

# SOLAS Regulation V/15

## 1 SUBMISSION TEMPLATE FOR MAJOR REFITS AND NEWBUILDS

Your National Administration requires that, under the provisions of SOLAS V/15 2002, a statement must be submitted justifying an owner's decisions affecting bridge design, the design and arrangement of navigational systems and equipment and bridge procedures, to show that the decisions were made with the aims of the Regulation. In particular a submission is required for decisions made for the purposes of applying the requirements of SOLAS Regulations V/19, 22, 24, 25, 27 and 28. Aspects of bridge design and operation other than navigation carriage requirements such as engine room alarms on the bridge also need to be considered.

*This template provides a framework to manage decision-making related to the aims of the Regulation for the Ship Control Centre (SCC). It provides:*

*1/ A convenient structure for gathering evidence to use in making a submission statement. Where material is to form part of the submission statement, the box is shaded.*

*2/ Advice on how to make the decision. Guidance is given in italics.*

*3/ A list of factors that should be considered in making the decision. Where evidence is gathered on ergonomic criteria to inform a decision but not used as part of the submission statement to an Administration, then the box is not shaded.*

*The submission statement is presented in the form of an operability case for the proposed new procedures and/or equipment and/or arrangement.*

Wherever possible, the submission statement should refer to existing documentation, rather than require the production of new material.

*The majority of the information required to complete the decision-making process is already available. For example:*

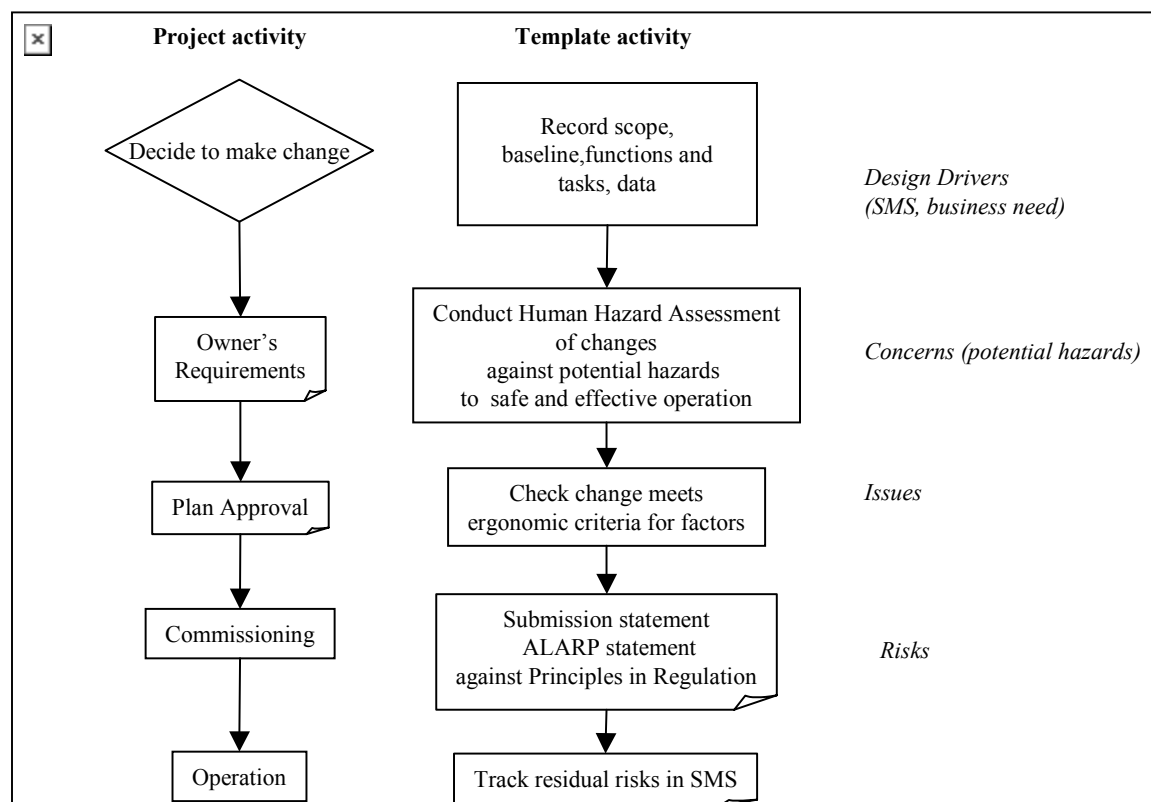
- *Information on training and operations from your ISM documentation.*
- *Equipment information from the manufacture proposal or documentation.*
- *Bridge layout from the yard's assessment against MSC Circ.982.*

*Supporting guidance is available from a number of sources, such as MSC Circ. 982, ISO 8468, the IACS/BDEA standard, SOLAS V/22, ergonomic guidance on human-centred design e.g. ISO 13407, ergonomic guidance on Human-Computer Interaction e.g. ISO 9241, and guidance on alarms e.g. EEMUA Publication 191:1999.*

*The rationale for the approach on which this template is based is provided in a separate ATOMOS report A.408.05.053.002.*

The submission statement has a number of sections that can be completed at stages through the refit or build project. The sequence of activities is shown below in Figure 1. The key to the fonts and shading is as follows: Normal text – requirement; *Italic text – advice*; Box – Submission statement in shaded sections, internal action tracking or information gathering in unshaded sections.

Owners, designers, assessors and others using this document are expected to have (or have access to) skill and knowledge in addressing human element issues sufficient to judge if the attestation in a completed template is valid. The role of a system engineer has been introduced to ensure that transversal aspects that cut across boundaries of scope of supply are addressed. No requirements are placed by this template as to the organisation responsible for such a role, and indeed the role may be split between different organisations. It is possible that the role is carried out as part of a Human Factors study.



**Figure 1 – Flow chart for completing template in conjunction with new build or major retrofit**

The steps in completing the submission statement are as follows:

1. Scope statement (made when the project is starting): Describe the decision being made, its rationale and scope.
2. Assess the risk potential (perhaps related to the owner’s requirements): Consider how the decision could affect safe and effective bridge operations.
3. Review the implementation of the decision against ergonomic criteria for four the factors; training, manning and operation, equipment and SCC layout.
4. Summarise any residual risks against the aims in the Regulation, and complete the ALARP statement.

