PAJ Symposium 2024
FSO Safer brief – “Oil Spill Prevention during a Civil War”

15 February 2024

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Background

- First major UN engagement in marine operations since 1956 Suez Crisis
- Key driver for this operation was the environmental risk of the Floating Storage & Offloading unit (FSO) Safer losing containment and spilling all of her embarked 190,000m³ of Marib crude
- UN reliance on maritime advice in all aspects of this operation
- Engagement of a renowned salvor
- Need for fundraising by Donor States – US$148M required for phase 1&2
- UNDP undertook project management; UN Resident Coordinator for Yemen was in operational command & control; UN New York oversighting the project/operation; UN procured tanker
- UN required a crisis & oil spill response capability for the cargo salvage operation; Yemeni's required a crisis/oil spill response for the short-long term; a differing & complex set of objectives
- Yemen specific;
  - Civil war since 2015; conflict started early 2000's
  - FSO Safer in Houthi control since 2015
  - Marib (inland oil reserve) under the Southern (Internationally Recognised Govt) control – 400km pipeline destroyed in parts during the civil war and coalition bombings
  - Marib crude is API 44.8 (Group II oil) with a Specific gravity of .80 – very light and valuable
  - Lack of a National emergency or oil spill plan & organisation to response
  - Old and inoperative oil spill response equipment
  - South (IGA) holds the international Convention status; the north under Houthi control does not have any international status (STCW90, OPRC90 etc)
  - Reliance on military command and control framework including extensive use of Internal Security ministry

The 3 major vessels involved

FSO Safer;
ULCC built in Japan in 1976
DWT 406,640 tonnes length 362m/beam 70m
Converted to FSO in 1986
Moored in Yemen in 1988
Operated under SEPOC (national oil company of Yemen)
Single skin tanker with 190,000m³ of Marib crude embarked as cargo
No Flag; no insurance; no Classification Society

MT Nautica (now MOST Yemen)
VLCC built 2008 – double hulled
Flagged in Liberia
DWT 308,000 tonnes length 333m/beam 58m

SMIT Ndeavor
Offshore support vessel built 2013
DWT 7300 tonnes length 100m/beam 30m

Vessel comparisons

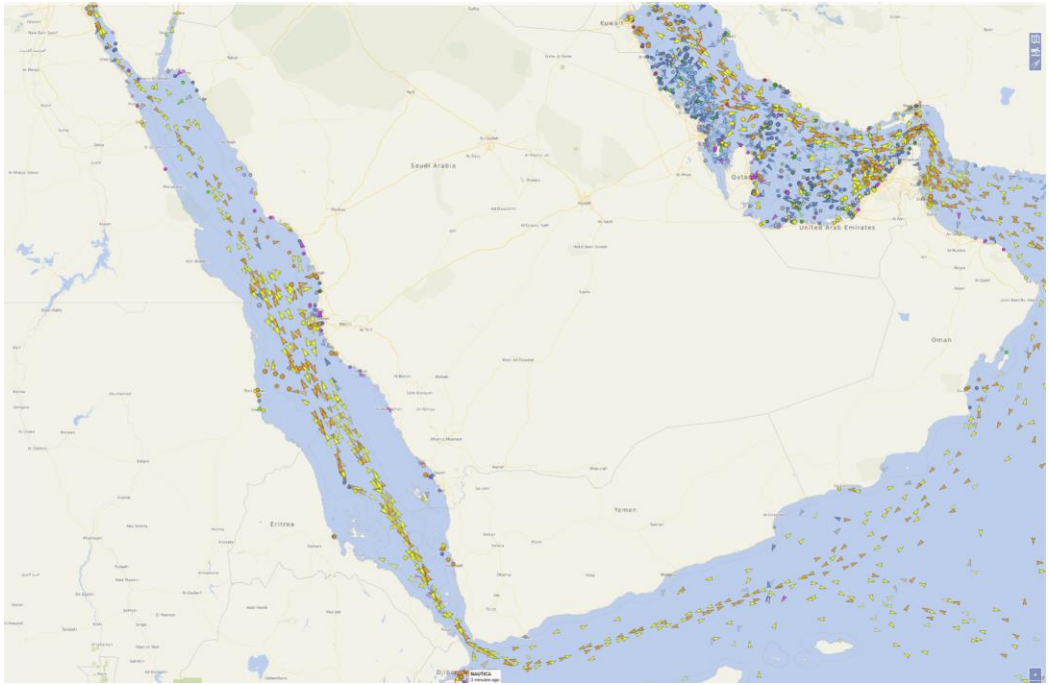
Oil tanker size categories

AFRA Scale[39]		Flexible market scal	
Class	**Size in DWT**	**Class**	**Size in DWT**
General Purpose tanker	10,000–24,999	Product tanker	10,000–60,000
Medium Range tanker	25,000–44,999	Panamax	60,000–80,000
LR1 (Long Range 1)	45,000–79,999	Aframax	80,000–120,000
LR2 (Long Range 2)	80,000–159,999	Suezmax	120,000–200,000
VLCC (Very Large Crude Carrier)	160,000–319,999	VLCC	200,000–320,000
ULCC (Ultra Large Crude Carrier)	320,000–549,999	ULCC	320,000–550,000

