Updated 19.1.2009

LIFEBOAT DRILL SAFETY ISSUE 2009

1 AIMPE LIFEBOAT DRILL POLICY: for davit-launch & freefall-launch lifeboats

Despite the fact that we won the battle for legislative/regulatory change some employers, or less-informed vessel-masters, from time to time act as if the legislation had not changed and demand that our members be IN a lifeboat during launch, or during raising or lowering, as part of a DRILL.
Importantly, AMSA'a guidance in Marine Notice 12/2007 is of no help at all and may contribute to some employers continuing to make those demands. [see item 9 on page 3]
Therefore it remains important for members to aware of the following:

☑: AIMPE's position remains an absolute rejection of our members being IN a lifeboat during raising or lowering of a lifeboat [or IN a freefall lifeboat during launch] during a lifeboat DRILL.

☑: We are happy to have the lifeboat lowered, EMPTY, to the water and we will go down the gangway or from the wharf to board a service-launch to take us around to the lowered lifeboat in order to operate it in the harbour.

☑: We WILL NOT climb down any jacob's-ladder/pilot-ladder as part of this process; if that is part of the company's plan to get us into a lifeboat then we will not participate AT ALL.

☑: Our members adopt this policy because to do otherwise would exposed them to a real and imminent danger: Sixteen per cent of all maritime fatalities occur during lifeboat drills arising from design faults, faulty construction, insufficient time and other resources for maintenance, and operator error all resulting in either failure of on-load-release mechanisms or the breaking of wires; being inside a freefall launch lifeboat when it is launched with less than a full complement on board means that the lifeboat is not being operated within its design criteria; the cross-sectional area of the boat striking the water was designed such that with 18 persons on board the boat would cleave the water gradually absorbing the kinetic energy, but with only two or three persons on board there is insufficient mass in portions of the cross-sectional area so the boat and all those inside come to an abrupt stop. This produces a concussive load on a person's neck, spinal column and major ligaments with each impact contributing to spinal wear and deterioration ultimately render us medically unfit for sea- with the aging profile of maritime employees this is a ridiculous proposition!
Additionally, the tendency to conduct a freefall launch at a time when the vessel is free of other obligations [most commonly when it is light-ship and therefore significantly higher out of the water than normal] changes the angle of entry and increases the shock load. Combinations of all of the above, in respect of freefall launch lifeboats, has resulted in broken limbs, concussion, and/or spinal damage.

☑: Under the Workplace Relations Act [i.e. WorkChoices] an employee **is entitled** to withdraw him or herself from any duty where they believe there is an imminent danger.

☑: Accordingly, all members should refuse to participate in lifeboat drills as set out above and, consistent with their obligations under the Occupational Health and Safety [Maritime Industry] Act, they are obliged to counsel or instruct other employees to do likewise.

☑: AIMPE will back any member in this, as appropriate.

Henning Christiansen

FEDERAL SECRETARY

2 LIFEBOAT DRILLS : Regulatory background

1. Several years ago AIMPE members objected on safety grounds to the AMSA + employer requirement that members are required to be IN a lifeboat [either davit-launched or gravity-launched] during raising or lowering of the lifeboat to conduct a lifeboat drill.

2. The institute argued the risks to members during lifeboat drills were totally unacceptable, quoting the 2001 UK study [12 dead, 87 injured] and Australian incidents & injuries in Lifeboat Drills which showed that the two ***equally-highest causes of fatalities were life-boat-drills*** & confined-space-entry. [see attachment for details]

3. AIMPE declared our policy for **members to REFUSE** [BASED ON PERSONAL SAFETY] to be IN a lifeboat [either davit-launched or gravity-launched] during raising or lowering of the lifeboat to conduct a lifeboat drill.

4. For 18 months shipowners were afraid to act for fear of offending AMSA, despite being obliged to by OH&S [Maritime Industry] Act and existing shipboard Safety Management System to keep you safe.

5. For 18 months AMSA insisted that Marine Order 25 be applied exactly to-the-letter:- "...each lifeboat shall be ***launched with its assigned operating crew aboard*** and manoeuvred in the water at least once every 3 months during an abandon ship drill." And that this means that the ".assigned crew." is in the boat when it is ".launched." and that includes being lowered.

