



Prevention First 2002

ANALYSIS OF THE P-36 ACCIDENT IN CAMPOS BASIN, BRAZIL

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Historical Background

- **The rig was originally built for drilling and production operations.**
- **The rig was converted into a Producing Unit capable for processing 180,000 bbl of oil per day, which required large structural and naval modifications.**
- **The accident took place in Roncador Field, Campos Basin, when the rig was producing around 84,000 bpd of oil and 1.3 million m³/d of gas.**



P-36 Semi-Submersible Platform

P-36 Main Elements





ANP / DPC Investigation

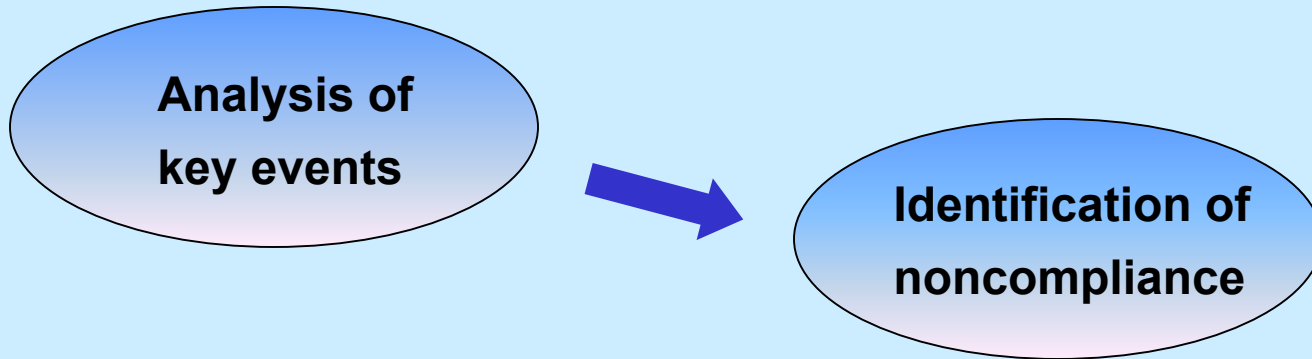
OBJECTIVE

Examine the causes of the accident and, as a result, acquire supporting information to implement corrective measures and regulations aimed at improving operational practices and procedures for offshore activities

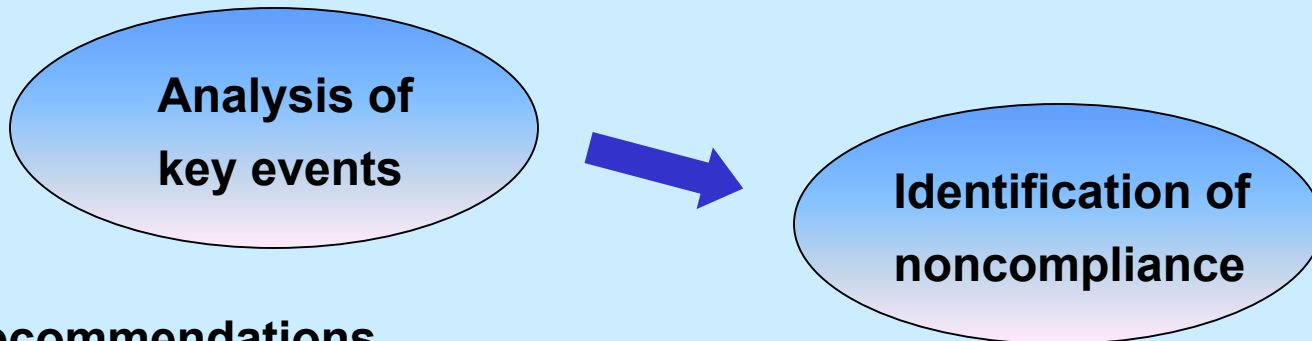


Investigation Methodology

- Chronology of events having causal relationship with the accident
- Analysis of the causes of the explosions