**Table of Contents**

1	Submission template for major refits and newbuilds	1
2	Scope Statement	4
2.1	<i>Summary of the decision for a major retrofit or new build</i>	4
2.2	<i>Description of SCC and operation</i>	4
2.3	<i>Functions and crew tasking affected by the decision</i>	5
2.4	<i>Data used to inform decision</i>	8
3	Assess risk potential	9 <sup>+</sup>
4	Train the team	15
5	Operate the Space	18
5.1	<i>Manning</i>	18
5.2	<i>Procedures</i>	19
6	Equip the Space	22
6.1	<i>Relevant Rules and Regulations</i>	22
6.2	<i>User interaction</i>	23
6.3	<i>Automation and status indication</i>	26
6.4	<i>Workstation design</i>	28
6.5	<i>Equipment design</i>	29
6.6	<i>Documentation design</i>	30
7	Design the Space	33
7.1	<i>Relevant Rules and Regulations</i>	33
7.2	<i>Environment</i>	33
7.3	<i>View</i>	34
7.4	<i>Access</i>	35
7.5	<i>Layout</i>	36
7.6	<i>Audible and visual annunciators</i>	37
7.7	<i>Occupational safety</i>	38
8	ALARP statement	40
8.1	<i>Summary of residual risk. To be completed by the owner at commissioning.</i>	41
8.2	<i>Cost-benefit justification</i>	43

## 2 SCOPE STATEMENT

*A scope statement is required as a quality record to log the decision being made, the nature of the change being introduced, and the state of the ship and crew at the time (real for retrofit, planned for newbuild). This tells the Administration why the decision is being made and outlines its scope and expected risk to safe and effective operation.*

### 2.1 Summary of the decision for a major retrofit or new build

Summarise the decision being made.

*This is probably a reference to a project summary or perhaps even the title.*

*The goals and motivations behind the decision and their compliance with Company policy for safety and environmental protection should be stated. Ways in which the decision is being used to support leadership in safety and environmental protection should be indicated. This should be in accordance with the SMS if appropriate, or should make appropriate references to it. If the decision is made by an organisation with no operating ships and therefore no ISM-based SMS, the way in which the decision supports safety and environmental protection will need to be recorded.*

<b>Statement that decision meets aims of Regulation 15 (to be completed by owner at time of decision)</b>
References for relevant documents (if applicable):
Summary of decision being made (if not in documents):
Decision in relation to safety, quality, environmental policy (if not in document):
Questions and information needed to complete this entry
Follow up actions

### 2.2 Description of SCC and operation

Describe the SCC, including compliance with carriage requirements.

*The plans and procedures for key shipboard operations should be described, possibly using the 'context of use' framework.*

*The intent of this section is to establish a baseline for conducting the risk assessment and mitigation. If the design (or operation) changes between the risk assessment and actual operation, then the initial risk assessment may no longer be appropriate and will need updating in conjunction with the ALARP statement.*

<b>Baseline description (to be completed by owner at time of decision)</b>
References for relevant documents (if applicable):
Summary of design, procedures, training (if not in documents):
Questions and information needed to complete this entry
Follow up actions

### 2.3 Functions affected by the decision

*This section gives the Human Hazard Assessment the information it needs to consider any issues of workload, consistency, distraction etc.*

*The table below should be completed to indicate the SCC functions affected directly and indirectly by the decision.*

<b>Functional requirements and their impact (to be completed by owner at time of decision)</b>		
<b>Function</b>	<b>Direct impact</b>	<b>Indirect impact</b>
Collision Avoidance— Detecting and avoiding other craft and objects.		
Navigation—Keeping the vessel safely clear of shoal water, close to her intended track, and on schedule.		
Other SCC functions e.g. cargo handling.		
Administration—Routine watch duties such as communications, log keeping, and supervising watch personnel.		
<i>The functional requirements should be specified here (perhaps as a document reference)</i>		

## 2.4 Crew tasking affected by the decision

*The table below should be completed to summarise the watch conditions (e.g. indicate which crew members will be on watch, and the workstation at which they will operate) and to indicate which watch conditions will be affected by the decision, and for each watch condition affected, indicate how the crew roles and duties will be affected. Both positive and negative aspects should be summarised (or document references given). The following definitions apply:*

*Normal condition: When all shipboard systems and equipment related to primary bridge functions operate within design limits, and weather conditions or traffic do not cause excessive operator workloads.*

*Irregular condition: When external conditions cause excessive operator workloads requiring professional assistance on the bridge.*

*Abnormal condition: When internal technical system failures require operation of basic back-up systems or when they occur during an irregular operating condition, or when the officer of the watch becomes unfit to perform his duties and has not yet been replaced by another qualified officer.*

*Emergency situation: When failure of internal ship systems not affecting the ability of navigation or manoeuvring, or fire incidents occur which need to be controlled and managed from the bridge.*

*Distress situations: When the ship has lost its navigating or manoeuvring capability.*

OPERATIONAL IMPACT OF DECISION TO BE DRAFTED BY OWNER AT TIME OF DECISION AND COMPLETED/VALIDATED BY SHIPYARD AT PLAN APPROVAL										
WATCH CONDITION	SHIP'S EXTERNAL ENVIRONMENT			OPERATIONAL CONDITIONS AND SITUATIONS						IMPACT
	VISIBILITY	WATER WAY	TRAFFIC	NORMAL	IRREGULAR	ABNORMAL	EMERGENCY	DISTRESS	CREW ROLES AND DUTIES AFFECTED	
1	Unrestricted	Offshore Waters	Light							
2	Restricted	Restricted	Moderate							
3	Restricted	Restricted	Heavy							
4	Restricted	Pilotage Waters	Heavy							

## 2.5 Data used to inform decision

The design drivers or concerns should be recorded.

*The concerns that led to the decision should be recorded here. The concerns may be economic business matters and/or safety concerns (e.g. from the SMS).*

*It is good practice to list the sources of data that led to a decision to retro-fit or construct a new ship. It is also worth checking informal sources of data to ensure that the design drivers are justified. The SMS should have a Continuous Improvement element that may be able to generate data that should influence the design.*

*Sources of data include can incident reports and feedback from current operations, e.g. reports from Masters of safety management deficiencies or SMS reviews, product claims from manufacturers, national and international standards, and IMO Guidance.*

<b>Statement that decision is to meet aims of Regulation 15 (to be completed by owner at time of decision)</b>
References to relevant documents (if applicable):
Summary of concerns that are driving the decision (if not in documents):
Data from current operations that should influence the design:
Questions and information needed to complete this entry
Follow up actions



### 3 ASSESS RISK POTENTIAL

*This section outlines the activity of a Human Hazard Assessment. Where the changes being made from the decision are routine and established, then any risks arising ought to have been captured already by the SMS and will be addressed by the design as a consequence. If the SMS (or a relevant SMS) has not captured data from known changes, then a data collection activity would be the main way to identify issues and risks, and possible ways of mitigating them.*

*Assessment of the SCC should ascertain whether novel features in manning, procedures, equipment or operation are present. Where the decision introduces changes that are novel features q.v. then specific careful exploration is required.*

Identify the risk potential (both increased and decreased) arising from changes resulting from the decision under the following headings as applicable. The risk assessment needs to consider:

- The influence of the crew characteristics on human error potential, and
- The influence of design characteristics on the potential for crew error.

