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MARITIME UNMANNED SYSTEMS INITIATIVE

EXERCISES REPMUS¹ 22 & DYNAMIC MESSENGER (DYMS) 22

Information for Industry

Annexes:

- A. Planning Cycle Overview
- B. Working Group Structures
- C. REPMUS 22 Indicitive C4 overview
- D. DYMS 22 Indicitive C4 Overview

REPMUS 22 and DYMS 22 INFORMATION TO INFORM POTENTIAL INDUSTRY PARTICIPANTS

Introduction.

1. REPMUS is an experimentation exercise conducted annually by the Portuguese Navy. It is a national exercise into which NATO is invited as a partner, designed to allow a large scale Operational Experimentation (OPEX) where Navies work together with Industry and Academia to develop Maritime Unmanned System (MUS) technical capabilities, test new technological advances, advance operational requirements, and ensure integration and interoperability of these new capabilities with legacy systems and between allies.

2. DYNAMIC MESSENGER (DYMS) is the first of an annual series of experimentation exercises, under the joint ownership of the NATO Maritime Commander (MARCOM) and the Allied Command Transformation (ACT). 2022 will be the first iteration of this exercise, which is, designed to allow large-scale OPEX where NATO operational communities (Nations and

¹ Robotic Experimentation and Prototyping augmented by Maritime Unmanned Systems

NATO entities) work together with Industry and Academia to develop operational concepts and doctrine and promote integration of Maritime Unmanned Systems (MUS) into NATO operations utilizing the NATO Standing Maritime Forces. (SNMG 1 & SNMCMG 1).

3. The exercises will both be conducted in the North Atlantic Portuguese Exercise Areas, with DYMS 22 following REPMUS 22 as follows:

05 th - 10 th Sep 2022	REPMUS 22 Week 0 - Set Up and Integration Week
09 th Sep 2022 (TBC)	REPMUS Pre-Sail Conference(PSC)
11 th - 17 th Sep 2022	REPMUS 22 Week 1 – Live Serials IAW the SOE
18 th – 22 nd Sep 2022	REPMUS 22 Week 2 – Live Serials IAW the SOE in conjunction with DYMS 22 Experimental Enhancement (EE) & Force Integration Training (FIT) phase for DYMS 22 components, including Command Team workshops.
23 rd - 24 th Sep 2022	Combined MUS Awareness & Distinguished Visitor (DV) days
25 th Sep 2022	DYMS 22 PSC
25 TH – 30 th Sep 2022	DYMS 22 - Live Serials

4. The NATO Maritime Unmanned Systems Initiative will partner and assist in the planning and coordination of and continuity between both exercises.

Aim.

1. The aim of this document and its enclosure is to:
 - a. Encourage early understanding for industry about the nature of both exercises and encourage potential contributions.
 - b. Outline the planning cycle to which participants will be expected to contribute.
 - c. Outline the construct of the planning teams and in particular the REPMUS working Groups and the DYMS syndicate teams to which industry, through national sponsorship can contribute to the planning phase.
 - d. To provide an overview of the NATO Goals and Objectives for each exercise.
 - e. To give a basic overview of the operational Scheme of Manoeuvre (SOM) for each exercise
 - f. To share an overview of the initial vignettes which might be used to assist in developing potential industry contributions.

Overview of the Planning Cycle.

2. An overview of the REPMUS 22 and DYMS 22 combined planning cycle and key planning events appears at Annex A.

3. Industry which is sponsored to participate will be expected to provide an appropriate contribution with expertise into the planning cycle.

REPMUS Working Groups and DYMS Syndicates.

4. The structure of the REPMUS 22 CPT Working groups and of the DYMS 22 EPT syndicates is laid out at Annex B.

5. SMEs from participating industries will be invited to join the relevant WGs and Syndicates.

NATO Goals and Objectives (G&Os).