- Analysis of the causes of the sinking



- Recommendations



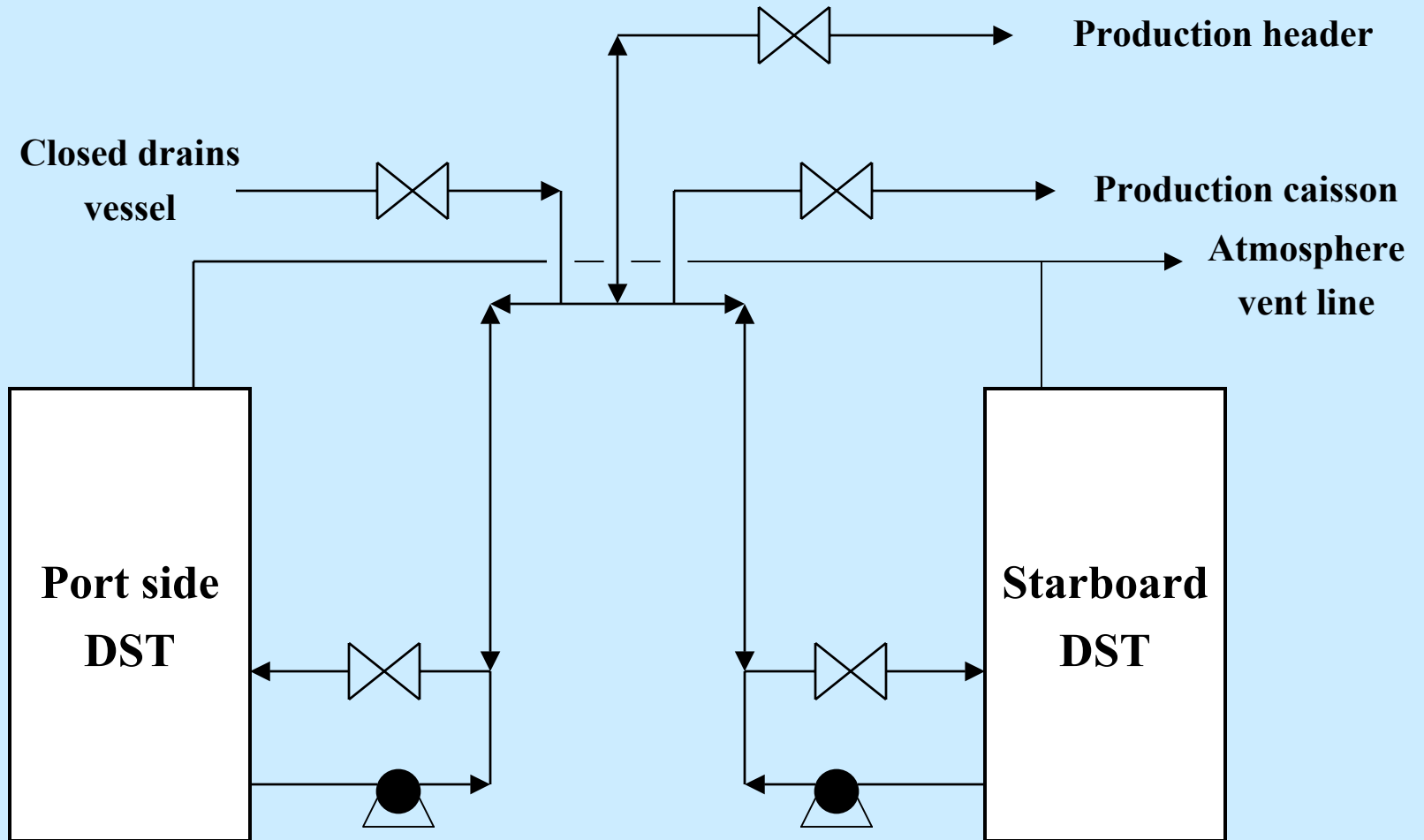
Analysis of the Accident

CRITICAL EVENT

- ↖ Drainage operation of the **Drains Storage Tank** in the aft port side column