*It should be noted that the level of risk is not the same as the scale of change. Sometimes, a major change will actually have little impact on operation and human error. Sometimes, a small change in procedures can have a major impact on human error potential.*

The Human Hazard Assessment should review the impact of the decision on the potential hazards associated with the Regulation and Bridge Resource Management.

*The process can be summarised as follows:*

1. *Gather data.*
2. *Consider whether the decision will introduce any issues for safe and effective operation.*
3. *Record the issues.*

*To support the subsequent design process, it may be useful to also do the following:*

1. *Enter the issues identified into the project risk management system;*
2. *Review the state of the issues after implementation;*
3. *Include opportunities for positive impact as well as hazards, and track their implementation also.*

*The potential hazards to consider are listed below, together with the features of effective and safe BRM. The table headings address the various changes (or aspects of changes) that may be under consideration. For each type of change, identify whether there are any issues to be considered.*

Human Hazard Assessment. To be completed by the owner at the time of owner's requirements.

*It is recommended that the completed hazard assessment is sent to the ship yard and equipment suppliers to ensure that the aim of the decision is met and that the risks are mitigated.*

Potential hazard to safe operation or detriment to effective operation	Decision (or changes arising from decision)			
	Changes to the crew e.g. new standards, new training regimes, new team structures, different mixes of languages or cultures, new watchlists, new ship/shore arrangements, scheduling of leave periods, working hours/rest hours	Operational changes e.g. new use of existing equipment, new procedures, new Regulations, cargo characteristics, port scheduling, organisation of on board training and drills, planning (voyages, cargo, maintenance).	Equipment changes, automation	Changes to SCC design and layout
<b>Safe Navigation</b> Interfering with safe navigation under all operational conditions				
<b>Human Error</b> Introducing one person error potential				
Increasing the risk of human error				
Failing to allow errors to be detected in time for appropriate action				
<b>Distraction, workload</b> Disrupting tasks to be performed				
Introducing excessive or unnecessary work				

Human Hazard Assessment. To be completed by the owner at the time of owner's requirements.

*It is recommended that the completed hazard assessment is sent to the ship yard and equipment suppliers to ensure that the aim of the decision is met and that the risks are mitigated.*

Potential hazard to safe operation or detriment to effective operation	Decision (or changes arising from decision)			
	Changes to the crew e.g. new standards, new training regimes, new team structures, different mixes of languages or cultures, new watchlists, new ship/shore arrangements, scheduling of leave periods, working hours/rest hours	Operational changes e.g. new use of existing equipment, new procedures, new Regulations, cargo characteristics, port scheduling, organisation of on board training and drills, planning (voyages, cargo, maintenance).	Equipment changes, automation	Changes to SCC design and layout
Introducing conditions or distractions which may cause fatigue				
<b>Situation awareness</b> Interfering with bridge team and pilot making full appraisal of the situation				
Interfering with vigilance of bridge team and pilot				
Preventing expeditious, continuous and effective information processing and decision-making				
<b>Information presentation</b> Preventing convenient and continuous access to essential information				

**Human Hazard Assessment. To be completed by the owner at the time of owner's requirements.**

*It is recommended that the completed hazard assessment is sent to the ship yard and equipment suppliers to ensure that the aim of the decision is met and that the risks are mitigated.*

Potential hazard to safe operation or detriment to effective operation	Decision (or changes arising from decision)			
	Changes to the crew e.g. new standards, new training regimes, new team structures, different mixes of languages or cultures, new watchlists, new ship/shore arrangements, scheduling of leave periods, working hours/rest hours	Operational changes e.g. new use of existing equipment, new procedures, new Regulations, cargo characteristics, port scheduling, organisation of on board training and drills, planning (voyages, cargo, maintenance).	Equipment changes, automation	Changes to SCC design and layout
Unclear, ambiguous or inconsistent information, symbols, coding				
Failure to indicate operational status				
<b>Lookout</b> Interfering with effective lookout under all conditions				
<b>Hindering effective and safe BRM</b> 1. Establishment of watch conditions based on internal and external operating factors. 2. Pre-passage planning and briefing of the bridge team... 3. Delegation of tasks and assign responsibilities, including goals,				

**Human Hazard Assessment. To be completed by the owner at the time of owner's requirements. It is recommended that the completed hazard assessment is sent to the ship yard and equipment suppliers to ensure that the aim of the decision is met and that the risks are mitigated.**

Potential hazard to safe operation or detriment to effective operation	Decision (or changes arising from decision)			
	Changes to the crew e.g. new standards, new training regimes, new team structures, different mixes of languages or cultures, new watchlists, new ship/shore arrangements, scheduling of leave periods, working hours/rest hours	Operational changes e.g. new use of existing equipment, new procedures, new Regulations, cargo characteristics, port scheduling, organisation of on board training and drills, planning (voyages, cargo, maintenance).	Equipment changes, automation	Changes to SCC design and layout
objectives, and priorities.				
4. Setting priorities				
5. Providing support to master and/or pilot				
6. Supporting communication among bridge team members and the pilot.				
7. Adequate monitoring				
8. Effective and safe use of electronic navigation aids				
9. Supporting the detection of and/or challenge to deviation from the passage plan and standard operating procedures				
Issues to be tracked				

Human Hazard Assessment. To be completed by the owner at the time of owner's requirements.

