2006 CCRTS

The State of the Art and the State of the Practice

Dynamic Decision Support for Time Critical Targeting

Topics: Cognitive Domain Issues, Experimentation, Architecture

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Abstract

Tactical air command and control systems must consider a multitude of environmental and operational conditions when reassigning assets, which often results in a lengthy decision process. This paper presents a suite of tools that are intended to compress the kill-chain by providing support for the planning and reassignment of tactical air strike assets. These tools provide a collaborative planning environment, enhance situational awareness, assess risk, and provide options for dealing with changes in the battle-space environment. Each tool is described and a simple scenario is provided to demonstrate the usage of the tools.

1. Introduction and Background

In today's complex and dynamic battlefield environment, air strike planning represents a complicated and time consuming process. According to [1, 2], the time required to plan one-time contingency strike operations usually takes between 8 and 10 hours. Strike force planning essentially consists of assigning a collection of strike force assets to a set of targets and providing support for those assets. An air strike package typically consists of attack aircraft, fighter support, suppression of enemy air defense (SEAD), and C^2 elements. In addition to strikes against specific targets, armed reconnaissance and other patrolling missions are planned and armed with weaponry that is effective against an array of target types.

Because the battle-space environment is subject to rapid change, reassigning assets is often necessary to maintain tactical objectives. Such environmental change includes change in Meteorological and Oceanographic (METOC) conditions, pop-up threats, changes in location or priority of dynamic targets, and the introduction of time sensitive targets (TSTs) or time critical targets (TCTs). A TST is defined by [3] as a target "requiring immediate response because [it] poses (or will soon pose) a danger, or [is a] highly lucrative, fleeting target of opportunity." A TCT is a "time sensitive target with an extremely limited time window of vulnerability, the attack of which is critical to ensure the successful execution of the Join Task Force operations." A dynamic target is defined as being of significant importance but can be prosecuted at any time within a given day. In anticipation of TSTs and TCTs, combat operation planners often incorporate excess capacity of assets into the mission set. While this introduces flexibility into the plan and may decrease required response time, it is very inefficient and becomes infeasible as the frequency of environmental changes increases. When excess capacity is not abundant, the number of factors and the amount of information that must be considered when re-tasking is immense. This complexity is compounded as the problem size increases, resulting in the decision maker being left to choose from an overwhelming number of possible solutions (even for moderately sized problems) [4].

References [1, 2] present analysis of time critical strike operations and identify several broad areas for improvement. From participation in Carrier Airwing Training cycles and from gap analysis with Naval and Marine personnel who manned the targeting cell during Iraqi Freedom the need for the following key enabling capabilities have been derived:

- a common view into the targeting process for each target, including all relevant information for its prosecution in easily understandable form
- tools to reason about applicable laws of armed conflict
- process monitoring and status indication, including who is working which subtask
- an architecture that supports scalable deployment, collaboration, and incremental addition of services that embody enhanced or new support capabilities
- Accurate data dissemination to maintain command and control across all echelons
- Predictive analysis to develop high probability search spaces
- Deconfliction management

This paper describes a system, designed to improve current time critical strike operations by meeting these needs, and extends the work presented in [5, 6]. The next section gives a broad overview of the Real-time Execution Decision Support (REDS) Information Management and Decision Support suite. Section 3 discusses the individual applications that comprise REDS. Section 4 presents a simple example which illustrates the use of REDS in tactical operations. Finally, section 5 contains our conclusions and plans for future work.

2. System Overview

The REDS suite provides enhancement of the current strike planning and retargeting process; it takes advantage of the parallel nature of the mission planning and targeting cycle by providing distributed network-centric tools and processes. The applications that make up REDS provide an infrastructure specifically designed to enable response to TSTs and TCTs in real-time. A brief overview of the enhanced work-flow for one level of decision maker using REDS is illustrated as follows. An ATO is passed to each of the task unit commanders. Task unit commanders select strike leaders and distributed planning commences. As missions are flown, information is processed in real-time via the Information Management and Decision Support applications. When a time sensitive issue is encountered, the integrated environment sends specific and applicable information to the decision-maker for course of action development and forwards decision data to the platforms that will execute the new mission(s). Temporal milestones are managed and displayed to ensure compliance with the situational constraints. When changes occur, decision support applications are used to reassign assets based on current battlefield information.

Overall, the pace at which mission planning for high tempo operations takes place can be improved via the proposed distributed planning/re-planning infrastructure. Reds is built upon an enterprise architecture that is enhanced by decision support applications that improve the speed and quality of the information it seeks to provide thereby reducing the usual mission planning timeframe by a factor of four to five times. These decision support aids facilitate rapid retargeting, that utilizes available strike force assets, within minutes of a risk assessment trigger or insertion of a target.

These new decision support technologies are intended to provide the following specific functionality:

- Distributed and collaborative planning environment
- Blue force entity state correlation between real-time and existing planned information
- Red/White force entity state verification with existing information
- Collaboration support through the use of profiles which can be published and shared through the enterprise
- Notification to watch-stander of all entities of interest to them as they enter and exit the Common Operational and Tactical Picture (COTP)

- Merging of legacy database information with real-time entity state information
- Evaluation of target entities based on priority, state, and Rules of Engagement (ROE) requirements
- Assignment of strike aircraft or packages to newly introduced targets and/or threats
- Continuous evaluation of current strike package capability to achieve mission success
- A continuous determination of the risk to each blue force entity in the COTP
- Re-evaluation of risk based on a new assignment
- Evaluation of risk mitigation levels based on SEAD allocation for a reassigned strike package, or as necessary, when assets have been disabled or otherwise compromised
- Meteorological and Oceanographic (METOC) data analysis

Major benefits of the REDS system include:

- One-of-a-kind situational assessment capability that reduces operator fatigue and provides multiple decision-makers with continuous, easily assimilated information to support operational requirements.
- Risk analysis that provides a unique threat validation and assessment capability to continuously compare and monitor Blue force assets. Through the validation engine, users are able to adjust to emerging situations before problems arise.
- Decision support that facilitates optimal weapon-target pairing of available, in-theatre assets. This re-planning decision aid expedites the re-planning process to dynamically allocate available strike assets based on the changing battle-space.
- Retrieval and fusing of operational and tactical battle-space information through distributed real-time and near real-time sources.

3. Time Critical Targeting Support Applications

The REDS decision support suite contains a set of tools that interact to provide the objectives discussed earlier. The Element Level Planner (ELP) provides an interactive, distributed collaboration environment for detailed planning and re-planning. Mission Monitor (MM) provides support for mission management and real-time information awareness. The Sensor Intelligence ROE Environment Net (SIREN) provides the user with heightened situation awareness. Risk Assessment and Validation Engine (RAVE) offers planned and real-time risk assessment to blue force platforms. Finally, Rapid Asset Pairing Tool (RAPT) presents the decision maker with multiple options for responding to changes in the battlefield environment. With this state-of-the-art suite of tools, mission repair, re-planning, and retargeting of in-theater assets can be achieved in near real-time.

3.1. Element Level Planner

The ELP is a strike planning software application predicated upon the Naval Strike Air Warfare Center (NSAWC) Strike Planner's Checklist and Naval Warfare Publications (NWPs). It offers an automated, knowledge-based implementation (through the process of evaluating the Strike plan during development) of the Strike Planner's Checklist. It provides greater efficiency and flexibility for strike mission planning. In addition, the ELP provides real-time dissemination of Strike data for collaborative planning and allocation of available strike assets based on the changing battle-space and occurrence of high-priority targets. The ELP is a Unique Planning Element (UPC) of the Joint Mission Planning System (JMPS) Framework.

3.2. Mission Monitor

The MM is another UPC of the JMPS Framework. It is a real-time execution monitoring application to display tasking, planning, and status information pertaining to strike operations. It also provides decision makers a method to collaborate, develop schedules, and task aircrew.

3.3. Sensor Intelligence ROE Environment Net

SIREN is a real-time situational monitoring and analysis software application predicated on receipt of correlated track data provided from existing track management systems. It is also designed to receive Intelligence information from airborne and ground sensors when available. It offers an automated, knowledge-based analysis capability through processes that evaluate track status, assess weather, incorporate Risk assessment, and develop trends on emitters. SIREN also combines Characteristics and Performance (C&P) and planned mission information with real-time track data for each identified entity in the COTP. Automated ROE and Collateral Damage Tier assessment are currently under development. SIREN provides a continuous impetus to alert watch-standers to changes in the environment and a profiling capability that allows the user to define their view of the COTP. Profiles are shared within the enterprise so that all SIREN clients can view them and collaborate. In addition, SIREN provides real-time dissemination of data for RAVE and RAPT to perform risk assessment and allocation of available strike assets based on changing battle-space information and occurrences of high-priority targets.

3.4. Risk Assessment and Validation Engine (RAVE)

RAVE is a real-time risk assessment and analysis software application. It Determines risk to blue entities in the COTP through validation of threat capability based on situational and a priori information that is provided from RCS templates and C&P data. It provides a quantified numerical value derived from threat Kill Chain Analysis and considers deconfliction as well as actual and predicted platform and threat state. It provides a risk-based trigger function to RAPT. RAVE uses the initial threat lay-down in the Enemy Order of Battle (EnOB) as a starting point and maintains knowledge of updates via SIREN. It provides a continuous impetus through SIREN to alert watch-standers to changes in risk. The profiling capability of SIREN allows users to define thresholds of acceptable risk for blue force entities of interest to them and to be warned when the risk to any of these entities exceeds the thresholds.

3.5. Rapid Asset Pairing Tool

RAPT is a real-time asset analysis and allocation software application. It dynamically reassigns assets to accommodate changes in the environment including the introduction of TSTs and TCTs. During the allocation process RAPT considers current asset status, platform and weapon C&P data, probability of mission success, risk, temporal and spatial constraints, launch acceptability regions (LAR), fuel constraints, mission integrity, and disruption to the existing air-plan or ATO. It generates multiple options which include assignments from attack assets to targets as well as simple SEAD support for those assets. Rapt accepts user input on the importance of the various factors considered, acceptable risk and distance thresholds, and time windows for bounding temporally constrained targets. The time to decide and times on targets are incorporated to manage the unique targeting constraints imposed by the particular situation. Decision times are based on existing planned mission push times, threat response times, and whether the new target can be prosecuted within the given air-plan timeframe. RAPT employs evolutionary search methods to maximize the quality of the resulting options and the efficiency of the tool.

4. Test Scenario

Several scenarios have been developed for testing the REDS system. This section walks through one such scenario to show results and the use of the various applications that make up REDS. This scenario was made very simple for the sake of brevity and clarity.

