INTRODUCTION

Human beings communicate with each other frequently and in many different ways: most obviously in spoken words and in writing, but also via codes, gestures, facial expressions and body language. Even our behaviour can communicate a powerful message to those around us. Communicating with each other is routine, second nature, therefore we hardly ever think about the process and we may believe we have nothing to learn about how to communicate effectively.

The problem with everyday communications is that we tend to use natural, non-technical language and informal phrasing. For example, talking with friends and family, we can make many errors of communication: use the wrong words, put words in the wrong order, choose phrases that can be interpreted in several different ways, make 'slips of the tongue' and assume that the other person had understood what we intended. We also make allowances for any messages we receive that are less than perfect – we fill in gaps or make assumptions about what was meant.

Everyday communication errors are unlikely to have major untoward consequences; when we make a call on our cell phone in a noisy environment or the earpiece we are using distorts the sound, we don't expect that calling the person back at a later time will have extremely negative consequences – it rarely does. In work situations however, certain communications are 'safety critical' in the sense that highly damaging consequences may follow if we make errors that result in information we send or receive being, for example unclear, incomplete, not received, misheard/misread, sent too late or not understood (Bellamy 1984).

A specific problem area in work communications is the communication *between* work teams at shift handover. Problems have been found particularly with transferring information concerned with ongoing maintenance tasks that extend across several shifts (Health and Safety Executive 1996).

This short document is a form of communication, but it's a one-way communication and the authors have tried their best in hopes that the reader will understand the content by making the words clear and unambiguous. Of course, in the absence of feedback from the reader, they cannot know for sure that their attempt to transfer information from one place to another place has been successful.

TERMS/DEFINITIONS

Communication: An act or instance of transmitting information, or, a process by which information is exchanged between individuals through a common system of symbols, signs, or behavior (Webster's dictionary).

Shift Handover (or shift turnover): The process whereby the shift team going off duty hands over responsibility for plant operation and safety to the shift team coming on duty.

DISCUSSION

Level of concern

The Health and Safety Executive (HSE) is the body responsible for industrial health and safety in the United Kingdom. HSE regulates all UK industry using a process of site inspections, management system audits, safety case assessments and incident investigations. Through these activities, HSE inspectors have found that the same 'top ten' human factors issues continue to arise. Problems with safety critical communication is one of that top ten. In their publication, 'Successful

Health and Safety Management' (HSE 1997) they state that, 'Communication…is often seen as the single most important area requiring improvement.'

This publication suggests that organizations should consider the requirements of importance for health and safety information coming into, flowing within and going out of an organization. A few examples of what is considered to be important aspects of information that flow through an organization are listed below:

- Information coming into the organization
    - The latest legislation and how to comply with it
    - Technical developments on risk control
    - Good practices from other sites, the industry in general or other relevant sources
- Information flowing within the organization
    - Company policies, visions, mission statements and values
    - Plans, standards, procedures, performance expectations and performance measures in the form of newsletters, posters, emails, face-to-face discussions, job descriptions etc.
    - Comments and suggestions for improvement
    - Lessons learned from incidents and accidents
    - Visible behaviors such as management visits to site to provide the opportunity for face to face interaction with the workforce
    - Taking a lead in meetings
    - Involvement in incident investigations.
- Information flow from the organization
    - Statutory information to regulatory authorities, such as accident or ill-health reports; emergency plans
    - Information about the safety of articles or substances supplied for use at work.

The information that flows into, within and out of the organization described above focuses on health and safety matters, but the same channels of communication are critical to the success of running the business – site tours and inspections, meetings, written publications etc. – and it is typical, and useful, now that many companies combine business and safety issue; for example, putting health and safety matters at the top of the agenda for every business meeting.

Safety critical communications are the subject of a short HSE 'Briefing Note' (HSE 2004) and a similar Briefing Note from the Energy Institute (Energy Institute 2003) which provide useful checklists to enable you to assess your own communications issues They are available free online (HSE and Energy Institute websites).

Thus, communication problems appear common across all industries: nuclear, oil and gas, aviation, process industry and the railway industry. The case study below amply illustrates – from a single incident – the range of communication problems, as well as poor practices and procedural circumventions that can occur within the maritime industry.

A Case Study in Poor Communications

The Marine Accident Investigation Branch Digest no.3 (MAIB - 2009.) described some of the problems found on board merchant vessels during 2009; this included poor inter-personal skills and communications. Several such problems were illustrated by an incident that took place on board a roll-on roll-off cargo vessel. Whilst the vessel was at berth, the crew carried out routine maintenance. The engineering team had discovered an important defect with the generators - they would not auto start – but, because of poor relations between the chief engineer and crew, they did not report this to him.

