INTERNATIONAL MARITIME ORGANIZATION

IMO

E

MARITIME SAFETY COMMITTEE
83rd session
Agenda item 25

MSC 83/25/7
3 July 2007
Original: ENGLISH

WORK PROGRAMME

Safety of Navigation

Proposal to develop a New Work Programme Item to address software updates

Submitted by Australia and the United Kingdom

SUMMARY

Executive summary:	It is proposed to add a new item to the work programme of the Sub-Committees on Safety of Navigation (NAV) and Radiocommunications and Search and Rescue (COMSAR), to develop formal procedures to address firmware, operating systems and software updates on shipborne navigation and communication equipment. This will have a financial effect on the shipping industry.
Action to be taken:	Paragraph 13
Related documents:	SOLAS regulation V/16; MSC/Circ.891; ISO 90003:2004, ISO 17894:2005; IHO Circular Letter 77/2006; A.970(24), A.971(24); and MSC-MEPC.1/Circ.1

1 This proposal is submitted in accordance with the guidelines on the Organization and method of work of the Maritime Safety Committee and the Marine Environment Protection Committee and their subsidiary bodies (MSC-MEPC.1/Circ.1).

Scope of the proposal

2 The International Hydrographic Organization (IHO), in Circular Letter 77/2006 to IHO Member States, expressed concerns that when improvements are made to the IHO S-57 and S-52 Standards, timely updates to new and existing ECDIS were not necessarily forthcoming.

3 Australia and the United Kingdom separately supported the submission of the IHO Paper to NAV 53 regarding the requirement for the regular maintenance of ECDIS software.

4 Further, Australia and the United Kingdom believe that this issue is not confined to ECDIS and applies to other shipborne equipment, but in particular to navigation and communications equipment. The increasing complexity of processor-based electronic systems on board vessels may therefore necessitate the regular updating of firmware, operating systems and software due to changing technology and regulation. Although the application of SOLAS chapter V regulation 16 covers the general subject of maintenance of equipment, Australia and the United Kingdom are of the opinion that more formal procedures to cover the maintenance of navigation and communications processor-based electronic equipment should be mandated by the IMO.

Identification of Compelling Need and Justification of Action

5 The fundamental principles of programmable electronic systems, coupled with innovations made by manufacturers, means that firmware, operating systems and application software updates will periodically become available. This may be as a result of improving technology, to address regulatory changes, to incorporate new functions or to address programming deficiencies and/or errors. Every effort should be made to ensure the timely application of such updates to the benefit of the wider maritime community. One example lies with ECDIS where, for example, if modifications are made to the S-57 ENC product specification or the S-52 presentation library, then any new features which these changes bring about may not be recognised and, thus, correctly displayed on a ship borne ECDIS display unless application software upgrades are made. Improvements serve no useful purpose unless there is a means to implement them on board the vessels they are intended to benefit, and the lack of implementation could lead to potentially unsafe situations.

Analysis of the issues involved, having regard to the costs to the maritime industry and global legislative and administrative burdens

6 The purpose of this proposal is to advocate a new work programme item to develop formal procedures to address updates to navigation and communications processor-based electronic equipment fitted to Convention vessels. Most marine navigation and communication equipment manufacturers have a network of dealers and service engineers or representatives in a number of regions so cost implications can be minimised through a pragmatic approach. It should be noted that in many cases costs will be covered by existing agreements between ship owners and manufacturers and their agents. The administrative burdens to the Organization and to Member States are anticipated to be minimal.

6.1 Although the regulatory text of SOLAS regulation V/16 covers the maintenance of navigation equipment and the text of SOLAS regulation IV/18 covers GMDSS equipment, in both cases the scope is broad and makes no direct reference to software. As software increasingly becomes the means of implementing improvements and feature enhancements, Australia and the United Kingdom feel there is a case to introduce formal procedures to be mandated by the Committee in order that the safety aspects of such changes can be realised effectively on board ship.

6.2 There are a number of existing international publications which standardize the development, operation and maintenance of software in relation to processor-based systems and they will be introduced in subsequent paragraphs. However, it should be stressed that International Standards Organization standards are voluntary, although Administrations can mandate them into national regulation.

Relevant Standards, Circulars and Resolutions and current industry standards

7 **IMO MSC/Circ.891 Guidelines for the use and application of computers**. This is specific to Computer-based systems which are used to perform essential functions such as:

- propulsion, steering and manoeuvring,
- navigation and communication,
- cargo loading, discharging and control,
- safety of passengers and crew, and
- essential calculations (e.g. stability and loading).

7.1 However, the scope of the circular does not cover equipment where there are already IMO Performance Standards as indicated in paragraph 1.2. Since all systems which have carriage requirements mandated by SOLAS chapter V also have IMO/ITU Performance Standards, MSC/Circ.891 would not appear to be relevant to such equipment.