REPMUS 22

6. The REPMUS 22 NATO G&Os have yet to be ratified by the MUSI Steering Board, however, they will look to build upon the success of REPMUS 21 and in draft form they are as follows:

- a. Overarching NATO Goals;
 - i. Acceleration of Allied MUS development programs.
 - ii. To experiment with new and emerging technology in the field of MUS (including sensors, C3, autonomy AI and others) by testing and evaluating them in live scenarios.
 - iii. To develop, experiment with and refine MUS platform, systems and enablers concepts of operation.
 - iv. To enable through trials testing and experimentation, interoperability and standardisation between Allied MUS systems and between them and manned assets;
 - v. To develop the technological exploitation of MUS capabilities to fulfil the NATO maritime capability gaps.
- b. Overarching NATO Objectives;
 - i. To demonstrate NATO's and Nations' technological and operational capability, present and potential, with respect to the use of MUS in maritime operations to relevant communities.
 - ii. To experiment and develop the C4 systems to allow integration of MUS into maritime operations and provide a Common Operational Picture and common mission planning and execution concept, horizontally across the maximum number of Allies.
 - iii. To experiment and develop interoperability and Interchangeability of MUS systems amongst as many Allies as possible, including the use of manned – unmanned teaming.
 - iv. To continue the development of MUS technologies and capabilities to support the development of the future ASW mission, including supporting the ASW Barrier Smart Defence project.
 - v. To continue the development of MUS technologies and capabilities, through trials and experimentation, that promote autonomous operation of MUS (such as AI / Big Data and Machine learning).

- vi. To continue to develop techniques and experiment with technologies to enable the development of high bandwidth underwater communication and the possibility of underwater mission networks.
- vii. To continue with the development of unmanned systems and support tools for over the horizon MCM operations, including ensuring maximum interoperability between allies and the tactical development of MCM through trialling warfighting doctrines and concepts.
- viii. To develop and improve the capture, analysis and dissemination of meteorological and oceanographic data, including near real time Rapid Environmental Assessments (REA) to support Allied maritime operations using unmanned systems.
- ix. To continue to develop and demonstrate technology and capabilities that enhance the contribution MUS capabilities can make to Allied Maritime ISR and Maritime Situational Awareness in all domains.
- x. To increase the training of military operators in the use of MUS including in planning and execution of MUS operations.

DYMS 22

7. The DYMS 22 G&Os have yet to be ratified by the DYMS Steering Board, however, they will look to build upon the work of the REPMUS exercise that precedes it and transfer the focus to the operational exploitation of MUS in the following warfighting mission areas:

- a. Naval Mine Warfare (NMW).
- b. Maritime Surveillance Activity in support of Maritime Security Operations (MSO, Amphibious Operations (AMPHIB OPS) and Anti-Submarine Warfare (ASW)).
- c. Countering asymmetric threats in Force Protection (FP) and Harbour Protection (HP), including threats from unmanned systems in all domains (UxVs).

8. G&Os have been set and published in the DYMS 22 EXSPEC (Yet to be approved and published) as follows:

- a. Overarching Goals (All 3 mission areas);
 - i. Supporting the development of NATO doctrine, tactics, techniques and procedures in the use of MUS in NATO.
 - ii. Increasing MUS interoperability based on common use of agreed Allied doctrine, tactics and procedures, including manned / unmanned teaming.
 - iii. Supporting MUS training and MUS operational awareness to the NATO and National operational communities.
 - iv. Contribute to the continuing development of MUS technical interoperability standards.
- b. Overarching Objectives.

i. Naval Mine Warfare:

1. Support the development of Tactics, Techniques and Procedures for combined stand-off NMW operations with MUS to inform future NMW doctrine.
2. Support the development of a CONOPS for unmanned underwater systems (UUS) use in discrete operations.
3. Support the development of a CONOPS for unmanned aircraft systems (UAS) use in MCM drift mine detection.
4. Test and evaluate UUS, tools and decision aids use in NMW against the NMW NATO Capability Shortfalls.

ii. Maritime Surveillance (ISO MSO, Amphib Ops and ASW);