*It is recommended that the completed hazard assessment is sent to the ship yard and equipment suppliers to ensure that the aim of the decision is met and that the risks are mitigated.*

Potential hazard to safe operation or detriment to effective operation	Decision (or changes arising from decision)			
	Changes to the crew e.g. new standards, new training regimes, new team structures, different mixes of languages or cultures, new watchlists, new ship/shore arrangements, scheduling of leave periods, working hours/rest hours	Operational changes e.g. new use of existing equipment, new procedures, new Regulations, cargo characteristics, port scheduling, organisation of on board training and drills, planning (voyages, cargo, maintenance).	Equipment changes, automation	Changes to SCC design and layout
Follow up actions				

## 4 TRAIN THE TEAM

*Sections 4 to 7 identify the ergonomic criteria necessary for safe and effective operation. When the implementation of the decision (retrofit or newbuild) has become clear, then these sections should be completed in a review. For each of the criteria, record whether the implementation has followed recognised good practice against the questions. For each of the boxes for the submission statement, record the summary of the finding.*

*This section of the template discusses how the training of the SCC operators and maintainers and the establishment of SCC procedures meet ergonomic criteria and supports compliance with the aims.*

*The need for additional specialized training should not be depended upon. The acceptability of a feature cannot depend upon a period of familiarization unless it is shown to be a repetitive task or will form part of the normal training.*

The safe operation of equipment may depend on the achievement of particular operator or maintainer performance or training standards. Where this is the case, the equipment training requirements should be identified, together with the means of their implementation.

<b>Training requirements for operating equipment to meet Regulation 15. To be completed by the equipment suppliers and supplied to the system engineer. The completed form is to be supplied by the system engineer to the owner in time for training provision to be costed, planned and implemented.</b>					
<b>References for relevant documents (if applicable):</b>					
<b>Summary of changes to training (if not in documents), using the table below as appropriate:</b>					
Item of equipment (e.g. ECDIS, echo sounder etc.)	Type of training				
	Notices and briefings	Onboard training	Pre-joining training	Continuation training	Initial training

*Relevant documentation on training may well form part of the SMS, related to STCW or Safe Manning Certificate (SMC) documentation. The scope and standard of training provided should enable the crew to meet the needs of the SMC.*

<b>Statement on suitability of training provision. To be completed by the system engineer at plan approval. <i>This will require liaison with a number of parties.</i></b>	<b>Yes</b>	<b>No</b>
How has crew training been considered in the design of the change?		
Does the training provision align with assumptions provided by equipment manufacturers?		
Have all the types of task included in the operational situation, for which the operator needs to be trained, been defined?		
Are risks, penalties and performance goals for both process and operator behaviour emphasised during training?		
Is training in recovery procedures, for use after making an error, included as part of the overall training programme?		
Are operating teams trained together in the allocation and/or transfer of responsibility?		
Are operating teams trained together in the transfer of information?		
Are infrequently used, but important, skills and knowledge, given frequent refresher training?		
Have performance standards and enabling objectives been set?		
Are the criteria for fitness for duty of any crew members on call who are assigned as members of the SCC watchlists provided?		
Is the proposed training feasible in the context of watchlists, duty patterns, and conditions of employment?		
Is the training compatible with the operation of the ship		
Justification (or reference to appropriate documents)		
Shortfalls, issues and concessions:		

<b>Statement that changes to training meet the aims of Regulation 15 (to be completed by the owner at time of commissioning)</b>	
<b>References for relevant documents (if applicable):</b>	
<b>Summary of changes to training (if not in documents), using the table below as appropriate:</b>	
Scope of training	Type of training



	Notices and briefings	Onboard training	Pre-joining training	Continuation training	Initial training
Passage planning,					
Maintaining watch,					
Lookout,					
Mooring,					
Manoeuvring,					
Ship at anchor,					
Team working,					
<i>Note: SCC but not SOLAS V navigation:</i>					
Maintenance					
Management of the safety functions of the ship,					
Perform operations to prevent damage to the marine environment,					
Ensure safe carriage of cargo,					
Operate watertight closing arrangements,					
Operate fire-fighting and emergency equipment and life-saving appliances,					
Operate main propulsion and auxiliary machinery and maintain them in a safe condition					
Information required for completion					
Follow up actions					

## 5 OPERATE THE SPACE

*This section of the template provides headings for considering how the operation of the SCC and its equipment and systems (when treated as part of a worksystem) meets ergonomic criteria and supports compliance with the aims.*

### 5.1 Manning

This section lists the manning factors that affect safe and effective operation, and that would need to be considered in the design of a new SCC or major retrofit. The template should be used to record how they were taken into account in determining the proposed composition of the watch in the SCC, which may include appropriately qualified ratings.

*Such an exercise is required at a whole ship level for SOLAS V/14, and it should be possible to complete this section without duplication of effort. However, the interest here is in practical day to day watches rather than minimum manning.*

<b>Statement by the system engineer that the following conditions have been considered. <i>This activity will require liaison with a number of parties</i></b>	<b>Yes</b>	<b>No</b>
Weather conditions, visibility and whether there is daylight or darkness;		
The workload on the watchkeepers caused by the nature of the ship’s functions, immediate operating requirements and anticipated manoeuvres;		
The workload on the watchkeepers caused by the nature of the ship’s functions, immediate operating requirements and anticipated manoeuvres;		
The trade pattern and the activities taking place on board the ship at any particular time;		
Culture		
Nationality		
Language		
Fatigue, meals, rest breaks		
Management and supervision		
Justification or reference to supporting documents:		
Shortfalls, issues and concessions:		

Statement by the system engineer that the following ergonomic criteria related to manning have been considered. To be completed at plan approval. <i>This activity will require liaison with a number of parties</i>	Yes	No
Maintaining a watch, i.e. ensuring that at no time shall the bridge be left unattended;		
Fall back or reversionary modes to be considered as part of system dependability, and the manning required in such modes;		
Career progression;		
Duty cycles (i.e. hours of work or rest),		
Safety management;		
Training and certification		
Justification or reference to supporting documents:		
Shortfalls, issues and concessions:		

<b>Statement that changes to manning and operation meet the aims of Regulation 15. To be completed by the owner at commissioning.</b>
<b>References for relevant documents (if applicable):</b>
Information required for completion
Follow up actions

## 5.2 Procedures

The impact of the decision on procedures ought to be assessed. The procedures where a change is required need to be identified.

*The scope of procedures to be considered is equivalent to the scope of training described in Section 4 above.*

*IMO Resolution A.850 recommends that adequate safeguards must be in place to ensure that a "single person error" will not cause an accident.*

Information to be provided by equipment supplier to system engineer to enable procedures to be assessed (and drafted as necessary). Draft to be supplied with tender, and final version to be provided
--

before commissioning.
Essential information presented by equipment (see BDEA/IACS document for list of essential information):
Alarms and warnings presented by the equipment:
Operational states of equipment and their indication:
FMECA outputs and procedural requirements to ensure continuous presentation of information and availability of control functions.

