

Comparison and Awareness of Situation (COMPAS)

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ABSTRACT

Since the French COP demonstration at JWID'01, the concept of decisional COP has been illustrated. This concept was based on the extrapolation of the current situation from the operational situation using the operational plan. In 2001, this demonstration was incomplete due to the lack of available planning tools. Since the end of 2003, the NATO new planning capabilities offered with TOPFAS make possible the implementation of some initial decisional COP capabilities, as demonstrated during JWID'04.

The JWID'04 FR COP demonstrator (COMPAS) compares the current operational situation with the planned situation. The current operational situation is obtained through standard AdatP-3 messages. The tasks of operation are extracted from the TOPFAS task tree. Associated units are identified through the Troop to Task Rules elements. Task view filtering allows to show the units per task and associated graphical layers. The units' real location provided by the operational situation is displayed, as well as the opposing forces location, in order to compare the current and planned situations. This demonstrator was experimented on the Lillehammer NATO site and on the Celar-Bruz French site during the June 2004 exercise. The test trial has been conducted with NATO, Germany, Italy, Norway, Romania, Turkey and USA. Lessons learnt from these experiments are the foundation of a spiral development process.

The decisional COP implemented in the COMPAS demonstrator for JWID'04 is a first step toward an integrated visualization environment where commander and staff have the capability to control the operation issues by anticipation of the battlefield events and the consequences of these events.

1.0 A MULTI-LEVEL COP CONCEPT

According to the PIA 03-301 French document [1] the COP should integrate various pictures from tactical level up to strategic level. The COP is the ultimate command tool supporting knowledge base, planning decision and command & control process. For this purpose the COP should contain all relevant information: past, current and future.

This vision is close from the US COP Joint Vision 2020 [2]: "The JV2020 COP is a piece of hardware that not only fuses all source data, but is also a knowledge-based process for decision making – the aegis for Fires, ISR, Logistics and Manoeuvre – and due to its speed of processing information into knowledge, will entirely eliminate the levels of the joint components and Service components from the joint force commander's

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command and control (C2) structure”... “This new COP, tailorable to display the joint operations area (JOA) from subsurface to space, will not only provide every staff level of planning and real-time execution performed by a CINC, JTF commander, or component commander today, but also provide the real-time view of the battle space.”

Since the French COP demonstration at the Joint Warfare Interoperability Demonstration 2001 (JWID’01), a concept of multi-level COP has been illustrated. This COP has included:

- A Joint Common Tactical Picture (JCTP) based on real time information provided by all theatre sensors and Intelligence reports. This JCTP included air, ground surface tracks as well aggregated land unit situation. The information is collected from the Air, Land and Maritime component as well as strategic sensors at theatre level (Satellite, ...). This JCTP provided an initial common picture to the Joint Task Force headquarter and to the JFLCC, JFACC and JFMCC.
- A reference Picture provided by the JTF cells (J2 for intelligence, J3 for situational awareness of current operations, J4 for logistic, J5 for plans, J6 for C4I status). This picture, based on the JTCP information, is the result of the analysis of the different cells preparing future joint staff decisions.
- A prospective Picture built from the history of friend and enemy manoeuvres, the current situation, the current Course of Action (CoA) of own forces and the estimated course of action of enemy forces. Current situation, history and CoAs should be compared in order to validate the enemy intentions. Simulation could be also used for situation awareness forecast for the following days.