The scenario begins when the ATO is received by the Carrier Air Group (CAG) Commander. Using the tool shown in Figure 1 that resides within the Mission Monitor, the CAG Staff breaks down the portions of the ATO that are their responsibility and assigns these to strike teams with appointed leads. Team assignments are automatically disseminated via the collaborative architecture. It should be noted that this process would normally occur during execution of the previous day's operations.

When the strike leads receive their assignments, they parse the ATO into ELP and planning commences. Figure 2 shows the ELP as it resides in JMPS. Each folder within the "Element Level Planner" folder represents one of the items on the Strike Planner's Checklist. As planners proceed through their list of tasks, the element level details of the plan are filled in, routes are created, and briefs are generated. A whiteboard, as shown in Figure 3, is provided to support collaboration among team members. Note that this whiteboard can hold images as well as text.

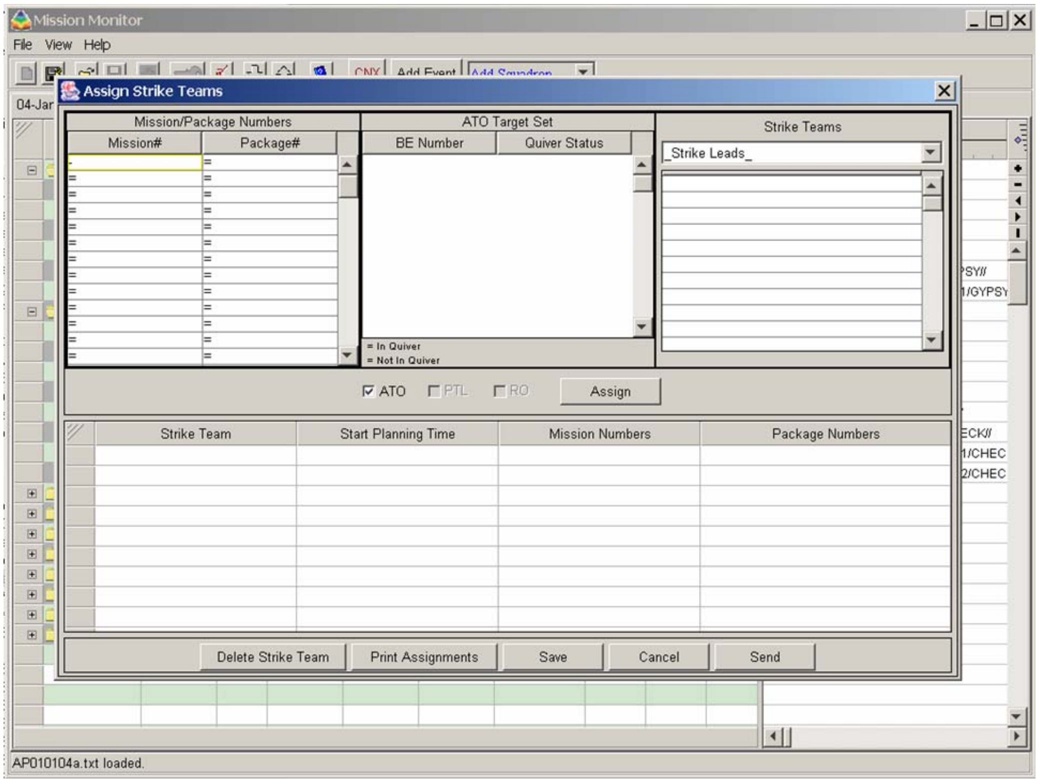

Figure 1. Strike team assignment tool within Mission Monitor

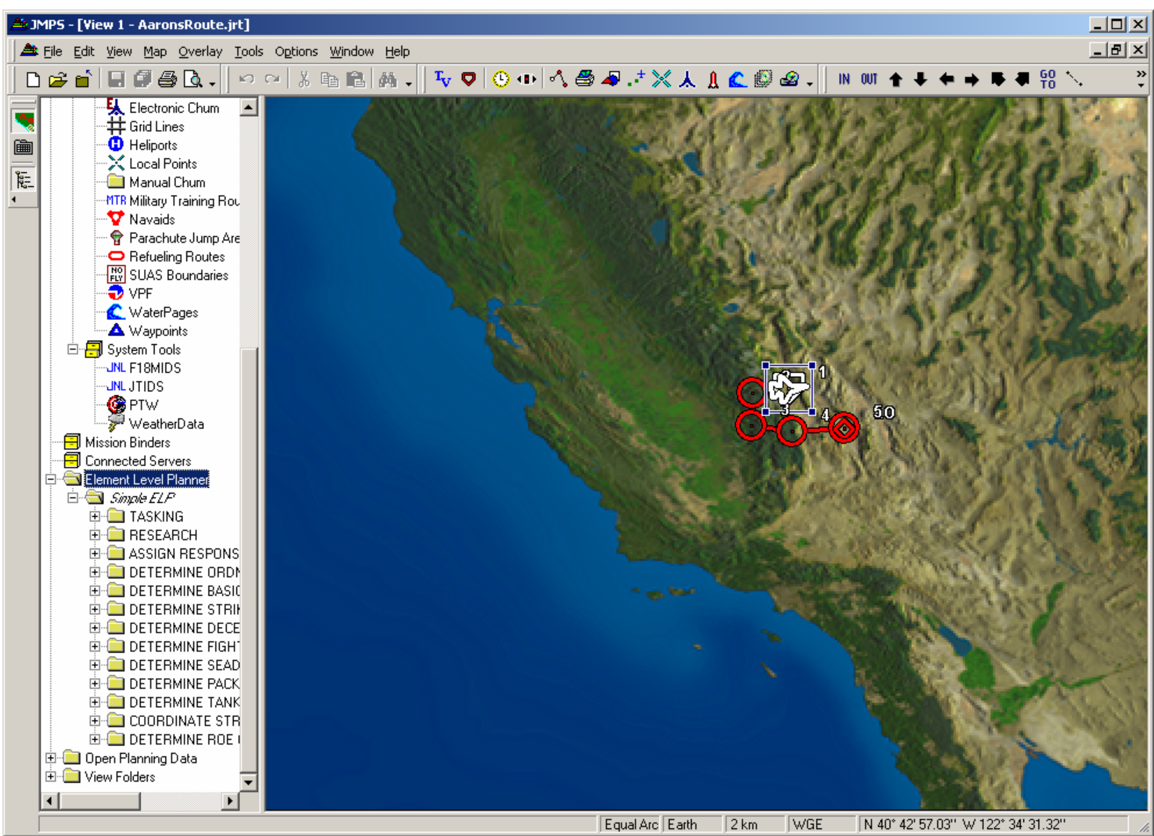

Figure 2. The ELP residing in JMPS

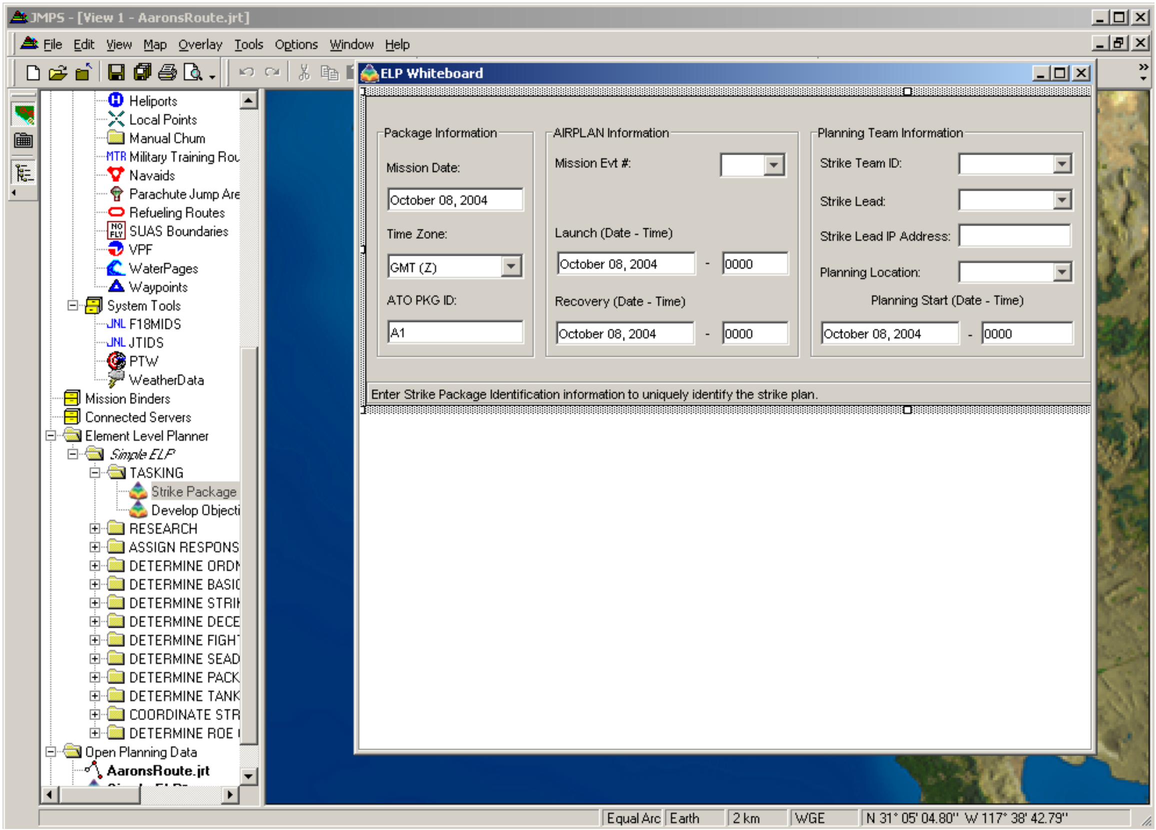

Figure 3. ELP Whiteboard

The output from the ELP is a set of detailed mission plans described as follows: Mission 1 is assigned to target A and target B with two weapons of type WPN1 allocated for each. Mission 2 is assigned to target C and target D with one weapon of type WPN2 allocated for each. Mission 3 is a SEAD mission with one asset of type ASSET1 and one of type ASSET2 both of which are assigned to threat α. All available weapons and SEAD assets are assigned. Note that each platform is carrying only one weapon or asset each. This plan is depicted graphically in Figure 4.

Before mission execution begins, the watch officers use SIREN to create personal profiles. The profile editor is shown in Figure 5. Each officer sets up filters on the COTP based on area of interest (AOI), track data source, entity category, threat type, and condition. Various threshold values are established, and a User Target List (UTL) is specified. The UTL consists of entities that the user considers potential targets. The UTL can contain broad entity types or specific located entities. The targets on the UTL can be inserted automatically from the Joint Integrated Prioritized Target List (JIPTL) or entered directly.

