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Abstract: This paper juxtaposes the communicative needs of the future with the good old concept of communicative competence. Communicative competence, as an STCW requirement for seafarers, is a key notion for Maritime English teaching. New operational functions and concepts are introduced, or existing ones are adapted, for the needs of autonomous and remotely operated (autoremote) vessels. The paper investigates the language requirements within the autoremote operation framework to check if these are covered by the yardstick (STCW) and the standardization tool (SMCP) used in Maritime English. The "remote navigator" needs to reach a good level of "remote situational awareness" through automated remote monitoring, but can resort to two-way communication for navigation functions. What linguistic skills are needed on the part of shore-based seafarers to be able to keep operations within "minimum risk condition"? Experts involved in autoremote design projects and those setting standards through class guidelines find that upgraded ship-to-shore communication is required and appropriate responses must be assured through interaction techniques, but these have not been delineated so far. The paper reviews the discourse used by those setting the foundations of ship autonomy so as to investigate to what degree communicative needs in shore-based seafaring are reckoned with.

Keywords: communicative competence, Maritime English teaching, autonomous and remotely operated ships

Introduction

MV Yara Birkeland, a container ship of 150 TEU capacity, a battery-powered autonomous vessel, was delivered in November 2020 and, after experiencing delays due to Covid-19, is expected to go into operation towards the end of 2021. We are moving from the stage of *conceptualization* (during which, roughly in the past decade, research was devoted to exploring and establishing the feasibility of autonomy in ship operations) to *realization*. This feeling of transition, of getting there, should not disorient us from the fact that it is the way concepts are constructed and the considerations included, prioritized or left out in their formulation, that shapes the future. A paradigm shift is on the way, as remote-controlled and autonomous shipping is, as experts agree, expected to be a reality in 10 years' time (Rolls Royce, 2016).

The autoremote conceptual framework is the platform where required skills and competence levels for future seafarers will be determined (Mackinnon & Lundh, 2019). Future ships will be monitored and supervised by specialized human operators located in offshore control centers. There is constant and growing concern (and my paper aims to contribute to this discussion) over whether the new skills that are required by these operators are delineated clearly enough and whether the industry regulatory standards (i.e. STCW, the International Convention on

Standards of Training, Certification & Watchkeeping, 1978/84, as amended 1995 and 2010) will have to be adapted, to cover for the need for trained and upgraded-skilled seafarers that will act as remote operators. The concern is aired by Simon Bennett from the International Chamber of Shipping: automated systems already present challenges with respect to the knowledge and skills required to manage and operate them safely and effectively (SeaSense, 2018). In fact, an ICS study on the effect of autonomous ships on the work at sea has highlighted that without highly skilled remote-operators, pilots of a new kind and riding gangs, auto-remote ships cannot remain operational (ISC, 2018). At the same time, it is mentioned that "communication will be one of the most important competences for any future seafarer in a technology driven ship operation" (ICS, 2018, p. 24).

The feeling among seafarers is that skills are being neglected in the rush to research autonomous systems, and this is in fact one principal reason unmanned/remotely operated vessels are seen as a safety threat. It was found, after 1,000 respondents were asked (members of the Nautilus Federation), that the fact of this neglect of skills within the research by manufacturers and maritime nations is key to the mistrust that has developed over social and human issues (ICS, 2018). So, the issue of skills that are neglected and are not brought into the equation is one of the social/human factor issues that seafarers are concerned with, which leads them to be reluctant to trust unmanned vessels.

The "competence and required skills of a remote navigator may not be the same as those of a traditional navigational officer" (DNV GL Position Paper, p. 11). As stakeholders have noted, a future hybrid and upskilled role for seafarers is emerging (ICS, 2018). My paper attempts to shed light to the upskilling needed for the human factor in autoremote operations in relation to using English for verbal and written communication. The aim of Maritime English teaching is to provide trainees with appropriate language competence, in other words help them develop their communicative competence in English. What are the features that will determine effective linguistic interaction for shore-based personnel? Within the issue of preparing future operators for managing unmanned vessels, this paper focuses on the competence of using English in oral and written form in specialized maritime communication that is autoremote in nature and has, therefore, certain peculiarities.