1. Support the development of a CONOPS for MUS employment in MSO.
2. Support the development of a CONOPS for the employment of MUS in extending the range / supplementing manned assets in organic ISR.
3. Support the development of CONOPS for MUS employment in the Rapid Environmental Assessment (REA) elements of an ASW Barrier.
4. Support the development of Tactical Use of Small Maritime Unmanned Aircraft Systems.
5. Support the development of a CONOPS for MUS employment in REA for maritime operations.
6. Support Military Oceanographic and rapid environmental assessment utilizing MUS use

iii. Countering asymmetric threats in Force Protection (FP) and Harbour Protection (HP), including threats from unmanned systems in all domains (UxVs);

1. Support the development of CONOPS for MUS use in FP and HP.
2. Test and update FP doctrine against asymmetric UxV threats.
3. Test and update HP doctrine against asymmetric UxV threats.

iv. Cross-cutting objectives;

1. Demonstrate MUS usefulness in maritime operations, in order to strategically advertise MUS use options.

2. Contribute to the development of NATO C2 concepts for joint and combined use of MUS in Maritime Operations.
3. Contribute to the development of NATO C4 Standards for MUS.
4. Support the development of a concept for a Maritime Mission Network to enable MUS to collaborate and work, cross domain, including in the underwater battlespace and to work together with legacy capabilities.
5. Assess the maturity of MUS in operational context in order to refine the future warfare development.
6. Assess concepts from open innovation projects with the support from the operational community.
7. Evaluate autonomy readiness in maritime domain to advance its employment in multi-domain operations (MDO).

Scheme of Manoeuvre (SOM).

REPMUS 22

9. For the NATO MUSI community, the overall REPMUS 22 SOM will build upon the success of REPMUS 21 and is likely to focus on the following 5 main thematic areas:

- a. Interoperability to Interoperability (I2)
- b. Underwater Operations including ASW Barrier & UW communications
- c. Oceanographic support including REA
- d. Stand-off Naval Mine Warfare
- e. Joint Common Operational Situation Awareness and C2

10. I2I activity will likely focus on broadening the interoperability with allies by linking high level integrators or directly linking platforms into the MAPLE – CCS C4 backbone. More use will be made of the “virtual ship” construct in a combined Operations Room at Troia which will seek to develop and disseminate a REPMUS wide Common Operating Picture. Interchangeability will see mission planning extended between allies and the establishment of a wider C2 process for transferring control between allied systems and mission execution through shared system tools.

11. UW will expand upon the work of the ASW Barrier in REPMUS 21, again using mostly synthetic ASW targets, ASW detection systems will be trialled in a barrier concept, consisting of components from multinational elements, CMRE, industry and possibly Academia to enable system development and gap analysis. The work on developing UW comms technologies will continue, including developing common standards and protocols for secure high bandwidth data transmission underwater.

12. Oceanographic and meteorological data collection and Rapid Environmental Assessment will focus on an integrated collection capability and near real time data collection, assessment and dissemination process, utilising command decision tools to best utilise the REA product in the various warfare disciplines. The process of integrating REA operations into

the same operational areas as other assets, including submarine assets and building the trust in MUS systems as integral operational components, will continue.

13. The Naval Mine Warfare effort will be focussed on a Mine Warfare Centre of Operations in Sesimbra and concentrate on building and enhancing the capability of MCM MUS and their payloads and tactical development of MCM, including C2 capabilities and techniques, within a combined allied force mix of MCM operating with the C2 nodes at range from the Mine Danger Area. Tactics will continue to be developed and evaluated and common standards for MCM operations, underwater mission networks, data exchange and command decision tools developed toward an operational status.

14. Building on the successes of REPMUS 21 it is intended in REPMUS 22 to fully develop an exercise wide Common Operational Picture, available at all exercise C2 nodes and disseminated to wider authorities. It will also be an objective to expand the process for passing tasking and in some cases transfer of control of MUS between nodes and between allies.