Just prior to moving off, the third engineer was relieved watch by the second engineer. The second engineer reconfigured the seawater cooling pumps and worked alone in the engine room. He failed to use the departure checklist provided to remind crew of all the steps required.

On departure, alarms sounded indicating that the generators were overheating. The second engineer did not report this to either the chief engineer or ship's master. Both generators tripped causing, among other things, a loss of hydraulic oil supply to the controllable pitch propeller (CPP). The CPP then locked in the full astern position and the vessel grounded soon afterwards.

The chief engineer and third engineers had stopped the main engines without contacting the bridge and with no knowledge of the vessel's navigational position. The engine room was a scene of chaos in which the chief engineer was unable to impose his authority on the engineers – all foreign nationals – who spoke to each other in their own language. The master was able to communicate with the chief engineer only via his first officer because the sound-powered telephone he had available went unanswered in the engine room and also, it was located on the bridge remote from the master's control position. The extended chain of communication caused confusion and led to the engines being restarted without the master's approval.

There are several lessons to learn from this event – not least concerning minimum manning, complacency of crew during critical maneuvers, use of checklists, poor placement of equipment and practices for changing watch. Those specifically concerned with communications include need to ensure that:

- *All crew are able and willing to communicate in one language*
- *Clashes of personality within the team that can hinder communications are resolved*
- *All crew are aware of the plant state (in this case, the CPP default position) using written signs and briefings*
- *Communications between bridge and engine room are adequate at all times*

Very similar issues have arisen in many other incidents. Winbow of the International Maritime Organization (2002) states that, "…effectiveness of bridge resource management and particularly ineffective relationships between master, crew and pilot are recurrent themes. Communication difficulties often occur in these areas due in part to cultural differences but also due to language 'barriers'."

This paper has distilled the findings from a number of different sources describing the difficulties experienced across a range of industries, including the maritime industry. Many common themes have emerged that can be shared with a view to improving how we communicate generally but also in safety critical situations. These are set out next.

The Communication Process

There are several distinct stages in any communication process. Again, they may be obvious to us from everyday communications; however, it is worth breaking the process down into its constituent parts to explore the problems that could arise at each stage.

In sending a message we must:

- Identify the need to communicate
- Select the means of communication
- Create the message
- Send the message
- Receive, understand, and act upon feedback

- Store the message

In receiving a message we must:

- Be prepared to receive messages
- Receive the message
- Interpret the content of the message
- Respond to the message
- Store the message

Problems in the Communication Process

Problems that can arise at each stage, possible reasons for those problems and possible solutions are captured in the Table below.

Table 1

Communication Stage	Problem	Solution
Sender		
Identify the need to communicate	Fail to identify the need	Ensure via training, assessment and procedures that all crew understand their responsibilities and the rules for communication: when and how to communicate and the goals of each communication.
	Identify the need but fail to communicate	Procedures, rules, and recommended practices must be credible and can be easily followed – ask for feedback from the end users on this.
Select means of communication	Use the wrong method of communication – example - hand gesture rather than radio call	Don't send messages in the wrong form. (e.g. by word of mouth if the receiver then has to write it down) The 'best' method is not always the most obvious – there is an advantage in face to face communications in that it shows commitment by the communicator. If the 'best' method cannot be used, use the next most favorable but compensate for this. For example, using two means of communication and by asking for feedback.
Create the message	Fail to make the message is clear – use non-standard ambiguous or complex language	If the message is in written form, consider the 'reading age' of the receiver, promote understanding by seeking feedback.
	Omit information	Devise some standard messages where possible.
	Include incorrect information	Establish rules for creating messages.
	Include too much or irrelevant information	Use training to raise awareness of problems and to develop good practices in message composition.
Send the message	Fail to send or send too late	