It has been 20 years since IMO, under Resolution A.918 (22), adopted in 2001, recognized that English shall be used on the bridge as the working language, and the standardization of language and terminology used in such communications would assist the safe operation of ships and contribute to greater safety of navigation. The emphasis was on setting standards of communication because it was realized, through research into multicultural crews, that English language competency of seafarers is one of the major problems that has contributed to many accidents and incidents at sea (MARCOM, 1999). There is a high percentage of accidents that are due to lack of English skills (it is generally accepted that 80% of accidents at sea are caused by human error, with half due to poor communication). The Standard Marine Communication Phrases (SMCP), promoting/advancing precise simple and unambiguous communication in English, were adopted by the IMO Assembly in 2001, following the 1995 revision of STCW. The ability to use and understand IMO SMCP is required for the certification of a navigational watch.

"Communicative competence" can be defined as a seafarer's know-how to get specific maritime "things" done through English, as per the relevant requirements of the IMO STCW Convention, 1978, as amended (Zhang & Cole, 2018). It is in fact the concept that underpins the specific requirements of the STCW 1995 Code, i.e., that seafarers need to be competent in using English for professional purposes. When seafarers can demonstrate the ability to "*use* English" to express themselves clearly and comprehensibly in speech and writing and the ability to "*understand* English" by interpreting messages they hear and read and responding to them appropriately, they prove their communicative competence in English (IMO Model Course 3.17).

Research has shown the need of re-skilling navigators to enable the acquiring of more specific competence themes (ICS, 2018; DNV GL Position Paper, 2018; Sharma et. al., 2019; MacKinnon & Lundh, 2019). Since we are dealing with terra incognita here, another point researchers agree on is the need for detailed investigation of the required competences. Of particular interest is a study related to the operation of remotely controlled ships with seafarers on board and STCW KUPs [knowledge, understanding and proficiency items] in STCW Table AII/I. Eighty-two navigation watch officers participated in a survey designed to evaluate the applicability of 66 KUPs. One general finding of this pioneering study is that some of the present KUPs required by the navigator will become obsolete, and re-skilling of the navigators goes hand in hand with new operational demands (Sharma et. al., 2019). The research sheds no light regarding the competence that is of interest to the Maritime English instructor, Competence 7: IMO SMCP - KUP 30, since it was not one of the extracted factors in the exploratory factor analysis and management of the results of the statistics. I believe that one way of approaching the subject of defining the required communicative competence would be to examine autoremote discourse.

Autoremote operations and communicative needs: is the linguistic component a missing link?

The autoremote paradigm is a discourse that is currently being charted as stakeholders set standards. To find out if the concepts that are created take into consideration language needs, I reviewed the following standard-setting analyses:

- The Advanced Autonomous Waterborne Applications Initiative [AAWA] project, based in Finland, aims at producing the specification and preliminary designs for the next generation of advanced ship solutions (Rolls Royce, AAWA Position Paper, 2016).
- The EU-funded research project Maritime Unmanned Navigation Through Intelligence in Networks [MUNIN], a feasibility study on autonomous systems potentials (MUNIN 2016).
- Class guidelines, namely Lloyds Register Code for Unmanned Marine Systems (2017) and DNV GL Class Guideline on Autonomous and Remotely Operated Ships (2018), as well as a national code of practice, the UK Maritime Code of Practice on MASS, Maritime Autonomous Surface Ships (2018).

The word "autoremote" is actually used as an umbrella adjective to denote "any operation, task, function or system where the intention is to create additional support, remote-control or autonomous functionality compared to conventional, crewed ships" (DNV GL Class Guideline, 2018. p. 13). An operation is indicated as autoremote both when the vessel is operated by manual remote control or autonomously by a system, or a combination of the two. Functions are automated in the autoremote framework and at the same time decisions are made by crew off the ship (remote monitor and control) or by the system itself by means of algorithms (autonomous control).

