1. What can be done to improve the fire detection in a container cargo under deck?

Objectives: rapid detection and localization of a potential fire in the holds on board.

Currently, 14mm copper pipes are installed, 100m long, which draw smoke in case of fire in the hold to the aft steering room.

Proposals: Equip the holds with heat and smoke detectors with thermal cameras, preferably remotely adjustable.

Use the cargo hold space ventilation which is extracting and sucks large volume in each hold. At the exit of each fan, make a bypass to divert some air and put a cell per hold at the exit of each fan.

2. What can be done to improve the fire detection in a container cargo on deck?

Currently there is no detection. Detection is only visual.

Use thermal cameras in each bay that measure the temperature of each container front. We could set an alarm at 50°c for example.

Keynote: install thermal cameras or thermal sensor with alarm thresholds in the bays.

Disadvantages: high cost. Install thermal cameras inside protective boxes. Important spare.

3. What can be done to enable a more precise and quick fire localisation?

See answers to the 2 previous questions.

Each container could have its own fire detection with a “wifi” connection. To see if technically this solution works properly subject to electromagnetic compatibility. If possible, investigate the feasibility of such an installation.

It is interesting to think about the design of the container as a whole (reinforcement of joints/seals, detection with “wifi” connection, waterproofing of the container sides...)

Provid the ship a portable thermal imaging camera.

4. What can be done to compensate the deficiencies of CO_2 with regard to smothering a fire in a container stow under deck?

The foam would be effective, but depending on the load, if for example the hold is nearly empty, this would mean too much foam and a large volume of foam to store. In this case, container slots would have to be removed.

A fire-fighting system with water spray already exists in holds with dangerous cargo. These are small diameter hoses and to extinguish a fire the hold would have to be drowned and therefore larger diameter hoses would have to be used to send the water from above or from the bottom of the hold. But if we drown the hold, we modify the structure of the ship (too important constraints)

The solution of foam or gas extinguishing does not seem possible and not very effective in both cases.

Actions to remember are: Cooling, isolating the problematic container, containing the fire and smothering the fire if possible.

Therefore, the basic requirement is to equip the holds with a **powerful hi-fog water system** with a cooling agent and the water cannon deck with a cooling agent. This system must be vertical (fixed to the ceiling) and horizontal (fixed to the walls of each hold).

It should be noted that a comparison is interesting between a container ship that has containers in the hold and on deck and a ropax ship that has cargo in its garages and on deck.

5. What can be done to improve the confinement of a fire in containers under deck to the particular cargo hold?

See question 4.

There are too many variable parameters that come into play (limited access, containers close to each other). No means to my knowledge.

6. What can be done to improve the confinement of a fire in containers on deck to the particular bay or section thereof?

See question n°4.

Install fixed guns directed between each crossway located on the port, starboard and center (if possible) to make a water curtain. See the "FiFi" guns installed on AHTS and PSV vessels in the Oil&Gas field. The tests are done with fresh water and in case of fire, switch to the seawater circuit.

Keynote: Install fixed guns at the lashing bridges, which can be started simply from the bridge like a fire pump.

7. What can be done to improve active firefighting on deck bearing in mind reduced crew and local conditions?

See previous answers.

We can also imagine a gantry / overhead crane equipped with guns that would have its station at sea at the level of the bridge/castle and that could move on rails along the length of the ship but that would require losing a row of containers in width.

Another solution is to post fixed but steerable guns at different strategic locations (such as the bridge) with enough power to be within reach of all the container bays.

Keynote: Install steerable guns at the monkey bridge and the front mast, which can be started simply from the bridge like a fire pump.

8. What can be done to protect vital ship structures under deck and on deck from excessive heat?

See question n°4**.**

It would be necessary to create a void space between the cargo hold 1st in front of the castle and the engine hold.

Install horizontal and vertical hi-fog water mist protection in each cargo hold.

9. What can be done to improve the protection of deck house and life-saving appliances?

See question n°4. Install water curtains like on tankers and fire protection A60 & camera.

It is also necessary to guarantee the continuity of navigation and manoeuvres at sea in the case of a fire on the deck at the front of the castle, so consider cameras with screens available to the officer on watch in the wheelhouse.

10. Additional remark concerning origin of the fires on containership

Do a risk analysis beforehand to know the source of the fires on these ships, such as misdeclaration of the contents of the containers.