As execution of the mission plans commences, the watch officers and CAG watch the progress and status of the missions using mission monitor. The mission monitor is shown in Figure 6 as it would appear immediately after the three missions have launched.

The left portion of the display shows the details of each mission, while the right portion depicts a timeline detailing mission progress. The bars of the timeline are shown in green if temporal milestones are met, and are red otherwise until back on schedule.

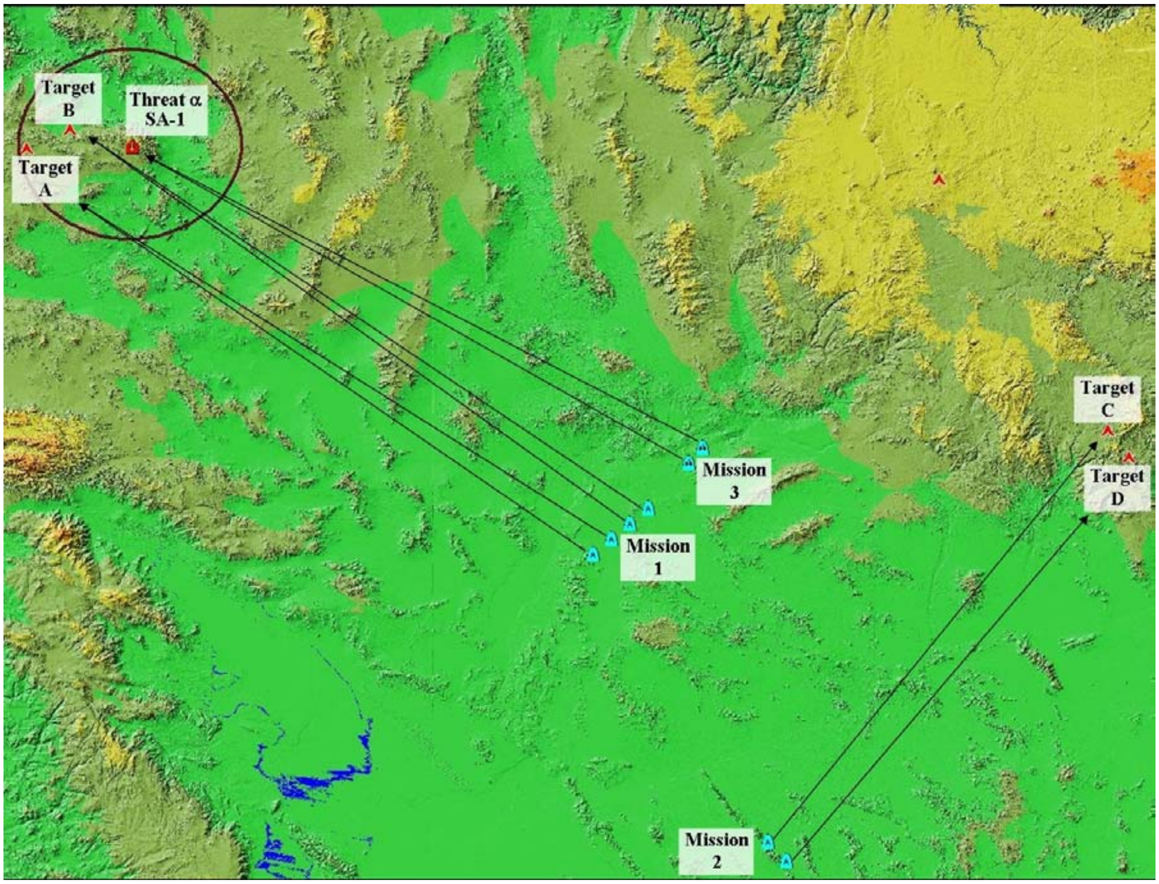

Figure 4. Shows the mission plan created by the strike teams

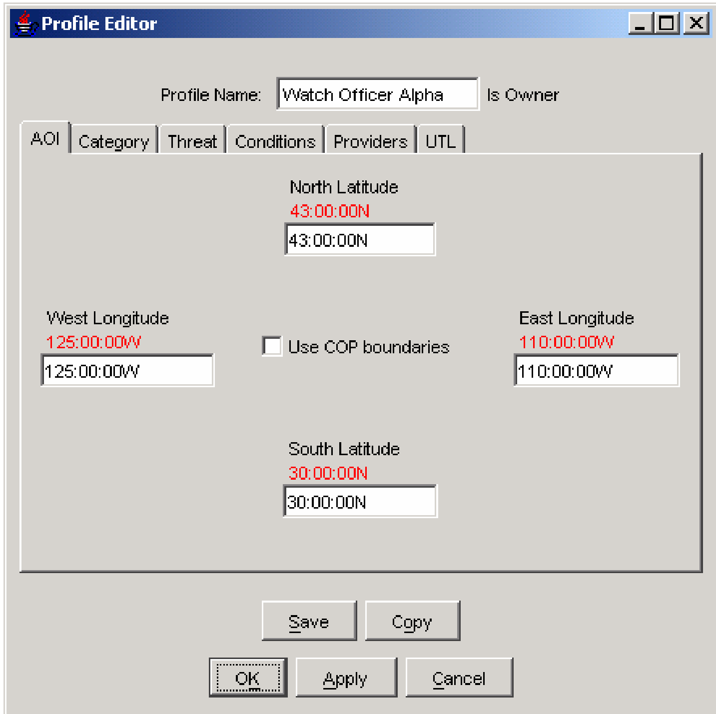

Figure 5. Profile editor

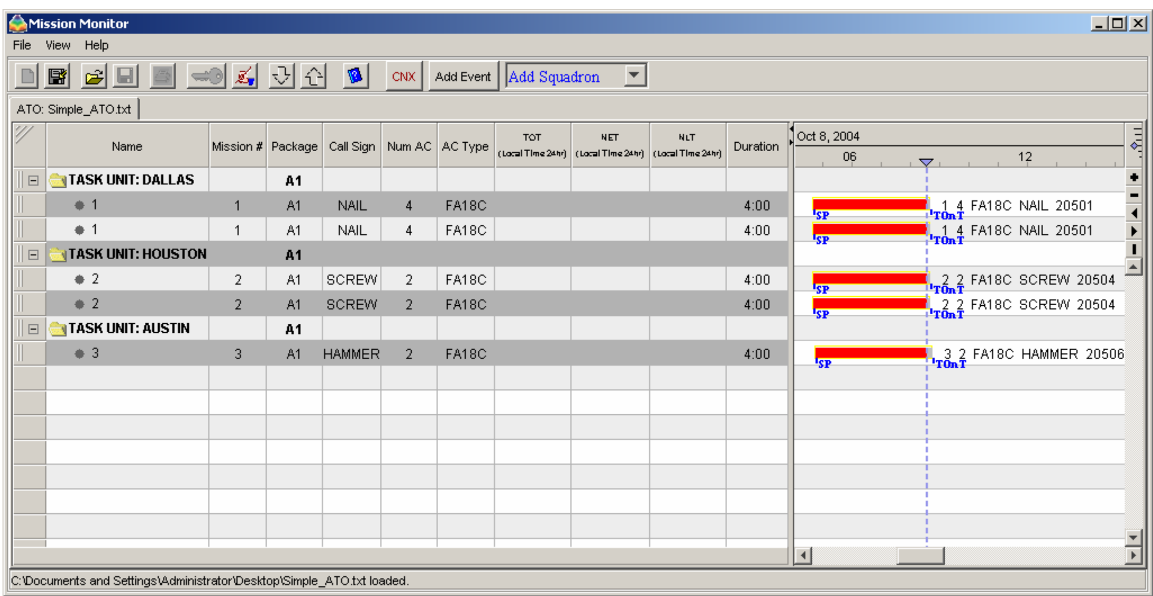

Figure 6. Main screen of mission monitor

The watch officers also monitor a map of the COTP showing locations of the entities it contains, and the RAVE display for blue force risk levels. The basic RAVE display is shown in Figure 7. Total risk to each blue force entity is shown as well as the risk to each entity from each known threat (ordered in descending order of risk imposed). The risk threshold values setup in an officer's profile are shown as yellow and red lines, and risk levels are displayed as green for acceptable risk, yellow for moderate risk, and red for excessive risk. This color coding is intended to bring high risk situations to the immediate attention of the user.

Shortly after the missions have launched, a TCT is discovered in the COTP as shown in Figure 8. Any watch officer who has included the target or target type on their UTL will get an immediate alert warning them of the situation. One of the officers does get the alert, looks at the map, determines that it is a rather simple situation, and decides not to use RAPT. The watch officer then uses the automated METOC analysis tool in SIREN to assess the weather near the TCT and pulls up SIREN's data card service to assess the real-time status and planned information for each of the missions. The main screen of the METOC tool is shown in Figure 9 and the data card service is shown in Figure 10 and Figure 11. The officer can see from these displays that the platforms in Mission 2 have sufficient fuel to make it to the TCT and out to the tanker, are carrying load-outs that will be effective against the TCT, and are assigned to the lowest priority targets planned. Therefore the officer chooses to reassign Mission 2 to the TCT, and informs the planners of what was decided. The planners then use ELP to quickly reassign Mission 2, and the architecture automatically sends the new plan complete with all needed auxiliary information directly to the platforms flying Mission 2.