DYMS 22

15. The Dynamic Messenger 22 SOM will be focussed upon the integration of MUS into NATO maritime operations at sea based around the two NATO Standing Naval Task Groups, Standing Naval Maritime Group (SNMG) 1 and Standing Naval Mine Countermeasures Group (SNMCMG)1 which will deploy to the Portuguese Atlantic Exercise areas where DYMS 22 will take place.

16. COM MARCOM's Intent, is for DYMS22 to present a unique challenge to integrate and employ MUS capabilities across a broad span of maritime operations, using a realistic crisis response geo-political scenario and set within a hybrid warfare context. The following warfighting disciplines will feature as focus areas:

- a. Mine Warfare,
- b. Force and Harbour Protection,
- c. Maritime Surveillance Activity in support of Maritime Security Operations (Including ASW)
- d. Amphibious Assault.

17. The exercise will generate significant OPEX opportunities, which will be targeted to accelerate the development of MUS doctrine, TTPs and interoperability across NATO's maritime domain. The intent is to use the REPMUS22 exercise, which precedes DYMS22, as a springboard to enable seamless transition to DYMS22, which will embrace the support of NATO and partner nations, sponsored industry, academia and other NATO stakeholders to develop, showcase and promote MUS capabilities within NATO maritime operations. It will be the first of a series of annual exercises, conducted in partnership with several internal and external stakeholders, under the co-leadership of MARCOM and ACT.

18. The concept of operations will fit loosely within the overall geo political scenario and involve the following phases after the arrival in area of SNMG1 and SNMCMG1:

- Phase 1 - to integrate and test their MUS systems.

- Phase 2 – MSA, MIO against maritime hybrid and asymmetric threats coming from south, location of UW threats and precursor MCM Ops for Amphib light landing in Troia Peninsular.
- Phase 3 - MSA, MIO against maritime hybrid and asymmetric threats coming from south, mine clearance in Sesimbra plus the Amphib light landing.
- Phase 4 – Providing logistical support to operations through the NATO FWD operating base in Troia, with comprehensive MISR protection activities.

19. The MUS MOC will plan and conduct REA and ISR in support of all operation activities. Pre landing ops will also be conducted in a covert way using MUS for MISR tasks.

20. After landing teams scout the Troia peninsular around the, the SNMG1 Commander is to ensure the security of the area. Continuing with MISR and POL analysis with MUS should include Force and Harbour protection measures.

21. The SNF Commander, using MUS and other systems is to enhance MSA in the area which is suspected to be transited by vessels, not transmitting AIS, conducting illicit or illegal activity. CTG Commander is to be prepared to conduct a broad set of operations IOT securely provide logistical support through the NATO FWD operating base in Troia.

22. The following Vignettes are likely to be used with MUS integrating into legacy systems:

- CCO - Enabler Establish Common Operational Picture for SA.
- CCO - Establish C2 Computers, Communication and Intelligence C4I operational networks.
- CCO - HOTO High level C2 from Troia to afloat CTG.
- MSO – MUS provide persistent POL (Pattern of Life) intelligence generation in a defined Area.
- MSO - ASW Barrier to locate UW threat (Potentially Passive, Active, & Multi-static).
- MSO - AUV/USV Boarding surveillance activity.
- MSO - Counter UAV activity all phases day/night.
- MSO - AMPHIB MUS support Amphibious Landing day / night.
- MSO – FP/HP Conduct multi domain harbour protection operations.
- REA - UUV/USV REA Oceanographic support to all activities.
- REA – Harbour and Beach survey with MUS.
- NMW - MCM Precursor Ops.
- NMW - Conduct standoff MCM operations.

Industry Participation

23. Industry will be key partners in the development and execution of both exercises, their role will be crucial and will continue, as it was for REPMUS 21 to be through national sponsorship rather than by direct entry through NATO or other mechanism. NATO may however act as a broker to connect interested and relevant industry to the right national sponsorship.

Criteria for Industry Participation in REPMUS 22 / DYMS 22

24. The participation of contractors and industry will be on the understanding that participation of any industry entity in DYMS 22 will not create any liabilities or obligations on the part of any NATO entity.