<b>Statement by the system engineer that the following ergonomic criteria related to procedures have been considered. To be completed prior to commissioning and validated in sea trials. <i>This activity will require liaison with a number of parties</i></b>	<b>Yes</b>	<b>No</b>
Do the procedures prevent single person error?		
Do the procedures support cross-checking and supervision?		
Do the procedures make provision for feedback and the ability to confirm that orders have been complied with?		
Do the procedures align with the training and certification of the personnel?		
Do the procedures provide clear assignment of responsibilities?		
Do the procedures introduce unnecessary workload?		
Do the procedures introduce distractions?		
Are the required responses consistent and compatible with user expectations?		
Are the procedures compatible with established conventions for terminology such as those for helm and communications?		
Do the procedures match the specific equipment		

fitted?		
Do the procedures address the needs of failure and fallback mode?		
Do the procedures cover all operational states indicated by the equipment?		
Are all operational states indicated by the equipment and all alarms addressed by procedures?		
Is the information to be communicated by the procedures unambiguously available at the time required?		
Are there no easier, more dangerous alternatives?		
Do the procedures cover all watch conditions and situations?		
Justification or reference to supporting documents:		
Shortfalls, issues and concessions:		

<b>Statement that changes to procedures meet the aims of Regulation 15. To be completed by the owner at commissioning.</b>
<b>References for relevant documents(if applicable):</b>
<b>(If no applicable documents) Justification that procedures meet ergonomic principles</b>
Information required for completion
Follow up actions

## 6 EQUIP THE SPACE

*This section of the template supports the analysis and recording of how the design of the SCC equipment and systems (when treated as part of a worksystem) meets ergonomic criteria and supports compliance with the aims.*

*The scope of equipment considered for ergonomic criteria relates to the worksystem rather than the change. For example, it is necessary to examine all equipment on the bridge/SCC from the point of view of achieving consistency and avoiding distraction. For the parts of the bridge covered by the IBS, then much of the information required should come from the supplier. However, even within an IBS, it is advisable to check that the ergonomic criteria are met, as well as between the IBS and the rest of the SCC equipment.*

*The scope may also need to consider paper and electronic forms of documentation, training aids, logs and administrative systems.*

Information to be supplied by equipment supplier to system engineer. Draft to be supplied with tender, final version to be provided prior to commissioning.
---

As applicable:
----------------

Details of user interface design and compliance with ergonomic criteria.
--

Details of automation and status indication and compliance with ergonomic criteria.
---

Details of workstation design and compliance with ergonomic criteria.
---

Details of equipment design and compliance with ergonomic criteria.
---

Details of documentation design and compliance with ergonomic criteria.
---

### 6.1 Relevant Rules and Regulations

The carriage requirements will be identified by the project and will help with defining the scope of the review.

Other Rules and Regulations that affect the safe and effective operation of bridge equipment may also need to be included in the review, to avoid duplication of activity.

<b>Compliance with relevant Rules and Regulations</b>
---

The Rules and Regulations relevant to this decision are as follows:
---

Information required
----------------------

Follow up actions
-------------------

## 6.2 User interaction

The user interfaces should meet ergonomic criteria, including the principles of software ergonomics. *Note that some aspects of user interaction, such as ‘mode errors’ are itemised under 6.4 ‘automation and status indication’.*

Questions to consider are:

Statement by the system engineer that the following ergonomic criteria related to user interaction have been considered. To be completed prior to commissioning and validated in sea trials. <i>This activity will require liaison with a number of parties</i>	Yes	No
Use of standards: Has the user interaction been designed in accordance with ergonomic standards? (Provide reference to compliance statement from the manufacturer)		
Response times: Does the system respond fast enough on all occasions for interaction without disrupting the task? State No if any exceptions (i.e. long response times) have an impact on safe and effective operation.		
<i>Visual clarity:</i>		
Is the information clear?		
Are display formats free from irrelevant information?		
Is there a logic to the grouping and structure of the information?		
Are the display formats too densely packed and cluttered?		
Is the coding of the information clear?		
Is there an explicit structure to the information presentation and interactive dialogue e.g. menus?		
Will the equipment cause distraction from the users primary tasks?		
<i>Consistency:</i>		
Is the information presented consistently within and between different sub-systems?		

<p><b>Statement by the system engineer that the following ergonomic criteria related to user interaction have been considered. To be completed prior to commissioning and validated in sea trials.</b> <i>This activity will require liaison with a number of parties</i></p>	<p><b>Yes</b></p>	<p><b>No</b></p>
<p>Will any inconsistencies cause confusion or errors?</p>		
<p><i>Compatibility with users' expectations:</i></p>		
<p>Is information and labelling presented in accordance with recognised standards and conventions? (give details).</p>		
<p>Is the information in a form that users are accustomed to?</p>		
<p>Do control functions work the way that users will expect?</p>		
<p><i>Alerting:</i></p>		
<p>Is there sufficient alerting for when the user may be busy with another item of equipment?</p>		
<p>Would the alerting cause distraction?</p>		
<p>Does the attention-getting nature of the alert match the nature of the signal or event?</p>		
<p>Does the alert appear in the right place and format?</p>		
<p>Is the information in the alert easily understood?</p>		
<p><i>Error prevention and correction:</i></p>		
<p>Are there suitable checks in the dialogue and in the input handling to prevent erroneous data or control inputs?</p>		
<p>If the user makes a mistake, is there assistance in recovering from it?</p>		
<p>Is an 'undo' function provided where possible?</p>		
<p>Is the time taken for error recovery short enough to avoid risks or hazards occurring as a consequence?</p>		
<p>Will user errors be sufficiently clear to the bridge team that single user errors can be avoided?</p>		



