Summary of Session 1 : Safety

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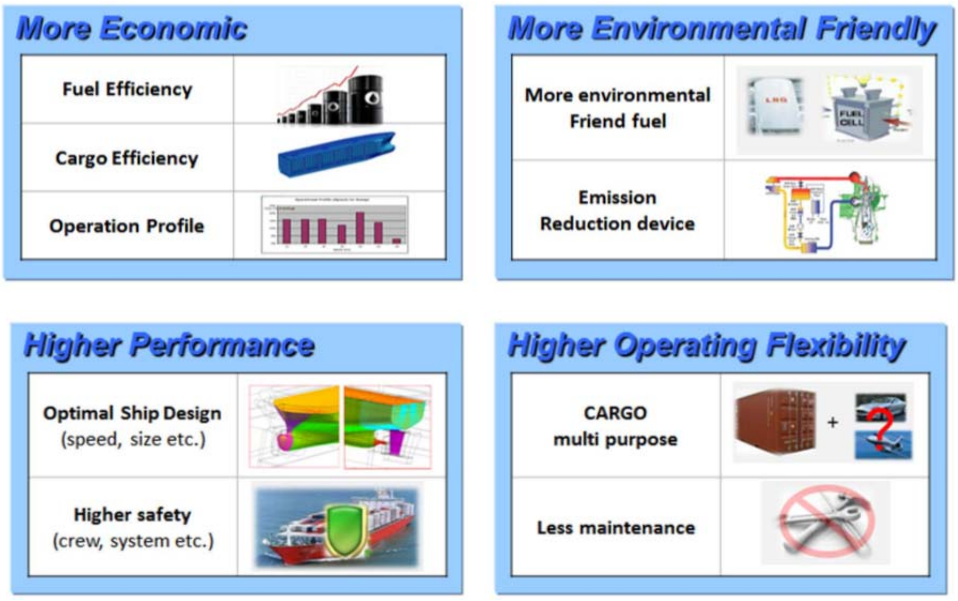
Items	Country	Organization	Name	Title
Containership Safety	China	Marine Design & Research Institute of China	Song Liu	Safety of Large Container Vessel
	Japan	Japan Marine United Corporation	Masanobu Toyoda	Containership Safety
GBS (SCF, CSR-H)	Japan	Imabari Shipbuilding Co.	Kenji Kamita	GBS – Ship Construction File (SCF)
	Korea	Hyundai Heavy Industries	Oh-seok Kwon	Investigations of New(Harmonized) CSR Application
GBS (SLA)	China	China Classification Society	Haidong Luo	The key points and latest status of Goal-based Standard-Safety Level Approach
i-Shipping	Korea	Daewoo Shipbuilding & Marine Engineering Co.	Kwang-Phil Park	Performance Analysis based on Operation Data with Integrated Monitoring System

1. Mr. Song Liu working for Marine Design & Research Institute of China, made a presentation with the title of "Safety of Large Container Vessel".

- The speaker started with the tendency of large size container vessels, and explained benefits of large size, Scale Effects.



- The speaker touched features of large container vessel.

· Size

→ VLCS (Very Large Container Ship) : Loa 300m ~ 350m

→ ULCS (Ultra Large Container Ship) : Loa 350m ~ 400m,

even longer

in recent future

· Cargo features

→ more total nominal containers, more BAYs/ ROWs/ TIERs

· Contract speed still at high level

→ High encounter frequency in waves

· Engine Power derated, but still at high level

→ large scale propeller

→ mid-aft engine arrangement, long shaft length

· Hull form

→ bow flare, flat bottom above propeller

→ support more slots both in hold and on deck

· Structural features

→ Main dimension increased – Decrease of rigidity, first order natural frequency

→ High Tensile Steel – Application of HTS with big thickness, EH40, EH47

→ Hull form / high speed – Slamming influence for both ends and bottom

→ Large opening size and Twin islands arrangement

→ Vibrations

→ Whipping and Springing

- He explained safety factors to be considered.

· Stability

→ In case of heavy cargo, for excessive stability, comfort of crews, and lashing safety, in hold, intentionally leave upper tiers empty, and it helps to reduce GM.

→ In case of light cargo, because stability is still critical due to high VCG of cargos, ballast water is needed for both stability and longitudinal strength.

→ He also touched 2nd generation intact stability criteria with 1st level criteria, 2nd level criteria, and 3rd level direct assessment.