6. On Thursday 7 October 2004, during a lifeboat drill off Port Hedland, 2 seafarers died and 3 others sustained injuries, including spinal injuries and broken bones, on MV Lowlands Grace. [See photograph].

7. The following day AMSA suddenly acted by issuing a 'certificate-of-equivalence' which made clear that whilst it was necessary that assigned operating crew must subsequently be in the lifeboat to *manoeuvre* it, it was **no longer required that the such assigned-crew be present IN the lifeboat during the launching itself**.

8. AMSA subsequently amended Marine Orders Part 21- SAFETY OF NAVIGATION & EMERGENCY PROCEDURES- to also reflect this. **Such requirements have now been entirely deleted** and left to the discretion of the ship's Safety Management System; see extract from Marine Order 21 below, as at January 2009.

Marine Orders Part 21- SAFETY OF NAVIGATION & EMERGENCY PROCEDURES- Appendix 5, Practice procedures:

2 Survival craft and rescue boat drill

2.1 **Lifeboat and rescue boat drills**

2.1.1 A drill is to be conducted in accordance with:

(a) the provisions of Marine Orders, Part 25 (Equipment—Life-saving); and

(b) the ship's Safety Management System.

2.1.2 Where a boat is fitted with 'on-load release gear' the release gear is to be tested at least once per year, but only with the boat touching the water or partially waterborne. There should still be substantial weight on the falls.1

2.1.3 When a fire-protected boat is lowered into the water, the water spray system is to be tested.

2.1.4 Where a lifeboat drill is held at sea, and weather prevents swinging out and part lowering of a boat, the boat is to be swung out and partly lowered at the next suitable opportunity.

9. **However helpful such flexibility is to shipowners and employee-organisations, AMSA has gone further than necessary by providing GUIDANCE, via Marine Notice 12/2007, which does NOT adequately address our members' concerns.**