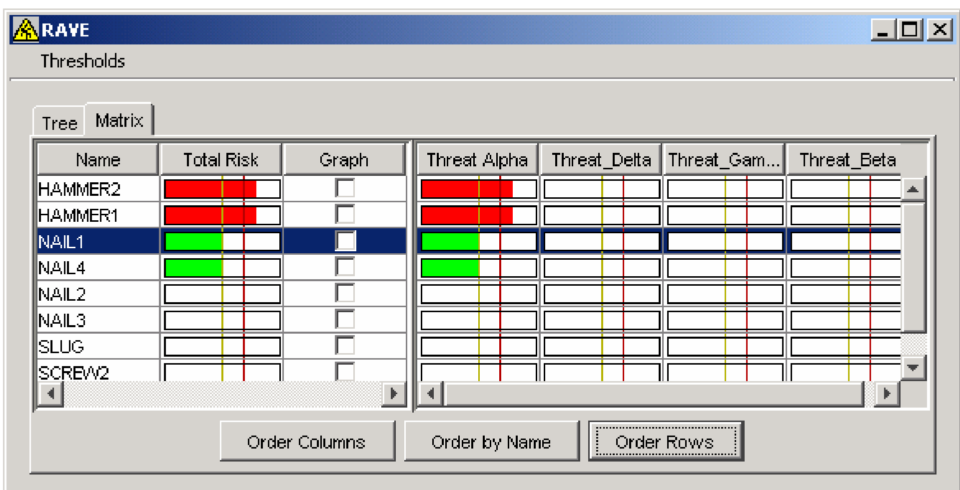

Figure 7: Basic RAVE display

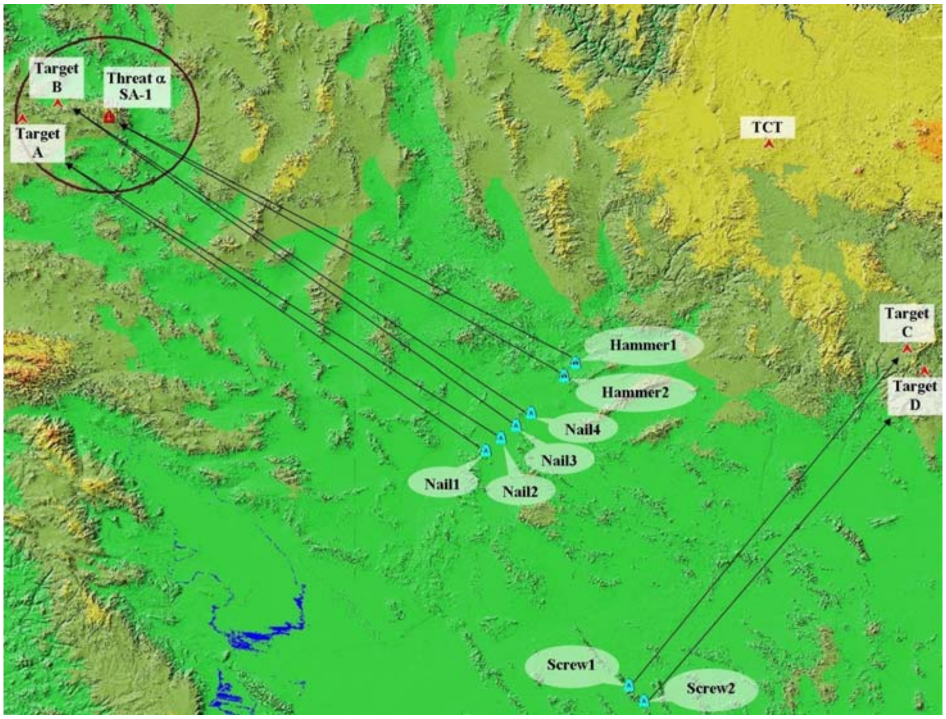

Figure 8. View of scenario with TCT introduced

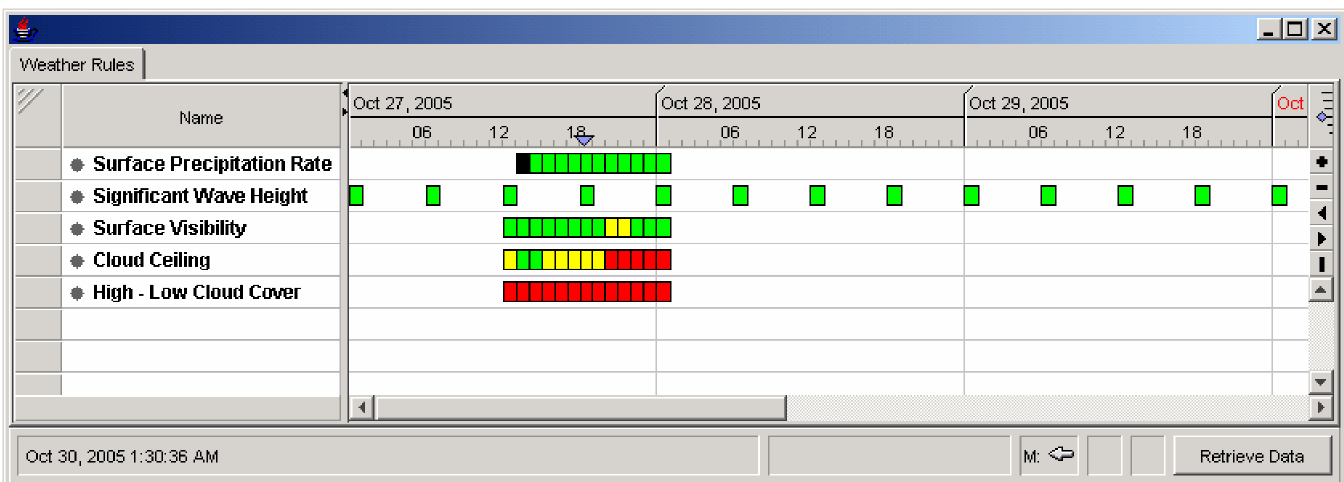

Figure 9: SIREN METOC analysis tool

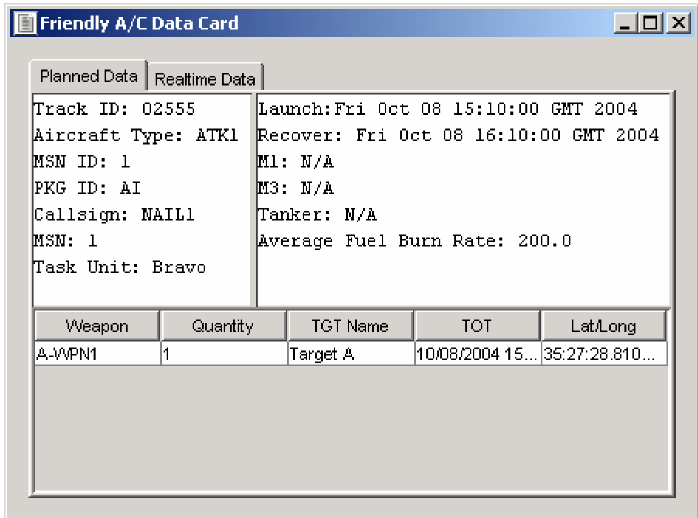

Figure 10. Data card showing planned data

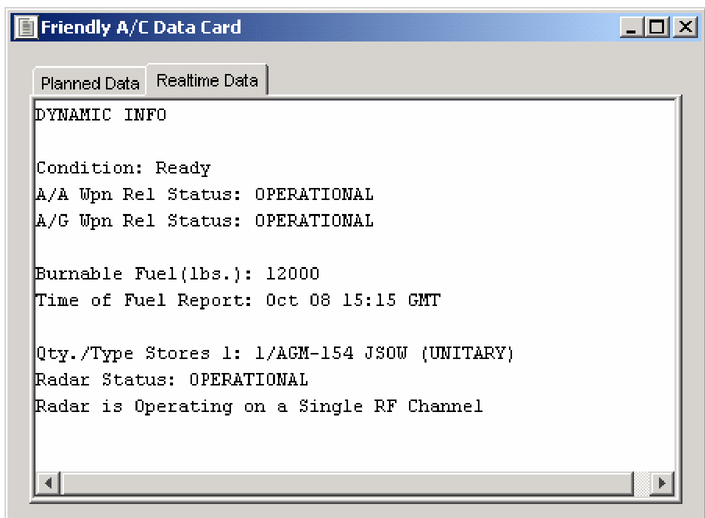

Figure 11. Data card showing real-time status information

A very short time later, a threat is discovered in the proximity of the TCT. RAVE analyzes the risk for the new route of Mission 2 which is now very high. One of the watch officers notices the change and chooses to run RAPT since the situation is now more complicated. After selecting the TCT from the UTL, the officer fills in the appropriate constraints and preferences as shown in Figure 12 and submits the request. RAPT generates several options and presents them to the user as shown in Figure 13. The top of the RAPT display shows various evaluation criteria for the selected option. The value for each criterion is highlighted in stoplight colors to indicate the option's quality. A summary of the option is shown in the center of the screen, and details of the option are shown at the bottom. The watch officer chooses option one and sends it to the planners using the collaboration architecture. The planners fine tune the option in ELP and the plan is automatically sent to the platforms flying missions 1 and 3.

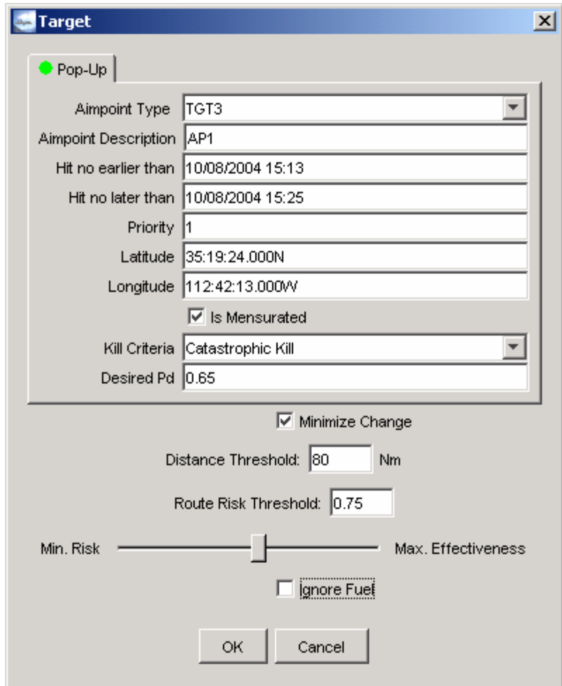

Figure 12: RAPT target submission window

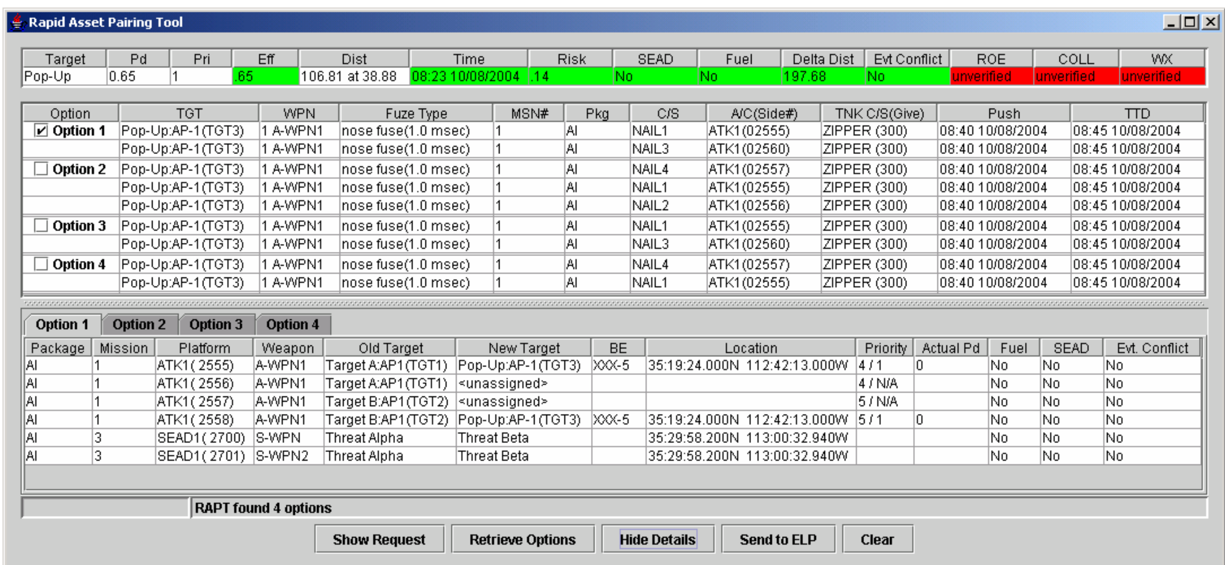

Figure 13: RAPT options display

After the missions have all completed, the intelligence officers perform post analysis which is enhanced using the RAVE graph display and the Gantt chart. The RAVE graph display as shown in Figure 14 displays the planned risk (in blue) and the actual risk (in black) for the mission throughout the flight of its route. The Gantt chart shows when each entity, through the course of the strike operations, came into and left the COTP as depicted in Figure 15. If an entity is undetected for a given period of time, it is considered to have left the COTP. This tool can be very helpful in a posteriori trends analysis.