7.2 **ISO 90003:2004 – Quality Management Systems (QMS) for software engineering**. This ISO standard provides guidance in the application of ISO 9001:2000 which supports the acquisition, supply, development, operation and maintenance of software.

7.3 **ISO 17894:2005 – Ships and Marine Technology**. These are general principles for the development and use of programmable electronic systems in marine applications.

7.4 **A.694(17)** – This IMO Assembly resolution gives general requirements to which all bridge navigation equipment should conform in Clause 8. The International Electrotechnical Commission (IEC) test standard IEC 60945 gives expanded guidance to Clause 8 in 4.7.2 and this is referenced by IMO through footnotes.

7.5 **IEC 61508** – Electrical safety of electrical/electronic/programmable electronic safety-related systems. This describes the life cycle requirements and gives a methodology for risk assessment of safety integrity levels and requirements for maintenance and repair.

7.6 As indicated above, several international bodies have produced a number of standards, circulars and resolutions which have applications relevant to software maintenance. However Australia and the United Kingdom feel that, given the reliance placed upon processor-based systems, formal procedures are required.

Specific indication of the action required

8 Ensuring that all affected vessels implement any necessary firmware, operating system and software updates on shipborne equipment will be a complex undertaking. Several considerations will need to be addressed including:

a) **Identification of affected vessels when firmware, operating systems or software is upgraded**. Manufacturers do not necessarily have records of ships carrying their products. They should, however, have some knowledge of their distributors and dealers, but it is recognized that this will not necessarily ensure the tracing of all affected vessels.

b) **Procedure for cases where affected vessels have been sold and/or renamed**. No formal procedures are currently in place. It should be noted that there may be commercial licensing considerations.

c) **Means by which firmware, operating systems or software changes are promulgated by manufacturers**. It should be possible for Original Equipment Manufacturers (OEMs) to contact and promulgate any firmware, operating system or software changes via service agents, flag States and OEMs' websites if such changes could affect vessel safety.

d) **Identification of appropriate person(s) to undertake shipboard firmware, operating system or software updates and associated cost implications**. It should not fall to unskilled people on board to undertake such updates. Updates should be done through a network of service agents or be facilitated by instructions in accordance with manufacturer's guidelines.

e) **Clarification on the affect of firmware, operating system or software upgrades on type approval**. The manufacturer should contact the relevant authorities to discuss changes and then arrange for the amendment of type approval certificates as necessary.

f) **Identification of build standard**. A key aspect of firmware, operating system and software configuration management is the ability to identify the build standard of all three elements of the equipment. Equipment should be designed to provide easy access to the build standard (in terms of the version of all relevant elements). It may be possible, for new equipment being developed, that future software updates be effected "over the air" directly by the manufacturer, through use of an appropriate terrestrial or satellite communications link.

Benefits which would accrue from the proposal

9 Benefits to users, in particular improvements to vessel safety, will result from performance optimisation as upgrades are applied to shipborne processor-based equipments.

Priority and target completion date

10 This issue should have a high priority due to the proliferation of navigation and communications processor-based equipments and the inherent need for periodic firmware, operating system and software updates. Two sessions each for COMSAR and NAV Sub-Committee's are proposed.

Remarks on the criteria for general acceptance

11 **Is the subject of the proposal within the scope of IMO's objectives:** The proposal is in line with the high-level action plan of the Organization and priorities for 2006-2007 biennium set out in resolution A.971(24) and in particular with the high-level action identified in paragraph 5.2.1 to: "*Keep under review the technical and operational safety aspects of all types of ships, including fishing vessels*". The Mission Statement contained within resolution A.970(24) states that "*The mission of the International Maritime Organization as a United Nations specialized agency is to promote safe, secure, environmentally sound, efficient and sustainable shipping through co-operation. This will be accomplished by adopting the highest practicable standards of maritime safety and security by efficiency of navigation…*". In the Strategic Plan for the Organization for the six year period 2006-2011 Paragraph 2.2.1 states the challenge for the IMO is to: "*be proactive in identifying trends and developments affecting shipping"*. It further states in Paragraph 2.6 "*the challenge for the IMO is to ensure the adequacy of all systems used in ensuring the safety of life at sea, including those concerned with large concentrations of people*".

Identification of which subsidiary bodies are essential to complete the work

12 It is recommended that the work should be co-ordinated by the NAV Sub-Committee in consultation with COMSAR. It is estimated that two sessions each will be needed to complete the work.

Action requested of the Committee

13 The Committee is invited to add a new, high-priority item to the work programme of the NAV and COMSAR Sub-Committees respectively.