25. The criteria and policy for allowing personnel from industry to participate directly in exercise REPMUS 22 / DYMS 22 will fall into two broad categories as follows:

- a. Directly contracted industry personnel supporting a national MUS development programme:
 - i. Personnel in this category are those who form part of a contract arrangement between industry and the Navy or MOD of the contracting nation.
 - ii. Such personnel will be treated like other military or MoD personnel from the nation concerned and can attend all planning or operational briefings and meetings and be allowed to work within the confines of DYMS exercise unescorted.(specific national rules will apply for embarkation to warships and government owned vessels).
 - iii. Such personnel must be cleared to the same basic security level as other Military and MoD staff from the contracting nation.
 - iv. It will be assumed that all data sharing, IPR provision and liability issues are inherently covered in the contract arrangements between the nation and the industry contracted.
 - v. Non-Disclosure Agreements will not be required as this is considered to be inherent in the contractual arrangements between the industry entity and the contracting nation.
 - vi. Nations which have personnel contracted that do not meet the requirements above, must bring this to the attention of the DYMS Planning team.
- b. Industry sponsored to attend by a participating nation:
 - vii. The participation of sponsored industry is limited to industry headquartered in NATO nations and those of official DYMS 22 partner

nation participants, unless otherwise specifically approved by the NATO entities directing the exercise.

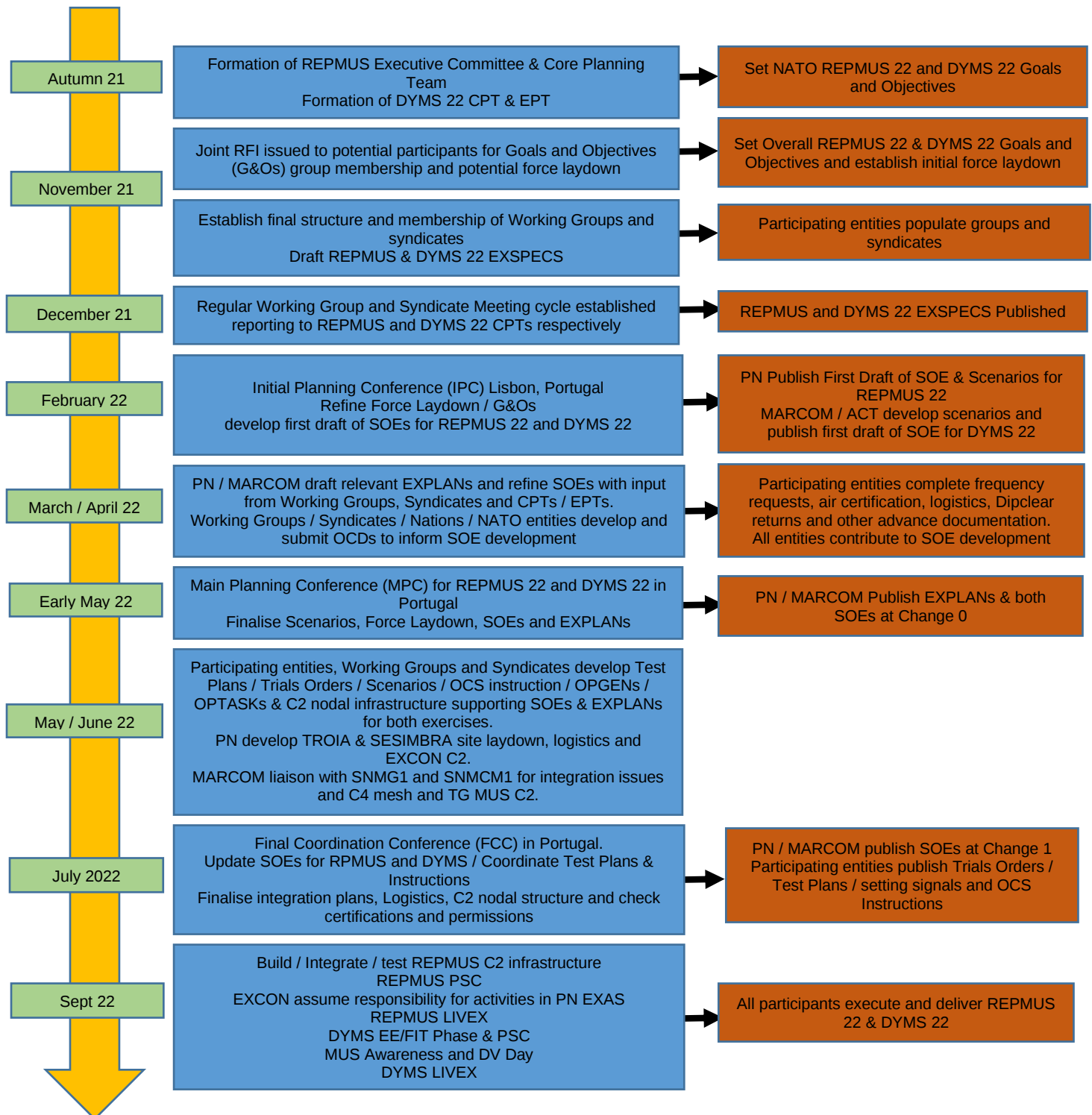
- viii. Personnel in this category are those from an industry entity invited by a sponsor nation to attend to demonstrate or integrate a specific system into DYMS in order for it to be evaluated by all participants. This may be at the industry partner's own expense or financially supported by the sponsoring nation.
- ix. Such personnel can be invited by the sponsor nation to attend specific planning and operational briefings where they are directly pertinent to the system being demonstrated and its integration into the exercise. Whilst such personnel may be security cleared, this will not be mandatory, however, Sponsor nation must provide a NATO / Military / MoD escort at all times that such personnel are on exercise sites ashore and afloat when they are not appropriately cleared.
- x. Sponsored Industry personnel may be asked to sign a Non-Disclosure Agreement undertaking not to disclose sensitive or commercial information not directly related to the demonstration of their specific system, which they may learn or be exposed to during the exercise.
- xi. Depending upon the nature of the sponsored activity an MOU covering data sharing, IPR provisions and liabilities may be required.