MT Nautica

FSO Safer

General areas



AIS sealane & vessel traffic densities in July 2023

2 Main Houthi ports

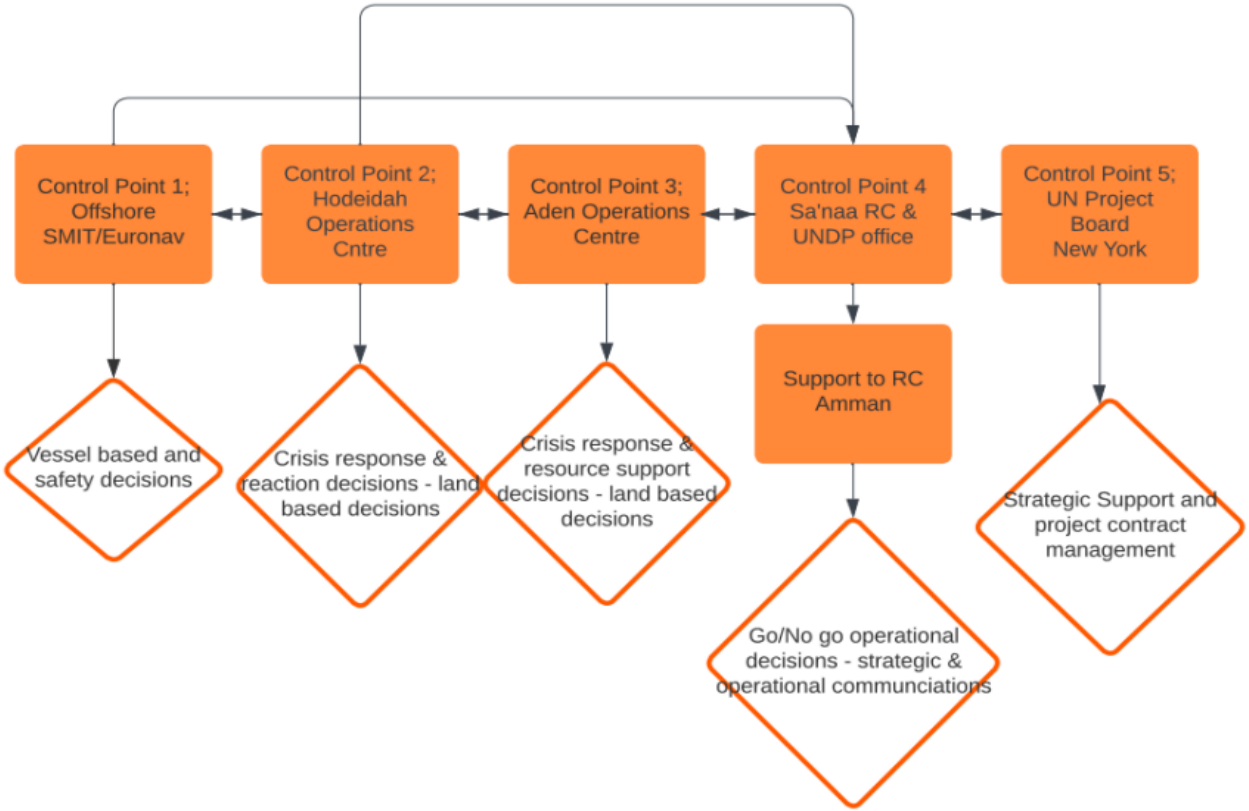
Port of Salif – wheat & diesel imports

Port of Hodeidah – general cargoes + fuel tank farm + LPG imports

FSO Safer as seen offshore with tugs Aden & Manakin in support

FSO Safer as seen from nearest point of land – with an active land mine field between point of photo and shoreline