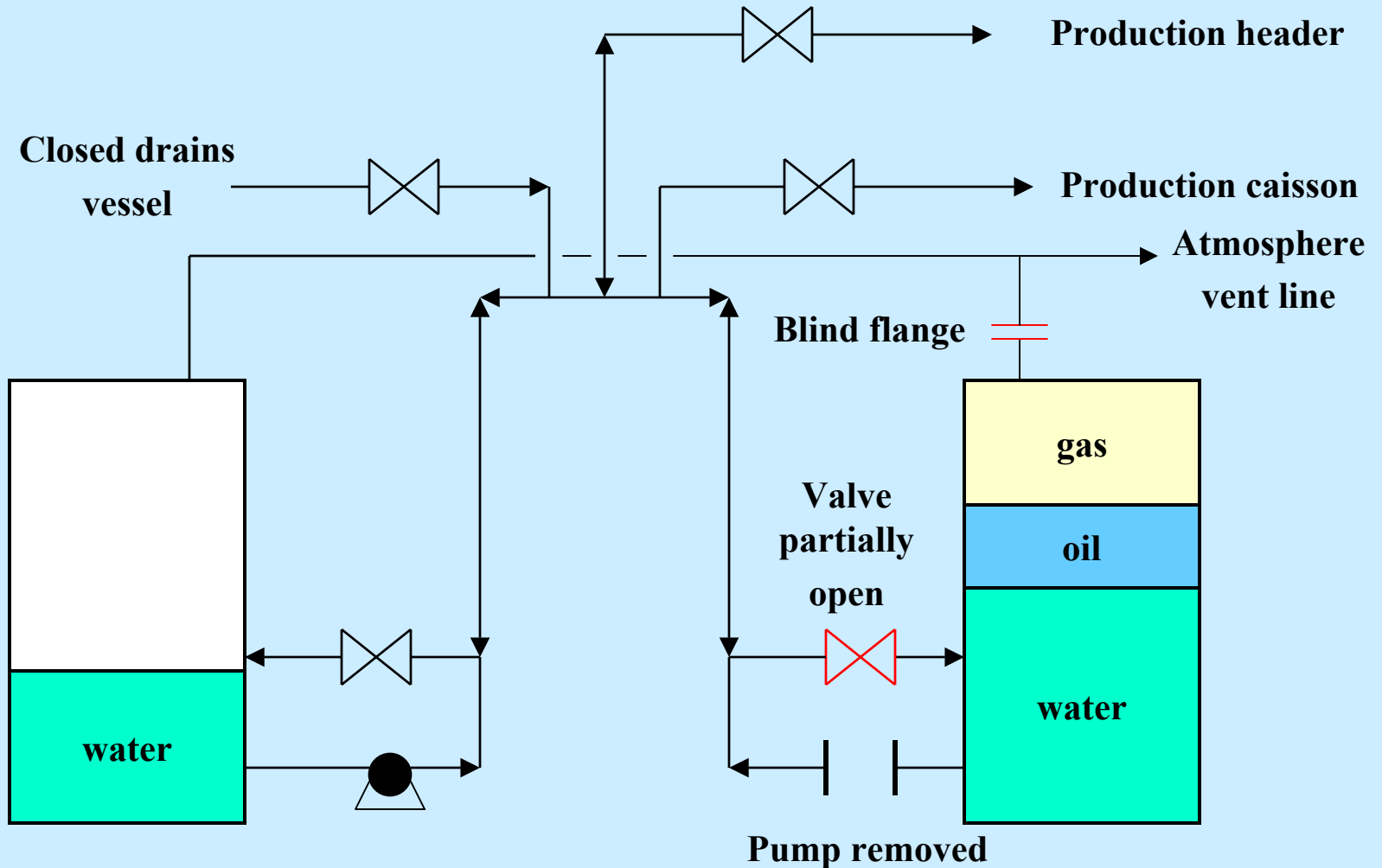


Process Flow Diagram of the Drains Storage Tanks





Process Flow Diagram (time of 1st explosion)



