From Paper to Digital: Advancements in ASOG/WSOG for Enhanced Operations

Digitalization of the Activity Specific Operating Guidelines

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Outline

I-Operation Activity Planning

I.1 The context
I.2 The CAM/TAM vessel configuration check
I.3 The ASOG monitoring

II-From paper to digital CAM/TAM/ASOG

II.1 The transposition
II.2 The workflow of the DASOG onboard applications

III-The DASOG onboard system

III.1 Selection of an OAP
III.2 CAM/TAM vessel configuration checking
III.3 Monitoring the ASOG onboard during a DP operation

IV-Additional features

IV.1 Emergency flowcharts
IV.2 History event log

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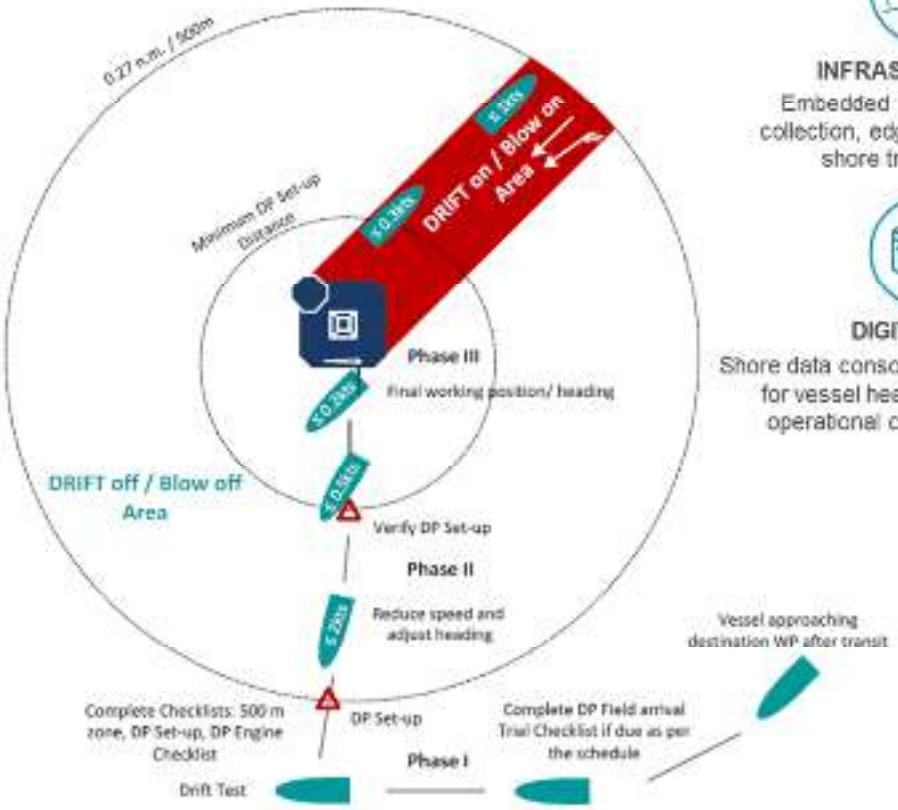
I.1-Operation Activity Planning - The context: The Cassiopée Project 1/2



INFRASTRUCTURE
Embedded system for data collection, edge computing and shore transmission

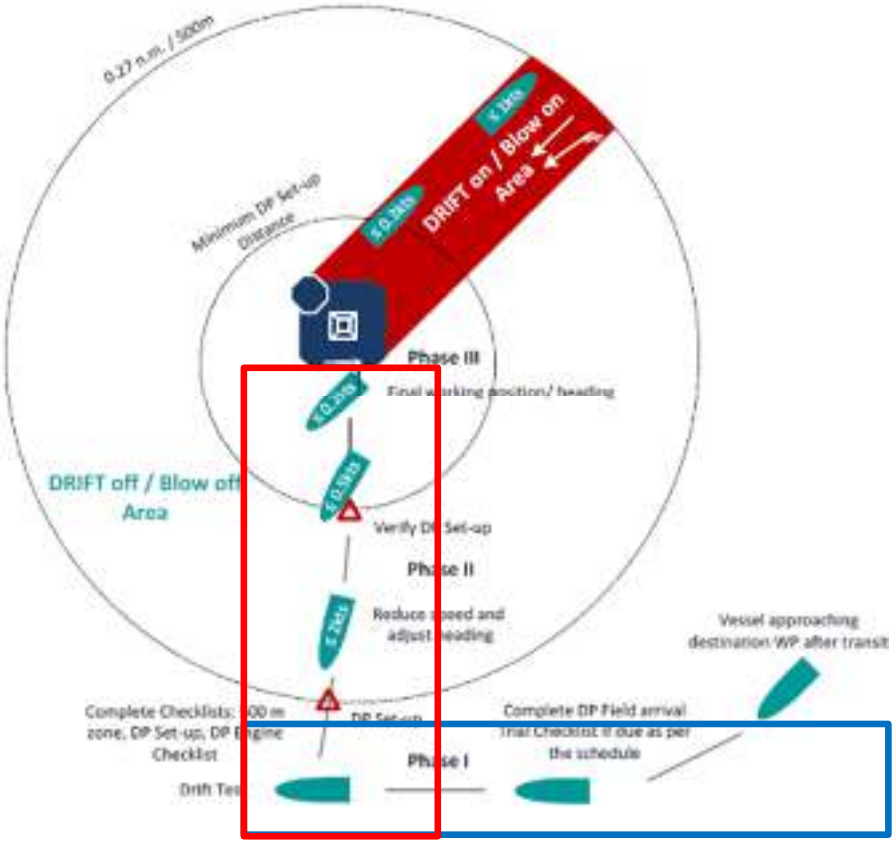
DIGITAL TWIN
Shore data consolidation and computing for vessel health monitoring and operational capability modeling

AUGMENTED CREW
Edge computing for real-time decision making tool

OPERATIONAL PERFORMANCE AND EFFICIENCY
Capitalize on data to reduce ship fuel consumption and their environmental impact

Design	Guido Perla & Associates
Builder	Sinopacific
LOA	59.75m
LPP	57.35m
Design draft	4.50m
Max draft	4.88m
Deadweight	3400 metric tons
Gross tonnage	1733 metric tons
Bollard pull	82.5 metric tons
Line pull winch	150 metric tons
Propulsion	Environmentally Friendly diesel electric
Missions	AHTS, towing, FiFi 1

I.1-Operation Activity Planning - The context: The OAP 2/2



Definitions *as per "Guidance on operational activity", IMCA M 220 Rev. 2 from Jan. 2021*

*"The **CAM / TAM** and **ASOG** are to be based on:*

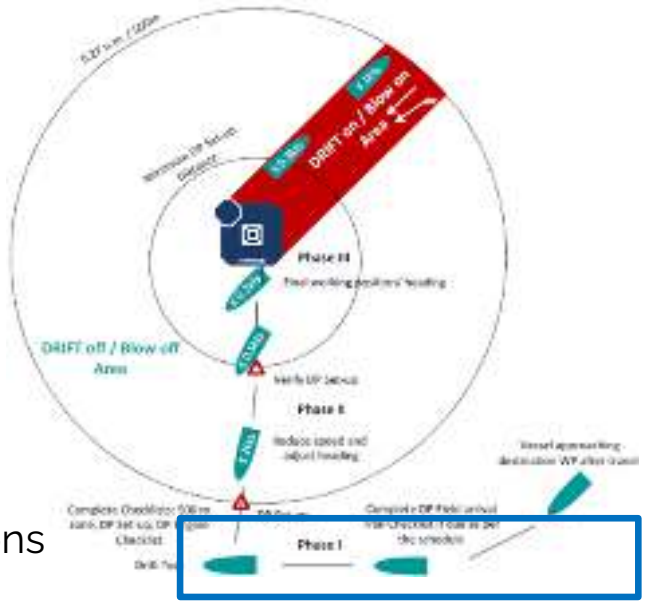
- *A thorough knowledge of the DP system*
- *DP operational manual*
- *The DP FMEA*
- *The industrial mission*
- *Vessel location and consequences of a loss of position and/or heading*
- *Risk assessment"*

CAM: Critical Activity Mode
TAM: Task Appropriate Mode
ASOG: Activity Specific Operating Guidelines

I.2-Operation Activity Planning - The CAM/TAM vessel configuration 1/2

CAM/TAM ship configuration parameters to be checked:

- Position reference system
- Sensors
- Propulsion Systems
- Power Generation Systems
- Fuel Oil Systems
- Ventilation & A/C System
- Water Cooling Systems
- Lube Oil Systems
- Compressed Air Systems
- Control systems configurations
- DP Control System configurations
- DP Operations: configurations
- Manning
- Training and Drills



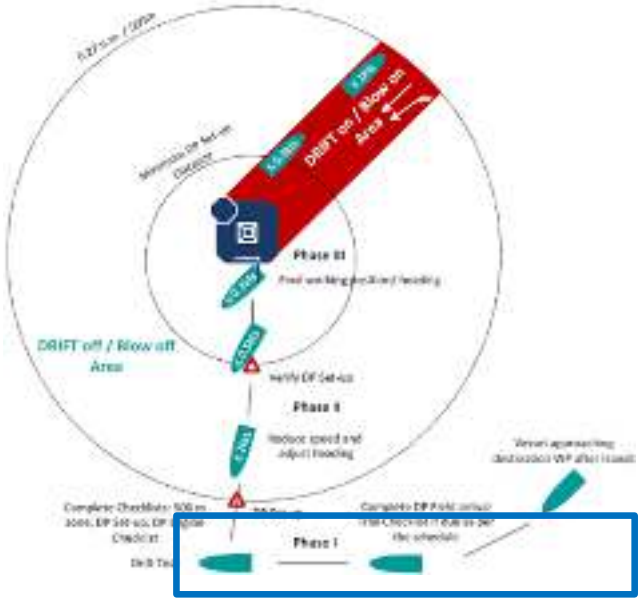
Definitions *as per "Guidance on operational activity", IMCA M 220 Rev. 2 from Jan. 2021*

"The ***CAM*** *(Critical Activity Mode) defines the most fault tolerant configuration for the DP system. […] For DP Class 2 and 3 vessels the CAM will ensure that a vessel's* ***worst case failure*** *design intent is* ***not exceeded****."*

"A ***TAM*** *(Task Appropriate Mode) is a risk-based operating mode in which the DP vessel may be set up and operated accepting that a failure has the* ***potential to exceed*** *the vessel's identified* ***worst-case failure****."*

I.2-Operation Activity Planning - The CAM/TAM vessel configuration 2/2

Action	Designation	Continue normal operations	Informative/consultative status
1-Position reference system	DGPS 1	All units are operational and available DGPS on 2 different differential systems and elevation masks	Any other setup
	DGPS 2		
	DGPS 3		
2-Sensors	Wind Sensor 1	All wind sensor available. No alarms	Alarm or loss of one unit
	Wind Sensor 2		
	Wind Sensor 3		
	VRS 1	All VRS units online. No alarms	Any other setup
	VRS 2		
	Gyro 1	All gyrocompasses enabled. less than 2 degrees' difference	Alarm or loss of 1 gyrocompass
	Gyro 2		
	Gyro 3		
3-Propulsion System	FWD Bow Tunnel T1	T1 on line, selected to DP, supplied by 480 Vac MSB-A Operational with no alarms	Any known deficiencies, problems or issues
	AFT Bow Tunnel T2	T2 on line, selected to DP, supplied by 480 Vac MSB-B Operational with no alarms	Any known deficiencies, problems or issues
	Port Z-Drive T3	T3 on line, selected to DP, supplied by 480 Vac MSB-A Operational with no alarms	Any known deficiencies, problems or issues
	Center Drive T4	T4 Offline Not selected on DP	Any known deficiencies, problems or issues
	Stbd Z-Drive T5	T5 on line, selected to DP, supplied by 480 Vac MSB-B Available and selected to DP, Operational with no alarms	Any known deficiencies, problems or issues



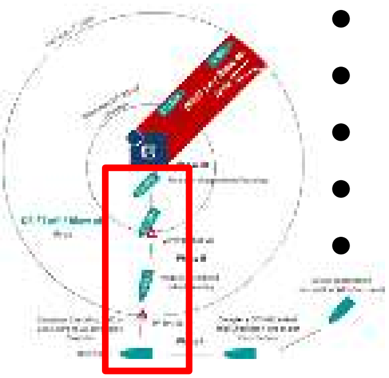
CAM: Critical Activity Mode
TAM: Task Appropriate Mode

I.3-Operation Activity Planning - The ASOG monitoring 1/2

Definition *as per "Guidance on operational activity", IMCA M 220 Rev. 2 from Jan. 2021*

"An ASOG provides guidelines on the operational, environmental and equipment performance limits for the location and specific activity. The performance limits are established based on the level of risk."

- Environmental Factors
- Position and Heading
- Power, Propulsion, Auxiliaries
- DP Control System
- Communications Onboard
- Simultaneous Events Onboard
- SIMOPS



ENVIRONMENTAL FACTORS

Condition	NORMAL	ADVISORY	YELLOW	RED
Wind	0 – 25 knots	Above 25 knots	Above 40 knots	Above 40 knots
Current	< 1.5 kts	1.5 – 2 kts	> 2 kts	> 3 kts
Wave/Swell Height	< 1.5 m	1.5 – 3.0 m	> 3.0 m	> 5.0 m
Visibility	Good visibility	Moderate visibility < 200 m	Poor or restricted visibility < 50 m	---
Rip tides	No rip tide notice	Notification from other vessels/info about rip tide	Rip tide visually observed in direct vicinity	Loss of position under the effect of a rip tide

POSITION AND HEADING

Condition	NORMAL	ADVISORY	YELLOW	RED
Position Excursion	No position alarms or warning	[illegible] position limits reach (>3 meters)	[illegible] position reached (>5 meters)	Excursion > 5 meters with Speed Over Ground (SOG) > 0.3 knots in an outward direction from the setpoint
Heading Excursion	No heading alarms or warning	If heading warning limits reached (>3°)	If heading warning limits reached (>5°)	Excursion > 5° with ROT above 30°/min in an outward direction from the setpoint
Drift-Off Incident or Force Off event	Station-keeping within Allowable excursion limit	>3 meters excursion from the desired position detected visually	>5 meters excursion from the desired position detected visually	Loss of control
Drive Off	Station-keeping within Allowable excursion limit	Discrepancy observed in PRS, unexpected ramping of thrusters, >3 meters excursion from the desired position detected visually	>5 meters excursion from the desired position detected visually. See ER Flowcharts: Single thruster run-off and Drive-off	Loss of control

POWER, PROPULSION, AUXILIARIES

DP Status	NORMAL	ADVISORY	YELLOW	RED
Number of Generators available	As per the Generator configuration defined for the Activity	Any alarm, poor performance, unexpected or unexplained event, Standby Generator not available or [illegible]	Any DG failure in operation, See ER Flowchart for Partial Blackout	Insufficient power to maintain position
Diesel Generators Load	Online DG < 45%	Any > 45%	Any > 50% or DG failure	Insufficient power to maintain position
Thrusters in DP control	All thrusters available, selected on DP, Operational with no alarms	Any alarm, poor performance, unexpected or unexplained event	Loss of any one thruster	Insufficient thrust to maintain position
Thruster loads	Average output < 45% of available thrust	Any thruster load > 45%	Any thruster load > 50%	Insufficient thrust to maintain position

IMCA

I.3-Operation Activity Planning - The ASOG monitoring 2/2

ASOG: Activity Specific Operating Guidelines

DP STATUS	NOMINAL	ADVISORY	WARNING	ALARM
Action	Continue normal operations	Operations can continue whilst risks are being assessed	Suspend operations in a controlled manner	Abandon operations
Additional action (if any)				See Emergency Rules Flowchart for Abandoning DP ops.
Clarification		Conduct dynamic risk assessment to determine whether to -continue, -or change position -or cease operations.	Contingency procedures should be initiated with a view to reducing the time to terminate. The vessel should be then moved to a safe position.	Take immediate action, to ensure the safety of -people, -the environment, -the operation -and the vessel. The vessel should be moved to a safe position.
Definition	DP station-keeping within safe working limits.	DP station-keeping not in immediate danger, but some event has occurred that requires re-evaluation of risk.	DP station-keeping maintained despite loss of redundancy in DP critical systems.	DP station-keeping loss,or loss inevitable.
Notifications		Notify -Master, -Chief Engineer, -Client Rep (if onboard) -and Rig/Platform	Notify -Master, -Chief Engineer, -Client Rep (if onboard) -and Rig/Platform	Notify -Master, -Chief Engineer, -Client Rep (if onboard) -and Rig/Platform