The Marine Notice says that	AIMPE's view is that
"…Launching, retrieving and maintaining survival craft can be a high-risk activity, particularly whilst at sea, and as with any high-risk activity, it should be approached in such a way that any hazards are identified and mitigated. Drills with survival craft should also be approached in the same fashion. Design of some equipment and instructions supplied by the manufacturer with regard to repair and maintenance may require special attention and training of ship's personnel to attain the required level of familiarity to overcome risks. **However, there has been no indication of undue risk to ships personnel involved in lifeboat drills if the lifeboat and its associated equipment are properly designed, constructed, installed, maintained, adjusted and operated in accordance with the manufacturer's recommendations and the requirements of SOLAS.** The ISM Code Section 10 requires procedures to identify equipment and systems which, under sudden failure, may result in a hazardous situation. The Safety Management System should provide measures to promote the reliability of such equipment and systems. The ISM Code furthermore requires an established program of drills and exercises to prepare for emergency actions and that qualified and trained personnel are available to carry out necessary tasks on board the ship.	As we said from the outset, these accidents occur even on first-world [USA, UK, Europe, Australia etc] vessels where the crew thought the lifeboats WERE properly maintained. The correct response is as taken by the Norwegian Maritime Directorate who stipulate the best control measure is to seek to perform these functions with the lifeboat UN-manned. In AIMPE's view no other control measure passes the tests of a Job Hazard Analysis which under the Safety Management System the Drill MUST be subjected to.
In relation to the development of appropriate procedures, it should be noted that an amendment to SOLAS Chapter III - Reg 19.3.3.3 entered force on 1st July 2006, **providing ship operators with improved flexibility in developing their procedures to minimise exposure of personnel should a lifeboat accident occur.** Some further strategies that maybe applied to prevent or mitigate the effects of lifeboat accidents are summarised as follows: • Safety pins fitted in holes through the release mechanism. These pins, which are intended to prevent the unintended activation of the release mechanism, may only be fitted with the express approval of the manufacturer of the mechanism. The ship's Safety Management System procedures should specify that the pins should be removed from the holes at all times other than during the lowering and retrieval of the lifeboat during a lifeboat drill. • Safety chains or pennants fitted between the falls and the lifeboat's structure. The intended role of these pennants is to minimise the fall of the lifeboat in the event of the failure or inadvertent activation of the release mechanism. They are therefore different from the "hanging-off" or maintenance pennants mentioned in MSC.1/Circ.1206. To minimise shock loads required to be borne by the safety pennants and their connections to the lifeboat and the falls, these pennants should be as short as practicable. Bearing in mind these loads, pennants may only be fitted according to arrangements approved by the lifeboat and davit manufacturers. Procedures implemented under the ship's Safety Management System should require the pennants to be disconnected and removed from the lifeboat at all times other than when being used for a lifeboat drill. • **Unmanned "trial" lowering of lifeboat at commencement of a lifeboat drill.** This is an alternative to launching the lifeboat with its assigned operating crew on board from the outset of the drill.	such flexibility should now be left up to shipowners and employee-organisations instead of AMSA's attempt [below] to continue to support the requirement for seafarers to unnecessarily put themselves at risk. We say 'unnecessarily ' because a Drill is NOT an emergency and so comes under normal OH&S laws as recognised by USA & Norway.
AMSA recognises that Australian representation of manufacturers of the equipment covered by the MSC/Circ.1206 annex 1 guidelines may not yet be adequate to fulfil the requirements of paragraph 12 of those guidelines. Ship-owners and operators are therefore strongly encouraged to liaise with relevant manufacturers to establish the extent to which they provide representation in Australia. However, where these arrangements do not sufficiently meet the needs of ship-owners and operators, subject to strict conditions AMSA may consider accepting an Independent Lifeboat Servicing and Testing Organisation in accordance with the guidelines at attachment to this Marine Notice. Notwithstanding such acceptance, ship-owners and operators **should ensure** that the equipment is maintained and serviced by suitably trained and skilled personnel in accordance with the manufacturer's recommendations. During inspections on Australian ships and port State control inspections of foreign-flag ships, AMSA surveyors will be **taking whatever steps are necessary to ensure** the required level of safety is maintained with the ship's survival craft…"	More meaningless expressions that shipowners MUST ENSURE [via our members, or shore contractors] that everything is so well maintained that nothing EVER goes wrong/fails. Utterly impossible with low manning, commercial pressure on job priorities and actual resources allocated to lifeboats necessarily being slight. Legally this is NO CHANGE from previous obligations all of which failed to prevent all the injuries and fatalities so far.
In AIMPE's view this Marine Notice once again avoids the real safety issue that because the diverse elements permitting an accident can NOT be guaranteed then it WILL occur sooner or later. In a necessary job we would do a Job Hazard Analysis, in which if the hazards CANNOT be eliminated then the last step of the JSA is to ask "does this unsafe job/act actually need to be done?". In the case of a practice/drill the answer must be "NO".	

10. AIMPE notes Circular 1/2003 from the **Norwegian Maritime Directorate** 17 February 2003 "**Guidance on risk reduction measures relative to lifeboat drills and maintenance of lifeboats and launching arrangements." Which expressly requires that:-**

> **"Risk assessment:** Abandon ship drills, including drills involving lifeboats and davit-launched rescue boats, **are to be regarded as work operations and are to be risk assessed in the same way as other work operations**, ref. Regulation of 4 August 2000 No. 808 concerning the working environment, health and safety of workers on board ship, § 2-1 (General guidelines for the working environment, safety and health) and § 2-2 (Risk assessment). Risk assessments should be documented as being made by competent personnel and cooperation with the equipment manufacturer in making such assessments is encouraged. "

11. AIMPE's policy on lifeboats, as set out above, remains in force. Members are entitled to rely on it and will receive the full support of the Institute should they do so.

12. The Institute considers it totally unacceptable under common-law duty-of-care as well as section 11 of the Occupational Health and Safety (Maritime Industry) Act 1993 for the vessel-owner to permit the vessel's safety-management-system to still require that personnel must be IN the lifeboat whilst it is being launched / lowered / raised.

sincerely

Henning Christiansen

FEDERAL SECRETARY

3 LIFEBOAT DRILLS : Safety Data

– Unsafe to be inside during launching drill procedures

On 14 October 1999 Australia made a report to the International Maritime Organisation ("IMO") Sub-Committee on Flag-State Implementation of nine serious accidents in Australia between 1991 and 1998 during lifeboat training/exercises.