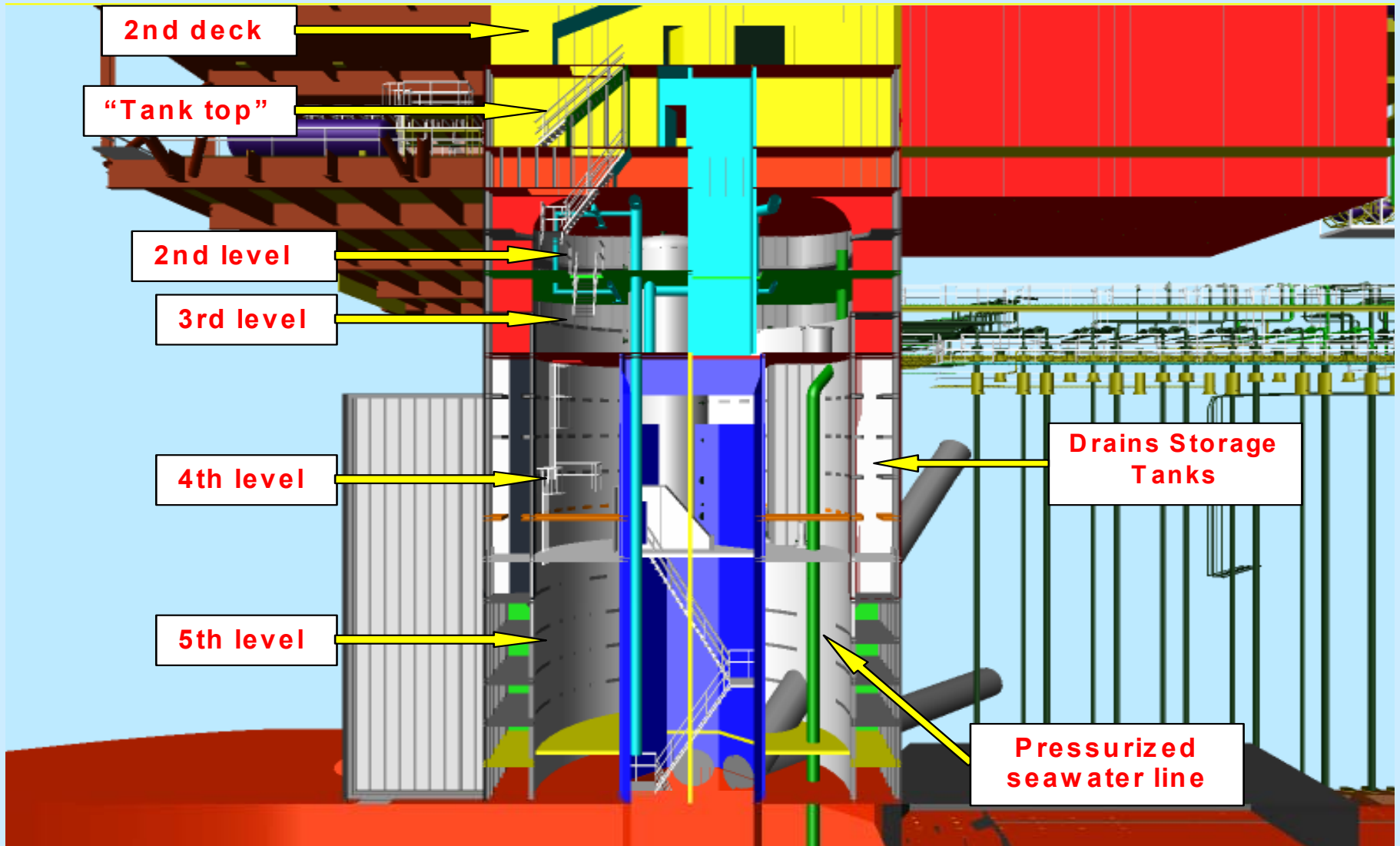


Analysis of the Explosions

- **First explosion** - mechanical explosion caused by the rupture of the tank (12:22 a.m. on March 15, 2001)
- **Second explosion** – very large chemical explosion killing eleven members of the fire brigade (12:39 a.m. on March 15, 2001)