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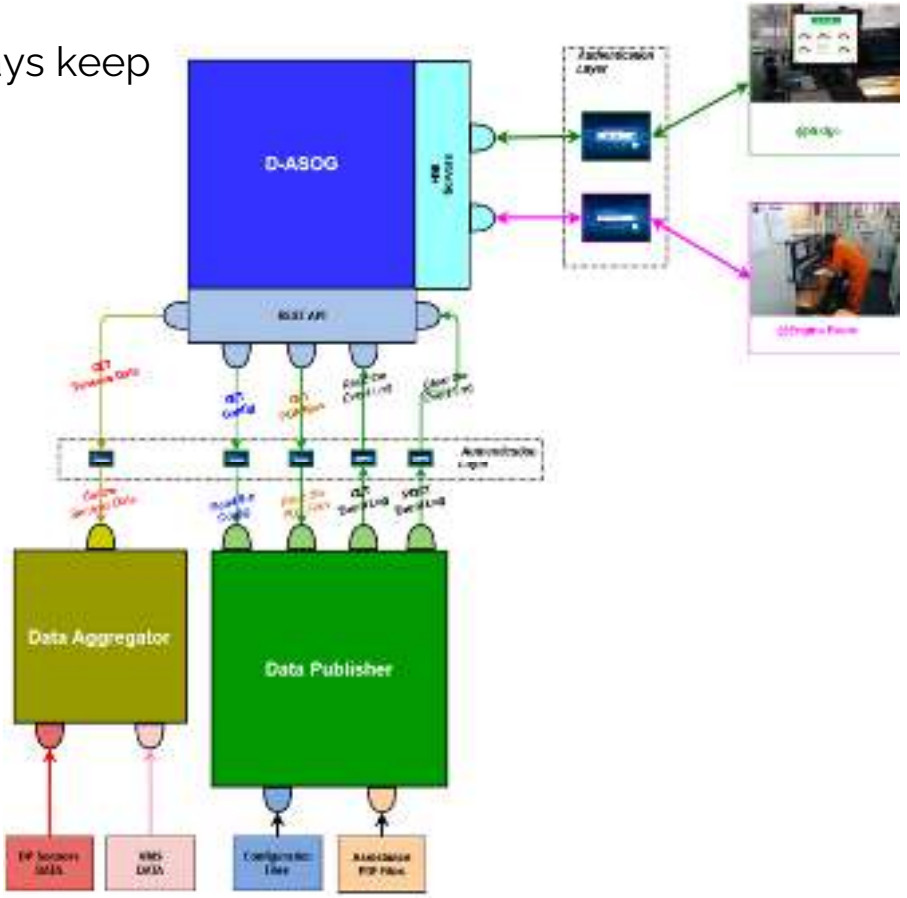
II.1-From paper to digital CAM/TAM/ASOG - The transposition

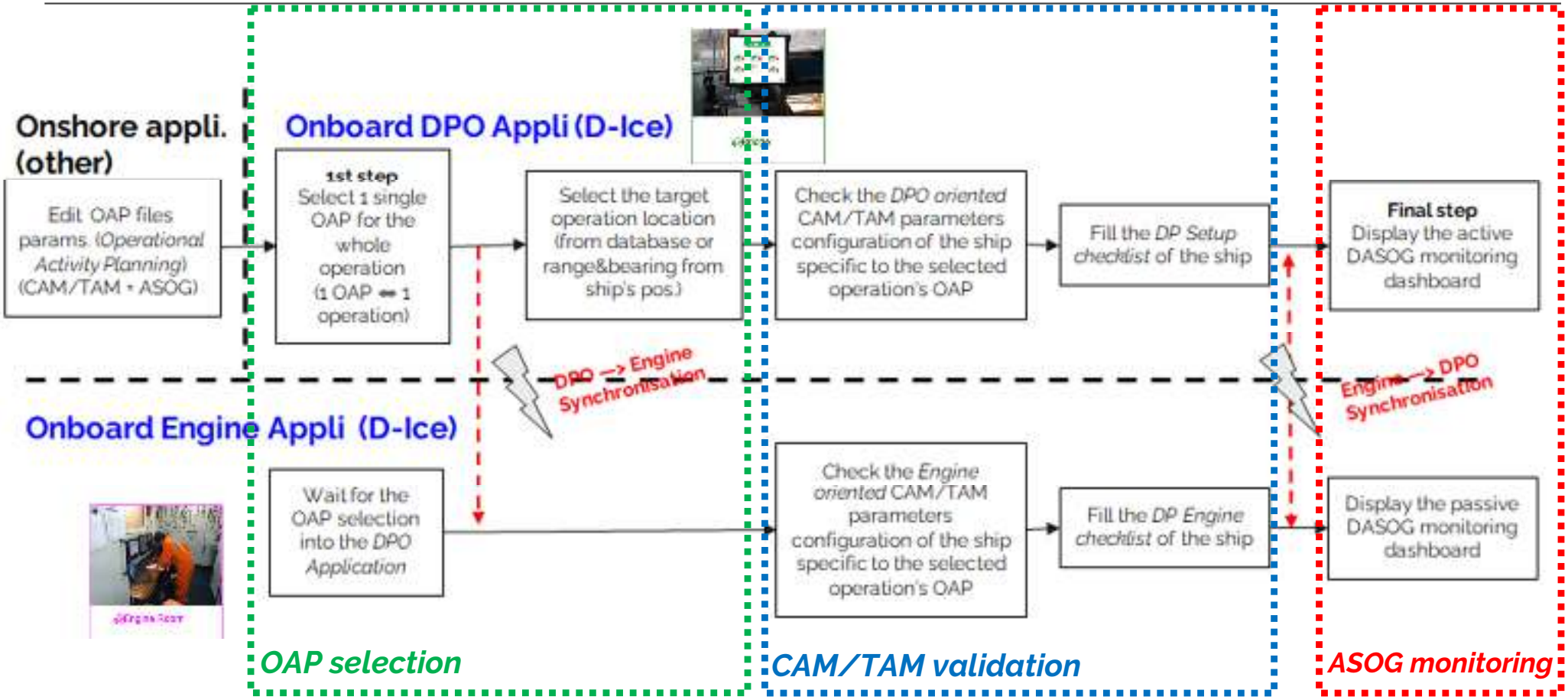
During an operation, the DP Officer uses the **ASOG** to always keep in mind the next possible different steps of the operation depending on how are evolving:

- the DP system
- the vessel configuration
- the environment

Digitalization



II.2-From paper to digital CAM/TAM/ASOG - The workflow of the DASOG



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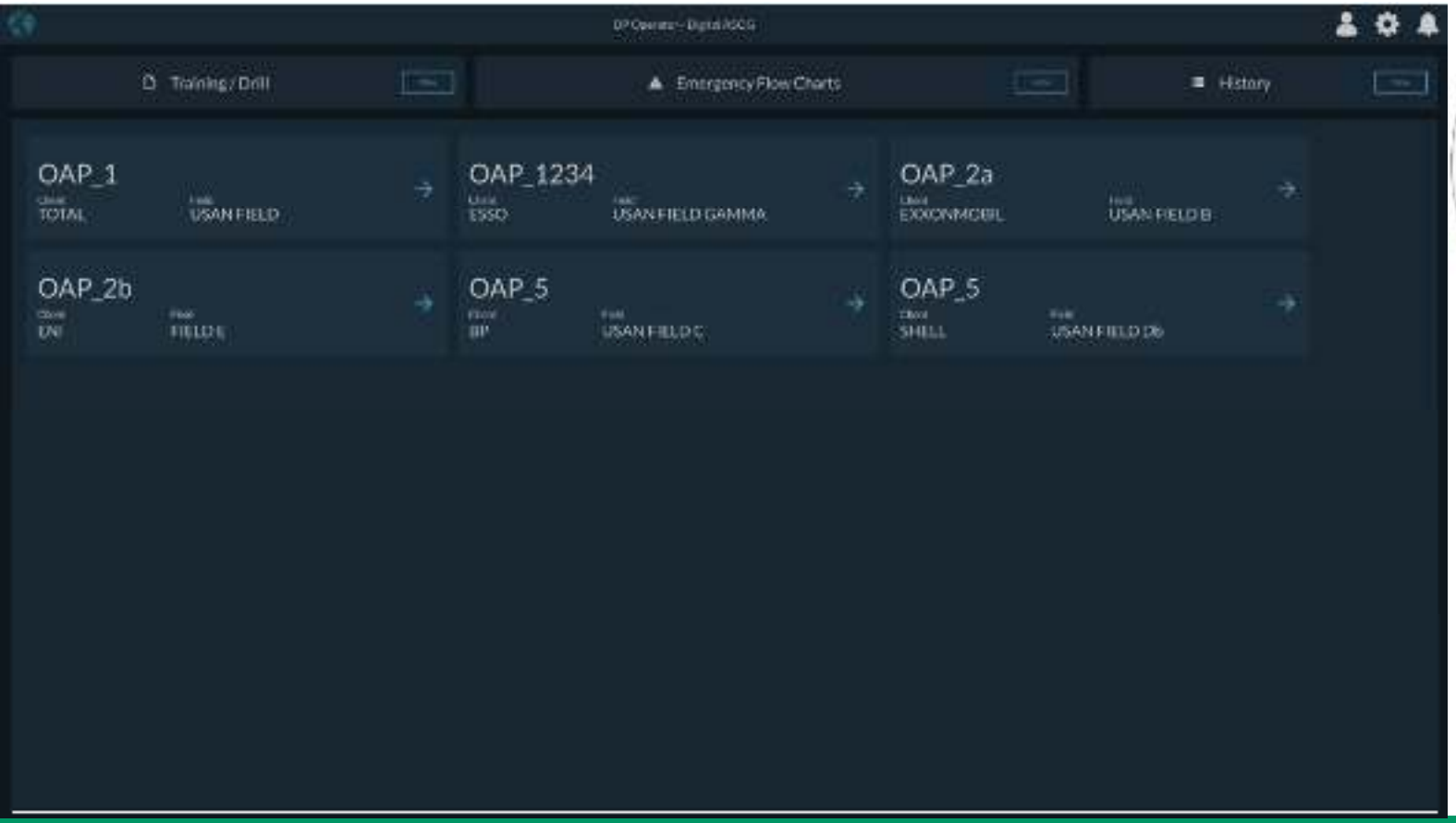
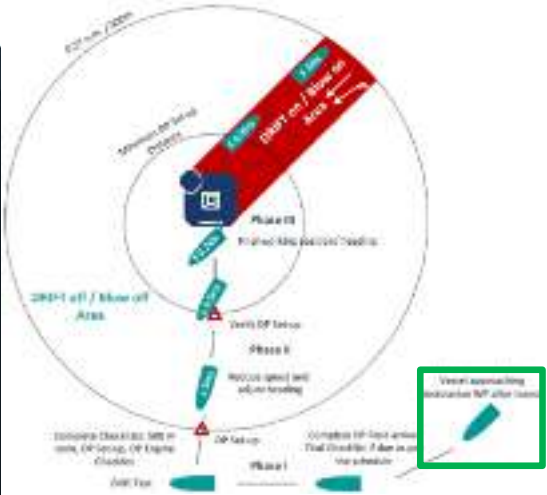
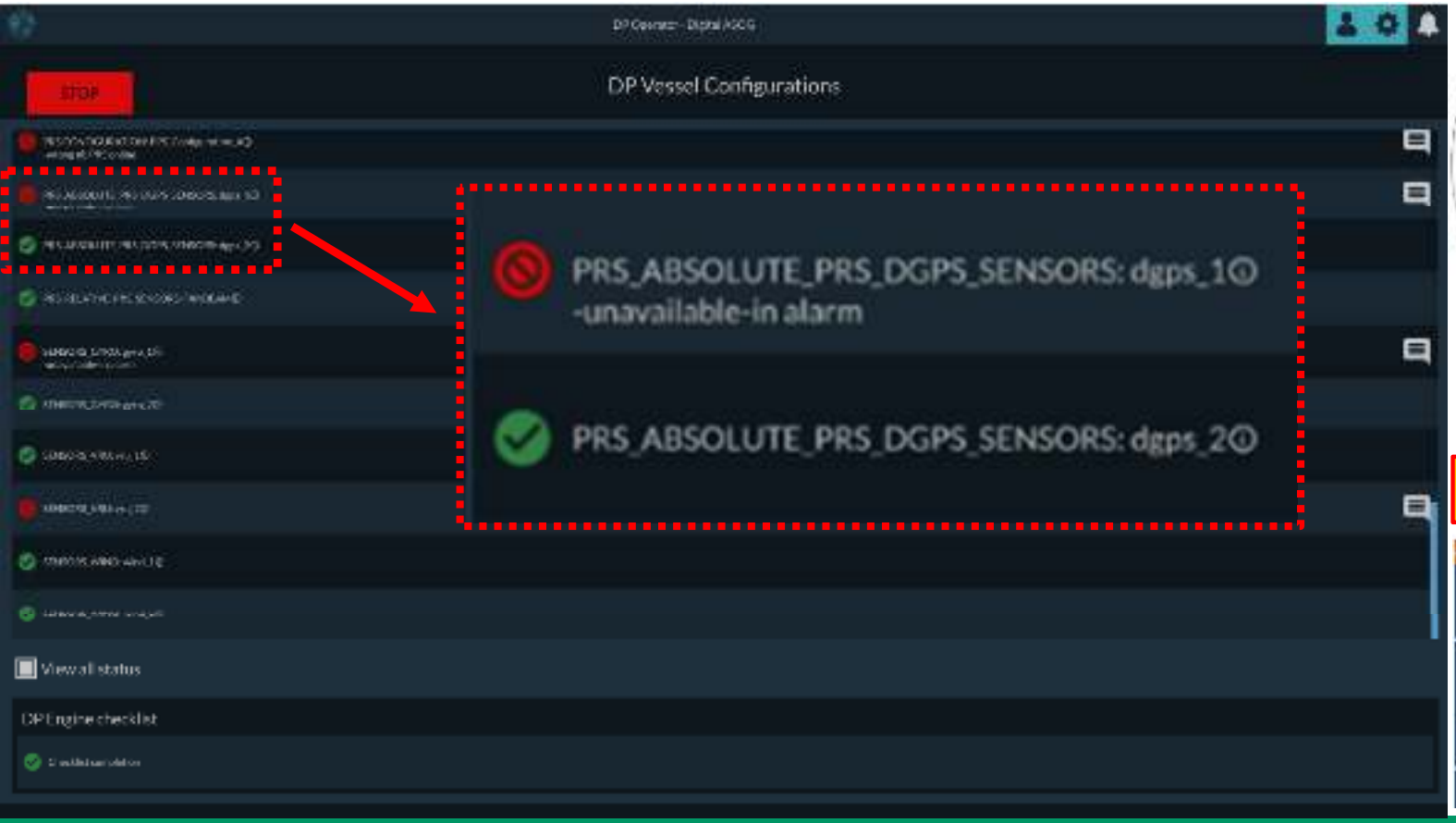
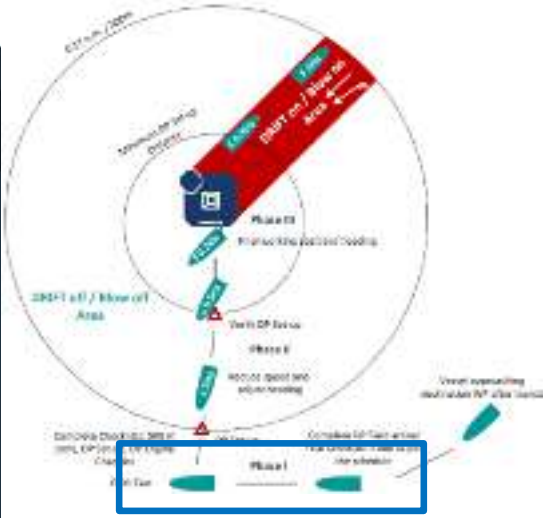
III.1-The DASOG onboard system - Selection of an OAP