· Cargo Security

→ He cited CSS Code (Code of Safe Practice for Cargo Stowage and Securing), and he emphasized that though ship length is increased due to longer BHD distance, safer consideration should be given indeed.

→ He also touched increased fire-fighting capability and mandatory verification of container weight.

· Structural Design and Assessment

→ He introduced New standard for container ships' longitudinal strength, IACS URS11A which includes net thickness approach, additional functional requirements for large container ships, etc.

→ For cargo hold analysis, compulsive requirement for one bay empty loading condition, IACS URS 34 was introduced.

→ Global FEM analysis should be considered using full ship model for assessing the structural strength of global hull girder structure, cross deck structures and

hatch corner radii.

→ With regard to vibration, hull girder's natural frequency should be calculated and vibration response should be assessed.

→ Whipping & Springing greatly affect fatigue strength and ultimate strength. Therefore, they should be considered in strength assessment for large container vessels.

- The speaker concluded as follows.

· Under the circumstances of limited operation record and statistics, much more researches and investigation should be followed to improve safety.

- There was one question from the floor.

1) Q : What is the situation of high tensile steel application in China's container ship industry?

A : The highest grade applied is EH47, and the largest thickness is about 85 mm.

2. Mr. Masanobu Toyoda working for Japan Marine United Corporation, made a presentation with the title of "Containership Safety".

- The speaker explained common understanding as follows.

· Ships complying with Class rules and International regulations have been recognized as being reasonably "safe".

· Any ship, however, may be at risk under extreme loading beyond expectations and safety margins of Class.

· Without due operational considerations under specified design conditions and maintenance, and quality training & management of the crew, safety of the ship is at risk, too.

- He emphasized the following 3 points.

· The social needs, operational needs and technologies are on the trend of "consecutive upgrading".

· Each Shipbuilder can hardly access worldwide casualty information and/or signs of

casualty in terms of sufficient quantity and quality.

· Since Class and IACS are most well placed to accumulate such information, necessity for early warning to Maritime industry and updating of Class rules without delay should be more stressed than ever.

- The speaker dealt with IACS UR S11A.5 and IACS UR S11A.6 which are effective from 2016 July 1.

1) Concern for IACS UR S11A.5 (Hull Girder Ultimate Strength)

- The vertical hull girder bending moment *M* in hogging or sagging condition, on the ultimate strength check is to be taken as:

$M = \gamma_S M_S + \gamma_W M_W$

· It is more difficult to control *Ms* for container ship than BC and OT because of the uncertainties of difference in declared weight and actual weight of each container.

Especially, the explanation for γ_S in technical background of UR is not clear.

2) Concern for IACS UR S11A.6 (Additional Requirement for Container Ship)

- The function of Classification Society is stipulated in the clause of S11A.6.2 “Yielding and buckling assessment” and S11A.6.3 “Whipping”.
- He pointed out that
  · These URs provide functional requirements only.
  · As a consequence, there will be difference in actual requirements to be developed by each classification society, which leads to difference in safety level.
  · Whipping effect, in particular, needs to be incorporated into hull girder ultimate strength assessment at each classification society’s own discretion

- The speaker concluded as follows.

· Since Class and IACS can be most well placed to accumulate casualty information, necessity for early warning to Maritime industry and updating of Class rules

without delay should be more stressed than ever.

· Technical background with detailed explanation should be provided for ship owner's and shipbuilder's understanding. (UR S11A.5)

· Additional requirement for large container ship should be more concrete to the degree not allowing any arbitrarily different safety level in each class rule. (UR S11A.6)

- There were two questions from the floor.

1) Q : How much does whipping shown in new UR S11A affect container ships?
A : It is difficult to say how new UR affects container ships now, because classes have their own procedures for whipping assessment, and the amount of effect will vary. Therefore, it is important to consider the same safety level for whipping effect.

2) Q : How largest size of container ship has been built?
A : Container ships up to around 20,000 TEU class have been built.

3. Mr. Kenji Kamita working for Imabari Shipbuilding Co., made a presentation with the title of "GBS – Ship Construction File (SCF)".

- The speaker introduced what SCF is.

· SCF is required in SOLAS II-1/3-10(GBS).

· SCF shall include specific information on how the functional requirements of the GBS Tier II are applied in the ship design and construction.