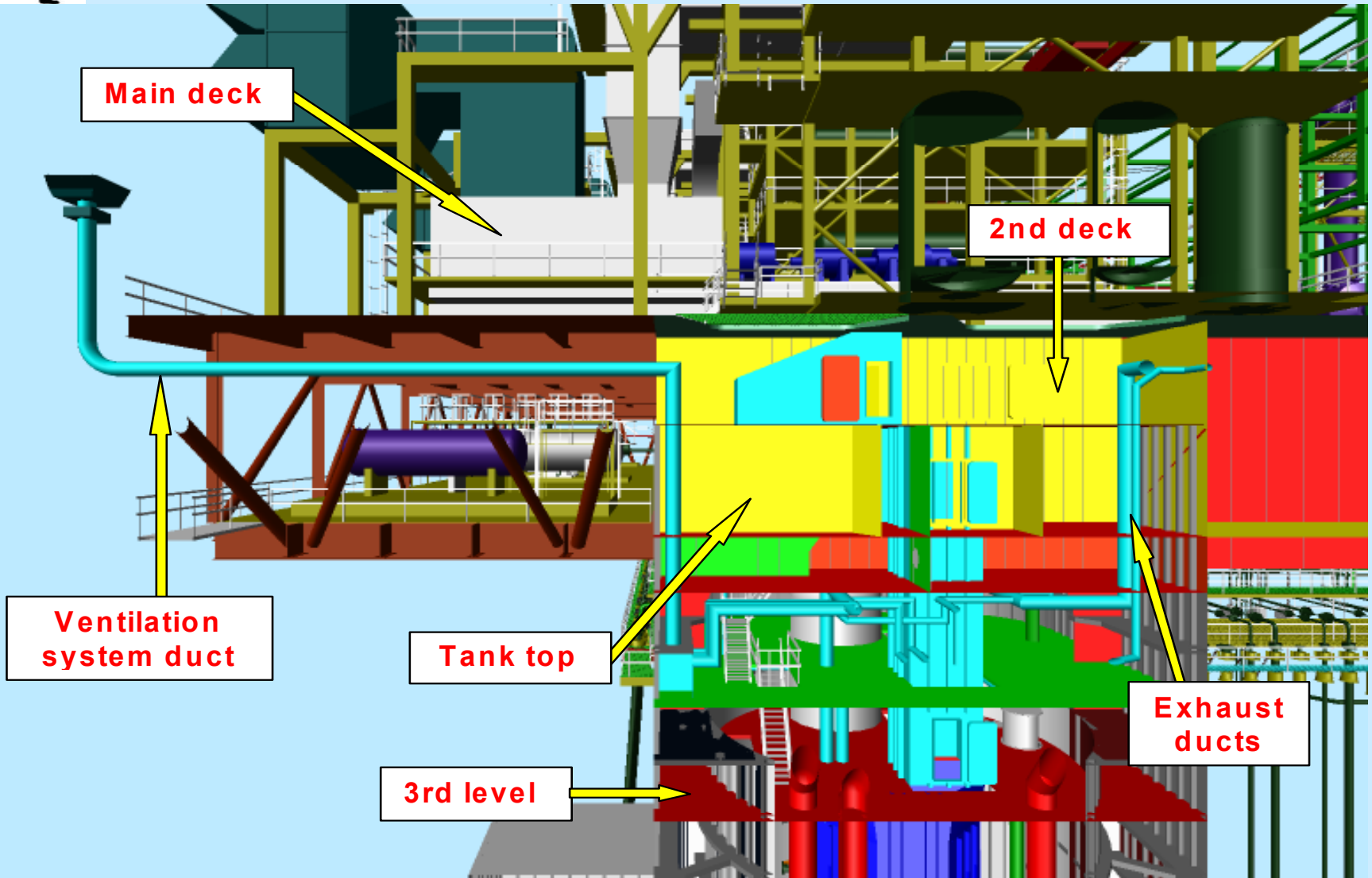


Aft Starboard Column





Decks and Upper Part of the Column





Analysis of the Explosions

Key events

Frequent movements of water in the drains storage tank

Storage of large quantity of oily water in the drains storage tanks

(operating procedures malfunction)

