (V. Kenny)


6.2.8 Italy (C. Camisetti)


[TAR94H] Targeted Research Action TRA-NESS: New Ship Concept on the framework of Short Sea Shipping, Coordinator CETENA Spa, sponsored by EU DGXII.


6.2.9 Netherlands (R. Bagchus, S. Winkel)

[ALB92H] Albus, W., K. van der Hoeven (1992), Shortsea, Research

[BAG93H] Bagchus, R. C., N.S. Winkel (1993), Sea change for road freight (Coaster and feeder traffic plan). National Research, DGSM


[BUC94T1] Shortsea transport, a product of the port of Rotterdam and four Northwest-european competitors , (1994), Report by AVV; Buck.


[DGS90H] DGSM, NEA, and MERC, (1990), Potential shift of cargo from road to sea (in Dutch), National Research.


[GRO93H] “Groene Golf”: final survey, trial shipping line, project Trade-routes (1993), Research by DGSM, MST, MERC, HARRIS.


Short Sea shipping lines and feeder services: between Rotterdam and European Ports (1991), Port of Rotterdam, Research.

Shortsea shipping in intermodal transport: start of a campaign by DST Educatieve Communicatie, DGSM (1993), Study.


6.2.10 Norway (A. Minsaas, J. Mohr)

Baardsen T., (1992), Fast Boat Industry, Report, SNF.


Frafjord J., Johnsen C., (1992), A Study of North Sea Trade, Report, SNF.

Haaland J., Norman D. V., (1994), Regional effects of European Integration, Report, SNF.


6.2.11 Portugal (H. Cid, M. Ventura)

[CAR92S1] Carichas E., (1992), Evaluation of Costs for Sea Container Cargo System Between Azores Islands and Mainland, Study conducted by RINAVE and sponsored by the Azores Regional Secretary of Transports and Communications.

[CAR92S2] Carichas E., (1992), Study on Sea Transport for General Cargo in Azores Islands, Study conducted by RINAVE and sponsored by the Azores Regional Secretary of Transports and Communications.


[MAU91S] Mauricio E., (1991), Study of Sea Transport for Petroleum Liquid Products in Azores Island, Study conducted by RINAVE and sponsored by the Azores Regional Secretary of Transports and Communications.

[POR93H] PORTLINE Transportes Marítimos Internacionais (1993), PORTRAILER - Ship Transportation of Trailers Between the Ports of Leixões/Portugal and Zeebrugge/Belgium. Research, self-sponsored.

[QSD95H] Quick Ship Dispatch Centers, Project developed in the port of Sines.


6.2.12 Spain (G. de Melo, M. Carlier)


[ZAT92A] Zatarain, G. (1992), Experience with retrofitting CLT propellers. Published in “the Motor Ship”.

6.2.12 Sweden (A. Sjöbris)


[LUM93S] Lumsuden, K. (1993), System development of standardised unit load carrier for sea, road and rail transport. Study sponsored by the Transport Foundation (Transportstifelsen VTS), Western Sweden Chamber of Commerce.

[ROB90S] Robertson, H., (1990), Mechanised mooring. Pre study, MARITERM AB. Sponsored by the Swedish Transport Research Board (TFB).

[SJO90S1] Sjöbris, A., (1990),Coastal and SSS. Pre study, MARITERM AB. Sponsored by the Swedish Transport Research Board (TFB).

[SJO90S2] Sjöbris, A. (1990), Integration of cargo units between railway and shipping. Pre study, MARITERM AB. Sponsored by the Swedish Transport Research Board (TFB) and the Swedish State Railway (SJ).


6.3 DGVII 4th FP projects

[ASD96H] Project “ASDSS”: Analysis of supply and demand of shipping services.

[BOP96H] Project “BOPCOM”: Baltic open port communication system.

[EBO96H] Project “EUROBORDER”: Identifies bottlenecks, develops functional specifications and proposes demonstrators to improve the ports’ function as intermodal hubs.

Project “European Marine Motorways”: The potential for transferring freight from road to high speed sea transport.

Project “IPSI”: Improved port-ship interface.

Project “SPHERE”: Small/medium sized ports with harmonised, effective re-engineered processes.

Project “SSS-CA”, concerted action on shortsea shipping.

6.4 DGVII/D studies

Europaeisches Entwicklungszentrum fuer die Binnenschiffahrt, feasibility study on the establishments of river-sea transport between Portuguese sea ports and Duisburg.

Intermodal European Logistic Center, Short sea shipping pilot - project German North Sea - Nordic countries / Western and Southern Europe.


MST Transmodal, Feasibility Study on the development of short sea shipping and inland waterway links between Holstebo-Struer and Duisburg.

6.5 Telematics projects (input provided by V.Speidel on behalf of ISL Bremen)


EIES, (1996). European Information Exchange Service for the Communication between Harbour Areas, DGXIII project, 4th FP.

INTERPORT, (1996). Integrating Waterborne Transport in the Logistic Chain, DGXIII project, 4th FP.


MULTITRACK (1996), Tracking, tracing and monitoring of goods in an intermodal and open environment, DGXIII project, 4th FP.

POSEIDON (1996). DGXIII project, 4th FP.

TILEMATT (1996), DGXIII project, 4th FP.

VADE MECUM(1996), DGXIII project, 4th FP.

WISDOM (1996). Waterborne Information System Distributed to Other Modes, DGXIII project, 4th FP.

6.6 BRITE-EURAM (DGXII) projects (input provided by A. Papanikolaou and J. Grant on behalf of WEGEMT and by C. Camisetti on behalf of the TRA-NESS targeted research action)


MAINCOMPSES (1995). Improvement of main system components and ride control system for fast passenger and cargo large surface effect ship.