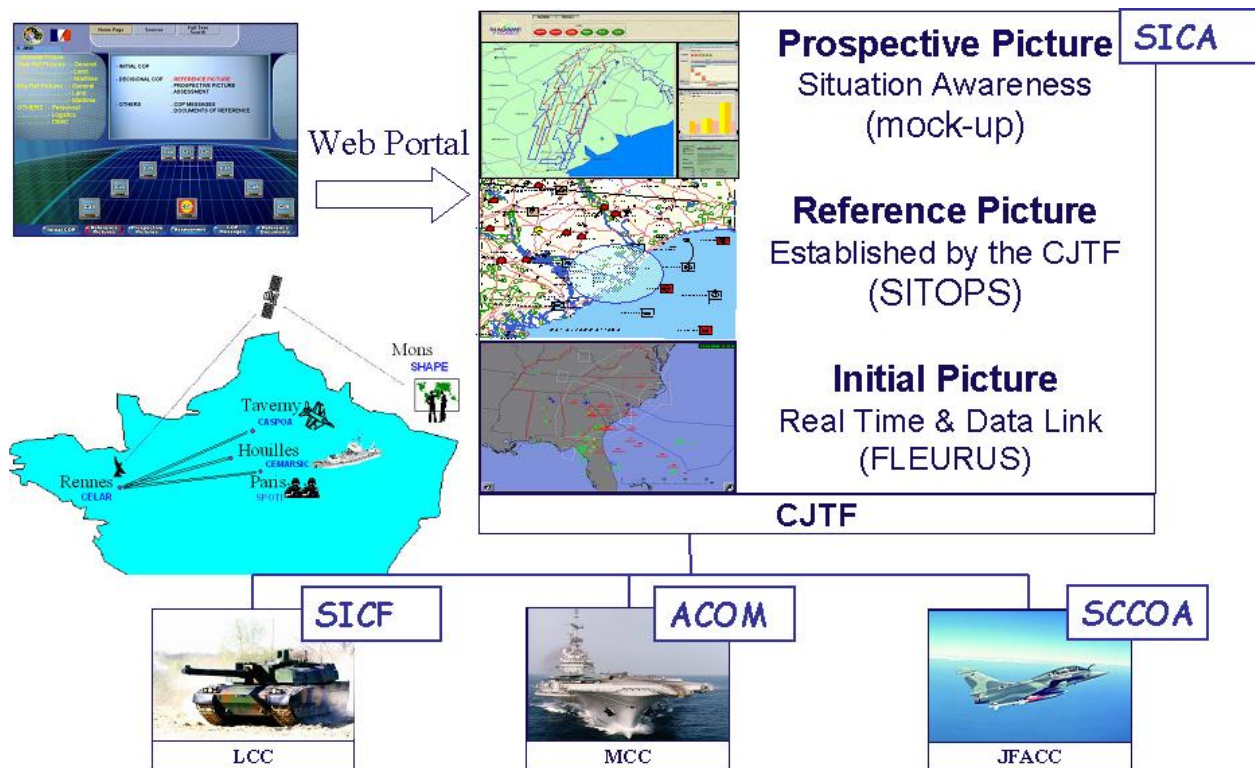


Figure 1: Multi-level Common Operation Picture.

For JWID 2001, a demonstration of this COP concept has been performed. The JCTP initial COP was built from the information provided by the French C4I components (SICF, ACOM, SCCOA) to a real-time data fusion tool (FLEURUS) and to the joint C4I database (SITOPS). The prospective picture concept was only illustrated due to the lack of available joint planning tools. A web portal was also developed within the French C4I environment SICA distributing to the users the different pictures.

2.0 THE JWID'04 EXPERIMENT ON PROSPECTIVE PICTURE

2.1 The Demonstrator

End 2003, the lack of planning tool situation changes with the NATO/NC3A prototype planning tool availability. So the time was come to experiment the prospective picture.

The tool for Operational Planning, Force Activation and Simulation (TOPFAS) is a software tool that helps an operator throughout the Operational Planning Process (OPP) as a Decision Support System.

The functionalities of TOPFAS include mission analysis, Course of Action (CoA) assessment, force generation, plan development, and plan review. A GANTT view helps the user to synchronize the tasks with the operation timeline. The force task view helps to define the force requirements. A cartographic interface helps to define key positions of units for the tasks. The map view allows the operator to enter graphic elements such as : areas of responsibility, manoeuvres or opposing forces positions, but no interface is yet provided with other C4I system and COP database.

Considering the lack of programmatic interface, and the fact that TOPFAS is a prototype with limited capability to assess the current situation, the concept of prospective picture has been experimented on an other tool (COMPAS) built to compare and assess the operational situation for JTF Computer Assisted eXercises (CAX). COMPAS belongs to the ALLIANCE CAX system. The COMPAS database is shared with the ALLIANCE joint scenario generator. ALLIANCE includes also Land, Maritime and Land simulations, so COMPAS was chosen for further link between Course of Action provided by TOPFAS on the one hand and ALLIANCE simulation capability to provide prospective picture for day+1, day+2, etc... on the other hand.