Operating failure in the level indicators of the drains storage tank

(maintenance procedures malfunction)

Blockage of the open drain vessel

(maintenance procedures malfunction)

Maintenance of the aft starboard drains storage tank

Isolation of the tank vent line without isolating the intake line

(operating procedures malfunction)



Analysis of the Explosions

Key events

Operation to empty the
aft port side drains
storage tank

Removal of water from the tank via the
production header

(operating procedures malfunction)

Operation carried out without
management supervision

(operating procedures malfunction)

Mechanical failure or incomplete
closure of the starboard tank valve

(maintenance / operating malfunction)



Analysis of the Explosions

Key events

First explosion



Inadequate classification of the area
around the drains storage tank

(project design malfunction)

Second explosion



Ineffective communication system and
coordination between the emergency
response team and the platform command

(operating procedures malfunction)



Analysis of the Sinking

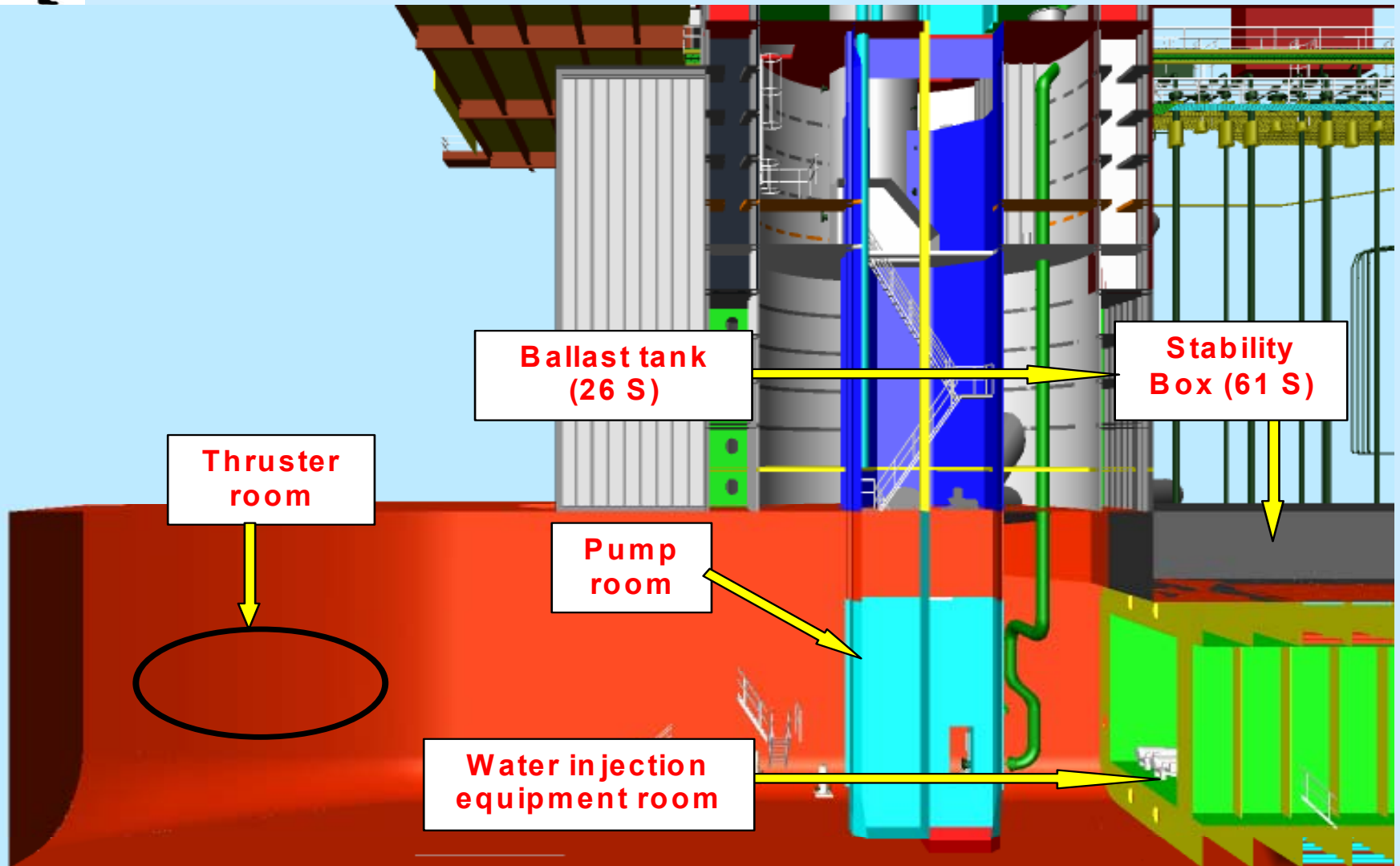
Progressive loss of stability and sinking of the platform