	Send to the wrong person	There can be multiple causes such as distractions or high workload, lack of competence/uncertainty – see general issues below the table.
Receive, understand and act upon feedback	Fail to receive	The sent message must make clear that an acknowledgement, feedback or action is required in response
	Fail to understand	Develop good habits and a culture of 'dialogue' among the crew members such that requests to repeat, resend or clarify any message – including feedback - are accepted practices
	Fail to act	Where action is required in response to feedback, the sender of the feedback should check that the action has been carried out
Store the message	Fail to store the message (when required)	Train all crew members in the required practices for recording and storing/archiving sent messages for possible later review and analysis.
Receiver		
Anticipate messages	Fail to receive message through lack of preparation – example, failing to take pager on site	Train all crew members to understand when message are likely to be sent to them, as well as their purpose and significance.
Attend to messages received	Fail to read or hear message	Provide the appropriate facilities needed to receive messages in all conditions. (e.g. cell phones with vibrate function or flashing light when in noisy working environments, high quality radios)
	Partially read/hear message	Establish, train, and encourage good practices for acquiring messages and addressing the entire content. Identify and eliminate possible incentives for crew members to ignore messages.
Interpret content of message	Fail to understand message	As above – seek clarification of messages that are not clear for any reason including language and accent problems. Select and train crews in communication and language skills.
	Misinterpret message	Consider the competence requirements of the receiver – ability to interpret and act on information received.
Respond to message	Fail to respond to message or respond too late	As above – the sender must make clear the requirements for feedback and prompt for acknowledgement.
Store message	Fail to store the message (when required)	Train all crew members in the required practices for recording and storing/archiving received messages for possible later review and analysis.

Common Causes of Communication Problems

The following causes apply to most of the problems above and care should be taken to eliminate these features in safety critical work:

- Lack of competence due to inadequate training or limited experience of crew
- Rules, procedures, and good practices are not always practical or easy to follow
- Excessive workload leading to stress, inattention or 'cutting corners'
- Fatigue/low level of alertness
- Complexity of the communication task

- Distractions
- Adverse environment – noise, poor weather (discourages use of outdoor intercoms)
- Lack of assertiveness – sender and receiver must have the confidence to clarify that information is correctly passed between them
- Absence of sanctions for blatant disregard of procedure/clear 'payoffs' for bending or breaking the rules

Additional Good Practices in Communications

- Involve those who need to send or receive communications in:
  - Establishing the required form and content of those communications
  - The means of communication
  - Selection and testing of communications hardware
- Risk assess communications
  - Develop an inventory of critical communications interfaces - identify which crew members or crews need to communicate with each other
  - Rank these communications in terms of how critical they are to the safety of the crew – think of the outcomes if these communications fail
  - Focus on the most safety critical communications to eliminate possible problems – see Table 1 – as far as practicable (Centre for Chemical Process Safety 2004)

SHIFT HANDOVERS

Supervisors and operators poorly communicated critical information regarding the start-up during the shift turnover; BP did not have a shift turnover communication requirement for its operations staff (CCPS Report on the Texas City Accident - 2004.)

When responsibility for ongoing work is passed from one workgroup to another, it is essential that safety critical information provided to the oncoming team is clear and accurate and can be transferred rapidly and efficiently. Outgoing teams will be keen to conduct the handover process quickly and go home: oncoming teams are often similarly keen to speed up the process so they can get to work so the process is generally rushed.

HSE's report (2006) suggests the following good practices in relation to shift handovers:

- Always allow adequate time for shift turnovers to occur and eliminate all distractions and time pressure at this time
- Conduct all handovers face to face to allow dialogue between oncoming and outgoing crews
- Arrange work such that no tasks that are risk significant – for example critical maintenance tasks or difficult maneuvers – are not carried over from one shift to another but are completed by one crew in a single shift. (This is often not achievable in reality)
- Match the time taken for the handover to the risk level of the operations being handed over
- Set clear company standards and guidance for handovers setting out the key information to be exchanged – for example current work and resources available
- Make sure that all appropriate documents are available for the handover – logs, permits to work and including anything that must be displayed on computer screens
- Take care that the language used on logs and the standard of handwriting is clear and intelligible

- Take extra care to brief crew members who are just returning to work following a vacation, sick leave or shift break
- Regularly monitor and assess shift turnovers and make any adjustments based on issues arising
- Encourage all involved in turnovers to make suggestions for improvement
- Communicate learning from incidents or accidents resulting from poor handover practices and use the information to improve the handover process

SUMMARY

Communication problems are endemic in all industries including major hazard industries. Problems can occur at any stage in the communication process: composing a message, sending, receiving, interpreting etc. Common causes of these problems include time pressure, workload, distractions, insufficient training or experience, language difficulties and the standard and provision of communications equipment.

Shift handovers can pose particular problems and can be rushed due to time pressures to start/finish work. Critical tasks may be handed from one shift to another without proper briefing of the oncoming crew to ensure that they understand the current state of repair of the plant, key operations taking place and resourcing of the work to be done.

Guidance is available from a number of sources and, given the general nature of the problems found across industries, can be applied to the marine industry as successfully as to any other industry.

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