This experimentation covers a limited objective as simulation is not used. Current situation is provided by AdatP-3 standard messages from NATO and Nations Command Control Information Systems (CCIS). These AdatP-3 messages were:

- OWNSITREP providing land unit positions of the allied coalition,
- ENYSITREP providing intelligence report about the enemy land unit positions,
- NAVSITSUM providing Naval unit positions of the allied coalition,
- MARITSUM providing intelligence report about the enemy maritime unit positions.

CCIS tool (TDS) is used to convert AdatP3 messages and to store the information in a database shared with COMPAS. An electronic dataflow management utility is also used to publish on the web the Pictures provided by COMPAS.

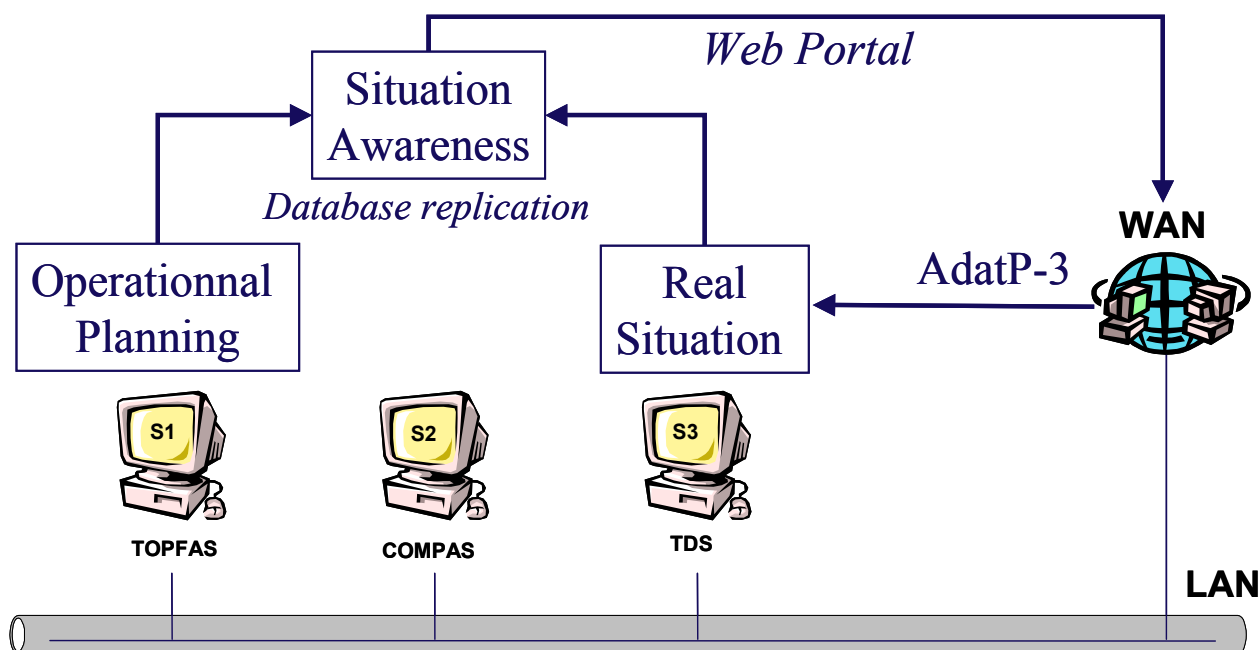


Figure 2: Demonstrator Architecture.

2.2 The Experiment

The JWID experimentation duration was 2 weeks. The scenario was organised in 5 phases (1 phase per day), and the scenario of the second week was the same as the first week. As a fictitious scenario, it was just providing an operational environment in order to support operational situation data exchanges between the coalition participants. According to the scenario, individual NATO / Nations demonstrations provide data. Interoperability is then validated by observing a correct interpretation of the data by the other systems.

The French order of Battle and course of action were included in the global Order of Battle and course of action. In the scenario, two hostile nations (Maykan & Caroline) generated subversion/invasion threat against two regional friendly nations (Lumbia & Tallobland). The scenario was settled in South East Africa, terrain data of USA was reused to create an artificial theatre.

The scenario context also included hostile nations plan/support/execute terrorist attacks inside the continental US. Friendly nations asked, and received, UN, US and NATO support to defend against hostile nations' aggressions. The US-led CTF defends against regional aggression from the sea (see the figure 2). USNORTHCOM and USEUCOM cooperate with mutual Intel and Operations.

