“How much? A Mariner needs to know!!”

By Capt. Yashwant Chhabra

From a cadet in 1976 to master in 1990, mostly ashore from 1993, last sailed as master 2009 - 2010, have seen it all changing, the bridge design and equipment's. Same purpose though - achieve safe voyages or maritime adventures!!

Learn new, unlearn old, modify skills and move from BC (before computers) category to the AC (after computers) high technology electronics: Mariners need to keep learning & applying new knowledge & skills. But a brief look through history first where failure to use technology were critical factors leading to the accidents.
25 July 1956: Andrea Doria & Stockholm collision off New York, wrong assessment of radar data; the ‘first radar assisted collision’.

A graphic of the collision. Andrea Doria sinks into the Atlantic.

Misc. reports & google images
18 March 1967: Torrey Canyon – stranded at Pollard Rock on Seven Stones Reef.

**Route short cut - yes;** But the Helmsman ‘**switched off the steering tele motor**’ instead of changing Auto to hand!!

Misc. reports, wikipedia & google images
10 June 1995: Royal Majesty stranded off Nantucket. ‘GPS antenna cable parted, on DR, over reliance on ECDIS and automation’, no cross checks of position / depths.
24 August 1999: Norwegian Dream & Ever Decent collision, ‘VHF assisted, improper use / over reliance of Radar & ARPA, vectors & reversed propulsion’
21 June 2004: Hyundai Dominion & Sky Hope collided at 0738 local time in East China Sea, ‘VHF, AIS & ARPA assisted’. Arguments on the situation, crossing or overtaking.

Hyundai Dominion: damaged break water forward

Sky Hope: damaged starboard bridge wing

MAIB Report 17/2005
07 November 2007: Cosco Busan Allision with the Bay bridge in San Francisco – ‘unable use the ECDIS system properly, did not know meaning of new electronic chart symbols’.

Report NTSB/MAR-0901
Symbol of buoy on paper chart (left) – in use for years, changed to the symbol on the right as would appear on an ECDIS – one of the contributory factors.

Figure 15. The International Hydrographic Organization (IHO) symbol used to represent conical buoys on paper charts (left) and the simplified symbol for the same buoys as represented, in red, on IHO S-57 electronic navigation charts (right).
16 September 2009: Maersk Kedal stranding / grounding.

‘Unaware of bridge controls when trying to reduce speed, disoriented by the large scale on ECDIS, improper ARPA settings & did not know vessels turning circle data’

Monggok Sebarok Reef, Singapore
10 Feb 2010: Sichem Osprey Stranding at Clipperton Island: improper ECDIS use, island analysed as clouds on radar.
07 January 2013: ‘Overseas Reymar’ Allision with the Bay bridge in San Francisco, ‘**Racon not working**’, Pilot unable use alternate means of navigation, master busy in phone calls!!

*NTSB, Marine Accident Brief No.DCA-13-LM-004*
Yearly number of vessel losses
1997-2011

15 Years of Shipping Accidents: A Review for WWF by Southampton Solent University
Total Losses by Year: a declining trend

Source: Lloyd's List Intelligence Casualty Statistics. Analysis: AGCS

www.agcs.allianz.com
Allianz Global Corporate & Specialty review 2014

Anglo-Eastern Ship Management

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Collisions - Claim cost & frequency per vessel, **THE RED LINE INDICATES NO SIGNIFICANT REDUCTION!!**

As per 28/01/2014 Limit >=USD 10000 (Non Capped)

Courtesy ‘The Swedish Club’
Accidents do not happen, they are caused, and can be attributed to failures of:

- Risk Management;
- Error Chain Management;
- Human Factors.

(Any or all in any combination)

IMO states: “The human element is one of the most important contributory aspects to the causation and avoidance of accidents”, and that “humans have most degrees of freedom to disrupt system performance” – analysis of most accidents points to these as key failures.