· SCF shall be kept on board the ship and/or ashore.

· Intellectual Property Rights (IPR) shall duly be respected.

· Highly IP sensitive information such as Yard plans, Lines plan, and Bulky output of strength and fatigue life calculation is stored at ashore archive center.

- SCF is composed of 4 items.

· Executive Summary, ES

· Ship Construction File Industry Standard, IS

· Unified Interpretation of SCF-IS, UI

· Guidance on System for Management of SCF in a Digital Format, GS

- The speaker touched some key points.
  · IP Level is divided into two, High and Ordinary Level.
  · Ordinary IP Level includes such as Capacity Plan, Loading Manual, Trim and Stability Booklet, Operation and Maintenance Manual, General Arrangement, Damage Control Plan, Coating Technical File, List of Materials, Midship Section, Engine-room Construction, and Equivalent to Lines Plan, etc.
    → Equivalent to Lines Plan means Key Construction Plans and Numerical Offset Hull Form Data in Loading Computer.
  · High IP Level includes Full Detailed Strength Calculation, Full Detailed Fatigue Life Calculation, Yard Plans, and Master Lines Plan.
    → They are stored and protected in Archive Center.
  · SCF with High IP Level need not be on board at all times.
  · SCF with Ordinary IP Level need to be on board at all times.
  · Report of strength calculation should include requirements by CSR.

- The speaker explained NK Archive Center Scheme presented at ASEF in 2014 last year, and Time Plan for GBS/SCF finalization and application as follows.
  · December 2015 : SCF approval by all industry associations
  · Early 2016 : Implementation of SCF IS and Starting to prepare Archive Center
  · March 2016 : Joint SCF Submission to IMO MSC 96 with Information Paper
  · May 2016 : IMO MSC 96 notes SCF IS.
  · 2016 July 1 : GBS/SCF application to new ship contracts
  · 2020 July 1 : GBS/SCF application to new ship delivery

- The speaker concluded as follows.
  · The agreement on the protection of IPR and model procedures for access to SCF as well as the secure safekeeping of SCF throughout the lifetime of the ship is the pioneering achievements in history for Shipbuilders, Shipowners, and Classification Societies.

- There was one question from the floor.

1) Q : Who and how the contents of SCF will be verified?

A : IMO GBS requires verified as-built drawings to be kept by the shipowner indeed. Verifier is either relevant flag State or Classification Society as its RO. In most cases, however, relevant Classification society will verify the SCF.

During the discussion among Shipping industry, Shipbuilding industry and IACS, it was agreed that relevant Classification society will not verify and approve the contents of each SCF drawing but will only check the list of SCF drawings.

The reason was that the 2nd verification and approval of as-built drawings by the Classification society in addition to the initial verification and approval at the design stage require huge time and cost.

The contents of as-built drawings will not be verified as in the past and at present. The shipyard is therefore responsible for the accuracy and quality of the contents of SCF.

4. Mr. Oh-Seok Kwon working for Hyundai Heavy Industries, made a presentation with the title of "Investigations of New (Harmonized) CSR Application".

- The speaker indicated that previous CSRs (CSR-BC & CSR-OT) are differently originated from New CSR (Harmonized CSR) and explained the new rule application as follows.
  · Bulk Carrier having length (L) of 90 m or above (Single/Double Skin)
  (excl. OBO, Ore Carriers)
  · Double Hull Oil Tanker having length (L) of 150 m or above
  · Ships whose contract for construction is dated on or after 2015 July 1

- As an example, the speaker touched the main impact of New CSR about 208K Bulk Carrier in detail.
  · Especially grab weight increases from 20 tons to 35 tons.
  · The speaker emphasized the following points.
  → Analysis work is expected to increase about 3 times.

→ Newly developed software and analysis procedure are necessary to reduce the design work load.

→ Locations of fine mesh/very fine mesh analysis are increased remarkably.

- The speaker pinpointed that the criteria for non-tight structural member of HT32 would be increased by 4.6 % when it is compared to CSR-OT.

- The speaker summarized the main impact of New CSR with a following table.

Ship Type	- Capesize B/C - Newcastlemax B/C	- Aframax Tanker - Suezmax Tanker - VLCC
steel weight increase	3.0 % ~ 3.5 %	1.5 % ~ 2.0 %
design work load increase	about 1,500 man-hour	about 1,000 man-hour

- The speaker raised some discussion items through the comparison with DSA(Direct Strength Assessment) result and also proposed solutions to the problems.