There are four degrees of autonomy, as identified by the International Maritime Organization, Maritime Safety Committee 99. The degrees are non-hierarchical and MASS (Maritime

Autonomous Surface Ships) could be operating at one or more degrees of autonomy for the duration of a single voyage.

I. Ship with automated processes and decision support: Seafarers are on board to operate and control shipboard systems and functions.
II. Remotely controlled ship with seafarers on board: The ship is controlled and operated from another location, but seafarers are on board.
III. Remotely controlled ship without seafarers on board: The ship is controlled and operated from another location. There are no seafarers on board.
IV. Fully autonomous ship: The operating system of the ship is able to make decisions and determine actions by itself.

Within the autonomous ship concept, reference to communication denotes broadband or satellite telecommunication transmission systems, rather than verbal communication. In this respect, and if we embark on a quick visual discourse analysis, I find it interesting that in the following depiction of different levels of autonomy (fig. 1), AL0, "No Autonomy", is depicted with two people talking, whereas human interaction and verbal communication seem to be missing in autoremote operations.

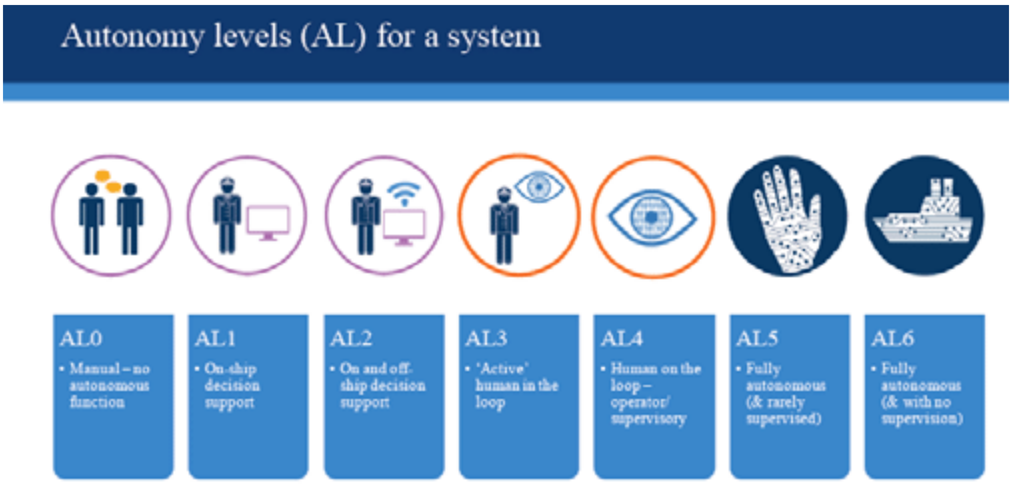

Figure 1. Lloyds Register Levels of Autonomy
Reproduced from Komianos (2018).

At first glance, then, it would seem from such a depiction that it is only on the first level where we have conversation for the operations to be conducted. It would seem that human interaction is inversely proportional to the level of autonomy: the higher the level the less the interactive needs. But it is actually the opposite. In autonomous remote operation degree two or three of the IMO scale we have the most demanding interactive acts. Various linguistic needs can be identified in reference to verbal communication: the on-board seafarers interacting with the shore-based operators for decision support or instructions; the interactions within the remote control centre to solve problems; communication of the remote control centre with VTS, pilots, other vessels. These needs are more intense in emergency situations. The type of language they need in order for operators to be able to work effectively within these remote centers has certain characteristics as well, and these are the ones I wish to analyse here.

Conceptual constructs within autoremote research

MUNIN (2012-2015) is a test-bed development study, a platform for testing autonomous operation that falls within level two autonomy. It envisages autonomous operation of an unmanned vessel during deep-sea voyage, whereas in congested waters tasks are executed by an on-board crew. After it is released by the on-board crew of skilled nautical officers and engineers, the SCC (Shore Control Centre) monitors and controls the autonomously operated vessel. The study regards "ship-shore communication and coordination" as one prerequisite for autonomous ships, especially in port approaches and channels that are difficult to navigate and require a pilot on-board the ship and VTS interactions (MUNIN objectives). Situation awareness is ensured by direct remote control via a shore-side replica of the bridge, in this way combating the physical distance between crew and vessel. It is very interesting that, as a last resort, there is a bridge team and problems are solved through face-to-face interaction that is end-oriented and targeted in nature.

