



National Transportation Safety Board

Washington, D.C. 20594
Office of Marine Safety

Interview Summary – DCA15FM035

Interview Of: ██████████, Chief Engineer

Date/Time: September 11, 2015 from 0916 to 1052 local time

Location: On board Carnival Liberty, San Juan, PR

Interviewed By: ██████████ — Fowler Rodriguez, ██████████ — Carnival Corp., ██████████

██████████ — NTSB IIC, ██████████ — NTSB Engineering, ██████████ — USCG, ██████████

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Case: Carnival Liberty engine room fire, September 7, 2015

- Has sailed as CE for 16 years with CCL (since 2000)
- Has had CE license since 1987
- Job description – in charge of technical department and technical spaces including electrical, electronic, plumbing, mechanical, diesel engines, HVAC – involved in all technical issues on board
- Staff Chief engineer is second in command of engine department – assigns work to people in the engine department – CE and Staff Chief working together all time – they prioritize all the jobs
- Staff chief in charge of wipers, oilers, fitters - for three weeks they have had a missing senior motorman so other jobs fall behind – catching up on jobs is difficult especially with Carnival Liberty
- They have a position called safety engineer on board – this is an extra engineer that has been added dedicated to safety systems
- Senior second engineer is the safety engineer but there is no job description for this position yet – not clear – only some descriptions from the office – implemented about two months ago
- Safety engineer does not have any person assigned to him – so jobs such as work in the lifeboats need to take someone from another group – this has created some challenges with other departments
- They are learning how to improve this position on board
- This change took place in July 2015
- Safety engineer maintains HF system on board
- Any safety related jobs are communicated to the master, staff captain and safety officer

Chief engineer recalled the following details of the accident:

- September 7 2015 around 1130
- Was in marshalling area – ship was loading spare parts inventory
- Heard sound from HF system running – very noticeable
- CE went to ECR - was trying to understand what was going – 1130 was strange for any testing because normally that is the time when people go to eat

- In ECR, saw the staff chief running around – 2nd engineer told him there was a fire on DG4
- CE looked at the CCTV monitor – picture not clear – because HF already released
- 2nd engineer told him DG4 had been shut down and DG1 started
- Bridge asked - can we close the WTD's? – CE said yes
- Went behind the main work station – shut down DG4 on the mimic panel
- Then took a look at HF panel – saw a lot of lights – all skids were on
- Looked at CCTV in SMCS and saw smoke and flame
- Looked back at HF and saw forward ER was on as well aft ER
- The guy told the CE the QCV's were closed for DG4, 5 and 6 (CE did not state who the guy was)
- Then CE looked at the CCTV - There was black smoke coming from the funnel which was from DG1
- The turbo charger was also in alarm for DG1
- The chief refrigeration engineer was there – CE told him to switch off the AC compressor
- CE then went behind to the mimic panel – switched off DG 1 so there remained DG 3 only on the network
- The CE and staff chief also turned off the feeder motor DG4, 5 6 and the boiler
- They were sure we switched off the right ones because otherwise they would be in darkness
- The EDG started, but not connected to the net but was giving power to the lights only
- Captain asked how things are going – CE told captain all HF skids were running and the pressure was low
- CE explained that the way to stop the HF sections was to press reset – if that is done, the entire system stops running – all the skids stop and release open
- CE asked permission to stop the forward engine HF but bridge asked for them to hold off
- Total flooding was also on
- When the bridge approved the reset of the HF, everything was then off and they adjusted the command for the aft engine – the pressure then went from 40 bar to 110
- A few minutes before that, they released CO2 after all engine emergency stations manned (CO2 station, ADG and EDG manned) – didn't get any answer from the ventilation team
- Roll call for Engine personnel complete – all people out
- Engine administrator showed him 2 cards for contractors that had not been removed from the engine room access board – CE saw the Wartsilla technician when he was initially going to the ECR and knew he was out of the engine room
- The other guy the CE saw as well, leaving the machinery area – saw them for sure
- All personnel out of engine spaces – CE made announcement in engine spaces to evacuate and that CO2 would be released – CO2 was then released
- Shut down of HF took time
- The fire squads were checking the temps in the area
- CE has a radio and he is on the same frequency as the staff chief who is with the safety officer during emergencies – needs to keep contact with staff chief all the time