Combined MSC Circ.1023 / MEPC Circ.392 on FSA by IMO.
Officers are responsible for navigating safely, **avoiding collision** and **stranding**. *(from paragraph 10 of STCW A-VIII/2).*

Composition of navigational watch -- master shall take into account…:

.6 **knowledge** of & **confidence** in, **professional competence** of.. Officers;

.7 **experience** -- **familiarity** with **equipment, procedures**, and manoeuvring capability; *(from paragraph 17 of STCW A-VIII/2).*

**OOW shall be thoroughly familiar** with the use of all electronic navigational aids, **their capabilities and limitations**, .. echo-sounder is .. Valuable .. *(from paragraph 36 of STCW A-VIII/2).*
Standard of competence: **proficiency** to be achieved for the **proper performance** incorporating prescribed standards or levels of **knowledge**, **understanding** and **demonstrated skill**; *(from STCW: Section A-I/1)*

“The cornerstone of good safety management is commitment from the top. In matters of safety and pollution prevention it is the ‘commitment’, ‘competence’, ‘attitudes’ and ‘motivation’ of individuals at all levels that determines the end result.” *(Point 6 of ISM Code preamble)*

**Competency** is the key element in focus now, the other 3 are important too in it’s application.
The old bridge design now in museums. Relying on basic tools of navigation.
Modern Bridge layout’s

A futuristic bridge layout – may even look like a computer lab!!

Google images
My last vessel as master, Torm Esbjerg, oil/chemical tanker at the sea island terminal off Freeport Bahamas, January 2010

ISM Code, the black hole of maritime legislation
**RISK MANAGEMENT**: “Assess all identified risks to its ships, personnel and the environment and establish appropriate safeguards”, 1.2.2.2 of the ISM Code as amended in July 2010 – an obligation of owners or operators.

How much should a mariner know? To get an answer we may apply the classic **5 Wives and 1 Husband** principle; **What? is to be done**, **Why? is it to be done**, **When & Where? is this activity to be done**, **Who? Will be responsible for doing the activity** (The Mariner) & **How? Will it be done**.

A Mariner needs to be competent and apply them all for proper performance – that is to **get the job done right, the first time & every time, without fail, with 100% efficacy**.
The trend of accidents proves that Risk Management is generally **not clearly understood**, many a times improperly applied including in **educating mariners** for what they have to do on board, and may miss address human factors, listed by IMO as.

<table>
<thead>
<tr>
<th>PHYSICAL ERRORS</th>
<th>MENTAL ERRORS</th>
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<tbody>
<tr>
<td>Action Omitted</td>
<td>Lack of knowledge of system / situation</td>
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<tr>
<td>Action too much / little</td>
<td>Lack of attention</td>
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<tr>
<td>Action in wrong direction</td>
<td>Failure to remember procedures</td>
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<td>Action mistimed</td>
<td>Communication breakdowns</td>
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<tr>
<td>Action on wrong object</td>
<td>Miscalculation</td>
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Education to mariners should be to ensure eliminate Human Errors which can be for many reasons, namely:

1: **PERSONAL**: Including **not knowing controls, equipment and communication errors**.

2: **ORGANISATIONAL & LEADERSHIP**:

3: **TASK FEATURES**: Work load, **complexity, automation, not fully aware of operating parameters, lack of experience**.

4: **WORKING CONDITIONS**: Stress, **ergonomics, human–machine interface**, illumination & shift timings.

Human mind working is complex, a combination of many factors including past experiences, thus individual perceptions can differ. No easy answers to address all Human Factors which impact all activities.
We are following Commercial aviation which leads in e-navigation and/or automation. However, vast differences exist between the way aircrafts and ships are operated.

Aviation accidents are rare, mid air collision extremely isolated and proves the efficacy of the systems.

Last known mid air collision: 29 September 2006: A Boeing 737 bound for Rio de Janeiro collided with an Embraer business jet above Brazil. The latter survived, all 154 aboard the Boeing 737 perished.