In the case of an encounter with a manned ship, it is recognized that uncertainty on communication between manned and unmanned ships may lead to risky conditions. Guidelines ask for minimum risk conditions to be maintained to cover for such risks. When the ship or some other part of the autoremote infrastructure is forced out of its normal operation, it is essential that the ship, through the relevant response, is put in a state of "Minimum risk condition" (DNV GL Class Guideline 2018). This is referred to as the state of least risk to life, environment and property and it is highlighted that the relevant response to minimum risk condition must be defined (p. 18). Therefore, definitions of the appropriate responses to reach minimum risk condition in various situations are to be developed, and classification societies, in their role of verifying the safety of a product so that it is certified, are leading the process of safety assurance for new autoremote systems.

It is stated that communication calls will be relayed to the SCC from which the human operator will reply and communication equipment must be linked to the SCC to facilitate voice communication with other ships. In the official report on the qualitative analysis that was undertaken, we find that 38% of the respondents found that "to ensure safe interaction of autonomous and conventional ships" is a challenge (p. 32), and that the primary challenge is seen in "a prevention of accidents - both due to technical failures and an interaction of autonomous and conventional ships" (MUNIN D9.2: Qualitative Assessment, p 33).

The results of the MUNIN project are mainly on a conceptual level. Especially because they are on a conceptual level, and setting a paradigm, it is even more important to examine if they make room for linguistic interaction protocols. The main concept is an autonomous ship guided by automated on-board decision systems but controlled by a remote operator in a SCC. So, within this framework, we have the concept of the situation handling rooms as well as the following roles: the operator, the SCC actors (a captain, who is also legally liable, and a marine engineer) and the supervisor. A focal point, from my point of view, is that the operator needs to provide pertinent information to get actors (the Captain and Engineer) "into the loop" as quickly as possible (Mackinnon et. al., 2015). This means a lot of linguistic interaction. The concept of the situation room entails discursive skills, as well, since it is expected that the captain and the operator will go into the "situation room" to conduct precise remote ship handling together.

It is not only with VTS, pilots and other vessels that remote operators need to converse with, not only with on-board teams, but within the SCC there are various linguistic acts to be fulfilled such as interaction between operator, supervisor, and actors to the effect of solving problems.

In fact, the interactions in the SCC comprise a rather challenging linguistic architecture that aims to fulfil demanding tasks. What is required for the concept of SCC as a socio-technical system to work is conversation, real-time communication sessions between two or more users. On a good day, there may be as many as six participants [*operator, supervisor, actors (Captain and Chief Engineer), on-board team, pilot, other vessels*] in the exchange of information. The operator needs to report to others. This reporting will be done in English, which can be used as a common language to avoid potential misunderstandings from switching to different languages even though some of the participants might share a common mother tongue. So, since remote control is the key, and this can be conducted by voice, a common language and a protocol would be needed.

In MUNIN's description of a hypothetical voyage, the "narrative of an unmanned voyage - when all goes well", the issue of multinationality and the danger of miscommunication due to language barriers is indirectly acknowledged, within the autoremote scenario. This narrative, intended as a loose scenario and not using technical vocabulary, is very interesting from the point of view of the verbal communication that takes place. The SCC operator, situated in Vigo, Spain, talks to the pilot at the Port of Gothenburg when the bridge is switched from manned to autonomous/remote. He also remotely operates eight other ships in Bangalore, India. He has two officers in the remote centre with him to converse with. Fifteen days into the voyage, when suspicious echoes are observed on the radar, off the coast of Dakar, Senegal, he decides to take one of his mates with him into the situation room (which is like having a meeting in a bridge simulator). After zooming the vessel's camera and identifying a fishing boat in the vicinity, "He called on channel 16 both in English and in Spanish and finally got an answer back in broken English" (MUNIN'S journey, 2016). Overcoming the linguistic barrier, the short dialogue that ensues, in broken English, with the Senegalese fisherman, saves the day and leads the operator to take appropriate collision avoidance action. As the voyage continues and the narrative ends, it is left to our imagination to imagine (within the scenario) that the Spanish operator, fictional Capt. Felipe Rodriguez, speaks in English to various other parties all over the world, e.g. the pilots in the ports where the vessels under his control sail. This proves my point on the importance of setting standards of communication to mitigate deficiencies in English even in the autoremote set-up.