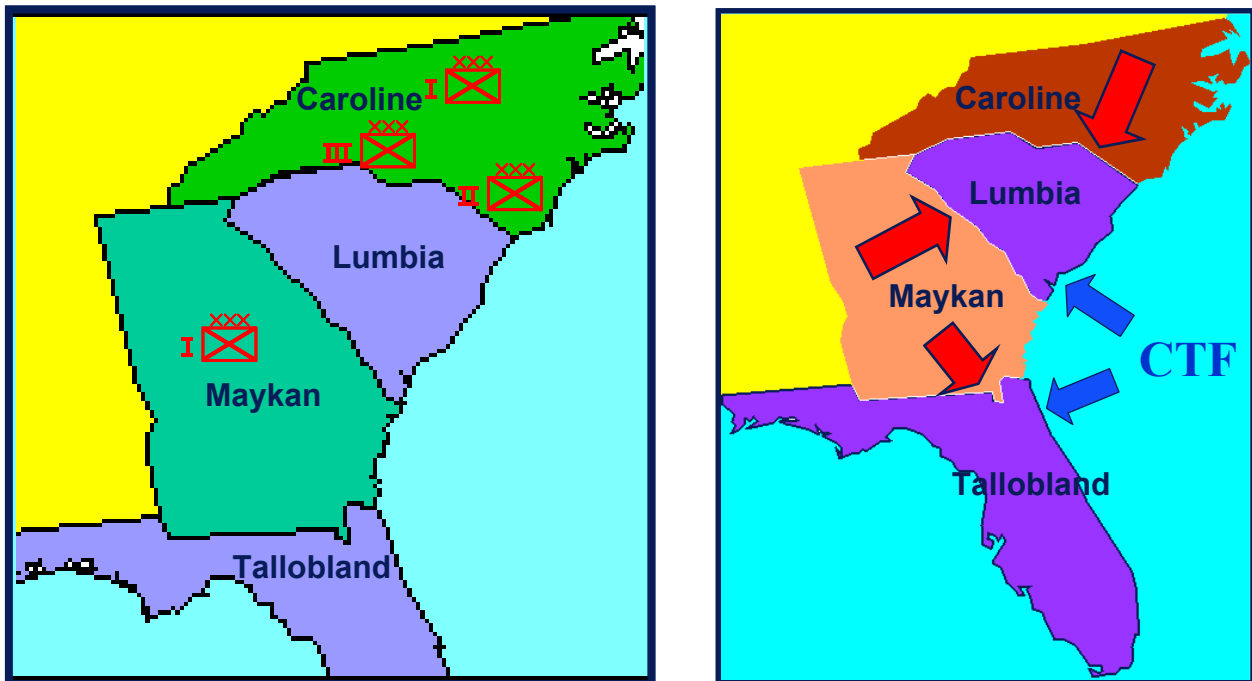


Figure 3: JWID'04 Scenario Context.

In the scenario, the main French contribution occurred on day 4 with the CFMCC amphibious attack (see figure 4).