Command and control

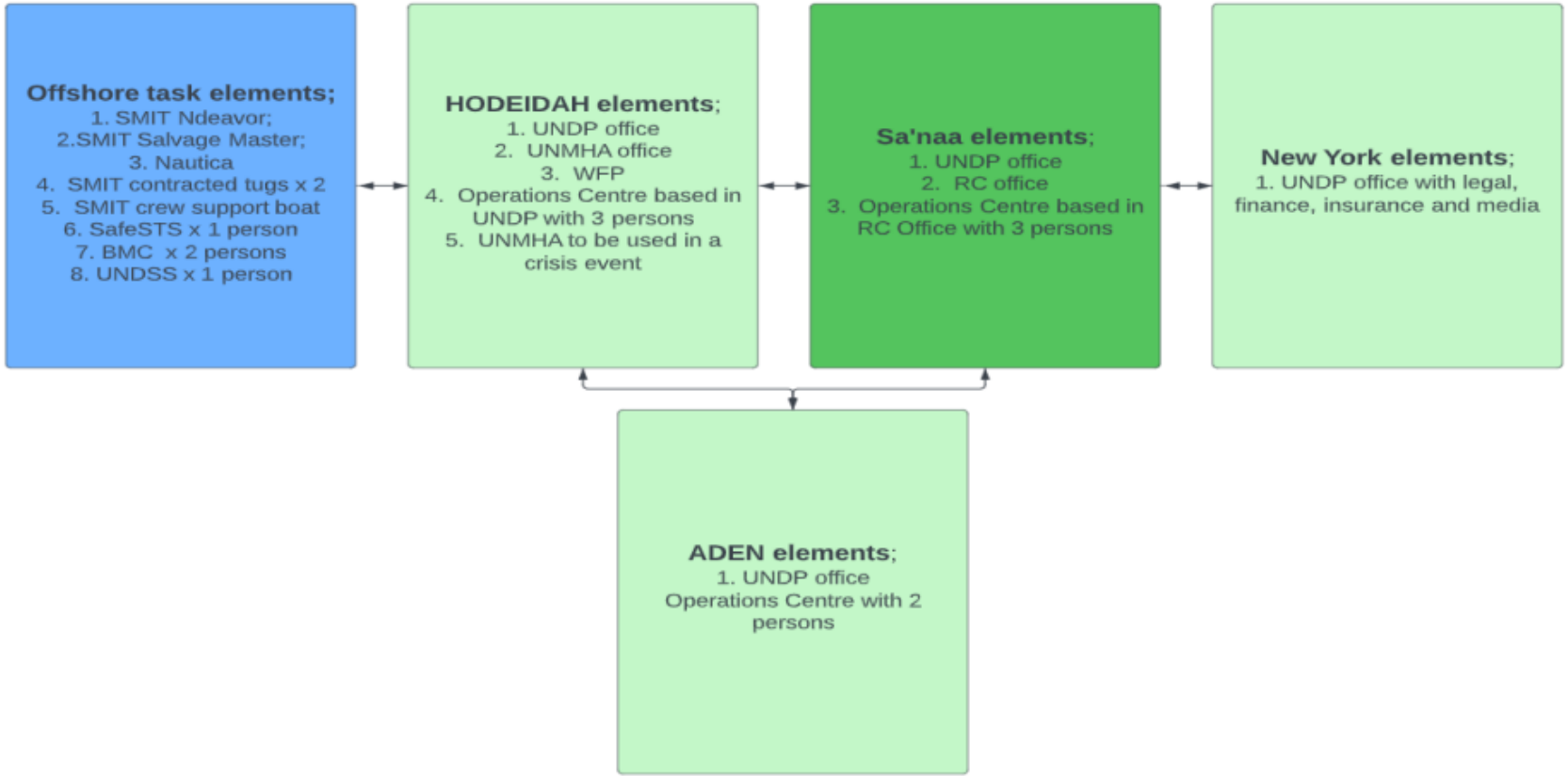


5 main Control Points established; UN Resident Coordinator David Gressly in charge of the operational aspects

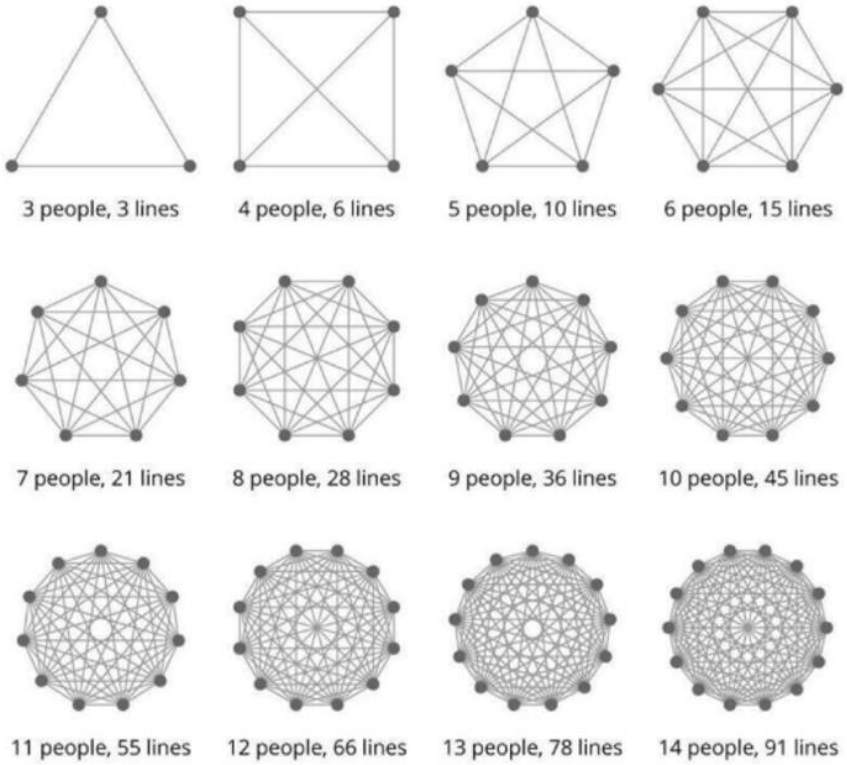
Key linkage with Houthi authorities through the ‘Safer Committee’; a committee established with port authority, navy, army, internal security, customs, subject-matter experts

Logistical support to SMIT ex Djibouti

Command elements – set up Control Points



Adding complexity into this operation



All UN communications to the Safer Committee had to be in Arabic text

All UN/Houthi meetings (including daily briefings) were in Arabic

The Safer Committee was comprised of between 15 – 25 Yemeni's – note diagram on the left