The United Kingdom's Marine Accident Investigation Branch ("MAIB") in it's comprehensive Safety Study 1/2001 "Review of Lifeboat and Launching Systems' Accidents" ("the MAIB Report") noted that many of the Australian findings "…echoed those seen in the UK database…"

"… MAIB database … indicates that **lifeboats and their launching systems have cost the lives of 12 professional seafarers, or 16% of the total lives lost on merchant ships… all occurred during training exercises or testing**…"

Causes of injury and death included:-

- inadvertent release or failure of On-Load release hooks
- Operator error or failure of Bowsing Tackle or Tricing Pennants
- Failure of falls/sheaves/blocks & chains
- Fouling of gripes
- Winch failure
- Davit failure
- unclassified

Results of MAIB Database Search			
Classification	Number of Incident	Injuries	Lives Lost
Hooks	11	9	7
Tricing and Bowsing	10	5	2
Falls, Sheaves and Blocks	12	19	2
Engine and Starting	18	15	0
Gripes	12	10	0
Winches	32	8	0
Davits	7	7	0
Free Fall	2	1	0
Weather	2	0	0
Not Otherwise Classified	19	13	1
Successful Evacuation	0	0	0
	TOTAL	87	12

The MAIB report went on to say that "…. Scrutiny of the data … …suggests that **anyone using a lifeboat, be it in a drill or a genuine evacuation, runs a risk of being injured or even killed**…"

The Australian Transport Safety Bureau ("ATSB") then released reports into six serious accidents in Australia from 2 January 1998 to 12 October 2001 that occurred during lifeboat testing or lifeboat Drills. AIMPE in 2003 produced the table below to reveal common features of these 6 recent accidents:-

	Maersk Pomor	City of Burnie	Waddens	Washington Trader	Alianthos	Cape Kestrel
Date of shipbuild	1995, Denmark	1984, Romania	1984, Germany	1999, Japan	1989, Japan	1993, South Korea
Date of incident occurred during in Port of	January 2, 1998 AMSA PSC inspect Gladstone, Qld	March 15, 1998 Lifeboat Drill Burnie, Tas	February 14, 1999 Lifeboat Drill Cairns, Qld	August 6, 2000 Lifeboat Drill Abbot Point, Qld	January 24, 2001 Lifeboat Drill Geelong, Vic	October 12, 2001 Lifeboat Drill Dampier, WA
Nature of incident	accidental launch of Free-Fall lifeboat boat falls to water	wires overloaded and break, boat falls to water	aft hook releases, then Fwd hook, boat falls to water	aft hook releases, then Fwd hook, boat falls to water	aft hook releases, Fwd Davit buckles boat hits shipside	wires overloaded and break, boat falls to water
primary cause?	**Operator error +** unfamiliar controls+ language of signs not first language of crew	**Operator error** in manually pushing contacts as winch motor failed on way back up	**Operator error** On-Load hook not properly locked to prevent accidental release by AB's coiling of rope	**Operator error** On-Load hook not properly re-set when a drill held 60 days previous	**Operator error** On-Load hook not properly re-set in drill earlier that day. + design faults	**Operator error** in manually pushing contacts as winch motor failed on way back up

That comparison reveals significant common elements:-

- all were primarily caused by operator-error
- if any mechanical defect was a contributory factor it was unknown before the accident
- except when the lifeboat was being raised/lowered with no persons on board (in 2 of the 6 accidents) those enclosed within the lifeboat during an accident all suffered serious injury.

<u>If seafarers in these 6 recent Australian investigations believed their lifeboats & davits were properly maintained yet these serious accidents occur either through operator error or unknown mechanical defects then AIMPE members are entitled to conclude that any of these accidents could occur during a lifeboat drill on their vessel too.</u>

ATSB, the Australian equivalent to the UK's MAIB, reacted by publishing "Safety Bulletin 03 – Lifeboat Accidents", which issues a warning to seafarers and observes that most of the lifeboat accidents are occurring during Lifeboat Drills.

AMSA 1 September 2002 released Marine Notice 17/2002 which identifies that **"….launching, retrieving and maintaining survival craft can be a high risk activity…it should be approached in such a way that any hazards are identified and mitigated…"**
This places the onus squarely on the seafarers/shipowners to determine how to mitigate that risk.