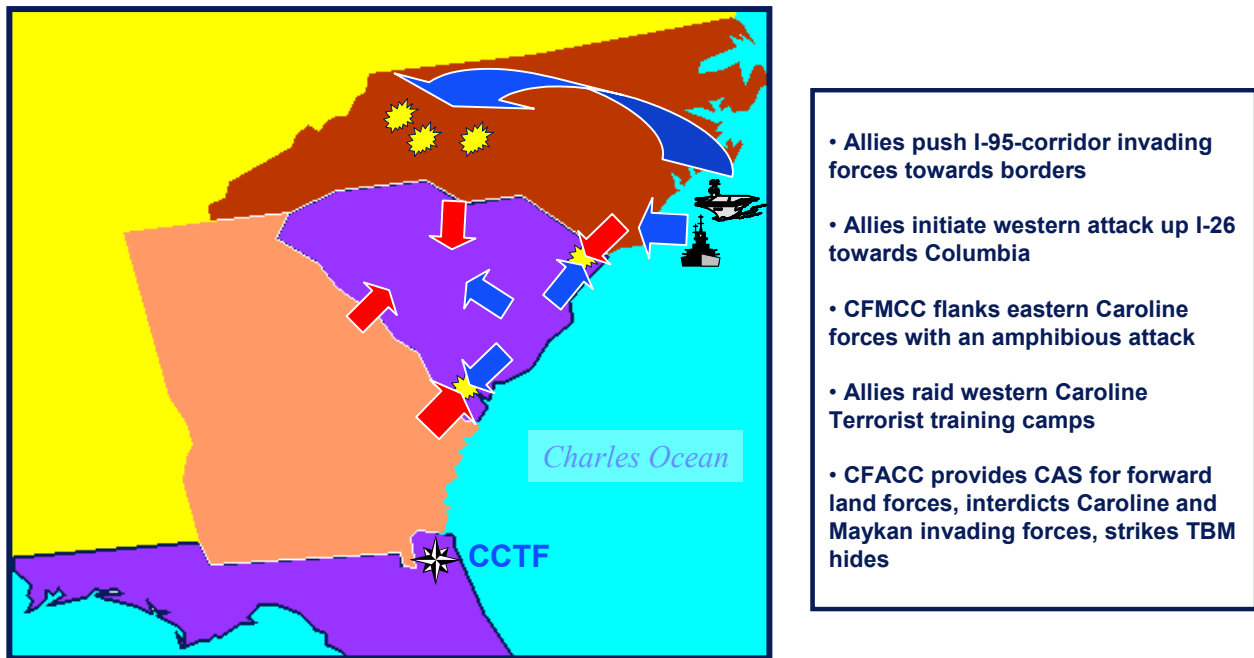


Figure 4: Scenario Day 4.

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The order of Battle for French forces included 5 ships and 3 Amphibious Battalions (2 Infantry, 1 Armour). The amphibious manoeuvre was planned with TOPFAS and the picture was published as figure 5 on the web. Remark : the two “!” icons symbolize the objectives of the land forces after their landing.