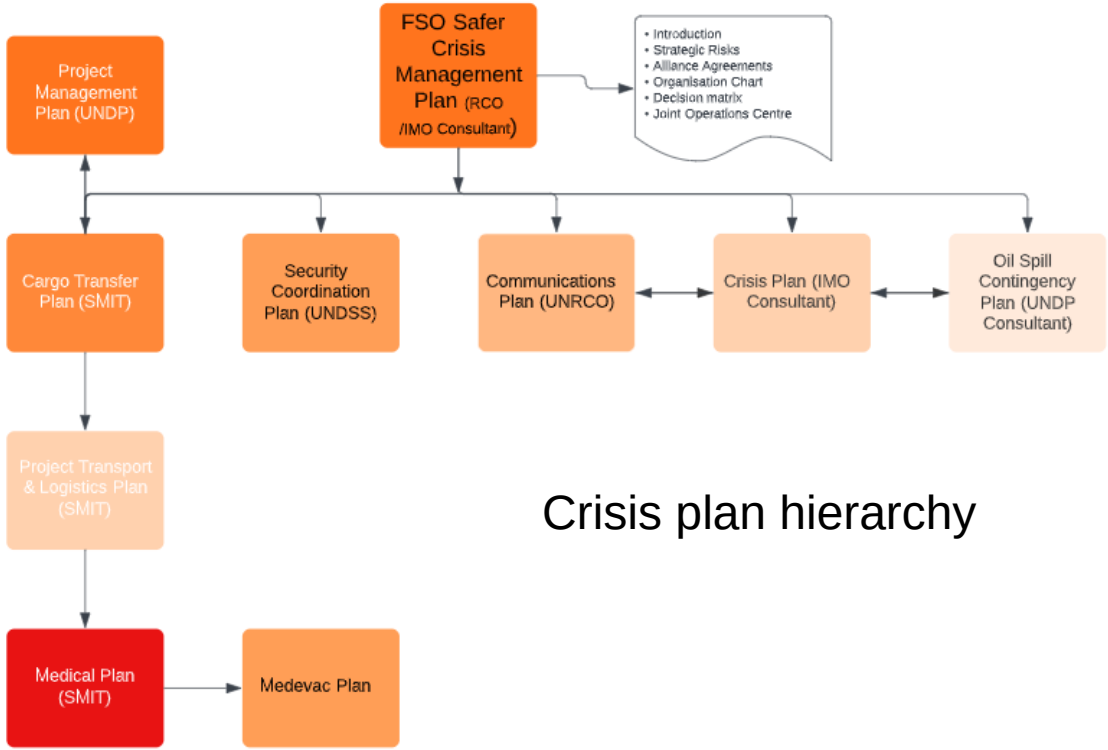
Very strong & dominant Houthi leadership

The Hodeidah Operations Centre had to conduct daily briefings with both the Houthis and the Internationally Recognised Government (the 'South')

Crisis Preparedness

- Production of plans
- Insurance needs
- SMIT pre-deploy requirements
- Reorientate risk into crisis risks
- Creation of Ops Centres
- Build oil spill capability
- Build UN personnel capacity
- Change thinking from STS to cargo salvage transfer
- In country training for SMIT

- For a 30 day operation



Crisis plan hierarchy

The number of plans …

- High level overall plan
- Project Resource Management plan
- Mooring Plan with Nautica
- Cargo transfer plan
- Project transport & logistics plan
- Document management plan
- Inerting plan
- Pump & hose management plan
- Tank washing & purging plan
- Waste stream management plan
- Pumping, ballasting & stripping plan
- Project schedule management plan
- UN Crisis Plan – high level
- UN crisis sub-plan
- UN Oil spill contingency plan
- UN Security plan
- UN crisis communications plan
- SMIT Oil spill contingency plan
- SMIT Medevac plan
- SMIT project emergency response plan
- SMIT project security plan
- SMIT HSE plan
- Yemen National OSCP
- Yemen FSO Safer OSCP

Risk Assessment

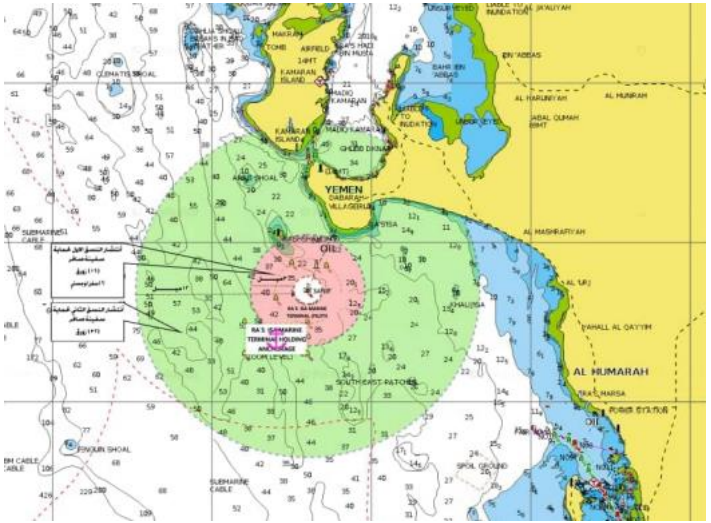
Risk	Cause	Impacts
Total loss of containment	Catastrophic fire; Complete structural failure; sabotage;	1.2MBbls spilled into Red Sea and surrounds; environmental damages; loss of confidence in UN; impacts for months on Yemen and neighbouring States; economic impacts suffered globally for shipping traffic
Fire Major	lightning (weather) strike; ignition source flashpoint reached (small fire/explosion/ mechanical ignition)	Potential total constructive loss (TCL) of Safer; project delay; localised damage to burn to waterline/sinking; pollution damage
Sinking at Mooring	Structural failure of hull due to changing pressures; collision on approach to STS mooring; catastrophic fire; flooding of holds through non controllable ruptures	TCL of Safer; wreck on seabed – unsalvageable; pollution damage; personnel loss
Personnel injury/death	Nature of workplace onboard Safer; minestrike; industrial accident; fall into hull; entry into void spaces; fire/explosion	Injury/death to personnel; impact on offshore crews; need for repatriation of injured/deceased;
Mine-strike by SMIT flotilla or MT Nautica	Sea mines – buoyant and ground mine types	Localised damage limited to hull of tanker – non sinking; injury or loss of life; delay to STS
Loss of Personnel	Transfer of knowledgeable personnel out of project; disaffected by project work	inexperienced pers involved; damage to reputations; loss of credibility; damage to political bow-wave; discontinuity and project delays
Community tensions created by an environmental crisis	Loss of containment = severe oil spill to sea	Damage to current progress in Yemen; loss of credibility; loss of asset (financial loss); hostility towards responders & UN workers

Houthi mine threat (open source)