Key Events

- Flooding of column and pontoon
- Admission of ballast water at forward port side
- Continuous submersion of the platform
- Evacuation and abandonment of the platform
- Attempt to salvage the platform



Column and Part of Aft Starboard Pontoon





Analysis of the Sinking

Key events

**Flooding of the column
and pontoon**

**Failure of the dampers of the column
ventilation system**
(maintenance procedures malfunction)

**Man holes to aft starboard ballast tank
and adjacent stability box left open**
(operating procedures malfunction)



Analysis of the Sinking

Key events

Admission of ballast water at the forward port side

Continuous submersion of the platform

Ineffectiveness of the actions to control flooding
(operating procedures malfunction)

Insufficient personnel capability in emergency stability control
(management system malfunction)

Two seawater pumps out of operation
(maintenance procedures malfunction)

Aft starboard ballast tank and adjacent stability box left open
(operating procedures malfunction)



Analysis of the Sinking

Evacuation and abandonment of the platform

- ✦ From the total of 175 people on board, 138 considered non essential for the emergence operations were evacuated, beginning at 1:44 a.m. and finishing up at 4:20 a.m., on March 15 of 2001.
- ✦ Final abandonment carried out by helicopters at 6:03 a.m., with the rig listing at 6°, in the same morning.



Analysis of the Sinking

Attempt to salvage the platform

- ↖ **Progressive flooding of the platform started at 8:15 a.m. on March 15 of 2001**
- ↖ **Nitrogen injection through the stability box vent line next to the damaged column**
- ↖ **Slow increase in draft and list**
- ↖ **Platform completely submerged around 11:40 a.m. on March 20 of 2001**



P-36 Accident





P-36 Accident





P-36 Accident Investigation

Environmental Impact

- ↖ Around 350 m³ of oil emerged during the first 24 hr after the sinking at about 150 km from the coast**
- ↖ Oil spill treated by mechanical recovery and chemical dispersion**



P-36 Accident Investigation

CONCLUSIONS AND RECOMMENDATIONS

- ↖ Improvement to the Operational Safety Management System**
- ↖ Review of Project Design Criteria**
- ↖ Review the Classification of Risk Areas, specially in majors modifications of the Installations**
- ↖ Simultaneous commissioning, maintenance and operation actions**
- ↖ Staff dimensioning, capabilities and training program**
- ↖ Management of unit conversion projects**



P-36 Accident Investigation

Observed failures and noncompliances



**Human and Organizational
Factors**



Need for effective Safety Management System



Regulatory Initiatives

Development of a Regulatory Model for Offshore Operational Safety

Performance Based Approach

Operator Responsibility => Implementation of the Life Cycle Safety Management System

Regulator Actions => Inspection and Auditing