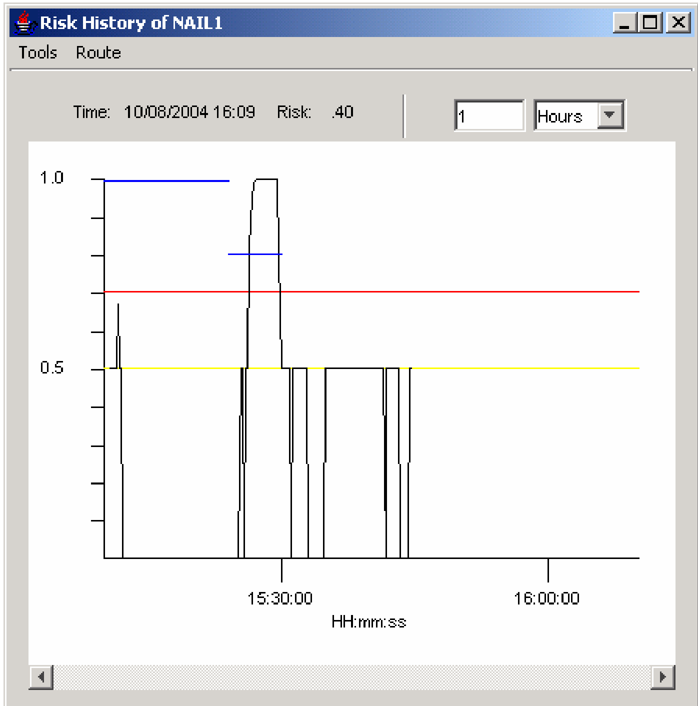

Figure 14: RAVE graph display showing planned and actual risk levels throughout mission execution

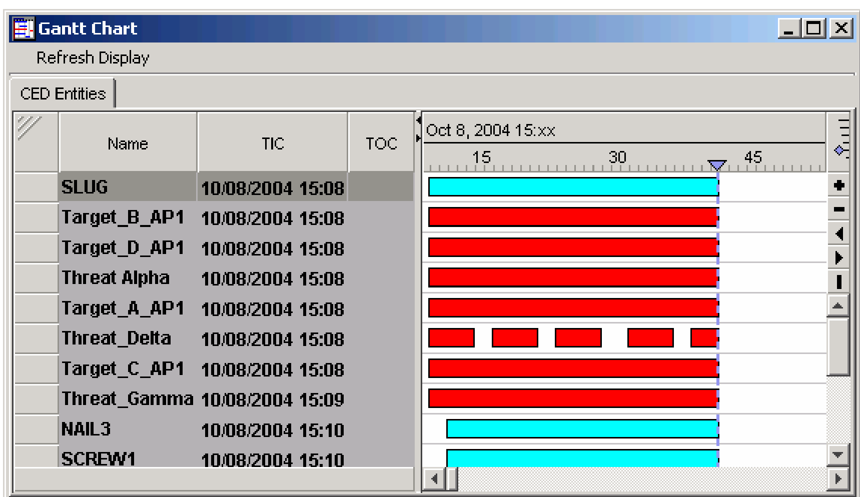

Figure 15: Gantt chart showing Time In COTP (TIC) and Time Out of COTP (TOC)

5. Conclusions and Continuing Work

The REDS information management and decision support suite enhances the current time critical targeting process. It takes advantage of the parallel nature of the current mission planning and targeting cycle by providing distributed network-centric tools and processes. The applications in REDS provide an infrastructure specifically designed to respond in real-time to changes in the battle-space. As situations occur, the integrated environment will support the decision-makers' course of action development and allow decisions to be shared directly with other officers at various echelons and the platforms that will execute new or modified missions. Temporal milestones are managed and displayed to ensure compliance with the situational constraints. The use of the REDS system improves the speed and quality of the information provided and is anticipated to reduce the usual retargeting process by a factor of four to five times.

The REDS suite is currently being evolved with continued research in several areas. Future work includes representing the options returned by RAPT graphically in such a way that the decision maker can assimilate the vast amounts of information provided in an option at a glance. RAPT currently does only simple SEAD assignment. It is currently being enhanced to handle the complex temporal and spatial choreography associated with SEAD support, and to consider all fires. Future work also includes folding predictive modeling, automated ROE analysis and collateral damage estimation into SIREN and RAPT. The METOC assessment tool is currently only a proof of concept prototype and needs to be evolved into a more useful form.

6. References

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REALTIME EXECUTION DECISION SUPPORT (REDS)

REDS

Dynamic Decision Support For Time Critical Targeting

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CCRTS 2006

REALTIME EXECUTION DECISION SUPPORT

SPAWAR
Systems Center
San Diego

Mission Statement Objective: To respond in real time to dynamic targeting situations by providing warfighters a capability to do rapid mission replanning, mission execution, and combat assessment utilizing in-theater assets.

REALTIME EXECUTION DECISION SUPPORT

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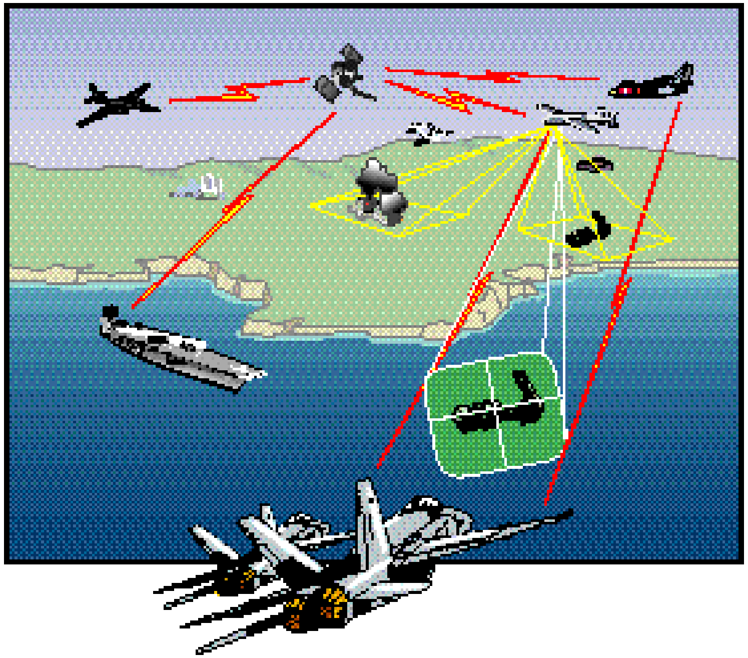

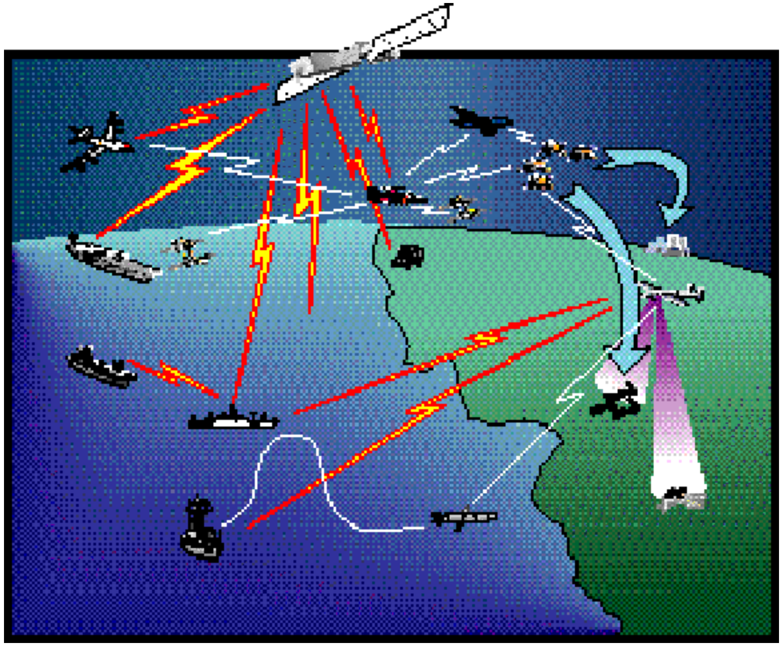

WITHIN STRIKE AREA

(Sanctuary Planned and Defined)

BEYOND STRIKE AREA

(Strike Package Moved well beyond initially planned environment)

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WHAT IS REDS?