POCs.

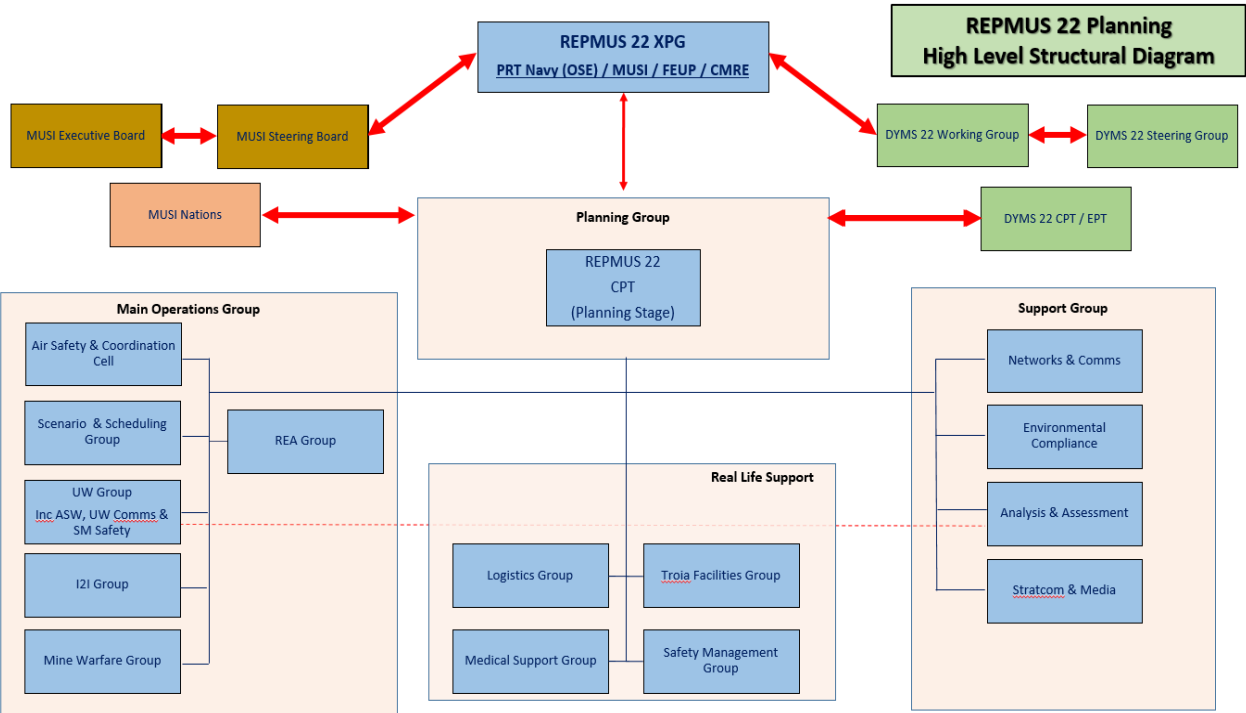
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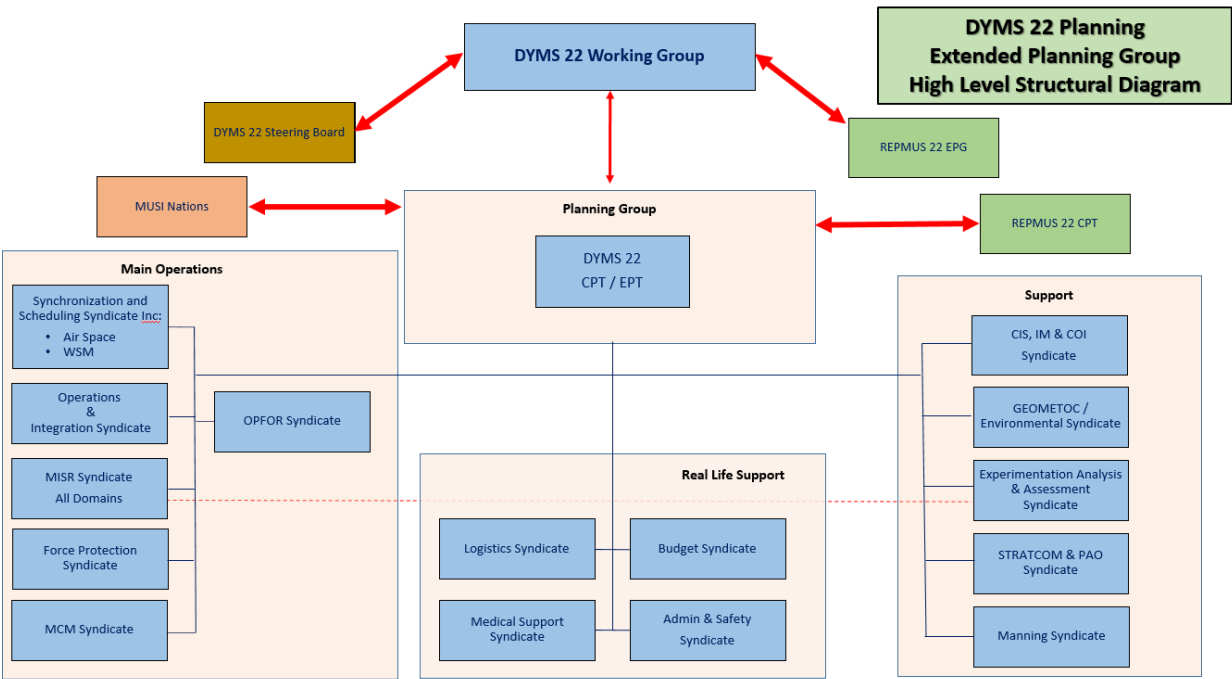
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REPMUS 22 & DYMS 22 Outline Planning Cycle