Operational functions which entail special attention to verbal communication: remote navigation and team situational awareness

New operational functions are introduced for the needs of autoremote vessels. Two of these functions display an intricate arrangement of verbal communications that supports the remote operator: remote navigation and team situational awareness. I will examine the newly emerging trend of co-operation between remote operating centres and ship-centered input within which the remote operating centres will make decisions, to see what type of linguistic input is perceived as necessary to ensure there is no miscommunication. To this effect, and since it is recognized that standardization of future system applications and their implementation is critical, I think that the required linguistic input needs to be standardized too. All these communications (what I have referred to as a linguistic architecture of communicative needs) need to be conducted in English in a simplified yet efficient manner.

Among the hazards for the navigation function is when another vessel is calling to agree on a non-ColReg compliant meeting situation, as well as the handover of responsibilities from one operator to another (DNV GL Class Guideline, 2018). In the AAWA initiative, it is stated that good skills are needed in safety critical and challenging situations, and that there are two functions that render verbal communication. First, when unmanned ships must facilitate emergency interventions for recovery and rescue at sea (Rolls Royce, 2016). Second, when a vessel is deviating from a planned course, in which case “the operator could choose to use VHF radio to communicate with the other vessel and confirm that action taken by the vessel is safe for both parties, and if modifications are needed the operator can take the vessel in manual control” (p. 10). The class guidelines regarding external communication specify that even though the navigation functions are under the responsibility of remote operation from the RCC, the autoremote infrastructure will still need to be able to communicate with external stakeholders to the ship. This means that the following functions need to be taken care of, either by *relaying the task to personnel in the RCC*, or by automatic systems on board:

- communicating with other vessels, VTS, tugs, pilot station, etc. using VHF transmitter on board the vessel
- transmit emergency messages from the vessel
- relay emergency messages received by the vessel
- reply to messages from other vessels
- voice communication with crew and passengers on board the vessel
- voice communication with humans near the vessel

(DNV GL Class Guideline, 2018, p.93).

Finally, an additional structure of communication can be seen in the description of new roles and responsibilities in the UK national Code of Practice that aims to set initial standards and best practice for those who design MASS. Apart from a Master/Commanding Officer on board who has overall responsibility, a new term is introduced, that of “MASS Watch Officer” who is located either in the operations room or on board, and whose role includes direct communication with equipment operators. The MASS Watch Officer manages the interaction between the Base Control Station (control units) operator, the crane operator, the USV (unmanned surface vehicle) payload operator (UK Code of Practice, 2018).

We saw that in autoremote scenarios the operator monitors several vessels and has a support team that can be called upon to assist in decision making if a problem arises. A recurrent concern is how the operator will reach situational awareness: “when human intervention is expected, special attention is placed on the timing aspect and the ability to establish Situational Awareness” (DNV GL Class Guideline, 2018, p. 28). The key questions, identified by researchers as the gap in human factors knowledge, is how the operator obtains and maintains situational awareness and whether the support team assembles quickly and makes informed decisions (MacKinnon & Lundh, 2019, p. 28). There are two types of situational awareness that arise, whose peculiarities are important: Remote SA and Team SA. In order to effectively reach remote situational awareness, special consideration should be made to “the complexity in describing the condition, event or observation to the remote operator” (DNV GL Class Guideline, 2018, p. 86). The on-board personnel should demonstrate awareness that the way information is relayed by on-board crew will affect SA in the remote operator. Reviewing the concept of team situational awareness, and how it is obtained, maintained, transferred and sustained, we find that it needs to flow between team members, they need to share pertinent situation awareness to avoid critical errors. Critical factors imparted upon team SA include verbal and non-verbal communications and shared information. Shared processes are to be employed by the team, through formal training and operational protocols. And it is important that the data is not just transferred but used for consensus decision making (Mackinnon *et. al*., 2015).