Information Management
- Distributed /Collaborative Mission Planning
- Dynamic Targeting/Re-targeting
- Mission Monitoring
- Intelligence Abstracts
- Assignments/Prioritization
- Mission Management

Dynamic Decision Support
- Situation Assessment
- Risk Evaluation
- Monitor COTP
- Weather Assessment
- Dynamic Asset Allocation
- Optimal / Near Optimal Alternatives
- Trends Analysis

ENTERPRISE
REDS

- Fully integrated suite of scalable applications
- Mission Management & Enhanced Situational Awareness
- Tailored Information Dissemination/Sharing/Assurance
- Predictive analysis/deconfliction/multiple weapon target pairing solutions

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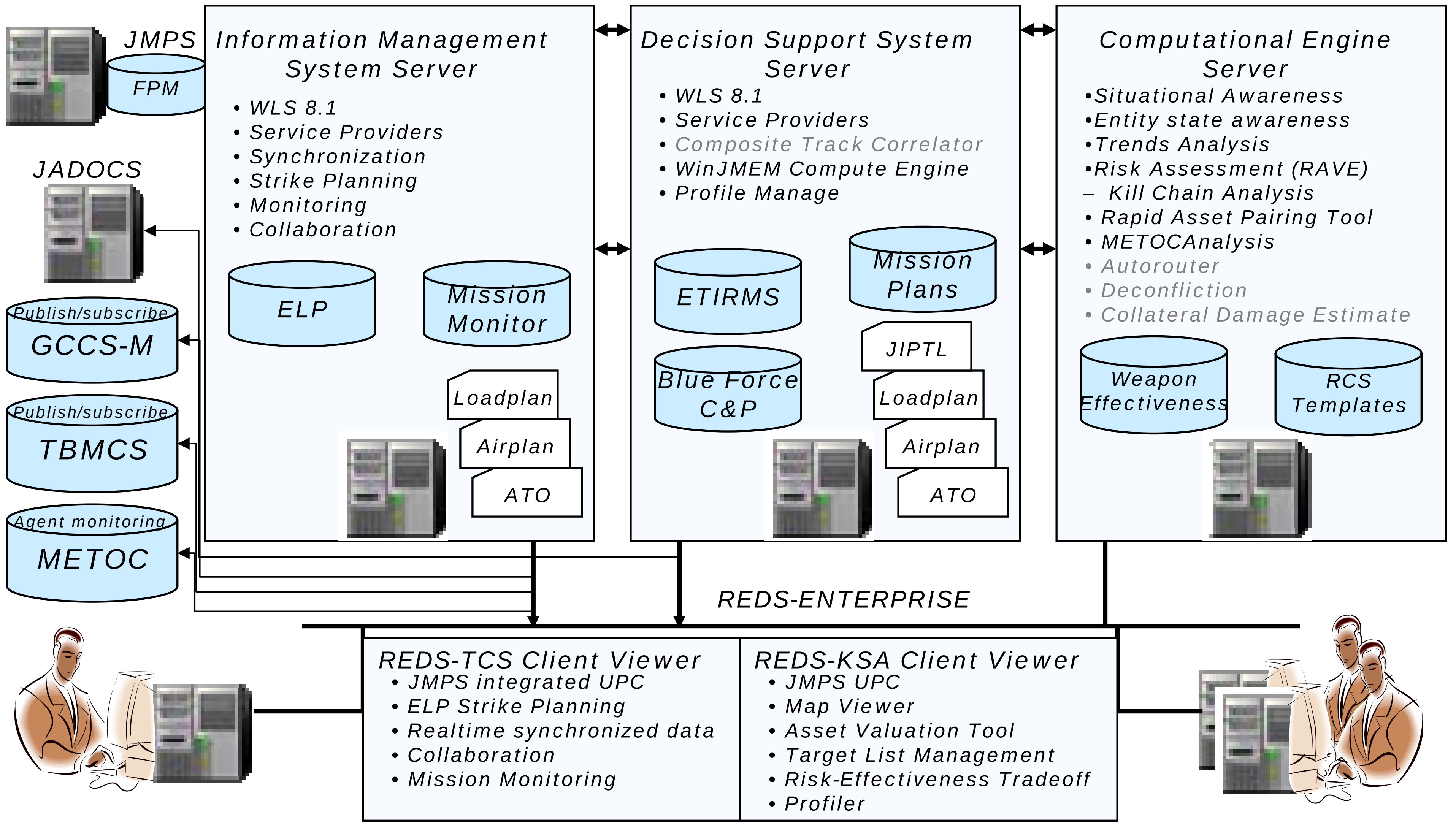

REDS Architecture

REALTIME EXECUTION DECISION SUPPORT

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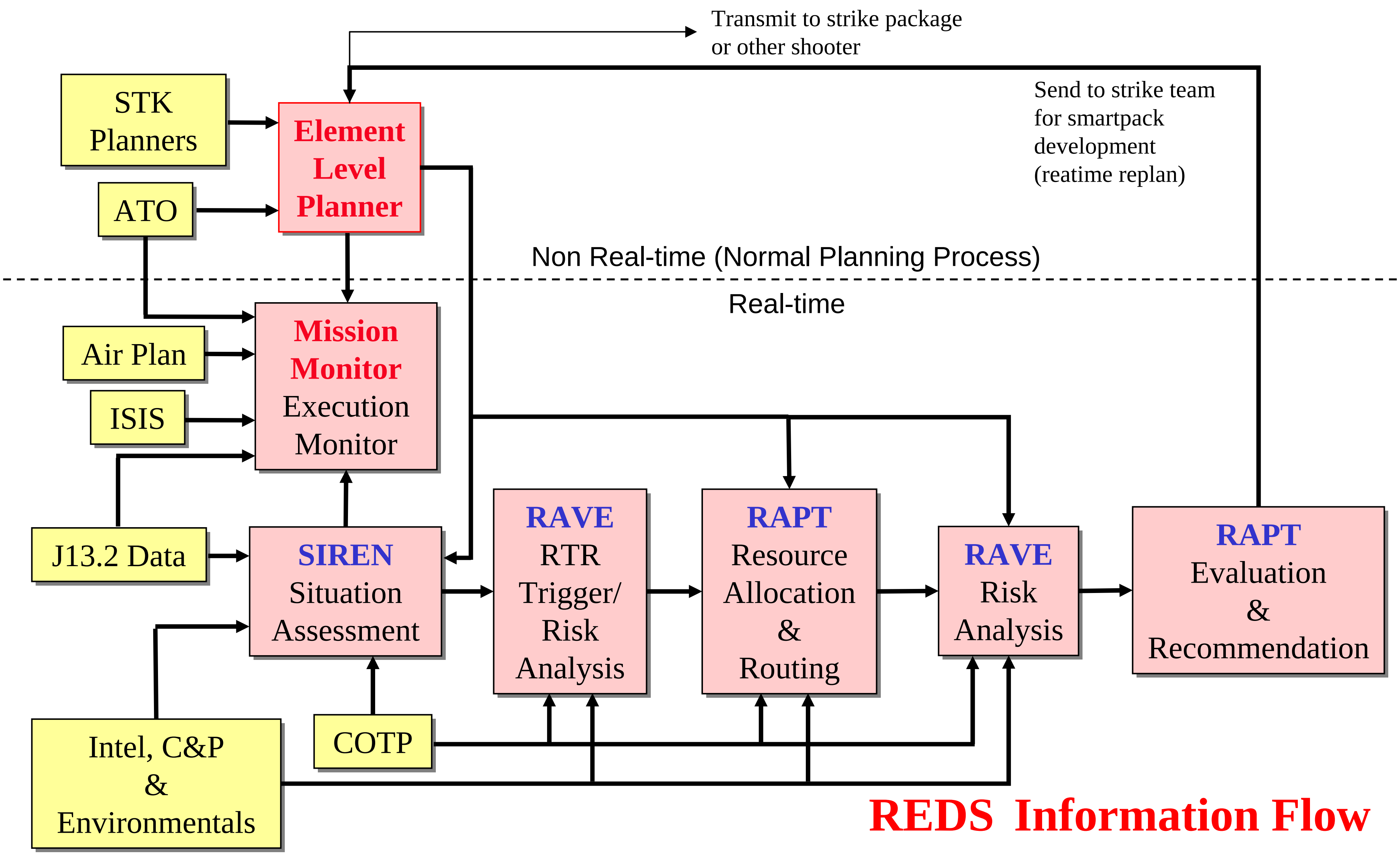

REDS Information Flow

REALTIME EXECUTION DECISION SUPPORT

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- **Element Level Planner (ELP)**
  - Predicated on the Naval Strike Air Warfare Center (NSAWC) Strike Planner's Checklist and Naval Warfare Publications (NWPs).
  - Automated, knowledge-based implementation of the Strike Planner's Checklist.
  - Provides greater efficiency and flexibility for strike mission planning.
  - Provides real-time dissemination of Strike data for collaborative planning and replanning.
  - Implemented as a Unique Planning Component (UPC) of the Joint Mission Planing System (JMPS) Framework.

REALTIME EXECUTION DECISION SUPPORT

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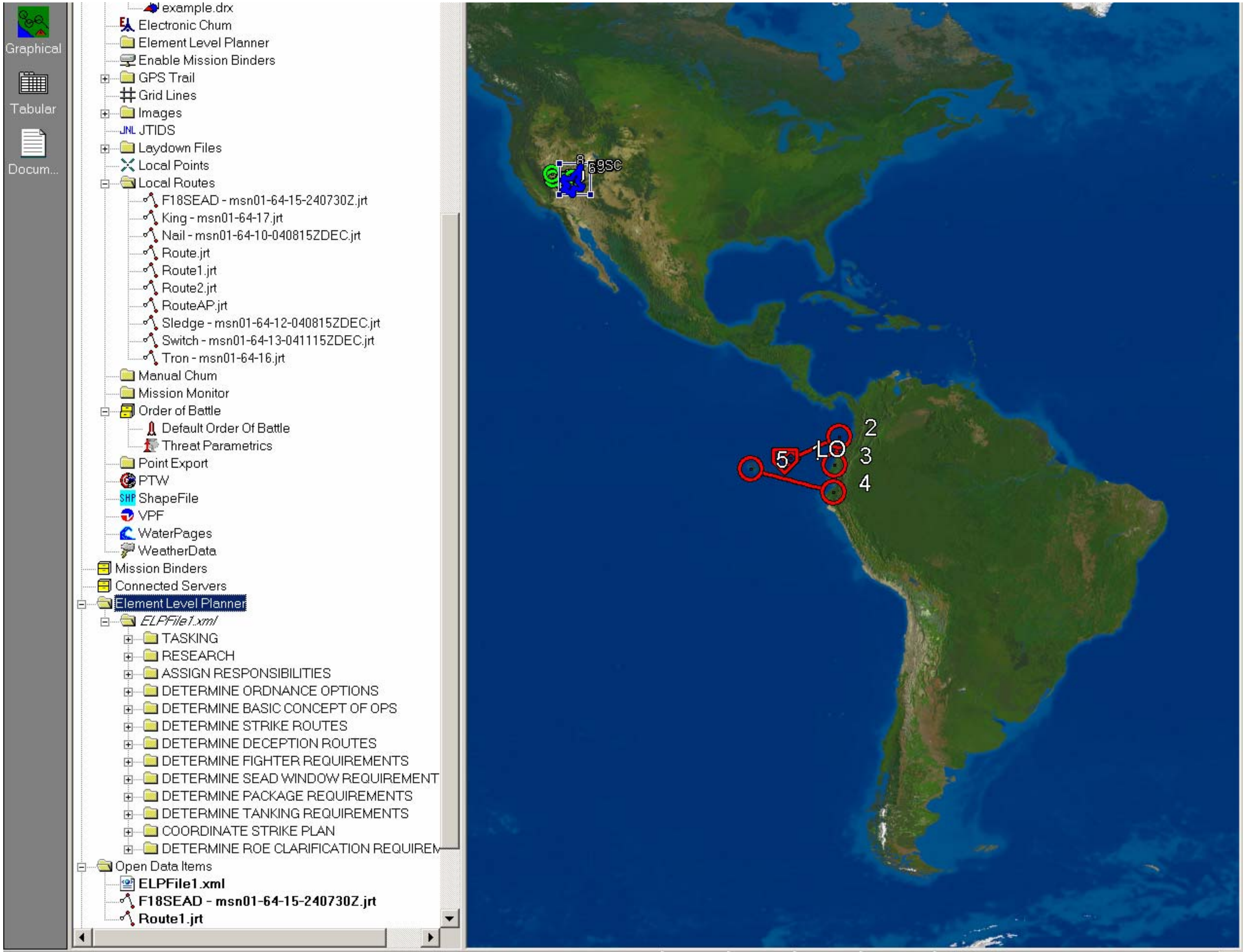