<p><b>Statement by the system engineer that the following ergonomic criteria related to user interaction have been considered. To be completed prior to commissioning and validated in sea trials.</b> <i>This activity will require liaison with a number of parties</i></p>	<p><b>Yes</b></p>	<p><b>No</b></p>
<p><i>Flexibility and control: This needs to be considered for interactions with a single user. A review is also needed to consider how the equipment (especially an IBS) supports the working of the bridge team as a whole.</i></p>		
<p>Firstly, does the equipment meet the different needs of the different users, and does this compromise ease of use for any particular users?</p>		
<p>Is the user ‘in control’ of the sequence of commands and actions, or is he constrained by the design of the menus etc?</p>		
<p>Is it possible to switch between tasks, perhaps with some tasks still incomplete?</p>		
<p>Are there shortcuts or quick commands for functions that require them?</p>		
<p>Is feedback provided in an informative manner?</p>		
<p>Is it obvious to the bridge team who is in control of particular functions?</p>		
<p>Are the arrangements for transfer of control compatible with good bridge watchkeeping procedures?</p>		
<p><i>Situation awareness:</i></p>		
<p>Does the equipment assist the operator in his situation awareness as regards his job as a whole, or is there a risk that he will become absorbed in what the equipment is doing, rather than what the ship is doing? Is there a risk of “head-down mode”?</p>		
<p>Does the user interface support intuitive decision making based on recognising the situation, rather than the user having to work out in his head what is actually happening (the difference between ‘data’ and ‘information’)?</p>		

<p><b>Statement by the system engineer that the following ergonomic criteria related to user interaction have been considered. To be completed prior to commissioning and validated in sea trials.</b> <i>This activity will require liaison with a number of parties</i></p>	<p><b>Yes</b></p>	<p><b>No</b></p>
<p>Justification or reference to supporting documents:</p>		
<p>Shortfalls, issues and concessions:</p>		

<p><b>Ergonomic criteria for user interaction</b></p>
<p>Summary statement of how the user interaction meets the ergonomic criteria (or reference to documentation):</p>
<p>Further information required</p>
<p>Follow up actions</p>

### 6.3 Automation and status indication

It is necessary to consider the design of automation from the point of view of the user. Is the user ‘in control of the automation’, is he ‘in the loop’ and aware of what the automation is doing?

*For complex systems, ‘mode errors are a major concern. The consequence of a mode error can be serious. Re-engaging automatic steering for instance; what heading is it going to take? The current one or the heading from last time it was engaged? The Airbus aircraft had a series of accidents where the pilots thought the autopilot was in one mode, and it was actually in a different one.*

<p><b>Statement by the system engineer that the following ergonomic criteria related to automation and status indication have been considered. To be completed prior to commissioning and validated in sea trials.</b> <i>This activity will require liaison with a number of parties</i></p>	<p><b>Yes</b></p>	<p><b>No</b></p>
<p>Does the equipment make it obvious to the user that it is in a particular mode for all modes and states?</p>		
<p>Could the user think that it is in a different mode and act accordingly?</p>		
<p>Is it always obvious what state the system is in?</p>		
<p>Is it always obvious what defects or failures have occurred, and what the implications of the failures</p>		

<p><b>Statement by the system engineer that the following ergonomic criteria related to automation and status indication have been considered. To be completed prior to commissioning and validated in sea trials. <i>This activity will require liaison with a number of parties</i></b></p>	<p><b>Yes</b></p>	<p><b>No</b></p>
<p>are?</p>		
<p>Can the operator override the automation, or intervene part way through a process?</p>		
<p>Has the automation introduced complex planning, set up and system management tasks?</p>		
<p>Have any planning, set up and system management tasks been considered in the operator tasks, training and responsibilities?</p>		
<p>Has the automation introduced monotonous monitoring tasks?</p>		
<p>What happens when the circumstances are beyond the capability of the automation?</p>		
<p>Will the operator be able to take over when the circumstances are beyond the capability of the automation?</p>		
<p>Dependability and failure modes: How dependable is the automation intended to be (e.g. from a SIL assessment or an FMECA)?</p>		
<p>Will the crew be able to cope with the various failure modes?</p>		
<p>Have procedures and assigned tasks been developed to address failure modes?</p>		
<p>Are the indications of failure modes sufficiently clear that the bridge team and pilot can understand the nature of the failure and its consequences?</p>		
<p>Justification or reference to supporting documents:</p>		
<p>Shortfalls, issues and concessions:</p>		

**Ergonomic criteria for automation and status indication. To be completed by the owner at commissioning.**

Summary statement of how the automation and status indication meet ergonomic criteria (or reference to documentation):
Further information required:
Follow up actions:

### 6.4 Workstation design

Statement by the system engineer that the following ergonomic criteria related to workstation design have been considered. To be completed at plan approval and validated in sea trials. <i>This activity will require liaison with a number of parties</i>	Yes	No
<i>Positioning of controls and displays:</i>		
Are the displays and controls positioned according to criteria such as frequency, urgency, criticality?		
Are controls and displays grouped according to sequence of use?		
Is the maximum height of the workstation compatible with the external view requirements?		
Is the workstation layout appropriate for the user population?		
<i>Cross-checking and sharing requirements:</i>		
Does the workstation design support teamworking and the assignment of tasks?		
Are members of the bridge team able to cross-check control actions and information display, and to conduct supervision?		
<i>Supporting tasks e.g. paperwork:</i>		
Is there adequate provision for the storage and use of manuals, log books?		
Is the user able to perform background tasks that may need to be done at the workstation, but which are not part of its primary purpose?		

Will background or supporting tasks that need to be done provide a distraction or additional workload?		
<i>The needs of specific users e.g. pilots:</i>		
Have the needs of all watch conditions and situations been considered?		
Has the ease of maintenance been considered?		
Have the specific needs of particular users such as pilots been considered?		
Justification or reference to supporting documents:		
Shortfalls, issues and concessions:		

<b>Ergonomic criteria for workstation design. To be completed by the shipyard prior to commissioning.</b>
Summary statement of how the workstation design meets ergonomic criteria (or reference to documentation):
Further information required:
Follow up actions:

### 6.5 Equipment design

This section is to be completed for the design of items of equipment located on their own e.g. against a bulkhead.

<b>Statement by the system engineer that the following ergonomic criteria related to equipment design have been considered. To be completed at plan approval and validated in sea trials. <i>This activity will require liaison with a number of parties</i></b>	<b>Yes</b>	<b>No</b>
<i>Location:</i>		
Is the location appropriate to the operator task?		
Will having the equipment at this location cause distraction to other users?		

<i>Panel layout:</i>		
Is the panel layout logical, are items grouped and sequenced in a manner that supports correct use and helps to prevent errors?		
<i>Controls, displays, labelling:</i>		
Are the controls, displays, labelling clear, easy to access and read with the equipment in its location?		
Has ease of maintenance been addressed?		
Have the needs of all watch conditions and situations been considered?		
Have the specific needs of particular users such as pilots been considered?		
Justification or reference to supporting documents:		
Shortfalls, issues and concessions:		

<b>Ergonomic criteria for equipment design</b>
Summary statement of how the equipment design meets ergonomic criteria (or reference to documentation):
Further information required:
Follow up actions:

### 6.6 Documentation design

The documentation affected by the decision, and which is required to support safe operation should be reviewed to ensure that it is provided in an appropriate form and language.