Free floating sea mines – pictured left & left below
Buoyant (moored) mines – pictured below
Ground mines – no reference available

Land mines along the coast posed major issues for a shoreline cleanup

Houthi provided security



Houthi chart describing the layers of security & defence around FSO Safer

UN requirements;

No weapons inside 1 nautical mile exclusion zone

Houthi to patrol exclusion zones

The spill risk (Courtesy of IMO)

Humanitarian impacts:

- disruption to the port of Hodeidah, which is a key entry point for goods and humanitarian aid
- disruption to power station water intakes and desalination plants

Socio-economic impacts

- fisheries and coastal communities
- disruption of shipping travelling through Bab-el-Mandeb Strait
- disruption of tourism in the wider Red Sea

Environmental impacts

- marine ecosystems including coral reefs, mangroves, tidal flats and seagrass beds
- Important bird habitats, designated marine parks and IUCN red list vulnerable marine species could be impacted

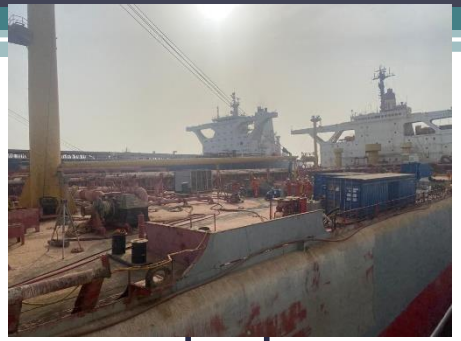
Phase 1 – transfer & salvage

- Gain access to the FSO Safer
- Purchase & modify VLCC into FSO (MT Nautica)
- Commence salvage operation
- FSO Safer removed from turret, towed to cleaning yard, scrapped
- Management plan installed for MOST Yemen & handed over

Phase 2 – Installation of CALM buoy [currently on hold]

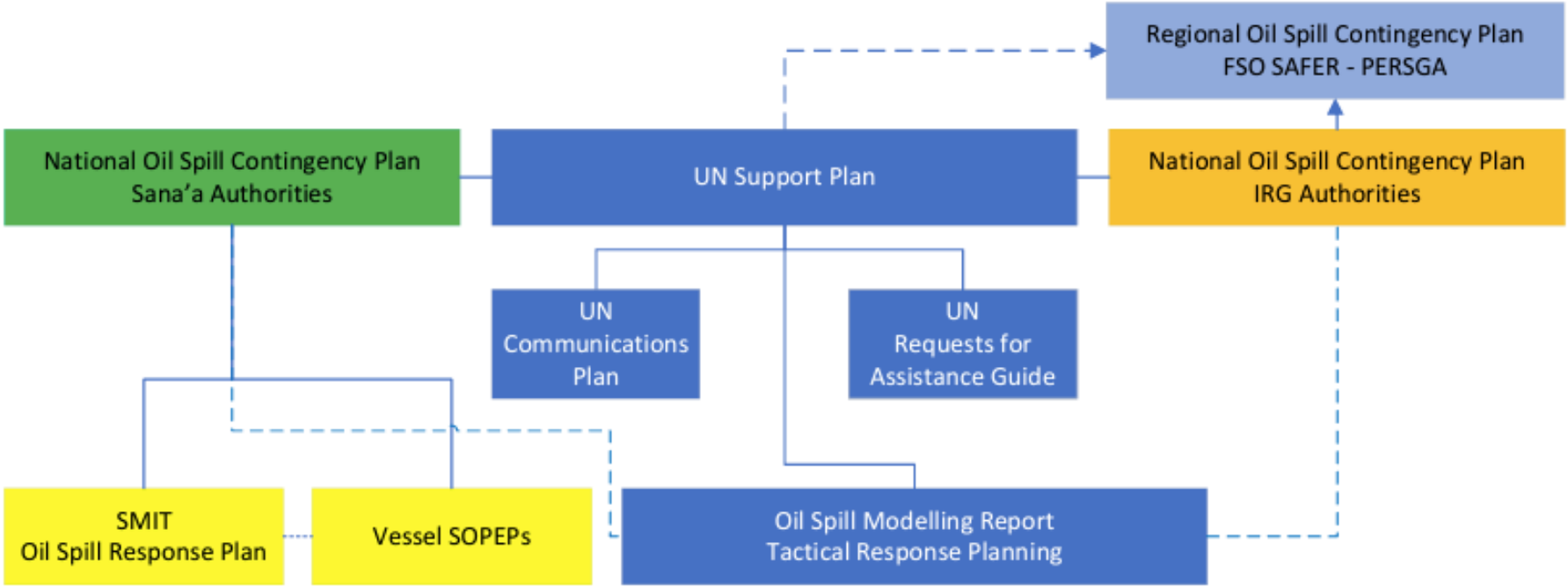
- Purchase & relocate CALM buoy to Port of Salif
- Empty pipeline & risers (3000m^3 currently in pipeline to Safer)
- Install CALM buoy & Connect MOST Yemen