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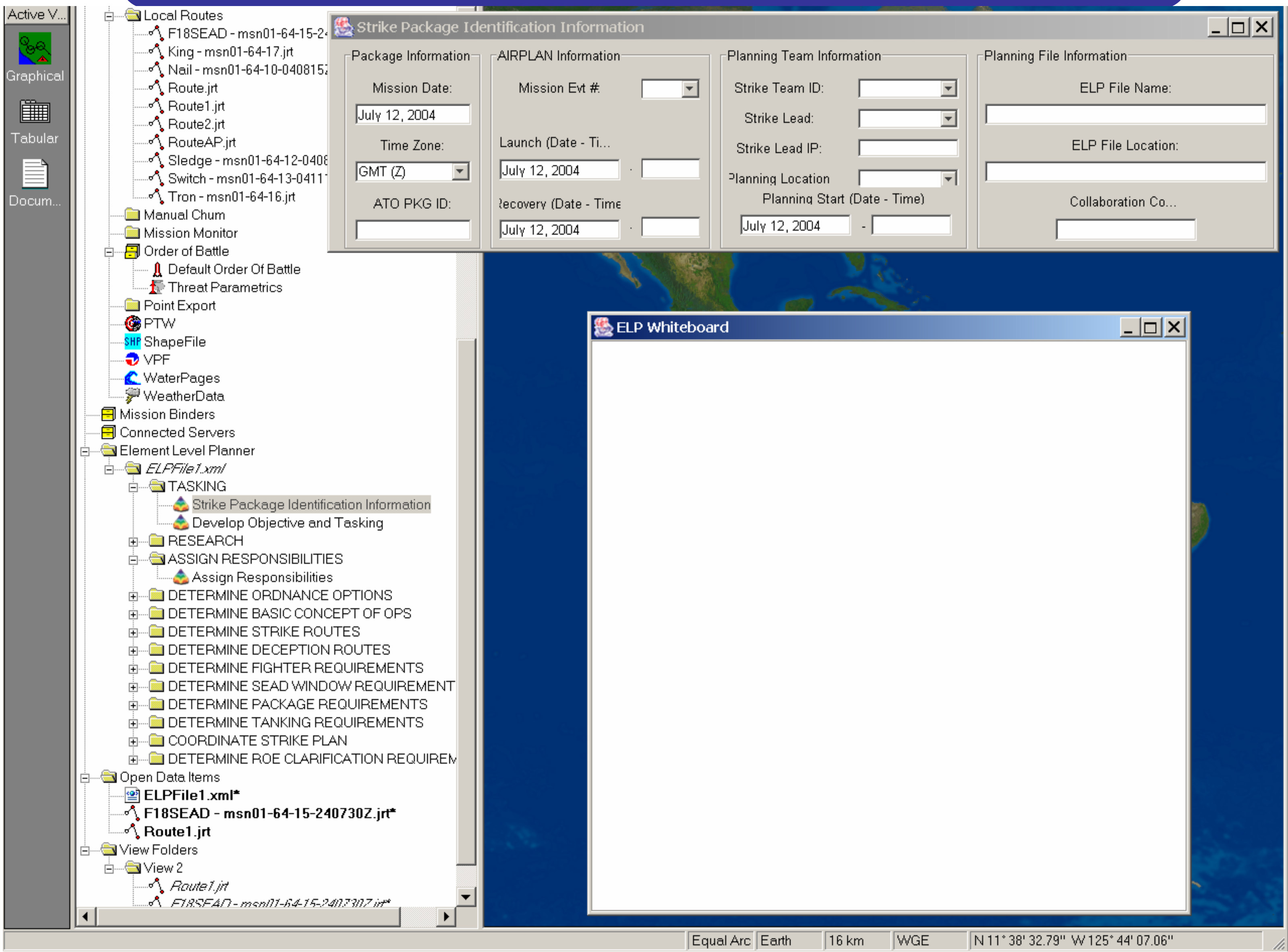

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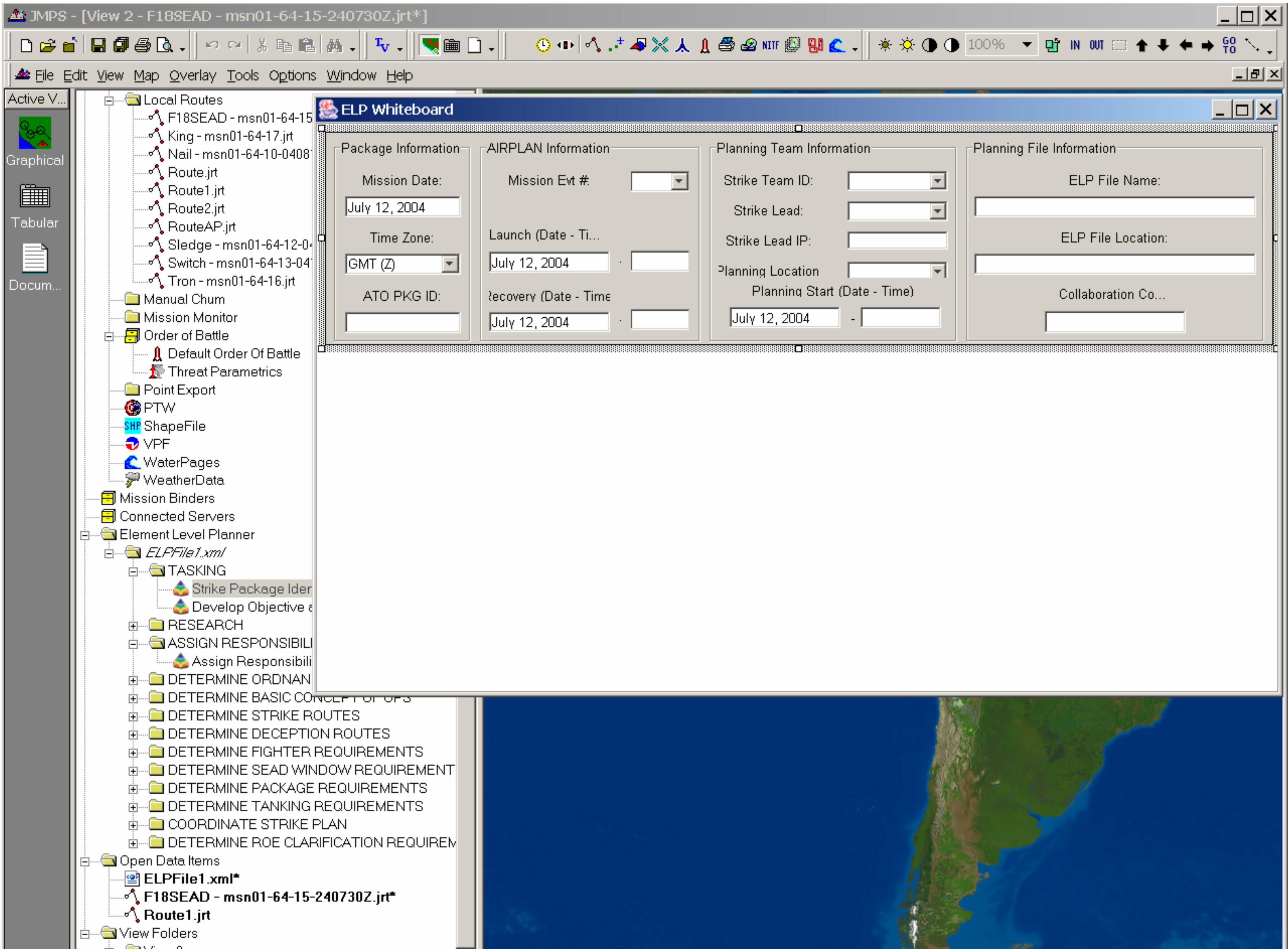

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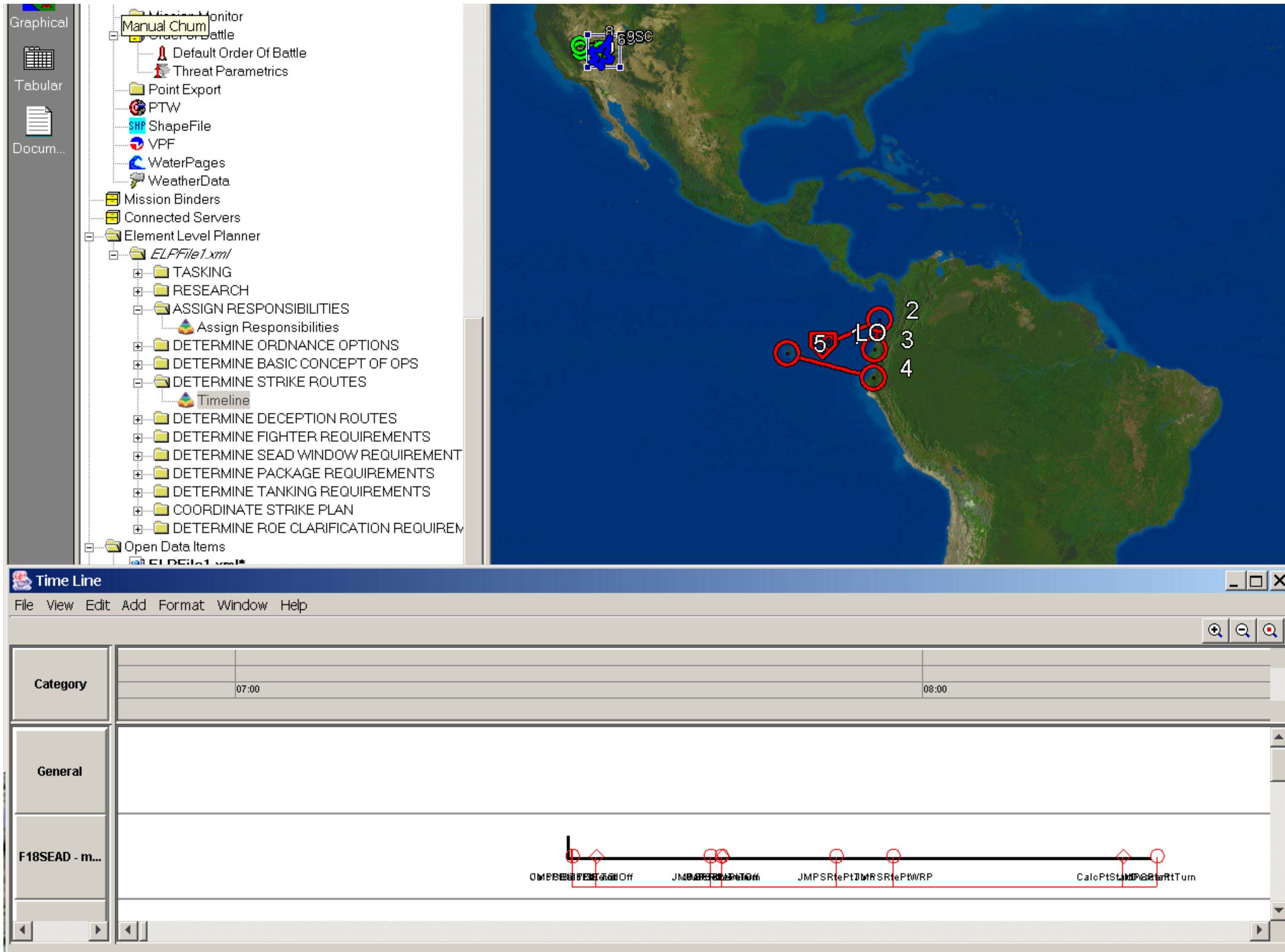