As a result, members of the AIMPE came to the conclusion that having identified a hazard, as responsible officers they are obliged by the OH&S Act and ISM Code to successfully mitigate that hazard. Their response is that during lifeboat drills safety can only be ensured by conducting the launching, lowering or raising operations with the lifeboat empty. This is consistent with available international data.

UK Government: MAIB publishes report into a lifeboat accident on mv Galateia (C)1994-2002

M2 COMMUNICATIONS LTD M2 PRESSWIRE-25 July 2002-
RDATE:07252002

The Marine Accident Investigation Branch (MAIB) today published the report of its investigation into a lifeboat accident on mv Galateia while in the process of changing ownership and flag in Seaforth Dock, Liverpool. The accident occurred on Saturday, 26 January 2002.

At about 1055 local time on Saturday 26 January 2002, while in the process of changing ownership and flag in Seaforth Dock, Liverpool, the port lifeboat of the bulk carrier mv Galateia fell 19 metres from the davits into the basin waters. Three crewmen who were on board at the time suffered various injuries, one serious head injury.

It had been arranged that a Classification Society surveyor would be on board the next day to carry out a safety audit so that an Interim Safety Management Certificate (ISM) could be issued in accordance with the ISM Code. At 1030, when the surveyor required a lifeboat drill to be carried out, the master, together with the chief officer and four other crew members, boarded the port lifeboat. The master explained where the controls were, how they worked and then told the chief officer to carry out the drill.

The lifeboat was lowered to the water, disengaged from the falls, the engine tested successfully and the falls reconnected. The lifeboat was then raised to the embarkation deck. Two of the crew left, leaving the remaining three to complete securing the lifeboat in the davits. Just as the chief officer moved the release gear operating handle into the stow position, both hooks opened and the lifeboat fell, striking the deck as it went. It landed in a partially capsized position with one of the entrance doors underwater. The chief officer and an Able Seaman suffered bruising, while the other Able Seaman had **serious head injuries and was unconscious underwater** for a time.

The crewman who suffered head injuries was in intensive care for about three weeks, but recovered after a few weeks' convalescence ashore.

MARINE REPORTS - 2002 - M02L0061
Transportation Safety Board of Canada (TSB) Marine Investigation Report
Crew Member Lost Overboard

Bulk Carrier Kent
Near Verchères, Quebec
16 July 2002
Report Number M02L0061

Summary
On 16 July 2002, in fair weather and good visibility, the loaded bulk carrier Kent was downbound off Verchères, Quebec, under the conduct of a pilot. In the late afternoon, the bosun and another crew member were securing the port lifeboat ready for sea. The **bosun was sitting on a davit cradle securing the trigger line when the lifeboat suddenly released** and struck him on its descent. He then lost his grip and fell backwards into the water.
The alarm was raised and several life rings were thrown to the bosun's aid. Auxiliary search and rescue craft were quickly on the scene, but the bosun could not be found. His body was recovered five days later. The cause of **death** was drowning.

Lifeboat Accident Kills One; Injures Two More

Portland Press Herald January 14, 2004

URL: http://www.rigzone.com/news/article.asp?a_id=10424

One man was killed and two co-workers were injured Tuesday when a **lifeboat they were testing** fell from chains attached to a giant oil rig and plunged into Portland Harbor.

OSHA Regional News Release

U.S. Department of Labor
Office of Public Affairs **Region 1**

Region 1 USDL 04-1021-BOS / BOS 2004-134
Tuesday, June 22, 2004
Contact: John M. Chavez Phone: (617) 565-2075

OSHA Cites Two Employers Following Fatal Accident in Portland Harbor

AUGUSTA, Maine -- The U.S. Labor Department's Occupational Safety and Health Administration has cited two employers involved in the construction of offshore oil rigs in Portland Harbor for alleged violations of the Occupational Safety and Health Act in connection with a Jan. 13 accident that **killed one worker and seriously injured two others.**

A lifeboat containing three workers was being lifted back to its stowed position aboard the oil rig, the Pride Rio de Janeiro, following a **lifeboat drill when the boat's sternhook failed, dropping the lifeboat and the workers approximately 60 feet into the harbor.**

"The workers should not have been in the lifeboat when it was being raised back to its stowed position," said C. William Freeman III, OSHA's area director for Maine. "**OSHA standards prohibit it.** Had proper safeguards been followed, they would not have been in the lifeboat after the drill and therefore not exposed to serious injury and death."