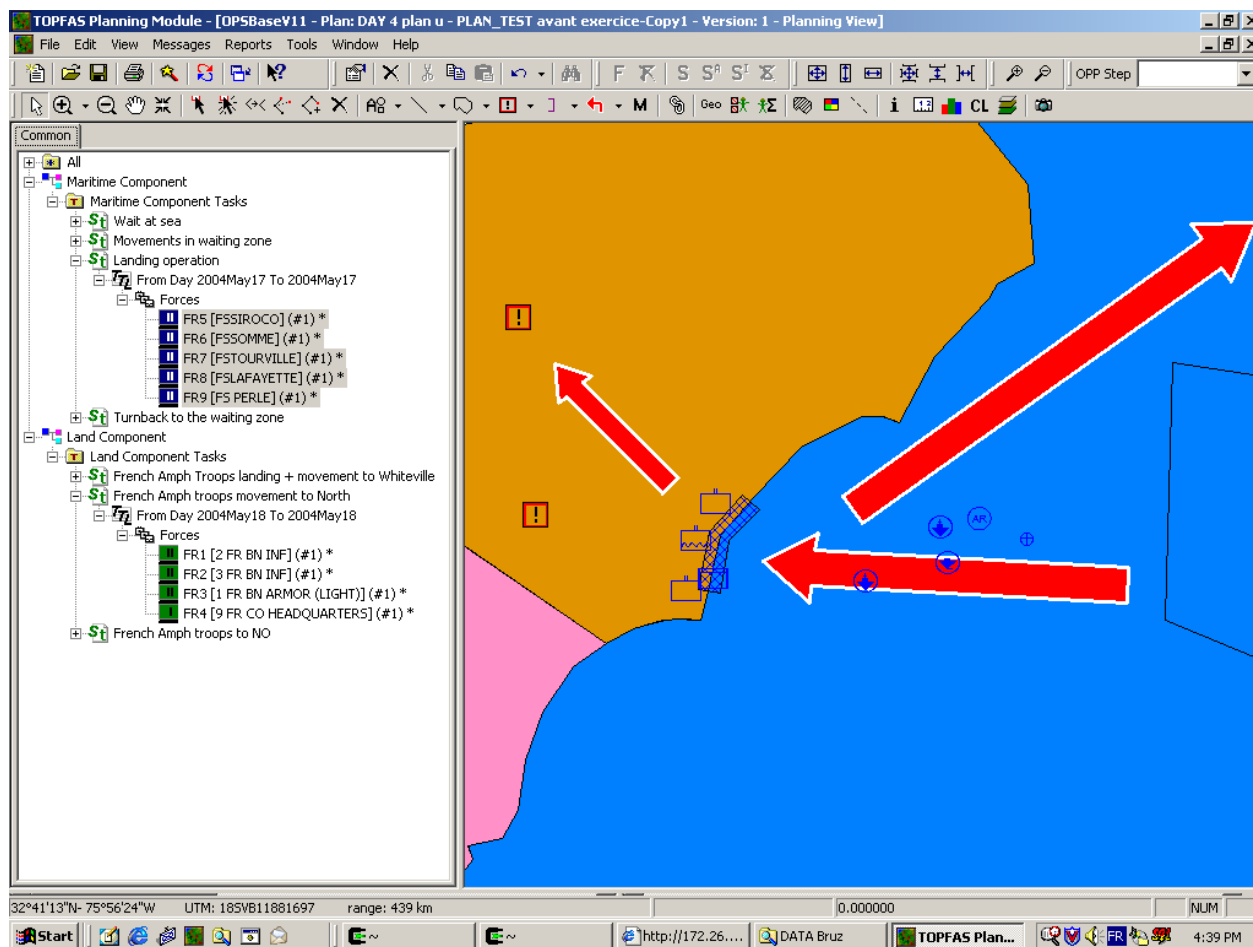


Figure 5: TOPFAS View of the FR Plan Day 4.

The COMPAS contribution consisted in daily publishing on the web the plan of the French maritime and land movements, for the current end subsequent days. COMPAS was also subscribing to the operational situation provided by the NATO LCC & MCC. Some test trials have been performed with GE, IT, NO, RO, TU, US.

The COMPAS demonstrator firstly replicated the TOPFAS information view, and secondly the operational situations provided by the MCC was superposed. Green dot lines show the difference between FR planned and real positions. Red lines show last movements of ships. Information about the other ships of the coalition is also displayed on the picture. The TOPFAS overlays (Mainly arrows here) are displayed to assess the synchronisation of current operations with previous plans (see figure 6).

In this COP the user can filter any information (here the land units are not displayed). Filtering capability includes units and tasks, as well as overlays (Arrows, Border, Area of Responsibility, etc).