- CE maintains contact with the staff chief and communication from the bridge come by telephone
- They started to pump the bilges perhaps because too much water
- Capacity was limited in the bilges because they did have no time to discharge bilge water at sea (only had 1 hour or 2 hours for discharge) – could not do it prior to arrival
- DG4 was de-loading when CE opened the breaker (command off) DG 1 and 3 remaining
- When CE checked the camera for the funnel, he saw black smoke coming from DG 1 and thought that was not good – could be anything
- Didn't know that someone also pulled QCV for DG#1 – therefore no fuel to DG1
- CE needed to keep the lights on so he ordered the AC compressor switched off – did not want the lights to go down – didn't want to scare everybody
- Later, everybody was talking about DG1 but there was no problem only that someone shut off the QCV – it had no fuel
- DG 3 had power of 4600 KW and DG 1 had 2400 KW– with 2 engines on the net they must share the load in parallel – in this condition the gap was too big plus black smoke - CE was not confident with DG 1 – switched off DG1 and remained with DG3 only
- Does not know who pulled the QCV for #1

Additional questions and follow up:

- CE was asked if there were any previous problems with DG4 – CE stated - big problems no – during the life of engine some temps and pressure not satisfactory – talked to Tim Horton in past who is their diesel manager – some turbo charger high EGT inlet and outlet
- They cleaned the turbo charger – mechanical cleaning bank A and B – nozzle rings also replaced – performance better after that
- CE explained potential of hot spots if EGT is too high - bellows can be ruined
- Turbo charger cleaning was done after the last overhaul
- Engine has worked fine for the past 1000 hours
- Decision to clean was from indications on turbocharger inlet and outlet temperature sensors – max at inlet is 599 C (at 600 C the engine shuts down) but on the outlet the temperature alarm 435 C (at 451C the engine shuts down) – at this range with a high load, it is necessary to check – nozzle rings, blade gaps
- Cylinder deviation temperatures – max alarm is 520 C (at 560 the engine will shut down in 300 seconds and request another engine online)
- At the beginning (starting) many alarms normal – as speed and revs increase, the temperatures stabilize and alarms go off
- Deviation for EGT – more than 120 C, there is a shutdown request from the IAS
- Did not notice any deviations with DG 4 – no other issues
- Specifically cylinder 2A – nothing noticed
- Hot spot inspections – once a month required by company – but requests this done more than once per week
- Kevin Blake from CCL sent them a new thermographic camera but it was not working when it arrived – they take temperatures with the Fluke

- New insulation boxes coming from Wartsilla – metal box – new for SOLAS – coming from Wartsilla – not yet on board though
- With the current itinerary, they have 0 hotspots (maximum hotspots are 180 C)
- If they did experience a hotspot more than 180 – double check with Fluke – replacement of insulation or maybe a leakage from EG bellows (if so they take out the cover and look for smoke and then repair)
- Nuisance alarms cannot be inhibited in IAS
- When CE saw black smoke from funnel, he knew this was exactly from DG1 – alarm on turbocharger bank A – load was low – on CCTV at DG1 he could see HF mist
- CE does not know who closed the QCV's
- Feeder motors, booster pumps, boilers also pre lubricating pump and LO purifier were shut down – shut down everything
- If fuel was isolated to an engine why high temp? CE stated perhaps because engine is missing air and load, back pressure? – Probably engine was trying to keep revs up
- New emergency response plan – team from office came on board in July to implement emergency plan (ERP) – engine team is more involved in emergency response
- ERP – big changes for hotel
- 1st time implementation drills were a disaster
- Some ships do not have the ERP implemented yet
- Staff chiefs emergency duty is with the safety officer – because he knows the engine room better than the safety officer
- At the time of the accident, the staff chief was in the ECR but then went with the safety officer as required
- CE did ERP training in shore based facility Almere, Netherlands (CCL's training facility)
- CE does not know exactly who activated total flooding for the HF – knows only that everything was on and that someone leaving the engine room activated everything in the ER
- Control boxes from HF – someone at bottom of the ladder – CE said there are different boxes from inside the engine room – within the stair, all the boxes are there – these are local mist only – total flooding can only be done from the panel in the ECR
- It is possible that total flooding was activated from the ECR – don't know who did it
- 2nd engineer told CE that he released HF from the panel in the ECR – but no mention of total flooding
- The engine staff does training on HF – they stress this to the staff – engine staff knows what they are doing
- When asked of the new HF cage with section valves on I95 – during an emergency no one is assigned to this station – CE stated this is a new HF station – the old emergency plan had the guy in charge of HF
- In order to secure HF total flooding, the only way is to reset the system – if reset, the skids stop
- When asked if it is possible to have crew close isolation valves for HF, the answer was yes – with the old emergency plan, an officer was dedicated only to the HF system
- CE pressed reset after captain gave him permission to reset
- The HF came back right away after he pressed reset – aft engine room