Two other hazards, not directly related to the accident, were also cited. They involved a Billy Pugh personnel carrier used to raise and lower employees to different levels of the rig. Specifically, no personal fall arrest systems were provided for workers riding in the personnel carrier and no one was operating a tag line on the rig's lower level to prevent the personnel carrier from swinging or swaying when being used in windy conditions.

.....Separately, the U.S. Coast Guard has issued a marine safety alert regarding potentially serious safety hazards involving the lifeboat's release mechanism. It is available at http://www.uscg.mil/hq/gm/moa/docs/1-04.htm.

Ships Officer Seriously Injured in Lifeboat Accident

07 December 2004

The ATSB has found that the third officer of the Panamanian tanker Port Arthur suffered a **fracture of his cervical spine during a lifeboat drill** on 20 October 2003. Three other crew in the lifeboat escaped serious injury when the boat fell 10 metres into Port Botany after its suspension hooks opened prematurely while it was being launched.

The Australian Transport Safety Bureau (ATSB) has released its investigation report into the accident which concludes that the lifeboat's on-load release hooks had not been correctly reset when the boat was last lowered. Lack of effective maintenance had made the hooks difficult to reset and their design made it difficult for the crew to confirm whether or not the hooks were correctly reset.

...Since it was formed in 1999, the ATSB has issued reports on four previous lifeboat accidents, three of which were also associated with improperly reset on-load release hooks.

Ms SUPERFAST VIII, 9.11.2004
Fall of a Man-OverBoard rescue boat to the sea in a drill in Hanko West Port.

While the Greek passenger vessel the SUPERFAST VIII was in Hanko Port, a drill was held onboard, in which the MOB boat was lowered to the sea. When the boat had been turned over the gunwale by means of the davit on the deck, the seaman in the boat detached the charging cable of the battery from its socket. The battery cable came to the boat from the davit fastened to a support wire. The combination of the charging cable and the wire got stuck in the release lever of the suspension hook of the boat so that the hook opened. The boat dropped to the sea from a height of over 20 metres together with three crew members. **All three were injured, two severely** and one less severely. The boat was not damaged.

Twelve hurt in naval base incident

August 16, 2004
A LIFEBOAT aboard a New Zealand navy ship fell into the water during a routine exercise at Sydney's naval base today, leaving two sailors with suspected spinal injuries.

HMNZS Endeavour was docked at the Garden Island base when a mechanism used to lower the lifeboat into the water appeared to snap, causing the boat to crash into the water about 10.50am (AEST).
The ship's commanding officer, David Hedgley, said there were 22 people in the lifeboat at the time.
"The boat fell about 10m ... the boat was being lowered at the time as part of the standard lowering procedure," he said.

AMSA surveyors follow AIMPE trend; they won't enter an un-stowed lifeboat!

OFFCUTS March/April 2008 On Watch
AMSA Surveyors will now not enter a lifeboat unless it is fully stowed, with all boat harbour pins and gripes in place and unless it can be demonstrated to the AMSA surveyor that lifeboat release arrangements are correctly set then additional restraints will be required to be fitted.
AIMPE welcomes this admirable [if belated] interest in employee safety, which has echoes of the position AIMPE and it's members first adopted 4 years ago.

MOTC [China]
Investigation of Lifeboat Drill Accident on Sept. 28, 2007 Completed

Date：2007/10/15 Department：Taichung Harbour Bureau

An accident occurred as crew of "Hai-Sung", a South Korea registered ship, practiced their **routine lifeboat drill** at wharf no. 24 in Taichung Port, 15:20 Sept. 28, 2007 Taipei Time. The lifeboat fell onto the sea, causing 6 crewmembers (totally 7 on board) injured. 3 mild injured had returned to their positions after taking proper treatment. Among the **other 3 badly injured, third Engineer "HWANG HUL JIN"(Korean) and boatswain "SOLIKIN"(Indonesian) both had broken ribs in the chest while sailor "SAW TIN MYINT"(Burmese) had the symptom of pneumothorax**. All of them are in stable condition after hospitalization.