It is clear to me that training approaches that will support individuals and teams within the autoremote framework should include the element of training for language skills if this support is to be adequate and successful. Training in decision-making techniques is even more important here because unlike a vessel where a Master has clear command and control, in a SCC decisions are arrived at through consensus. Also, SA is based on information from onboard personnel, and time is critical. The timing aspect is given special attention whenever human intervention is expected by the systems. Because the remote controller is relying on the on-board personnel to provide descriptions of the condition or event or observations which may be complex, and because this information is crucial for remote SA, there should be a special skill to be mastered: brief, concise and targeted linguistic response.

Having reviewed the concepts, the following analysis lists the new linguistic competences required for the concepts to work. We should note that those involved in autoremote operations might have good linguistic skills in English but they still need specialized training on required performance. In fact, the operators will be highly skilled individuals from advanced countries and job opportunities will move towards highly developed regions with mature technological capabilities and trained staff (DNV GL Position Paper, 2018). We can assume their English language skills are high too. Nevertheless, they still need to be trained in decision-making discourse, to become skilled in co-operation between remote and ship-centered input, and the language requirements should undergo a process of harmonization and standardization.

To start with the Remote Operator the appropriate knowledge, understanding and proficiency would be to use English to:
- Report information obtained during monitoring
- Assess information with the supervisor
- Analyze problems with a situation handling team
- Give recommendations for problem solving to the captain
- Co-investigate and share information
- Talk to the pilot to confirm that s/he is ready to assume full control; confirming the handover of control to the pilot
- Share SA with/in the team
- Consensus reaching
- Give/receive recommendations for corrective action regarding navigation
- In team situation, exchange information for transferring and regaining SA in a clear and unambiguous way.

The Supervisor and the Captain as part of the Situation Team must be able to use English effectively to
- Inform (operator) to take corresponding actions
- Share SA with the team
- Provide and confirm information via VHF such as ETA and rendezvous position when planning for a rendezvous with the onboard control team
- Handover, transfer SA via the situation room

These linguistic acts are mentioned here by way of illustration, and came up by looking within the scenario testing undertaken by MUNIN research. A comprehensive list should be developed and they should be described as the adequate knowledge of the English language to perform the remote operator's duties. It is noted that "there should be training for type and mission specific skills" and new operator skills will evolve and need to be assessed (UK Code of Practice, 2018). Similarly, the need for clear communication in a common language and the acquisition of targeted linguistic skills becomes pertinent here. To this respect, the following section presents some observations on the areas where special linguistic and communicative skills are required.

Suggestions on required linguistic performance of autoremote personnel

The areas where *specialized* linguistic and communicative skills are required are the following. They are not limited to verbal communication but also involve particular writing and reading skills.