*The documentation to be considered includes the following:*

- *Manuals (paper and electronic),*
- *Notices,*
- *Logs and records,*
- *Charts*
- *On-screen help.*

<p><b>Statement by the system engineer that the following ergonomic criteria related to documentation design have been considered. To be completed at plan approval and validated in sea trials.</b> <i>This activity will require liaison with a number of parties</i></p>	<p><b>Yes</b></p>	<p><b>No</b></p>
<i>Formats:</i>		
<p>Hve the appropriate formats of documentation been provided (e.g. on-screen help, manuals in paper or electronic form, reference cards, etc.)?</p>		
<p>Has the integrity of information provided in documentation been considered, including fallback modes for electronic provision and updating procedures?</p>		
<p>Is the documentation consistent with the equipment?</p>		
<i>Language:</i>		
<p>Is the documentation in the correct language?</p>		
<i>Workload and distraction</i>		
<p>Is the documentation easy to use e.g. can the right section be found, is it easy to relate to information on screen?</p>		
<p>Would using the documentation provide a distraction from safe and effective bridge watchkeeping?</p>		
<p>Have the needs of all watch conditions and situations been considered?</p>		
<p>Have the specific needs of particular users such as pilots been considered?</p>		
<p>Justification or reference to supporting documents:</p>		
<p>Shortfalls, issues and concessions:</p>		

<p><b>Ergonomic criteria for documentation design. To be completed by the owner at commissioning.</b></p>
<p>Summary statement of how the documentation design meets ergonomic criteria (or reference to documentation):</p>

Further information required:
-------------------------------

Follow up actions:
--------------------



## 7 DESIGN THE SPACE

This section of the template should be used to describe how the design of the SCC workspace meets ergonomic criteria and supports compliance with the aims.

### 7.1 Relevant Rules and Regulations

For a new build or major refit, there are standards and guidelines e.g. MSC Circ.982 that set out the ergonomic criteria for bridge layout. This section is used to record compliance against such standards.

*If there is a compliance statement (e.g. by the yard) against such a standard, then this may be all that is required to demonstrate that the criteria have been met.*

*However, it should be remembered that a number of sources of guidance such as MSC Circ. 982 are intended for particular users (e.g. tall Northern European crews) and particular types of use. The review needs to consider whether guidance needs to be tailored to the specific needs of the project.*

<b>SCC layout and standards and guidelines for ergonomic criteria. To be completed by the ship yard at plan approval.</b>		
Statement (or reference to documents) that SCC layout complies to standards for SCC layout e.g. SOLAS V/22, MSC Circ. 982, ISO 8468 (Ships' Bridge Layout and Associated Equipment - Requirements and Guidelines,) and ISO 14642 (Ships and Marine Technology - Ships' Bridge Layout and associated Equipment - additional requirements.):		
Information needed:		
Follow up actions:		

*The remainder of this section discusses the various ergonomic criteria to be considered and can be used to report situations where a standard response is not entirely appropriate. If the SCC layout is completely covered by the response above, then it does not need to be completed.*

*If the following section is being completed for a partial change where only some items are relevant, then for items that are not applicable, write N/A.*

### 7.2 Environment

*The environment of the SCC and its configuration should not inhibit a member of the watch from detecting by sight or hearing any external development.*

<p><b>Statement by the ship yard that the following ergonomic criteria related to the SCC environment have been considered. To be completed at plan approval and validated in sea trials.</b> <i>This activity may require liaison with a number of parties</i></p>	<p><b>Yes</b></p>	<p><b>No</b></p>
---	-------------------	------------------

Does the environment of the SCC meet ergonomic criteria in its proposed operational setting as regards the following aspects?		
Thermal environment (temperature, airflow, humidity, heat sources)?		
Noise?		
Lighting?		
Display visibility at day and at night?		
Vibration?		
Ship movement?		
Justification or reference to supporting documents:		
Shortfalls, issues and concessions:		

<b>Ergonomic criteria for the SCC environment. To be completed by the owner at commissioning.</b>
Statement of how the SCC meets ergonomic criteria for the environment (or document references):
Information required:
Follow up actions:

### 7.3 View

Does the external view meet Regulatory requirements and ergonomic criteria taking into account the intended users and the usage of the ship?

<b>Statement by the ship yard that the following ergonomic criteria related to view have been considered. To be completed at plan approval and validated in sea trials. <i>This activity may require liaison with a number of parties</i></b>	<b>Yes</b>	<b>No</b>
Does the external view meet Regulatory requirements?		
Is the horizontal field of view from the various workstations, including the arc of the individual blind sectors and the sum of blind sectors forward of the beam satisfactory?		

Is the vertical field of view over the bow from the conning position and the positions for navigation and manoeuvring satisfactory, including the line of sight under the upper edge of the window from standing positions at the workstation?		
Are the window arrangements satisfactory, including inclination, dimensions, framing and the heights of upper and lower edges of the windows?		
Is the view of other workstations and their operators satisfactory from the various workstations (so that BRM can be supported)?		
Justification or reference to supporting documents:		
Shortfalls, issues and concessions:		

<b>Ergonomic criteria for the SCC view. To be completed by the owner at commissioning.</b>
Statement of how the SCC meets ergonomic criteria for external view and internal sightlines (or document references):
Information required:
Follow up actions:

**7.4 Access**

<b>Statement by the ship yard that the following ergonomic criteria related to access have been considered. To be completed at plan approval and validated in sea trials. <i>This activity may require liaison with a number of parties</i></b>	<b>Yes</b>	<b>No</b>
<i>Does access to and within the SCC meet ergonomic criteria as regards the following?</i>		
SCC dimensions including deckhead and door heights		
Access to the SCC		
Movement and access within the SCC		
Maintenance access		

Justification or reference to supporting documents:
Shortfalls, issues and concessions:

<b>Ergonomic criteria for access to and within the SCC. To be completed by the owner at commissioning.</b>
Statement of how the SCC meets ergonomic criteria for access (or document references):
Information required:
Follow up actions:

### 7.5 Layout

<b>Statement by the ship yard that the following ergonomic criteria related to layout have been considered. To be completed at plan approval and validated in sea trials. <i>This activity may require liaison with a number of parties</i></b>	<b>Yes</b>	<b>No</b>
<i>Does the layout of the SCC meet ergonomic criteria with respect to the following?</i>		
Workstation positioning		
Layout of equipment		
Documentation		
Facilities		
Fixtures and fittings		
Growth margin.		
Justification or reference to supporting documents:		
Shortfalls, issues and concessions:		

<b>Ergonomic criteria for SCC layout. To be completed by the owner at commissioning.</b>
Statement of how the SCC meets ergonomic criteria for layout (or document references):

Information required:
Follow up actions:

### 7.6 Audible and visual annunciators

*Whatever its source, every alarm should be justified, properly engineered and be consistent with the overall alarm philosophy and risk assessment. As each extra alarm is introduced, the chances of overloading the operator with alarms increases, and the alarm system overall becomes less effective as a line of defence.*

Statement by the system engineer that the following ergonomic criteria related to audible annunciators have been considered. To be completed at plan approval and validated in sea trials. <i>This activity will require liaison with a number of parties</i>	Yes	No
Is the provision of alarms (audible and visual) consistent with the Human Hazard Assessment?		
Have unnecessary alarms been avoided?		
Are alarms only triggered when there is a need for rapid response (i.e. alarms should not be sounded when the equipment under control is working normally or the ship is in a safe condition)?		
Have the values that trigger alarms been set to be consistent with the needs of the task?		
Are alarms consistent with an alarm philosophy (e.g. as regards acceptance, cancelling, inhibiting, transfer) based on good practice?		
Are the means of accepting or cancelling alarms satisfactory e.g. will not cause a distraction or excessive workload?		
Are alarms prioritised or grouped to reflect urgency?		
Are alarms designed to avoid introducing a distraction?		
Are captions or alarm list messages easy to understand?		
Are the attention-getting qualities of alarms right		

(e.g. not too loud)?		
Is it easy to distinguish the different audibles, including alarm sounds, equipment alerts and telephones?		
Justification or reference to supporting documents:		
Shortfalls, issues and concessions:		

<b>Ergonomic criteria for audible annunciators. To be completed by the owner at commissioning.</b>
Statement of how the SCC meets ergonomic criteria for the environment (or document references):
Information required:
Follow up actions:

### 7.7 Occupational safety

<b>Statement by the ship yard that the following ergonomic criteria related to audible annunciators have been considered. To be completed at plan approval and validated in sea trials. <i>This activity may require liaison with a number of parties</i></b>	<b>Yes</b>	<b>No</b>
Does the decision improve on existing provision of measures for occupational safety?		
<i>Has adequate consideration been given to measures including the following?</i>		
Grab rails,		
Non-slip surfaces,		
Warning signs,		

Protective clothing,		
Protuberances,		
Safety equipment marking,		
Escape and survivability,		
Security		
Cleaning.		
Justification or reference to supporting documents:		
Shortfalls, issues and concessions:		

<b>Ergonomic criteria for occupational safety. To be completed by the owner at commissioning.</b>
Statement of how the SCC meets ergonomic criteria for occupational safety (or document references):
Information required:
Follow up actions:

## **8 ALARP STATEMENT**

*This section of the template can be used to state whether the safety and environmental risks arising from the decision are As Low As Reasonably Practical (ALARP) and in accordance with Company policy. (It is recognized that the probability of the crew, individually or when acting together, making inadvertent single errors, or combinations of errors, can never be reduced to below a Probable frequency.)*



**8.1 Summary of residual risk. To be completed by the owner at commissioning.**

Describe why the results of your investigations justify this decision and indicate the reasons for the design option chosen.

Summarise the residual risk, i.e. the risk remaining after the mitigation measures that you have described in sections 4 to 7 have been put in place, with estimates of likelihood.

Supporting evidence, e.g. from trial application, feedback from crew involvement in design and evaluation should be included here.

Residual Risk (i.e. issue that could not be eliminated)	Aim from Regulation 15					
	1.1 facilitating the tasks to be performed by the bridge team and the pilot in making full appraisal of the situation and in navigating the ship safely under all operational conditions;	1.2 promoting effective and safe bridge resource management;	1.3 enabling the bridge team and the pilot to have convenient and continuous access to essential information which is presented in a clear and unambiguous manner, using standardized symbols and coding systems for controls and displays;	1.4 indicating the operational status of automated functions and integrated components, systems and/or sub-systems;	1.5 allowing for expeditious, continuous and effective information processing and decision-making by the bridge team and the pilot;	1.6 preventing or minimizing excessive or unnecessary work and distractions on the bridge which may cause fatigue or interfere with the vigilance of the bridge team and the pilot;

Residual Risk (i.e. issue that could not be eliminated)	Aim from Regulation 15						
	1.1 facilitating the tasks to be performed by the bridge team and the pilot in making full appraisal of the situation and in navigating the ship safely under all operational conditions;	1.2 promoting effective and safe bridge resource management;	1.3 enabling the bridge team and the pilot to have convenient and continuous access to essential information which is presented in a clear and unambiguous manner, using standardized symbols and coding systems for controls and displays;	1.4 indicating the operational status of automated functions and integrated components, systems and/or sub-systems;	1.5 allowing for expeditious, continuous and effective information processing and decision-making by the bridge team and the pilot;	1.6 preventing or minimizing excessive or unnecessary work and any conditions or distractions on the bridge which may cause fatigue or interfere with the vigilance of the bridge team and the pilot;	1.7 minimizing the risk of human error and detecting such error if it occurs, through monitoring and alarm systems, in time for the bridge team and the pilot to take appropriate action.
Supporting evidence or document references:							
References to tracking residual risks e.g. in SMS:							

## 8.2 Cost-benefit justification

Describe why the costs of alternative decisions would be disproportionate to the increase in risk reduction.

<b>Cost-benefit justification. To be completed by the owner at commissioning.</b>
Justification summary (or document references)

## DISCLAIMER

Use of any knowledge, information or data contained in this document shall be at the user's sole risk. The members of the ATOMOS IV Consortium accept no liability or responsibility, in negligence or otherwise, for any loss, damage or expense whatever sustained by any person as a result of the use, in any manner or form, of any knowledge, information or data contained in this document, or due to any inaccuracy, omission or error therein contained.

The European Community shall not in any way be liable or responsible for the use of any such knowledge, information or data, or of the consequences thereof.