Salvage stages



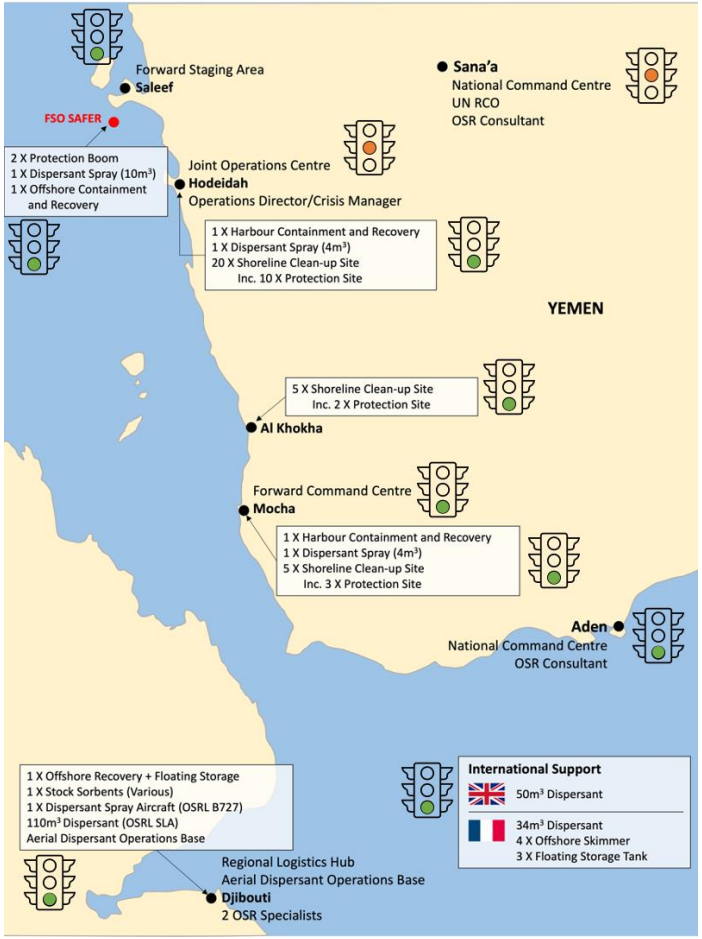
- Stage 1
  - Getting onboard systems operating
  - Completing inert gas ‘blanketing’ of cargo and wing tanks
  - Hull and deck survey of Safer
- Stage 2
  - Moor Nautica alongside Safer
  - Cargo transfer
  - Tank washing
- Stage 3
  - demobilisation

Oil spill plan hierarchy



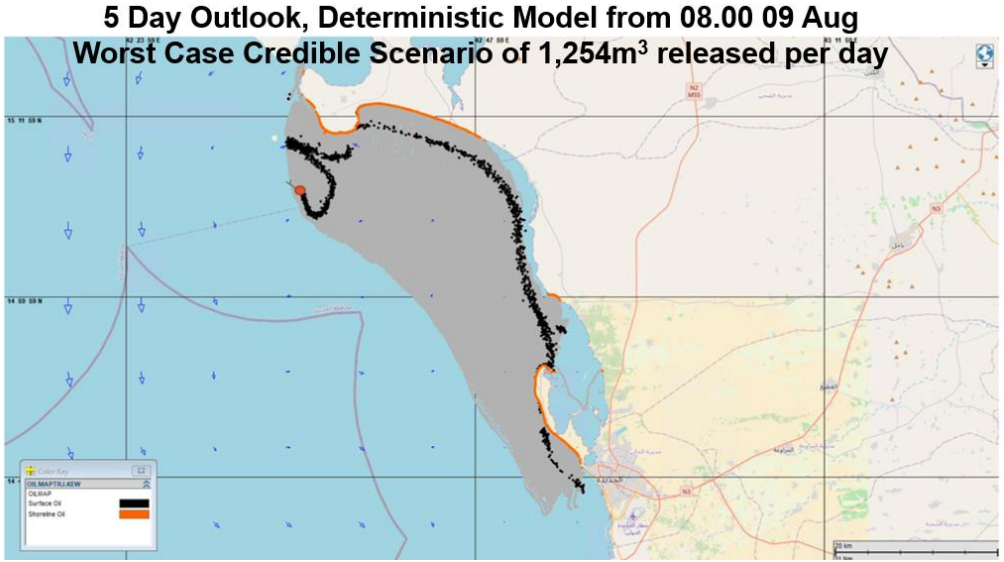
Oil Spill Response Resources

	Techniques	Location
1	**Monitor and Evaluate**	• Observation by helicopter, drone or fixed wing, and/or satellite surveillance in all areas. • Monitoring effectiveness of offshore response operations
	Next 5 day Model Run	**14 Aug 2023** Last Model Run: 04/08 WCCS 6,900m^3, 7 days
	Next Satellite Acquisition	**SAR: 18 Aug 23 15:25:07.35** **20 Aug 23 02:59:04.00**
2	**Resource Protection**	Protection for all sites identified as sensitive in the Tactical Response Manual.
3	**Dispersant**	• In and around SAFER safety zone. • Entrance channels to Ports. • Aerial spraying offshore in deep waters to prevent migration and protect shipping lanes. • Avoiding sensitive areas and seawater intakes
	B727 Status	**On Standby in Djibouti.** Demobilising, ETD Djibouti Sunday 13/08 @ 07.00L
4	**Containment and Recovery**	• In and around SAFER safety zone. • To maintain a navigation channel to the Port areas.
5	**Shoreline Clean-up**	30 sites for manual clean-up. (1-2km each site, 3-6,000 personnel in the first week)