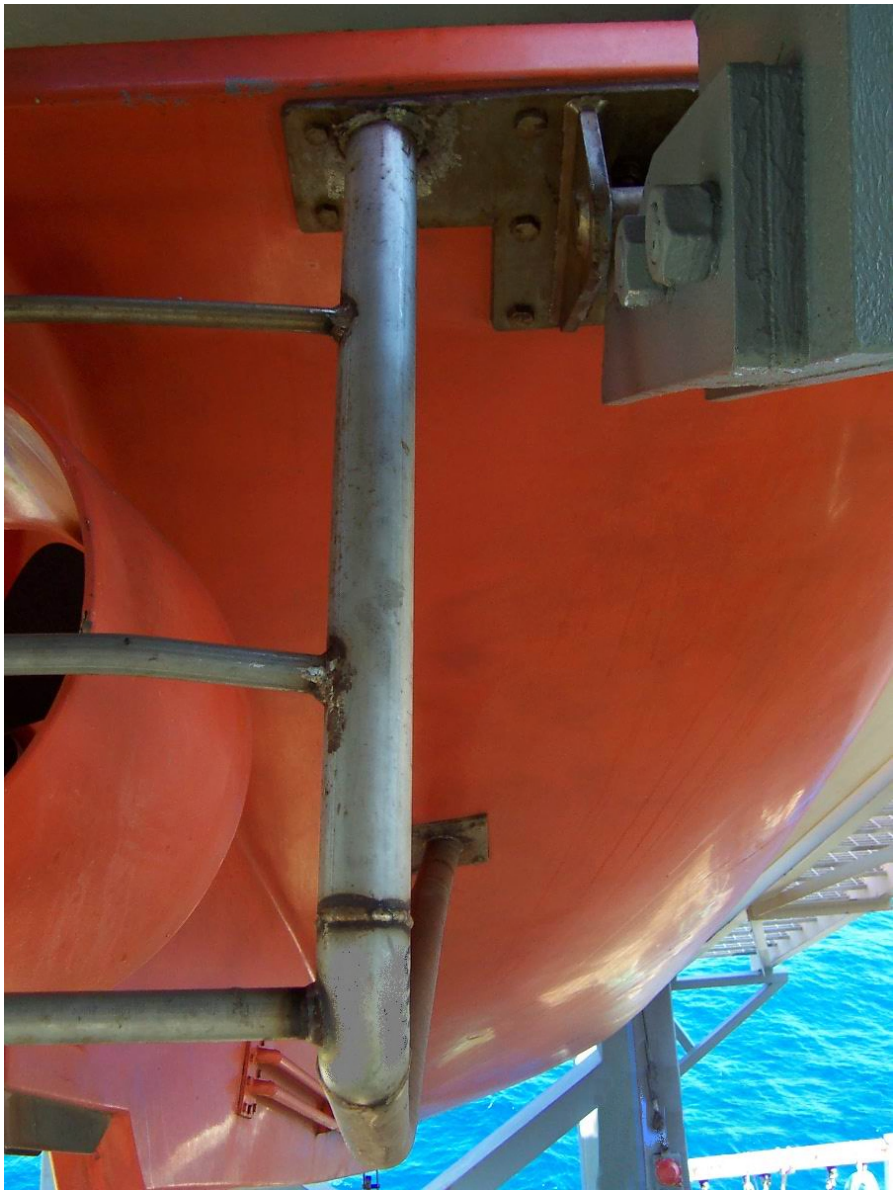
LIFEBOATS

4. Don't Rely on Stainless Steel; some grades may rot!

Experience gained in the Timor Sea and off the Pilbara coast has reached an unequivocal conclusion that 304 / 302 grade (Austenitic) stainless fasteners suffer from CSCC under normal service conditions on deck due to the high ambient temperatures and solar radiation which often raises metal temperatures above 70 Deg C. These fasteners are identified by head markings as per the attached spreadsheet.