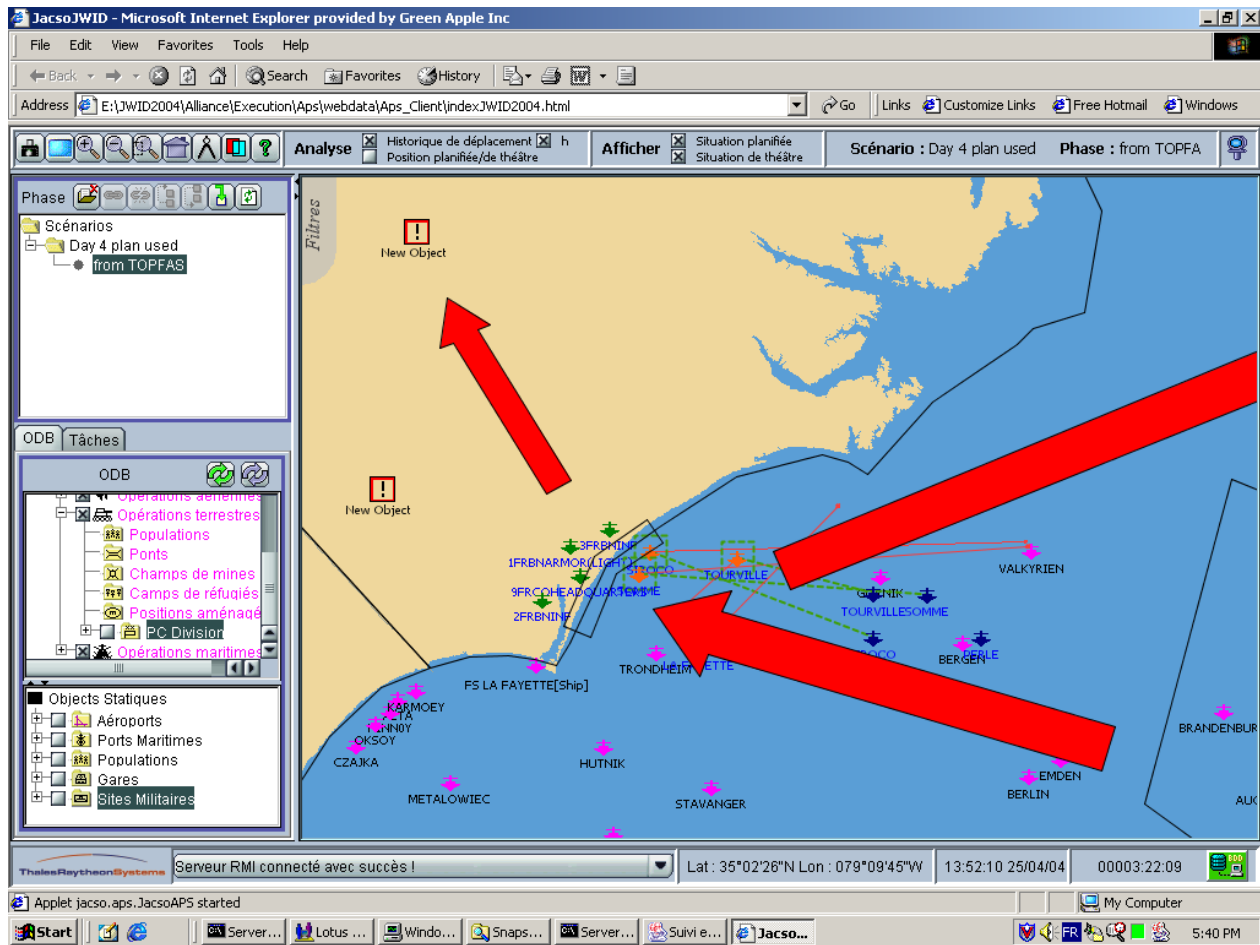


Figure 6: Comparison of Planned and Real Situation of Day 3.

The capability to display the movement of units was particularly useful for the land threats units on the border (see figure 7).

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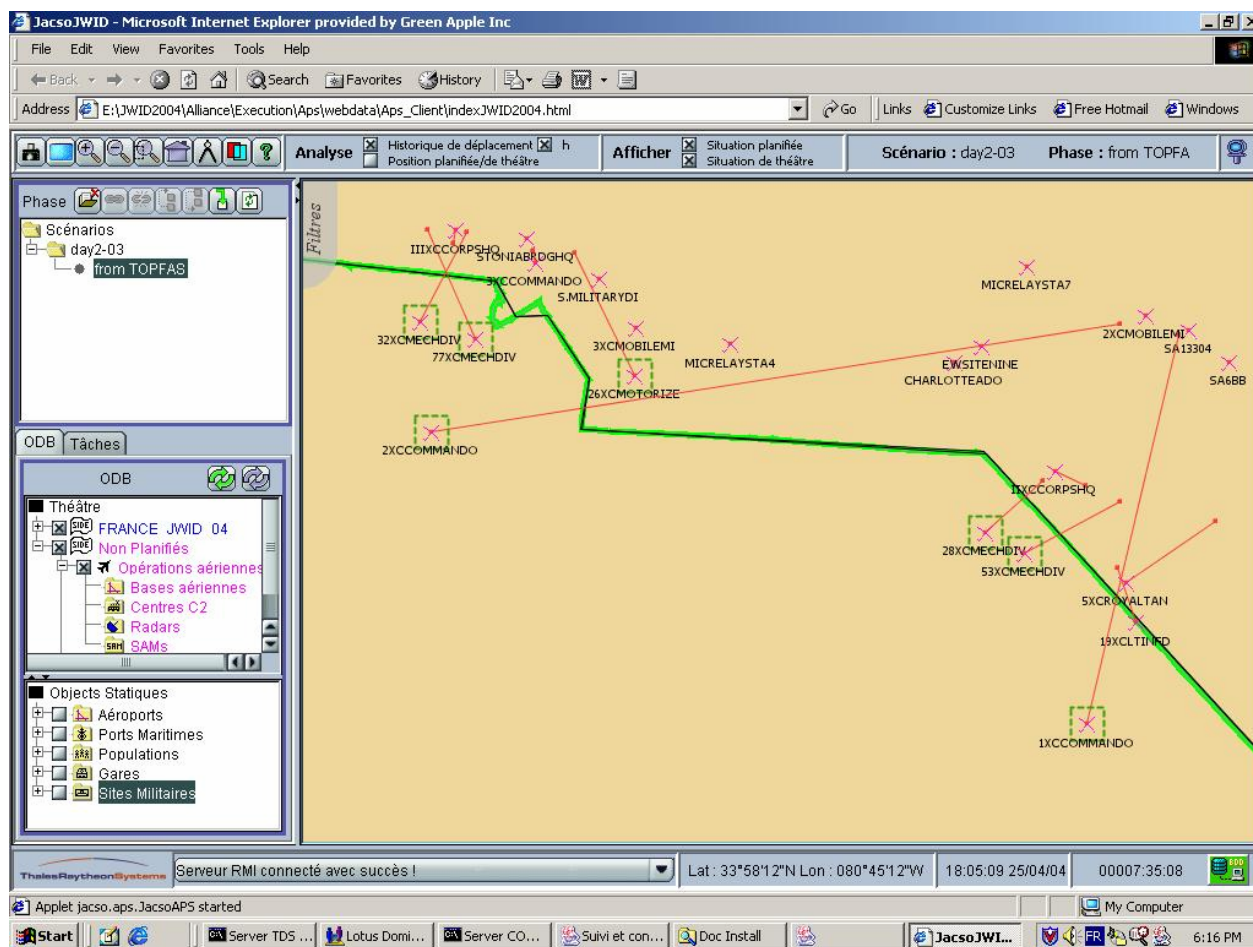