6.7 Other input from WEGEMT (ship design/shipbuilding/ engineering projects or publications; input provided by A. Papanikolaou and J. Grant and arranged by contributing country)

6.7.1 Belgium
6.7.2 Denmark


[DES96H] Design of a Harbour ferry, Research, Technical University of Denmark (DTU).

[WAV96H] Wave-induced hydroelastic response of fast mono-hull ships, Research, Technical University of Denmark (DTU) and Danish Technical Research Council (STVF).

6.7.3 France


[LAN95H] Lancelot E., (1994), Feasibility study for the route Marseilles to Barcelona by a fast marine transportation system (in French), Research.


6.7.4 Germany


[BMB94H] BMBF, STN, ISSUS, (1994), BV scenarios: Maritime Transport systems for the Baltic Sea (in German), Research, BMBF.

[ENG95H] Engelkamp, (1996), Inland water transport between North Spain and Duisburg (in German), Research, German Ministry for Research and Technology.


[LIN90S] Linde, H. (1990), Analysis of the German and European shortsea shipping system, Study, German Ministry for Research and Technology.


[MUE96H] Mueller, E. (1996), Development of a large sea-river ships with limited draft (in German) 4 projects, Research, German Ministry for Research and Technology.


[PUS94S] Pusch, (1994), Protection of the local conditions for the maritime industry in Germany (in German), Study.


Zips, J. (1995), Development of Fast Catamarans (3 projects within the national R&D program SUS, in German), Technical Report, German Ministry for Research and Technology.


Zips, J. (1995), Development of SWATH ships (project within the national R&D program SUS, in German), Technical Report, German Ministry for Research and Technology.

6.7.5 Greece


Papanikolaou, A., N. Daphnias, (1996), Development of the 80m LOA catamaran passenger car ferry SUPERCAT HAROULA, Project, ALPHA MARINE Ltd.


6.7.6 Italy


Bruzzone, D., Sebastiani L (1994), Application of a panel method to the hydrodynamic analysis of advanced vehicles, Research, Italian Ministry for the University and Scientific and Technological Research.


6.7.7 Netherlands


6.7.8 Norway

All entries provided are already covered in section 6.2.10.

6.7.9 Spain

[ROU95H] Optimizing routing system for the advanced design cruiser ship (1995), Research, Spanish Administration (CICYT), managed by the CDTI.
[VTS95H] Implementation of the VTS in the Spanish coast (1995), Project sponsored by the Spanish Transport Department, Maritime Administration.

6.7.10 United Kingdom

[BUR96H] Burns, R. S., G. N. Roberts, M. M. Pourzanjani. Modelling and control of small vessels, Research, EPSRC (MTD), Marinex, Polytechnic South West.
[PRI96H] Price, W. G., R. A. Shenoi, P. Temarel, Design of aluminium structures subjected to high frequency, high cycle loads, Research, EPSRC (MTD), Vosper Thornycroft, FBM Ltd, Southampton University.
[DOV96H] Dove, M.J., C.T. Stockell, R.S. Burns, A navigation and collision avoidance system for marine vehicles, Research, ESPRC (MTD), Kelvin Hughes, WS Atkins, University of Plymouth.
[BET96H] Bettes, P., P. Sen, J. B. Caldwell, Development of intelligent knowledge-based design systems for marine technology, Research, ESPRC, Newcastle University.
[HOR96H1] Horsley, M.E., Modelling of fires in steel ships and offshore structures, Research, ESPRC (MTD), Portsmouth.


Thompson, J. M. T., Safe transient basins: a new tool for designing against capsize, Research, EPSRC (MTD), University College London.

Caldwell, J. B., M. Pawlowski, Development of knowledge-based design systems for marine technology - ship safety, Research, EPSRC (MTD), Newcastle University.

Fairlie-Clarke, A. C., I. E. Winkle, Construction of hydrodynamic lifting surfaces, Research, EPSRC (MTD), Brown Brothers, Glasgow University.

Sen, P., M. J. Downie, Voyage management using parallel processing, Research, EPSRC, Newcastle University.

Horsley, E., Modelling of fires in steel ships and offshore structures, Research, EPSRC (MTD), Portsmouth University.

Hockey, G. R., C. M. Crawshaw, Human performance in highly-automated bridge systems, Research, EPSRC, University of Hull.


Fan, M., Fluid impact loading on wedge-shaped bodies, Research, Strathclyde University.


Atkins, A. G., The tearing of ships' plating upon grounding, Research, EPSRC (MTD), MoD, University of Reading.


Shenoi, R. A., Assessment of damage tolerance levels in FRP ships' structure, Research, EPSRC (MTD), MoD, Southampton University.


Molland, A. F., S. R. Turnock, Enhanced ship manoeuvring performance estimates through the effective design of rudder-propeller systems, Research, EPSRC (MTD), Southampton University.

Varyani, K. S., A. Incecik, A theoretical and experimental investigation of the hydrodynamics of a manoeuvring ship in deep and shallow water, Research, EPSRC (MTD), Glasgow University.

Hearn, G. E., A theoretical and experimental investigation of the hydrodynamics of a manoeuvring ship of deep and shallow water, Research, EPSRC (MTD), Newcastle University.

Vassalos, D., Ship capsizing in severe following/quartering seas by broaching-to (Visiting Fellowship), Research, EPSRC (MTD), Strathclyde University.


Roberts, G. N., J. Davis, Advance control strategies for motion control of vessels, Research, EPSRC (MTD), MoD, RNEC Manadon.

Vassalos, D., Ship capsize in severe following/quartering seas by broaching-to: a dynamical systems approach, Research, University of Strathclyde.