AIMPE members have found A4 or 316L to be suitable for most bolting applications, however this material is totally unsuitable for warm stagnant seawater applications (particularly piping) due to extremely rapid pitting corrosion to full material thickness within about a month. (exacerbated by the presence of hydrogen sulphide from microbial action or sour crudes.)

Woodside has a total ban on the use of 302 / 304 grade of stainless steels, except for "special duty" such as in superheated steam service (ASTM - Grade B8) or in submerged pump applications where temperatures do not rise above seawater temp.



There are a number of "standard" offshore components, particularly in the instrumentation / electrical area that are quite **successful in the North sea and most cooler climates that incorporate A2 grade bolting that fail within a short space of time in our climate.**

The insidious thing about this failure mechanism is **that there is no prior warning**, so NDT of parts will often show no defects.

Cracks can propagate to full material thickness within a few weeks. The first warning is usually a bolt head missing or found on the deck or alternatively sheared heads when trying to disassemble components.

In structural applications, these materials are particularly dangerous, as one bolt failure will lead to increased loading on the remaining bolts, which can initiate sequential failure of bolts under load resulting in catastrophic failure of the machine / system. (The beauty of mild steel, even under corrosion failure, is a visible yielding and strain hardening prior to failure as opposed to a brittle failure with no visual warning under CSCC).

Some useful Web resources are:

"http://www.key-to-steel.com/Articles.htm"

"http://www.key-to-steel.com/ViewArticle.asp?ID=58"

"http://www.eng-tips.com/"

"http://www.atlanticvalve.com/american/4000/metal.html"

See attached spreadsheet, summary and photos of lifeboat propeller guard.

Chloride Stress Corrosion Cracking

Austenitic stainless steels may be susceptible to chloride stress corrosion cracking (CSCC). The standard 304/304L and 316/316L grades are most susceptible. Increasing nickel content above 18 to 20% or the use of duplex, or ferritic stainless steels improves resistance to CSCC. High residual or applied stresses, temperatures above 65-71C (150-160F) and chlorides increase the likelihood of CSCC. Crevices and wet/dry locations such as liquid vapor interfaces and wet insulation are particularly likely to initiate CSCC in susceptible alloys. Initiation may occur in several weeks, in 1-2 years or after 7-10 years in service.

Methods of minimizing chloride stress corrosion cracking:

- **Improve design.**
- Examples: Fill or seal crevices, paint under insulation, keep tensile stresses below the yield strength, shot peen, provide galvanic or cathodic protection.

- **Select a higher nickel content austenitic alloy.**
- Examples: Alloy 330, 904L.

- **Select a ferritic stainless steel if the lower corrosion resistance is acceptable.**
- Examples: 439, 26Cr 1Mo, 18Cr 2Mo

- **Select a duplex stainless steel.**

- Examples: 329, 2205.

- **Evaluate stress relief.**
- *Note! Stress relief treatments above 425C (800F) may sensitize stainless steel to intergranular corrosion.*

These problems with stainless steel in Australia's climate and sea-conditions have led a number of offshore operators to adopt the following guide:-

Use of Stainless Steels Offshore

Common Name	Head / Nut Markings	Comments	UNS Number
304 Austenitic	A2 or 304 or 302 or B8 or "8" on Nuts	**BANNED OFFSHORE** Except for superheated steam service. Non-Magnetic	S30400
316 Austenitic	A4 or B8M or 316 or "8M" on Nuts	60 Deg C Max Service Temp Non-Magnetic	S31600
SAF 2205 or SAF Duplex	2205 or 31803 or Castings marked F22	Used in areas too hot for 316. Well heads and production pipe-work. Magnetic	S31803
SAF 2507 or Super Duplex	2507	Used for Production pipe-work Magnetic	S32750
Ferralium 255 Super Duplex	3255	Looks like black steel - Bolting.	S3255
Zeron 100 Super Duplex	Z100 or 3276	Used in Bolting on Flowlines and Riser Swivels.	S32760
254 SMO Super Austenitic	?	For Piping.	S31254

If in doubt, raise the matter through your on-board safety committee and ensure adequate resources are directed to establish whether materials in question pose a hazard in their intended use/location.

My thanks to the members who contributed to this article.

Henning Christiansen,

FEDERAL SECRETARY