1. Reaching remote situational awareness and team situational awareness. SA is about having all the data through microphones, sound capture cameras, sensors, but not only that. It is important to make sure that verbal communication is recognized in the reaching of SA. Since decision-making on board ships would be cooperative with Remote Operation Centers, the role of successful communication is even more vital, and the use of language for information-sharing and decision-making that is clear, precise and effective is fundamental.
2. Keeping detailed records in an operator record book. A detailed record should be kept on behalf of the competent person, containing comments and reflections, to reflect on each mission dangerous occurrences and good practice observed during the mission (UK Code of Practice, 2018, p. 60).
3. Following linguistic protocol in handover and change-over procedures. It is important to follow clear and unambiguous wording during the handover of responsibilities from one operator to another and change-over procedures. Designers have used data from the aviation industry, where communications are even more standardized, and have noted that in unmanned aircraft systems there are mishaps during change-overs from one vessel to another, when operators overview many vessels, or they hand over to the relieving operator (Rolls Royce, 2016). Unlike the handing over of the watch described in STCW, a handover is revoked when the operator is unsure s/he is competent to handle a situation. Also, clear, standardized procedures, as well as the associated language, should be followed when the manual control is moved to remote control.
4. Harmonization and standardization on VTS response. Verbal communication between VTSOs and vessels forms the basic function in the operation of VTS in order to fulfil its role, which is to offer support to the decision-making process of a bridge team. It is found from simulation experiments that SCC Operators felt that voice communication is essential for safe conduct of passage (especially in heavy traffic). This suggests that voice communication will remain a useful form of interaction between VTSOs, SCC operators and unmanned ships (Chong 2018). Shore-centered communications, like shore-centered technologies, should be standardized so that competent seafaring personnel become competent shore-centered controllers, capable of monitoring many vessels at once. In the same way that VTS communications are harmonized through common phraseology to deliver precise, simple, unambiguous communication to bridge team in manned operations, there must be a similar provision for remote operations, too.
5. Reading instructions for the operation of the Unmanned Marine Systems. Guidelines specify that operators shall be provided with adequate information and instructions for the safe and effective navigation of the UMS. These shall be presented in a language and format that can be understood by the Operator in the context in which it is required (Lloyds Register, 2017).
6. Following supervisors' instructions. In this respect, concepts such as closed-loop communications to safeguard against human error (used in pilotage, for instance, and long established as part of bridge team management) could prove useful. The "closed loop" is a communication protocol where information is given, repeated by the receiver and normally

confirmed by the issuer, and is the only way one can be sure an order is being followed (Blom, 2007).

Recommendations and conclusion: communicative competence as a target in teaching Specialized English

Autonomous ships have introduced new concepts and operational functions and the required communicative competence in English needs to be expanded to incorporate and accommodate these concepts. The discursive requirements for each operational function need to be delineated. For instance, for reaching team situational awareness the user needs to have the appropriate linguistic range to be able to engage in spontaneous interaction, giving recommendations, clarifications and justifying his/her position.

There is a recommendation for a new code that would only apply to autonomous and remote-controlled ships, the ASC (Autonomous Ship Code), anchored in SOLAS (DNV GL Position Paper, 2018). Whether there is an amendment to the existing STCW Code, or a new special code is developed, in both cases the linguistic requirements need to be delineated carefully, leading to a separate competence covering *specialized Maritime English for personnel working in auto-remote operations.*

The idea of Specialized Maritime English was propagated through the Revised 2015 Model Course 3.17 to reflect the Manila Amendments to STCW and cover the required performance of competence in the English language for Electro-Technical Officer, and is applicable here. Reaching communicative competence through a Specialized Maritime English course seems appropriate since linguistic competence, the KUP in the English language, seems to be more essential in General Maritime English, while communicative competence, namely the KUP of the specific duties, takes priority in Specific Maritime English (Yongliang, 2015). The requirement is to have adequate knowledge of English language to enable the operator/personnel in all functions/roles to perform remote operations, so that communications are clear and understood. Also, another suggestion is to include standardized checklists of what to check when assembling the support team; dialogues based on such checklists can be added to SMCP under the heading "Remote/Shore-based control".

The recommendation of Specialized English relates to personnel with seafaring experience. The class guideline is for operators to have seafaring experience on specialized ships. Even though roles and responsibilities in a Remote Control Centre may not follow the conventional roles and responsibilities as per STCW code, they do have two roles for officer of navigation watch and officer of engineering watch (DNV GL Class Guideline, p. 84). Yet there should be a distinction between SCC operators with seafaring experience and those who do not have one, and adapt the linguistic requirements accordingly, also specifying which part of General Maritime English needs to be taught.

In terms of the appropriate teaching tools, there is wide acceptance of the role of simulators in the preparation of future operators for managing unmanned vessels. Scenario-based teaching should be considered as an appropriate tool, since it involves developing problem-solving and decision making through simulation. Overall, well-designed simulator training would be needed for practicing challenging safety critical situations (Rolls Royce, 2016). Collaborative interaction in simulators using English vocabulary that the designers and other stakeholders will provide teachers as the required one to cover all possible scenarios could be helpful.

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