- CE stated the total flooding aft started again in the aft engine room
- After the HF system was reset, the aft engine room was operating from the panel in the ECR – they didn't press total flooding – after it started, the light indicated total flooding was active – only had a limited view from CCTV and from HF panel
- CO2 was on when they reset the HF system
- When asked about his previous comment where it was difficult to keep up – CE spoke of the invasion of contractors doing projects – when they left the ship, it was a mess (example – HF was running last night and no one advised the of it) very difficult to manage 60 contractors
- Another example – contractor accidentally shut down LO pump and the propulsion motor shut down
- CE does not want to see any contractors during maneuvering in ER
- Contractors – before running new HF system, major group almost 60 people, also people running cables for redundancy – some people for incinerators
- 3rd engineer and environmental technician followed them around
- With the age of the ship, there is more maintenance needed
- DG 3 on line when the CO2 was activated
- The ERP has new checklists - one for CE plus there are another 3 checklists – one for CO2, EDG/ADG and ventilation team
- There are 4 places to stop the engines – locally control unit, IAS, mimic panel and mushroom (emergency push button)
- Best thing to do is open the breaker and stop the engine so as to not reverse power
- Keeping the power on was his priority – he stopped the AC compressor to keep the lights on
- HF – new installation – they had HF before but this has total flooding added – 2 more skids added - ADG can provide power to the skids
- CE remembered HF upgrade was completed last year. Commissioning of the system, the start in automatic mode – simulating loss of power to see if this would take the load from upstairs – Lloyds oversaw this
- The HF panel on the bridge is not in control of the HF – they bridge can only see on the panel
- After HF reset CE pressed the buttons for aft engine room – for sure DG4 and also the cable trays – also pressed DG5 and DG6
- Recalled the pressure was between 110 and 120 bar after the reset
- When questioned on changeover from HFO to DO - on arrival to STT, the DO changeover started when the vessel was alongside – finished with maneuvering
- Normal process, 1 hour before reduce temperature from 116 C to 85/90/80 - first fix from feeder module – switch to DO when ship is safely docked
- For departure SJU, they went to HFO about 30 minutes before departure – switching back was 5 to 10 minutes after arrival
- CE didn't recall exactly how long DG4 was running previous to the fire – stated it was the only engine available in the aft engine room
- For this type of cruise they only used 2 engines underway throughout the night
- Thinks they departed SJU on 3 engines

- Hotel load 13 to 14 megawatt but depends on demand - Generators are 11 MW each
- When asked about the CO2 system – when panel is opened, another engine will start – there is a sign that states make sure 2 engines are running before discharge
- When asked about Wartsilla service bulletins – received by CE and staff chief (maybe daily engineer too) – if new they discuss amongst themselves and determined the action to take – includes ship manager
- CE has not had any Wartsilla service bulletins lately
- With respect to vibrations or pressure on fuel pumps – there is more vibration since the engines are bigger and more powerful
- Started to install pulsation dampers on DG4 – done in 2011 by Wartsilla in dry dock – worked fine
- Vibration depends on location of the engine and supports (i.e. DG3 and DG6 vibrate more)
- An example was the QCV's closing due to the vibration a few years back
- DG3 and DG6 are the worst
- Pulsation dampers are no longer installed – the previous chief engineer had some issues with the O-rings and they were removed
- CE received the new ones but they have not been installed

Glossary:

AC – air conditioning
 ADG – Auxiliary diesel generator
 C – Celsius
 CCL – Carnival Cruise lines
 CCTV – closed circuit television
 CE – chief engineer
 CO2 – carbon dioxide
 DG – diesel generator
 DO – diesel oil
 ECR – engine control room
 EDG – emergency diesel generator
 EGT – exhaust gas temperature
 EOW – engineer of the watch
 ER – engine room
 ERP – Emergency response plan
 HF – hi fog
 HFO – heavy fuel oil
 HVAC – heating ventilation and air conditioning
 IAS – Integrated automation system
 LO – lube oil
 MW – megawatt
 QCV – quick closing valve
 SJU – San Juan
 STT – St Thomas
 WTD – water tight door