





FIRE LOSSES ON PASSENGER VESSELS

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Purpose of Scientific Fire Investigation

To obtain the facts and learn from them, thereby facilitating improvements in legislation, design criteria, fire safety management and insurance policy requirements.

Aspects of the fire investigation to be considered

- Identify the cause.
- Determine reasons for spread of flames and smoke.
- Compare the fire performance of materials and systems with their expected behaviour.
- Develop guidance on the choice of materials of construction and design.
- Assess the adequacy of the response of the crew and passengers to the incident.
- Assist in the determination of liability.

There will be other priorities which conflict with the investigation

- Urgent repairs
- Cleaning and salvage measures
- De-watering of flooded spaces
- Tampering with evidence

Investigation Plan

- **Preliminary investigation**
 - *collect all immediately available evidence*
 - *follow the no disturbance rule*
- **Form tentative view & develop “working hypothesis”**
- **Collect less accessible evidence**
 - *repeatedly test new evidence against working hypothesis*
- **Evaluate all evidence, and consider whether tests are required**
- **Conduct necessary tests and refine conclusions**

Case Studies

ROMANTICA
Mediterranean



Circumstances of the fire

- Localised oil fire started in engine room at sea.
- Crew tackled fire.
- Fire worsened, and CO₂ was released.
- Heat transfer from funnel casing ignited combustible cladding of sun deck.
- Fire developed and spread throughout ship.



Fire in engine room begins to spread to upper superstructure



Remaining crew rescued by helicopter



Fire gains hold in the accommodation areas



Final stages of fire fighting after ship has been beached



General state of the accommodation areas

Case Studies

NORTH SEA PASSENGER
FERRY

Circumstances of the fire

- Bed linen stored on 10 trolleys lashed to bulkhead on landing of stairway before sailing.
- Noon crew member placed cleaning materials in cupboard adjacent to trolleys, locked door, but left light on.
- 17:00 Ferry sailed from Gothenburg.
- No signs of fire during patrol on stairway at 04:10 next day.
- 04:45 fire detectors on stairway operated.



View looking down onto landing where fire started white arrow shows linen trolleys



View from landing where fire originated towards stairwell



Showing trolleys of bedding [1] and store cupboard [2]

Outline of the store cupboard after examination and removal of debris. Left side bulkhead of the cupboard (arrowed).





Remains of fluorescent light fitting in store cupboard –
no fault identified



Store cupboard door lock still engaged (secure)



Contrast in damage between landing and alleyway beyond illustrates importance of fire doors.

Conclusions

- Fire damage patterns indicated fire most probably originated in bedding on trolleys.
- Carelessly discarded smokers' materials less likely on basis that security patrol 30 minutes earlier would have identified signs of smoke and smell of a smouldering fire.
- Deliberate ignition considered more likely cause.

Case Studies

STAR PRINCESS

Caribbean

2006



Circumstances of the fire

- Fire broke out at 03:10 on 23-03-06 while en route from Grand Cayman to Montego Bay.
- 2690 passengers and 1123 crew.
- One fatality caused by a heart attack.
- Fire originated on external balcony and spread upwards rapidly over several decks.
- Fire smothering systems controlled fires in staterooms.
- Crew fought fire with water from external areas and internal alleyways.



Fire damaged balconies and staterooms on the port side from deck 10 upwards



Looking down on to undamaged balcony, and fire damaged balconies beyond



Resolidified plastic on the balcony deck



Resolidified plastic layer lifted from the balcony deck

View looking aft on
the balcony deck
showing damage to
the stateroom doors





Incipient fire damage to a balcony dividing bulkhead



Fire test on a balcony unit assembly

Action taken after the fire

- Ship owners/managers required to make detailed review of materials of construction and fire properties of external balconies and furniture.
- Production of MAIB safety bulletin, April 06.
- UK Maritime Administration issue recommendation to IMO addressing fire risks, fire detection and controlling measures.
- Production of ICCL Safety Notice of 13-04-06

Shipyard and Ship Repair Incidents



- DIAMOND PRINCESS – Japan, 2002
- COSTA FORTUNA – Italy, 2003
- WESTERDAM – Italy, 2003
- ROYAL PACIFIC – Taiwan 2005



LOCAL FIRE SERVICE DOES NOT ALWAYS SUCCEED IN
ACHIEVING THE DESIRED RESULT





WESTERDAM at the yard



Escape of fire from internal spaces



Extensive fire damage in the restaurant and bar area

Stages in Construction

1. Steel shell
2. Dramatic increase in combustibles.
3. Reduction in new combustibles, ship's systems on-line

Steel Shell

- Small amount of combustibles
- Large amount of welding
- Little or no fire precautions

Dramatic Increase in Combustibles



- Installation and storage of furnishings and fittings with packaging.
- Fire detection/extinguishing facilities not installed.
- No fire zones properly established.
- Reliance on shore facilities for fire-fighting





Bins of
rubbish allowed to
accumulate





Fire stopping of pipes and services above fire door yet to be installed

Nearing Completion

- Reduction in packaging.
- Fire risk and location of risk changing governed by areas of human activity.
- Ship's fire detection and fire-fighting systems coming on-line.





Fire originated in a bin of waste materials including 'wood oil' impregnated cloths.







Precautions During Construction

- Maintain fire zones.
- Install temporary and moveable fire detection systems.
- Carry out continual risk assessments as the risk changes.
- Maintain fire watch patrols with key point checks.
- Procedures for removing combustible waste.
- Maintain adequate fire-fighting facilities (eg manifolds in stairwells).
- Consider shore assembled modular cabin installation to reduce combustible packaging on board.