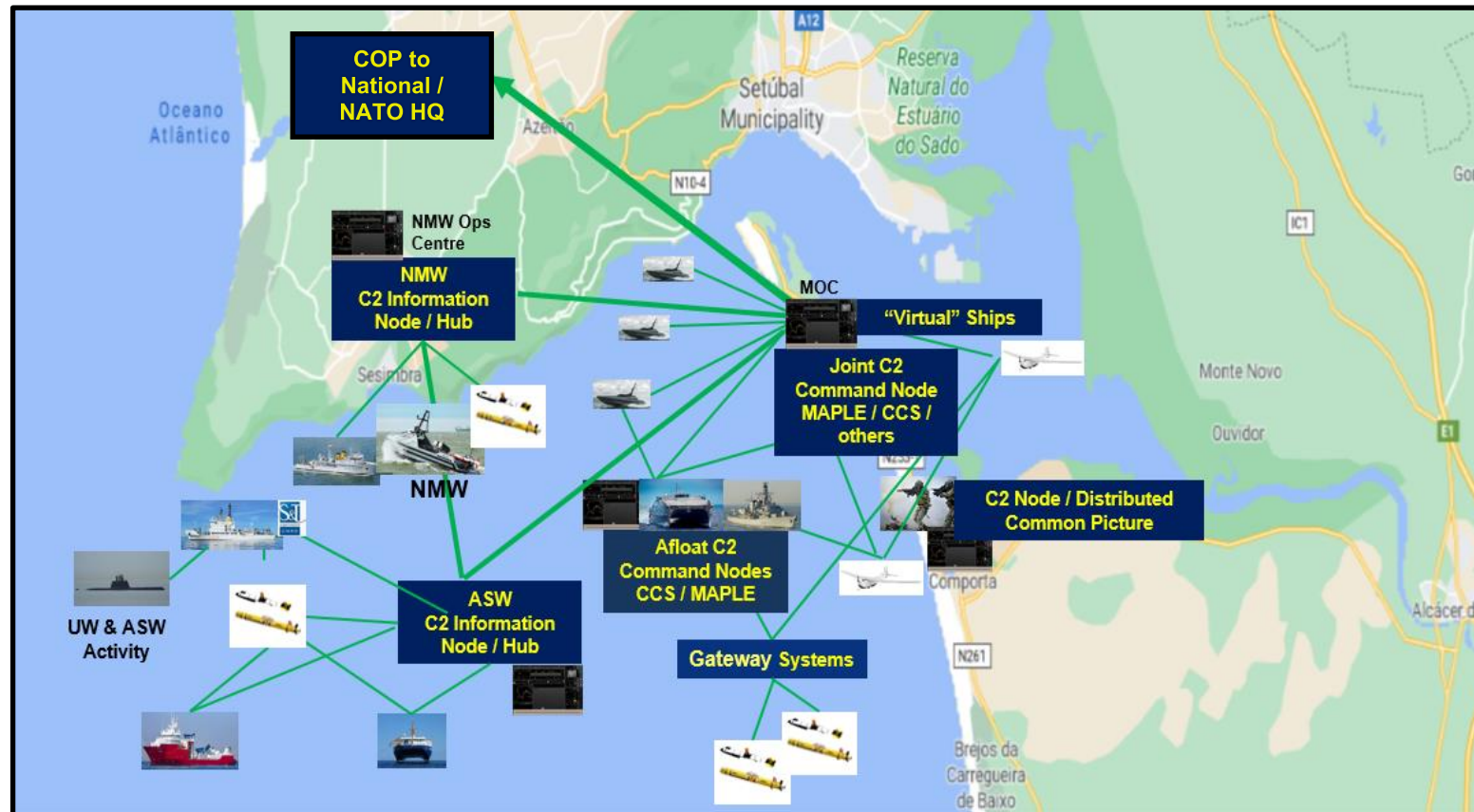
REPMUS 22 Working Group Construct



DYMS 22 Syndicate Construct



REPMUS 22 Indicitive C2 Laydown



DYMS 22 Indicitive C2 Laydown