Figure 7: Movement of Threat Units on the Border.

3.0 LESSONS LEARNED

The interface between TOPFAS and COMPAS databases is the first step toward an integrated visualization environment where commander and staff have the capability to control the operation issues, by anticipation of the battlefield events and their consequences.

The positive points learned were:

- the feasibility to import the order of battle, the task planning, the task allocation to unit and CoA overlays associated to each task.
- the feasibility of a mapping between the real order of battle and the ALLIANCE Order of Battle for further use of simulation.

The negative point learned was that the information associated to the task by TOPFAS was not sufficient to generate automatically a scenario. Moreover, TOPFAS does not associate indication of performance to the tasks. Those indications could be used to assess an operational situation. So we can only visually compare the actual situation versus the previous or planned situation.

The COMPAS database interface with a real situation was a success, in spite of the lack of information provided by the LCC in some fields of the ENYSITREP AdatP3 messages concerning the role of units. A further enhancement of this COP concept could be using history of movements to identify units. For simulation use, the position provided by the real situation could be used, but some assumptions on the unit status (ammunition, fuel, operational status, current mission, etc) should be made in order to compensate for the lack of information.

Filtering capability was very useful as the COP contained more than one thousand of tracks, especially when we wanted to visualize history of movements. Current filters are managed by order of Battle and by tasks.

After discussions with visitors, the possible uses of this tool with these first capabilities (and limitations) could be:

- Assess the assumptions provided by the Intelligence JHQ cell about the enemy Course of Action, by visual comparison of the overlays with the enemy positions and historic of movements.
- Evaluate trainees in exercises on the ability to conduct planned operations.

4.0 RECOMMENDATIONS

The limitation encountered with the lack of indicators to assess a task is clearly a general limitation observed on all COP tool demonstrators. These indicators should be developed in the planning tool in relation with force reporting capabilities, and using AdatP3 capabilities or future database exchange based on the C2IEDM Data model. Particularly for the Non-Article V operations, current situation report messages are unable to provide a comprehensive COP. A way should be first to associate an useful report to each task of the NATO task list and secondly to design task status symbol for the COP to alert the JHQ cells.

Operational level planning tools are not designed to describe individual missions (relevant of tactical level planning tools), so an intermediate step is required before simulation. The gap could be filled using either a mission planning or a scenario preparation tool. For the scenario preparation tool, the overlays generated by TOPFAS could be used on the picture map to help the user to input the mission data.

The ultimate COP should provide an unified multilevel Picture for the Initial, Reference and Prospective picture described in Chapter 1 as required in the reference documents [1, 2]. Particularly in the context of Intelligence Surveillance Target Acquisition & Reconnaissance (ISTAR) an advanced real time tracking system should support history of threat units movement and identification.

5.0 BIBLIOGRAPHY

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