Items to be discussed	Problems	Proposed Solutions
Strength of Double Bottom Structure	- Aftmost cargo hold in harbour condition - The lower draft proposed by New CSR in case maximum heavy cargo is loaded in aftmost cargo hold	apply deeper draft considering actual loading/unloading condition
Beam Sea Condition	Most of transverse members should be reinforced due to beam sea condition.	adjust loading considering probability level of beam sea
Evaluation Region for foremost/aftmost hold analysis	Big reinforcement is expected in way of outside of hold region such as engine room and fore peak region.	- modify application region - adjust shear force in way of outside hold
Inner Bottom Longitudinal Buckling	- The severest condition is harbour condition. - Global sigma - Local stress - Buckling strength of inner bottom longitudinal - Longitudinal scantling	modify harbor draft

- The speaker introduced co-work with several Classification Societies.
  · Review software accuracy and conformity
  · Re-establish approval procedure
  · Weight increase estimation and optimization
  · Assume design work and time

- The speaker concluded that the main impact of new CSR causes steel weight increase and design work load increase. For these solutions, he suggested that design should be optimized and design procedure should be developed.

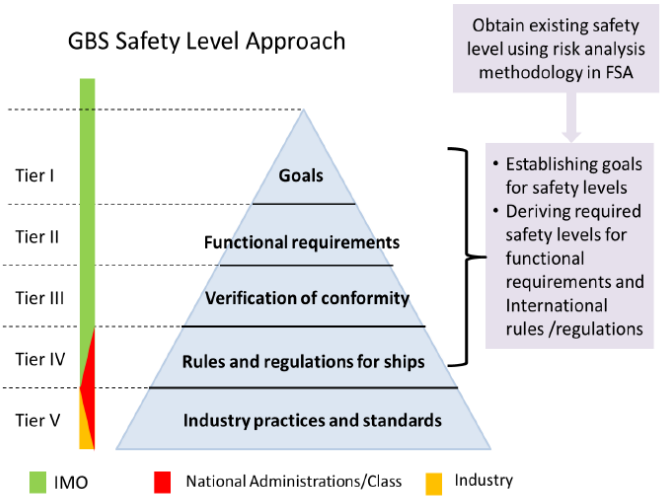
- There were no questions or comments from the floor.

5. Mr. Haidong Luo working for China Classification Society, made a presentation with the title of "The key points and latest status of Goal-based Standard-Safety Level Approach".

- The speaker explained the origin of GBS-SLA.
  · The disaster of "Erika" and "Prestige" provoked Europe to initiate more stringent Regulations in IMO where GBS was firstly introduced from the 89th Council of IMO.

- He did not touch all his presentation material, and instead he explained the concept of GBS-SLA; however, I would like to introduce the important information from his presentation material.

- The features of GBS-SLA



· Through the discussions in IMO, the SLA (Safety Level Approach) was regarded as future GBS, which is also advanced methodology for development and justification of Rules and Regulations.

· The most extinguished feature of SLA is the quantitative criteria of safety level obtained through risk analysis.

· Application of SLA will have great influence on shipbuilding and shipping industry, and by applying the SLA, the following could be achieved.

→ explicit and quantitative safety level

→ verification towards existing Regulations or new established Regulations

→ a systematic methodology to be applied for discovery of implicit inconsistence of IMO GBS Regulations

→ increased transparency by the justification of Rules and Regulations

- The state of art of GBS-SLA

· The discussion about SLA is rising up in IMO since the initial GBS verification audit is nearing completion.

· The present SLA is focused on

→ Development of the Interim Guidelines regarding determination of criteria of safety level and structure of SLA

→ Output of SLA

· The FSA(Formal Safety Assessment) could be helpful to explore the implicit existing safety level of current regulations. However, the application of FSA needs the assistance of casualty database and applicable risk model or first principle model. The achievement of existing safety level requests the collection and processing of data more strictly.