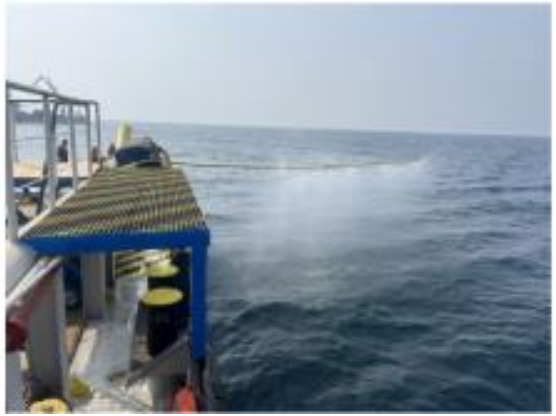
Ongoing oil spill preparedness

Daily trajectory modelling



Pre-emptive booming offshore

Oil Spill Preparedness & Yemen training



Offshore boom deployment by SMIT tugs

Offshore boat spraying by SMIT tugs

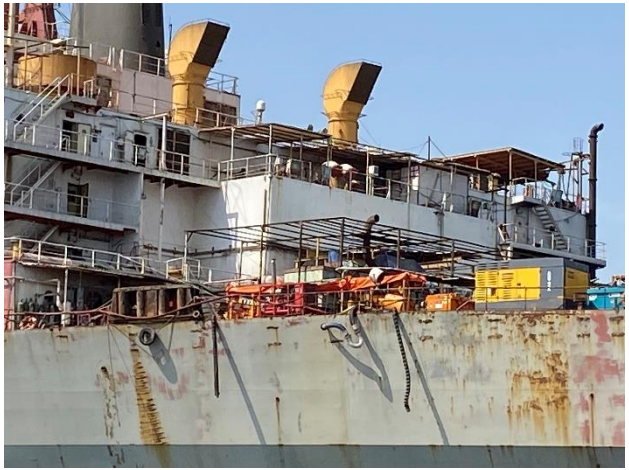
Onshore shoreline cleanup & protection/deflection booming

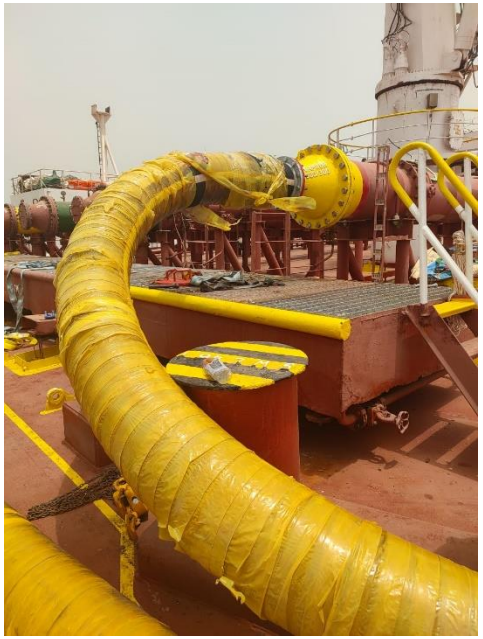
Lower photos courtesy of Kevin O'Connell – Spill advisor to UN

Cargo Salvage Operations

SMIT Ndeavor
EDT Leon
FSO Safer

Salvage equipment (inc inert gas (IG) generators) setup aft of bridge for protection from cargo





IG Hose rigged from the Nautica cargo manifold

Cargo distribution onboard Safer

Cargo (Marib crude) onboard FSO Safer at start of transfer – 190,000m³

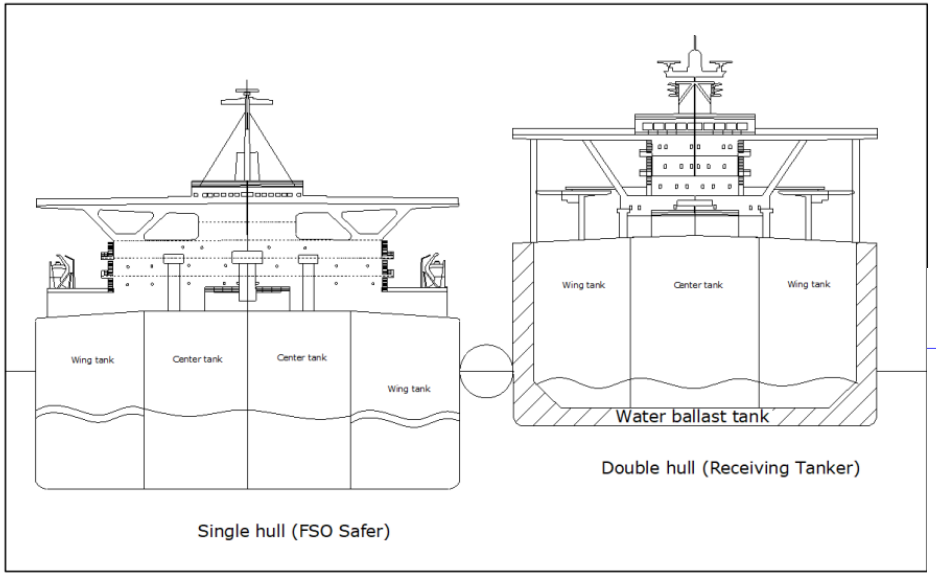
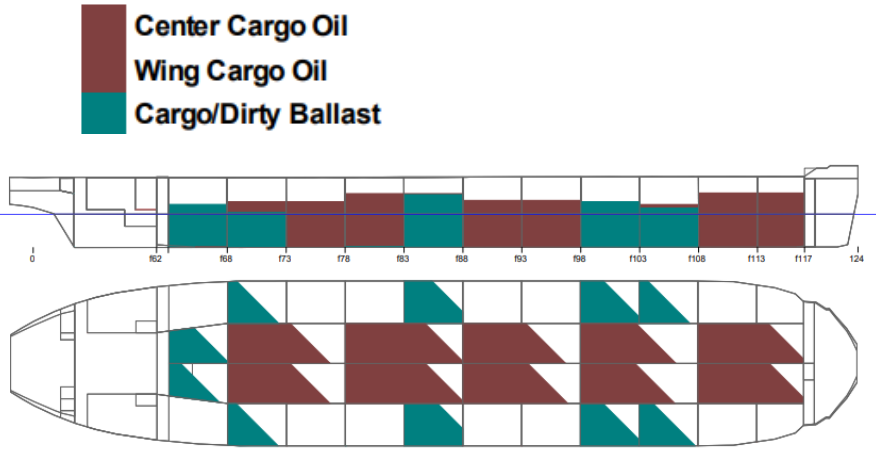