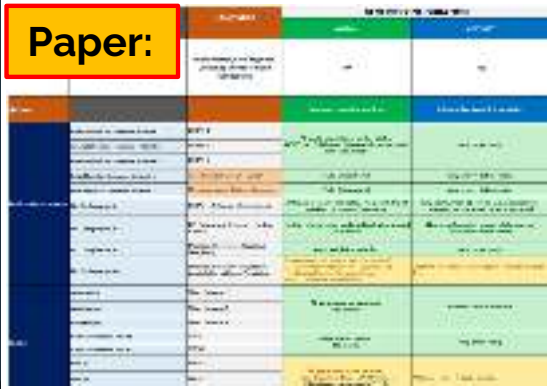


III.2-The DASOG onboard system - CAM/TAM configuration checking DPO

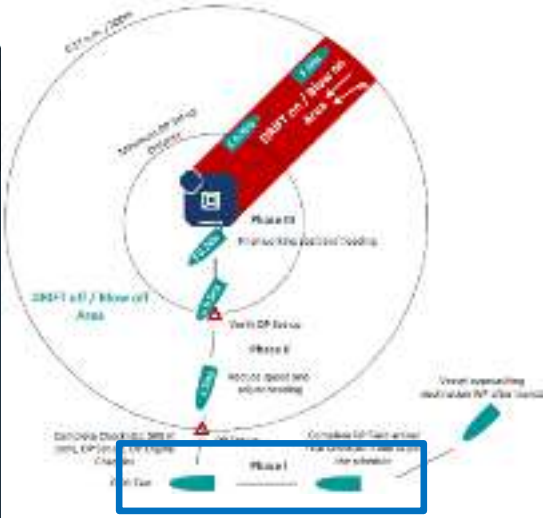




Paper:



III.2-The DASOG onboard system - CAM/TAM configuration checking EOW



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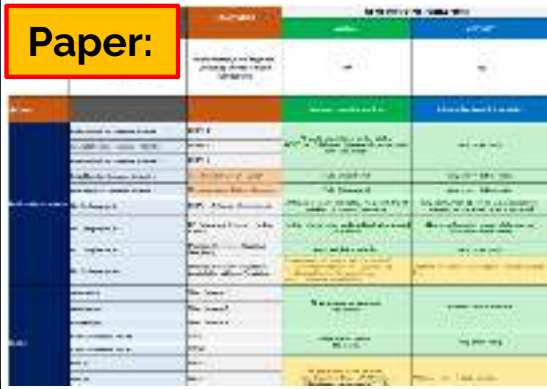
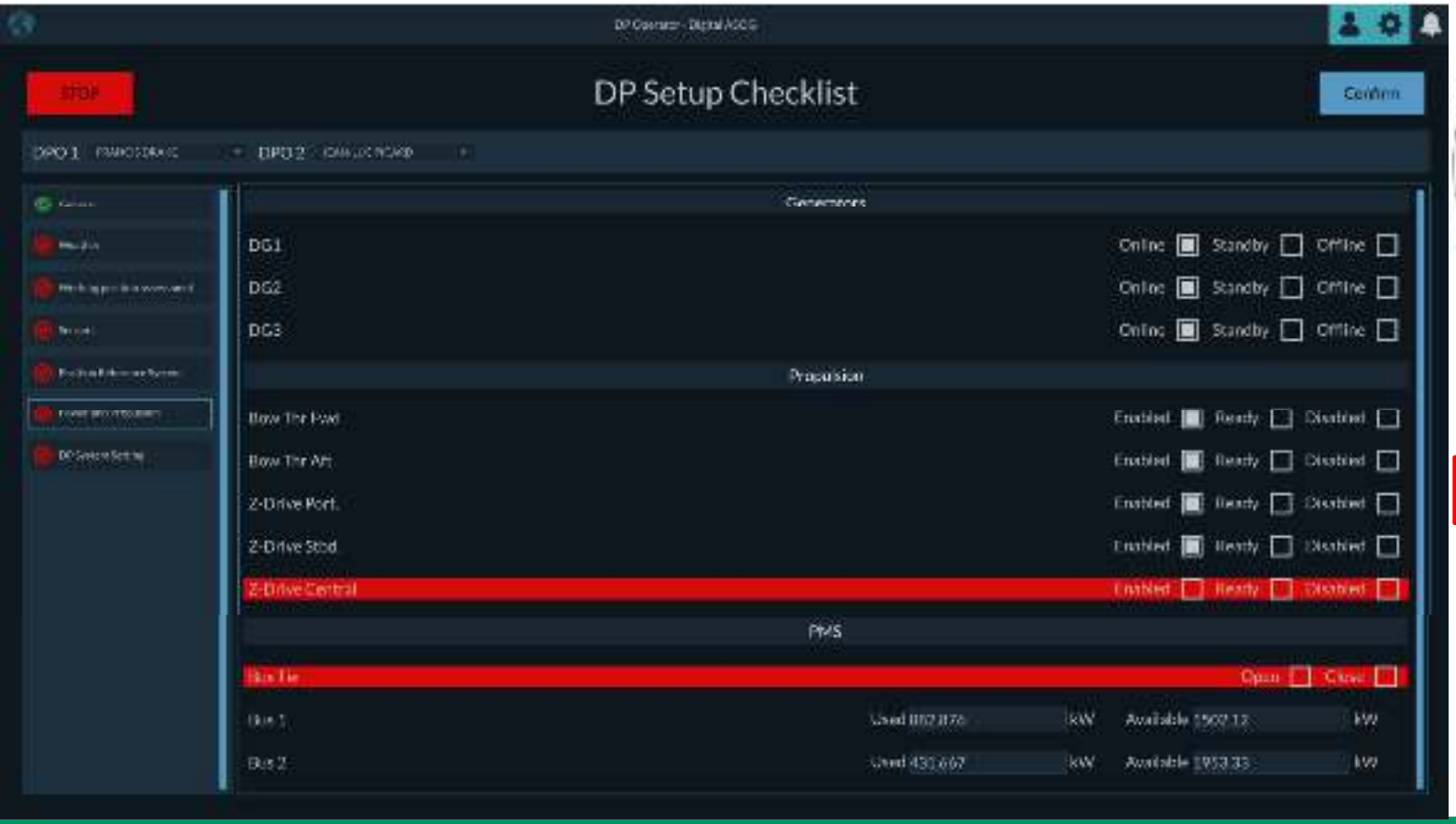
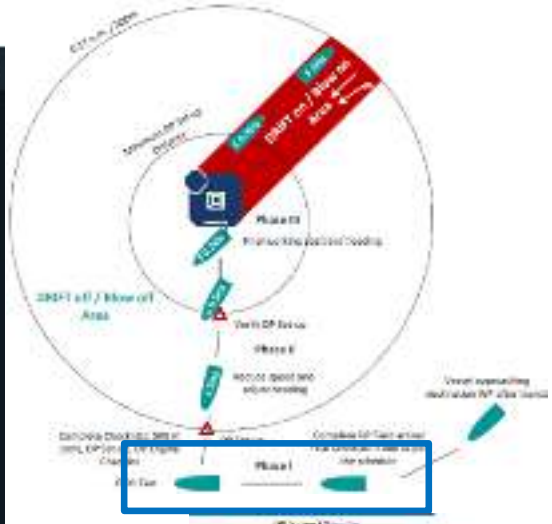


III.2-The DASOG onboard system - CAM/TAM configuration prefilled checklists

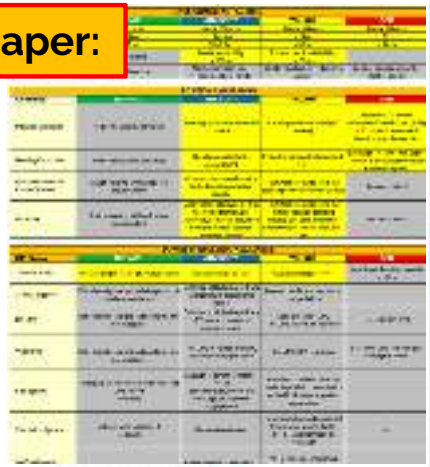


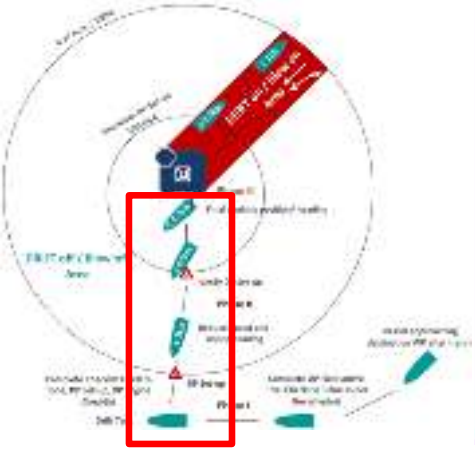


Paper:

III.3-The DASOG onboard system - Monitoring the ASOG onboard 1/5

Paper:





III.3-The DASOG onboard system - Monitoring the ASOG onboard 2/5

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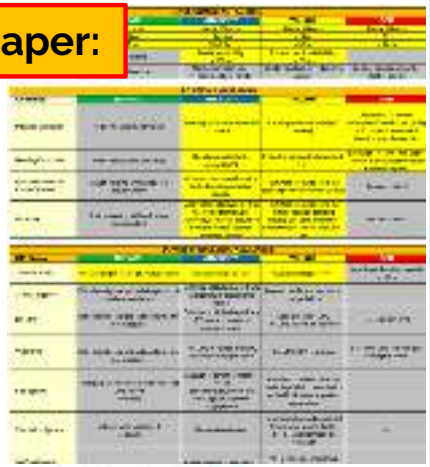

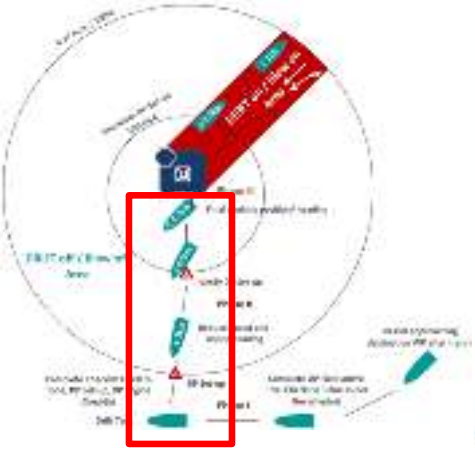

III.3-The DASOG onboard system - Monitoring the ASOG onboard 3/5

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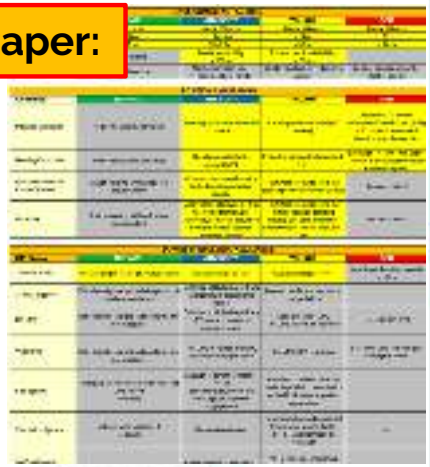
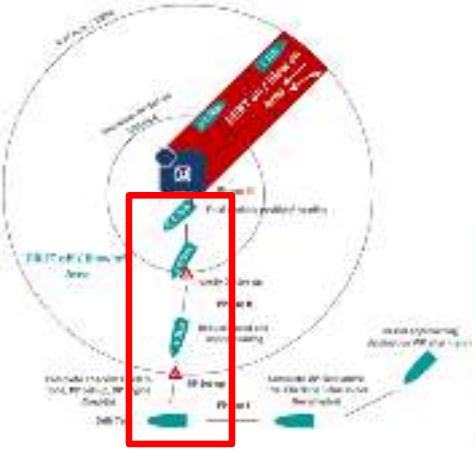
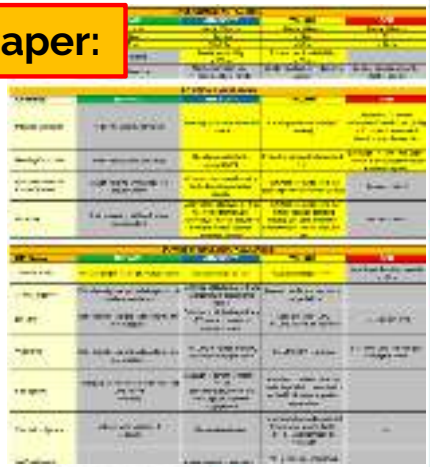
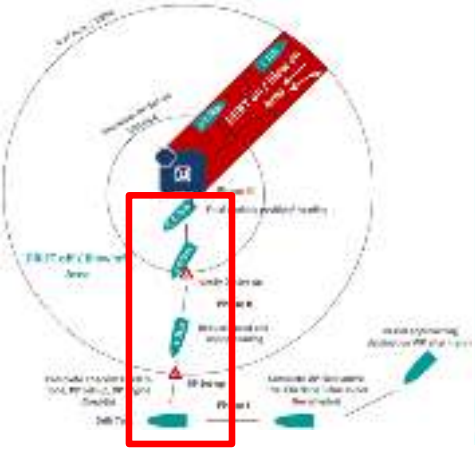


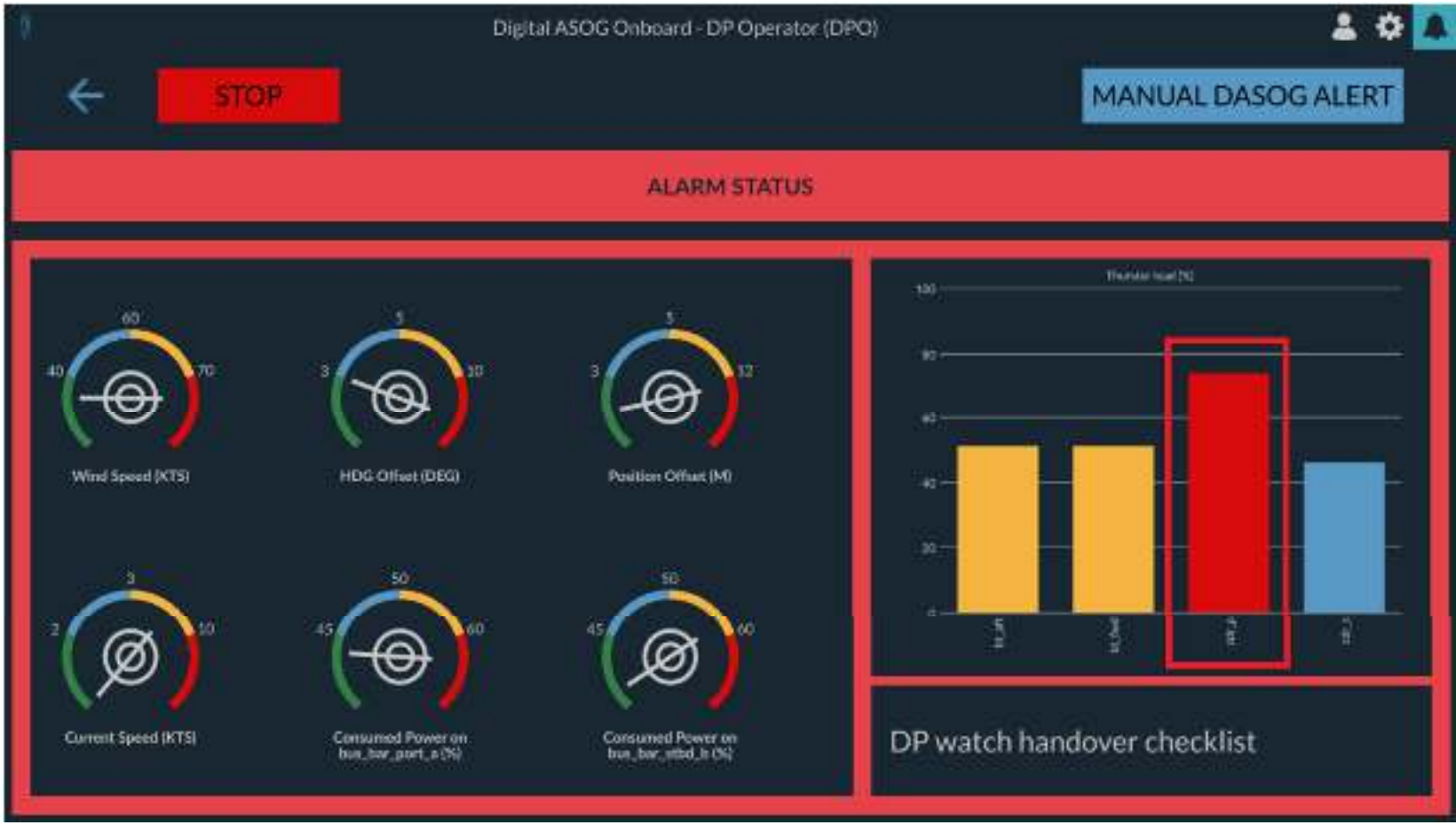


III.3-The DASOG onboard system - Monitoring the ASOG onboard 4/5

Paper:

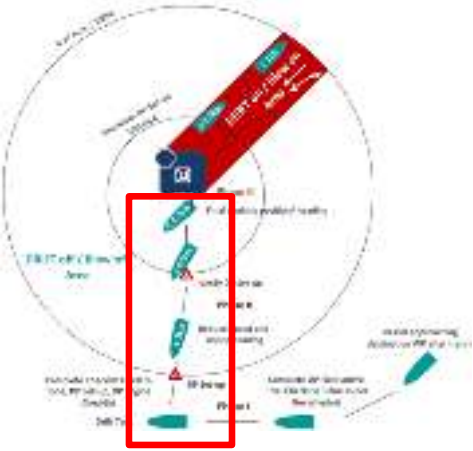


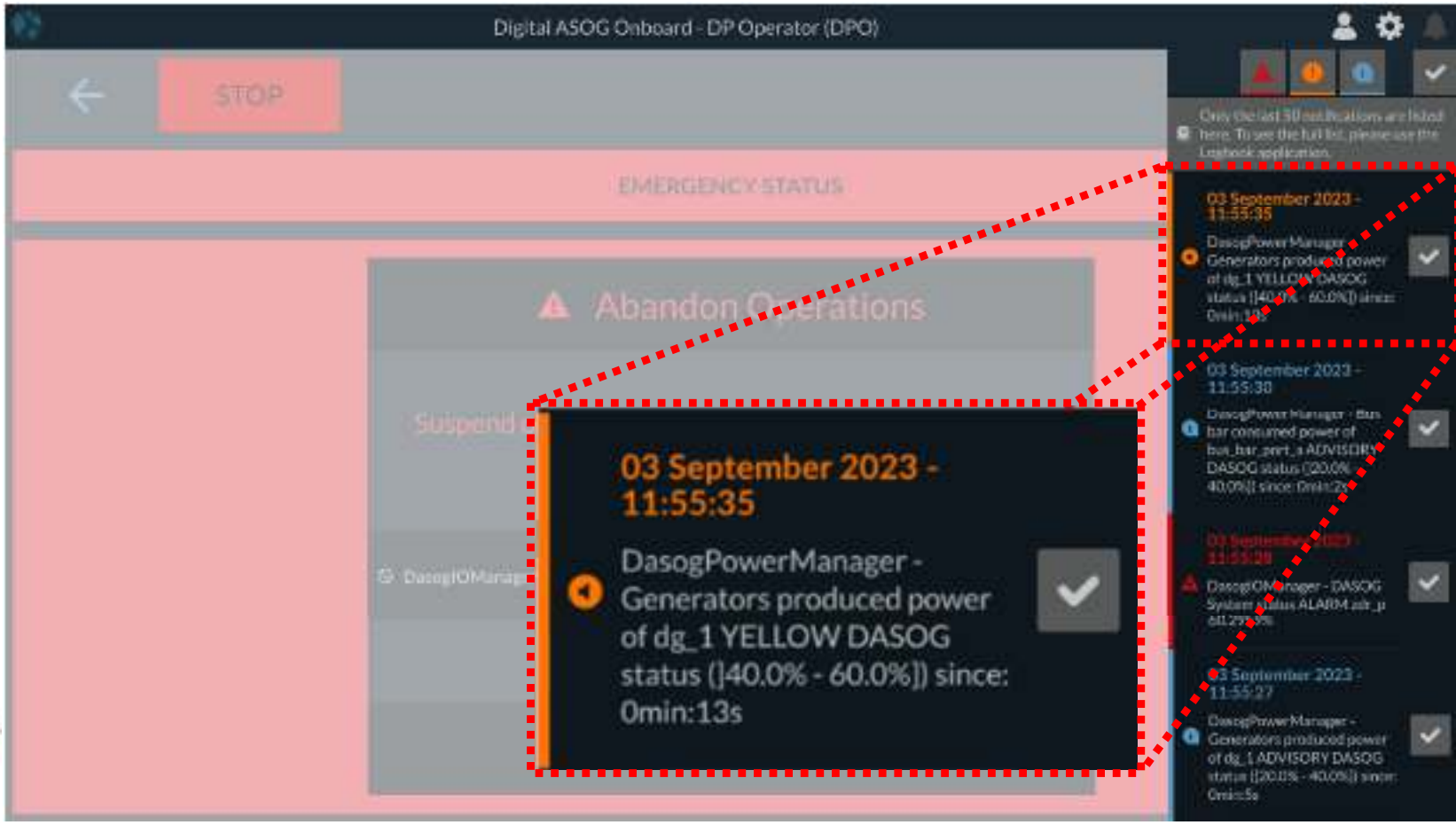




III.3-The DASOG onboard system - Monitoring the ASOG onboard 5/5

Alerts acknowledgement





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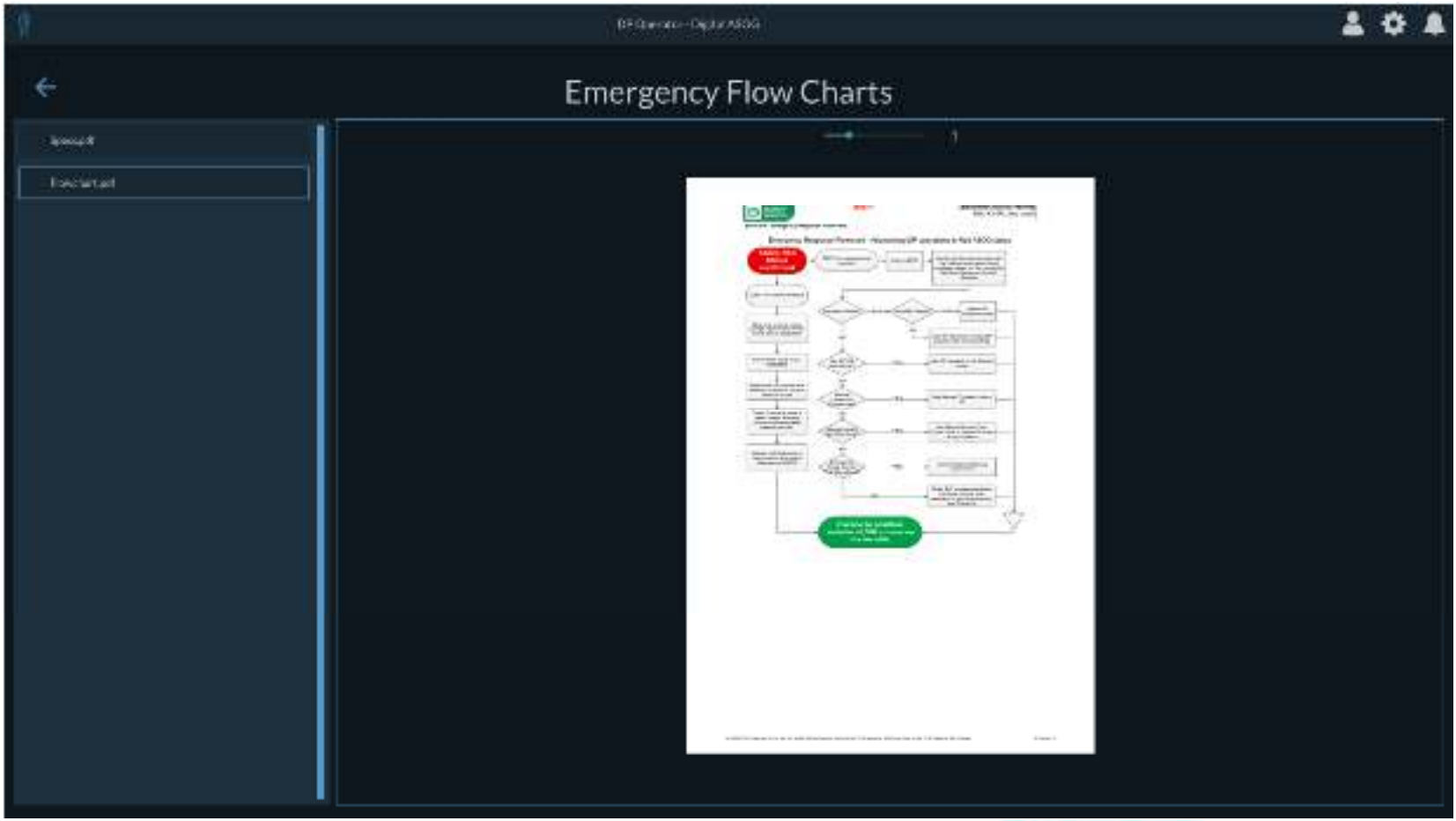
IV.1-Additional features - Emergency flowcharts