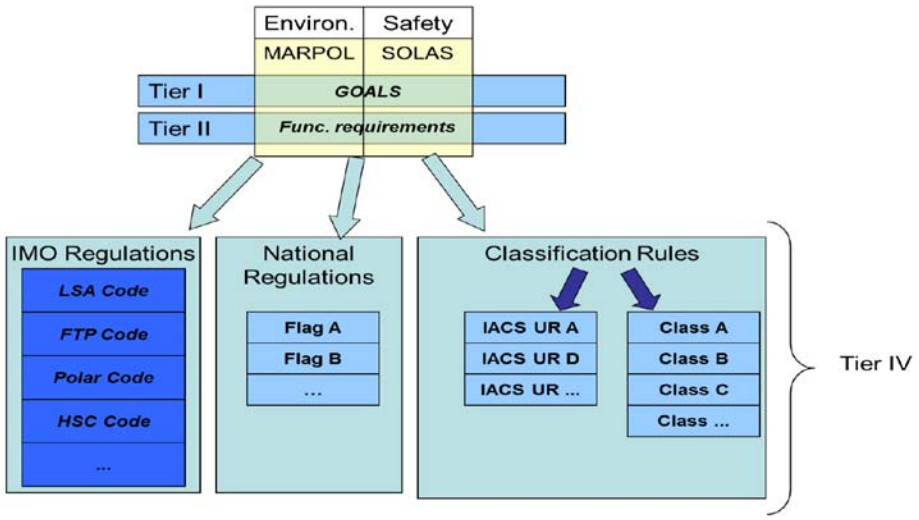
· The high-level structure of IMO GBS-SLA instrument should be kept as it is. That means that the goals and functional requirement would be contained in the IMO Conventions like SOLAS and MARPOL, while the more detailed requirements under Tier IV should be contained in related IMO Regulations, National Regulations and Class Rules. In that way, the GBS-SLA could be consistent and transparent.

However, it should be noted that IMO has no control over these national regulations and Class Rules.

→ This will influence the verification of conformity after implementation.

Therefore, this issue could be further discussed.

- The speaker showed Development of the Interim Guidelines – The conceptual structure of SLA with a figure as follows.



- Due to the complexity of SLA and application of risk analysis, which request professional technique, there is no illustration to show what the output of SLA looks like. It was determined in MSC 95 that a case study should be carried out combining the task of SOLAS Chapter III revision.

- GBS-SLA will certainly request higher technology on designer and ship yard considering its difference between traditional design procedures.

- By introducing more reasonable and rigorous verification process for compliance with goals and functional requirements, SLA can ensure the transparency and rationality of development of IMO instrument, as well as other instruments.

- It should be noted the industry practices and standards could be also verified, theoretically. How to accommodate the forthcoming SLA should be considered in advance.

- The works to be further developed;
  · The close link between the work of the IMO SSE(Ship systems and equipment) Sub-Committee and the Committee was recognized, in particular, on the development of functional requirements for SOLAS chapter III and the development of draft Interim guidelines for development and application of IMO goal-based standards safety level approach.
- In connecting with the plan approved by MSC 95, the following works should be carried out for further development of SLA.
  · development and finalization of *Interim guidelines for development and application of IMO goal-based standards safety level approach*
  · Initiation of a concrete example related to SOLAS chapter III, by implementing GBS-SLA
  · Impact analysis of SLA implementation

- There were no questions or comments from the floor.

6. Mr. Kwang-Phil Park working for Daewoo Shipbuilding & Marine Engineering Co., made a presentation with the title of "Performance Analysis based on Operation Data with Integrated Monitoring System".

- The speaker started his presentation with new technical challenges having come to the shipbuilding and shipping industries in recent years.

- The challenges these industries are facing were summarized with the key words such as IoT (Internet of Things), Big Data, e-Navigation, and Efficiency.

- To comply with those challenges, the speaker introduced an 'Integrated Ship Information Monitoring Platform' and presented a system developed based on the concept.

- Since DSME, as one of the shipbuilding companies, is taking part in the integration of all the hull and system parts to produce a ship, he said it is quite promising that DSME plays a role of an information integrator as well.

- Main idea is the centralized database which collects the data from navigation devices and propulsion equipments during the ship operation, and integrated monitoring screen with analysis features.

- He introduced basic integrated monitoring functions for navigation and machinery information. The speaker also presented screenshots captured from the developed system. From the system, he showed ship performance analysis functions and condition based on maintenance features for the main engine.

- The speaker concluded that the Integrated Ship Information Monitoring Platform can be a good tool in dealing with the new challenges upon the shipbuilding and shipping industries and even in enhancing the safety.

- There were no questions or comments from the floor.

Thank you very much for your kind attention.