Figure 5 – FSO Safer alongside a double hilled Recievuing Tanker. Due to transfer of cargo the height difference will shift from the Receiving Tanker to the FSO Safer



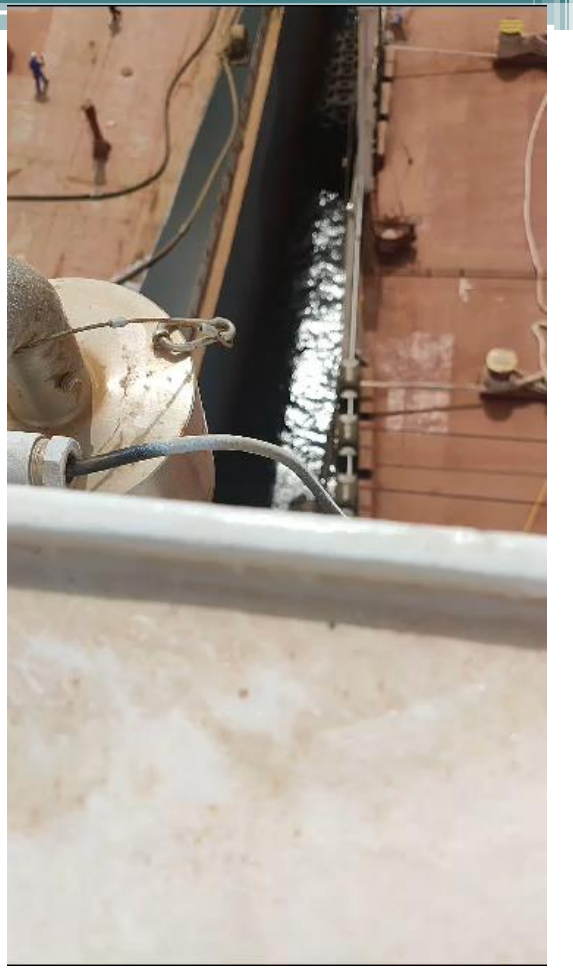
As operation progresses, multiple hose to manifold connections are made – multiple pumps connected. Maximum pump rate achieved was 900m³/hour

On deck temperatures peaked at 67º Celsius

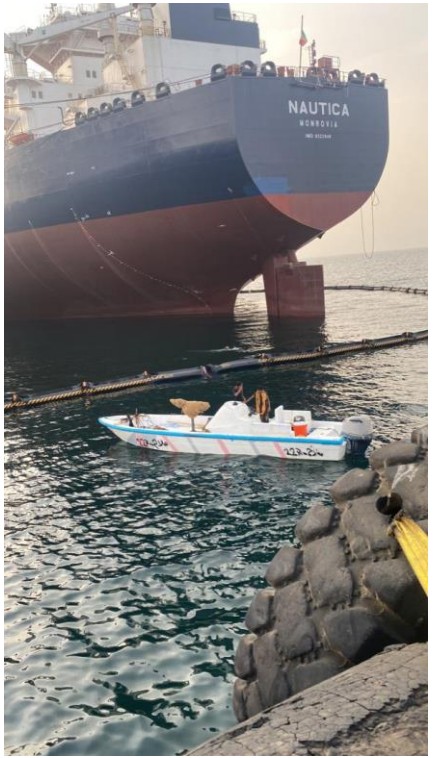
Air temperature up to 47º Celsius

Incidents

- 4 incidents during the cargo transfer operation
  - Diving, collision, oil spill to deck, reported piracy
- Oil Spill – approximately 10 m^3 to deck



The spill investigation



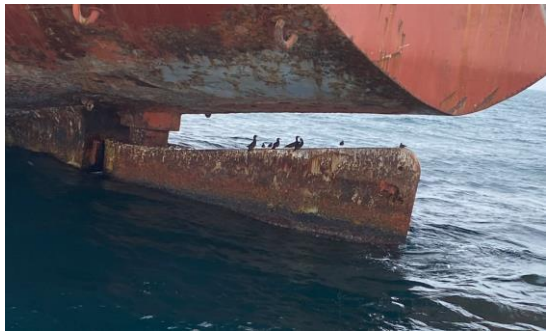
A thorough ‘no blame’ investigation undertaken by the Houthi Maritime Authority & Safer Committee

Support vessels & Rwabee

EDT Leon – had visited Israel 46 times over the last 5 years; tugs Aden & Manakin were sourced from SMIT Lamnalco

Houthi seized vessel “Rwabee” – base for security vessels around Safer

Views of the FSO Safer from Ndeavor & offshore tug Manakin



Fauna around FSO Safer;

Cormorants living on the rudder

Eagle rays swimming around Safer

Crisis management/oil spill management

Key lessons – follow OPRC 90 tenets

- Plans – described slide 12
- Training – offshore SMIT boom deployment & dispersant spraying; onshore oil spill field training
- Drills & exercises; crisis & medevac drill completed
- Expertise – UN sourced subject matter experts
- People – gathered for a 30 day operation (actually 70 days)
- Equipment – initially limited, but received during the cargo transfer

End

The view from the Hodeidah Operations Centre