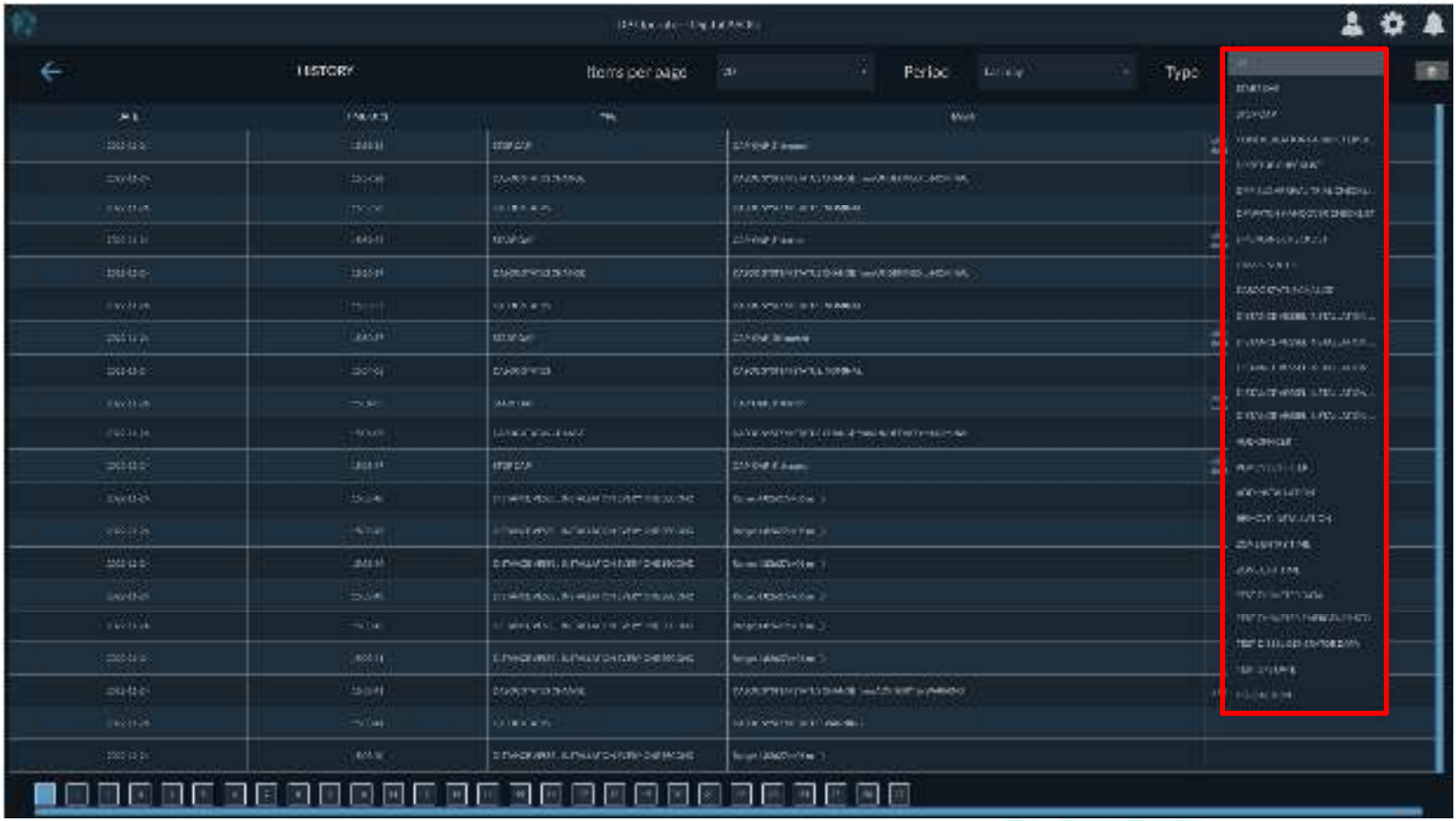
Integration into the applications



IV.2-History event log

Filter the events:

- **#Items / page**
- **Page**
- **Period**
- **Type**



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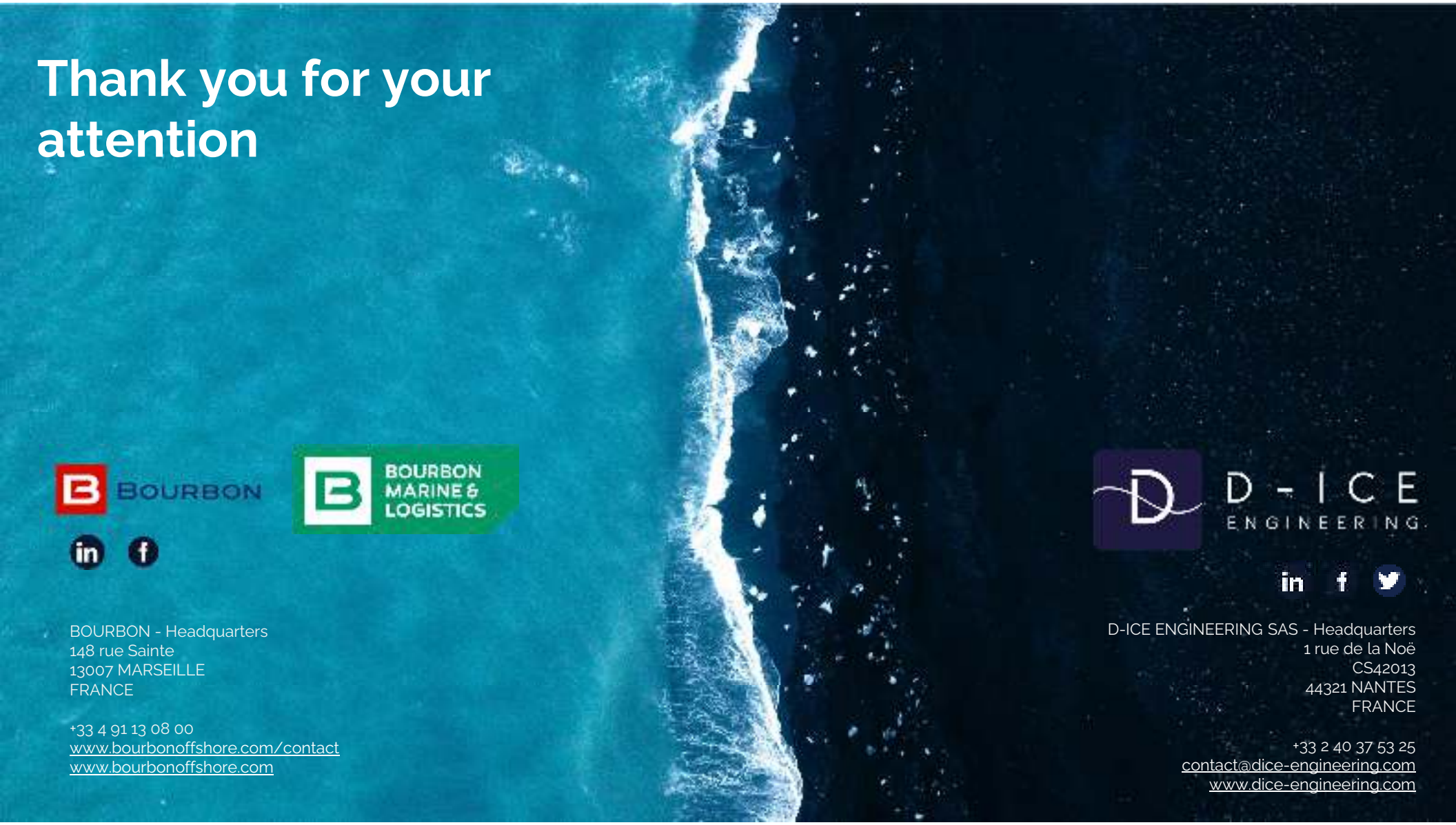
Conclusion

- The DASOG
  - Fully integrated decision support tools for mariners
  - Improve the safety & performances of DP operations
  - Improve the caution & availability of mariners

- Replacing ASOG-related paper-based processes:
  - Increases the reliability of the ASOG follow-up
  - Increases the traceability of DP operations
  - Future data and incident analysis

- Non-invasive solution
  - Connected to the systems already available onboard
  - To be progressively integrated in the operational processes

Thank you for your attention



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