Prior to this the known dates of mid air collisions are 01 July 2002, 12 November 1996, 22 December 1992, 31 August 1986, 25 September 1978, a fantastic safety record!!
- Aviation navigation minutely controlled
- Strict ATC monitoring
- Mandated separation zones
- Collision avoidance is almost totally automated
- Pilots are monitoring navigators - ensure adherence to plans
- Marine OOW is still a navigator who has to plan and act
In the situation shown below, in my surveys covering 476 navigators results are:

- Good visibility + in sight, 56% correctly say crossing, 28% say overtaking & 16% confused.
- Restricted visibility + not in sight only 48% analyse correctly (Rule 19-d), 23% apply in sight rules & 29% rely on fog signals (Rule 19-e); Understanding levels??

Both power-driven.

'B' is 10° abaft the beam of 'A', 8 miles at T-2
Integrating electronic equipment or e-navigation will lead to **AUTOMATION SYNDROME**, a serious problem in aviation:

Mariners role will change drastically, from finding information to getting it all instantly, more to monitor information (overload) and voyage progress.

Human / Machine relationship: Blind faith, failure to recognize automation modes, especially failures. All are known high risk factors, several examples shown earlier. Automation can deceive humans – Automation Surprises / Addiction - Over Dependent – Complacency.

ECDIS makes chart work almost vertical and out go the traditional tools. All manufacturers have different designs making it hard for a mariner to know or adopt to each of them, though all comply with IMO standards.
HEADING & SPEED
STANDARDISATION ??

ERGONOMICS ??
AUTOMATION SYNDROME

AUTOMATION IN CONTROL
OOW OUTSIDE – A MUTE SPECTATOR!!

Using Swedish Club Academy – MRM Module on automation
Anglo-Eastern Ship Management

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In August 2011, Joan Lowy commented after the 01 June 2011, Air France Airbus crash in the Atlantic, ‘Are airline pilots forgetting how to fly? Adding that ‘Industry is suffering from automation addiction’.

Automation flies aeroplanes. Pilots program navigation computers rather than fly manually, investigators recommend manual flying & handling a high-altitude stall, both having contributed to many accidents.

After the Asiana airlines Boeing crash at San Francisco on 06 July 2013, NTSB Chairwoman Deborah Hersman told reporters: ‘it appeared there was "an issue in aviation" with cockpit automation and relying on autopilots to fly planes.’
Is natural, but has to be slow and steady. Sudden and abrupt changes can be very dangerous. Buoys appear differently on an ECDIS.

A driver (operator) of a single long truck knows & applies a fact that when turning the front wheels make a large radius, the rear wheels much smaller.

But may not know how the propelling differential axle allows the inner wheels to rotate slower, the outer faster without locking, else the truck would topple.
Navigator an operator, like the truck driver, we need to apply 5 W’s & 1 H to analyse how much should an operator know?

**Competent**, aware of all operating features of the equipment, their functions, limitations, inter relationship, operating modes including failure modes, key factors to monitor, maintain & problem solving.

Education to account for Human factors & Risk Management when applying the competency in practice.

Not fall prey to Automation Syndrome – competent and experienced for manual operations so that they “Get the job done right the 1st time & every time!!”
"I hear...I forget
I see...I remember
I do...and I understand"

Ancient Chinese Proverb

On the job mentoring – a key component.
Representing Anglo-Eastern Ship Management Ltd., operating over 450 vessels, perhaps the only 3rd party manager with extensive effort into training and education of seafarers from start till post sea to ensure minimum failures, you are welcome to see our efforts on the websites.

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www.angloeasterngroup.com
A view from the bridge: How to keep clear ??
To conclude, with respect to all talks on shore based controls possible with e-navigation, I wish to quote SOLAS Chapter V, *Regulation 34-1: Master’s discretion.*

The owner, the charterer, the company operating the ship as defined in *regulation IX/1*, or any other person shall not prevent or restrict the master of the ship from taking or executing any decision which, in the master’s professional judgement, is necessary for safety of life at sea and protection of the marine environment.

THANK YOU