Mission Monitor

- **Execution**
  - Parse airplan, loadplan, ATO, target list
  - View ATO, airplan, loadplan, target list, cyclic ops execution
  - Monitor missions and sorties – real-time gahnt bars based on ATO and airplan
    - Planned / actual times of key events
    - Mission dependencies
    - Planning information from strike teams
    - Applicable mission data
    - Real-time status data
  - Develop Inputs to next day airplan
- **CAG Tools**
  - View ATO mission# / package designations
  - Target assignments
  - Target contention
  - Assign strike leads/teams
  - Group missions
  - Collaborate with strike personnel
- **Bravo Papa Tools**
  - Collaborate
  - Deconflict asset assignments
  - Modify airplan and disseminate changes in real time
  - Develop new strike plan

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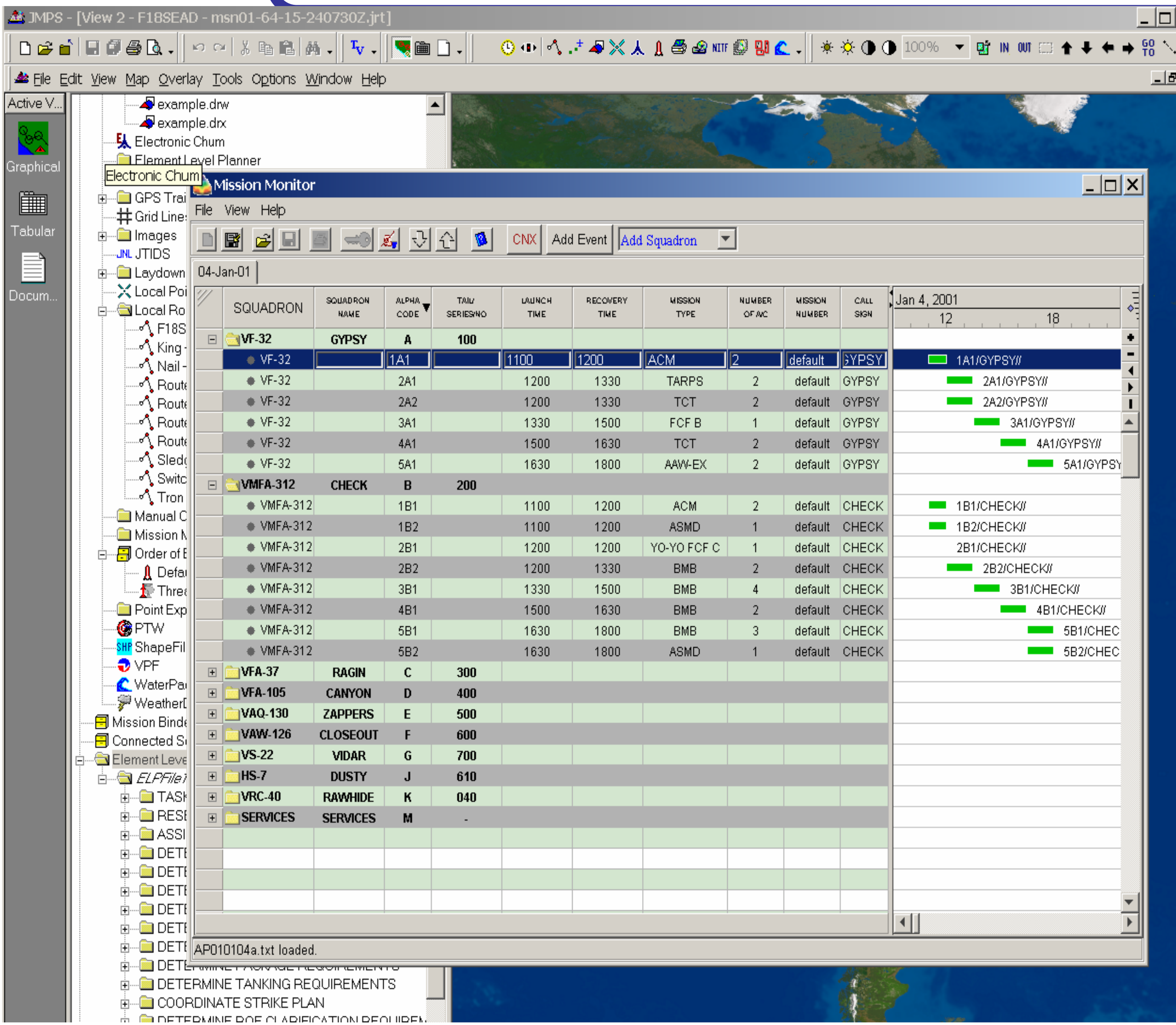

Mission Monitor

- Parses the ATO, Airplan, Target List and distributes to ELP Server
- Provides for assigning aircrew to missions
- Displays the ATO /ACO/AirPlan/LoadPlan/ STO/SPINS/ROPE/METOC
- S/W Agents update the MM from the ELP
- Information drill down by clicking a mission.
- Color code displays planning and execution status
- Provides dynamic AirPlan change capability
- Embed temporal relationships and Environmental info

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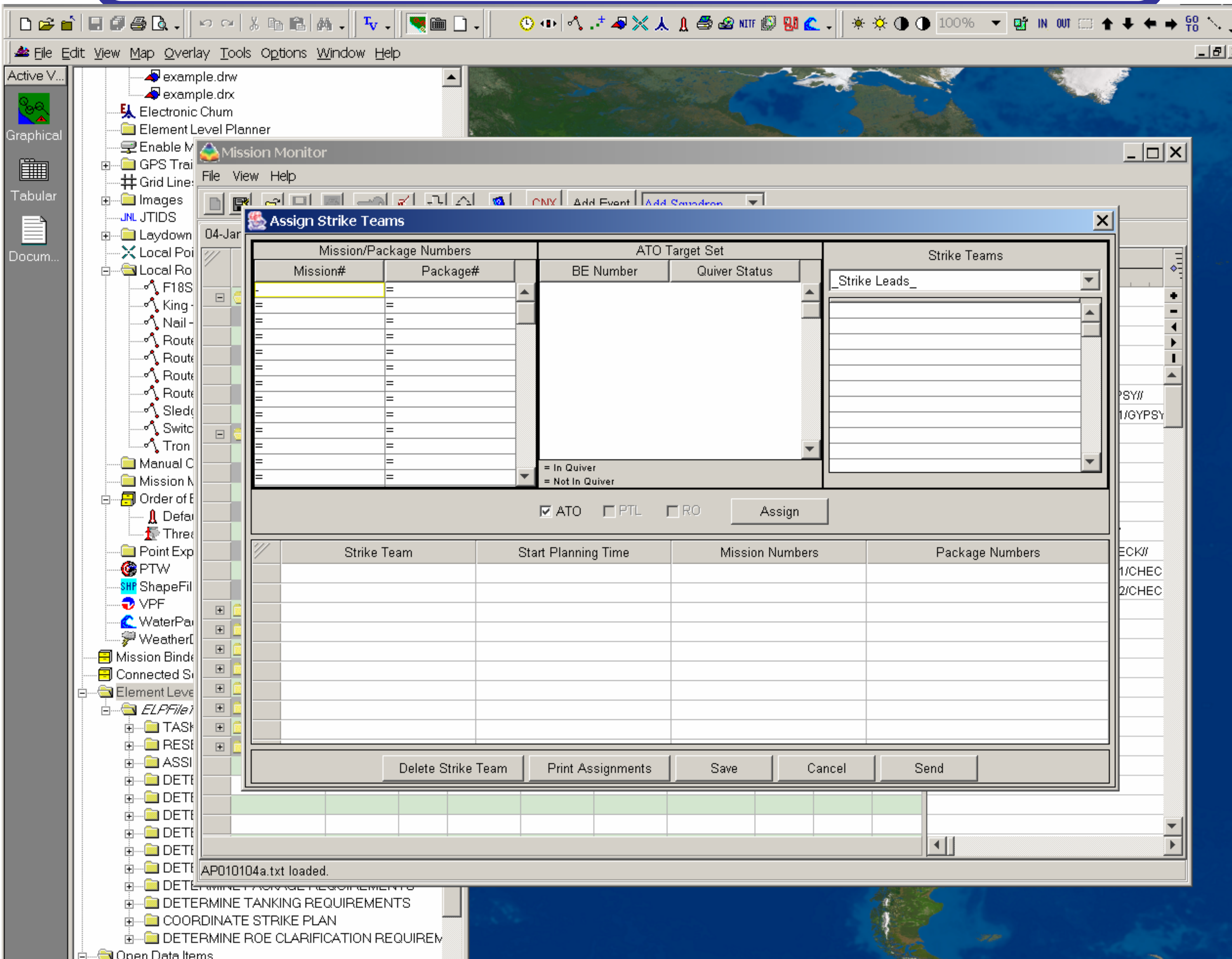

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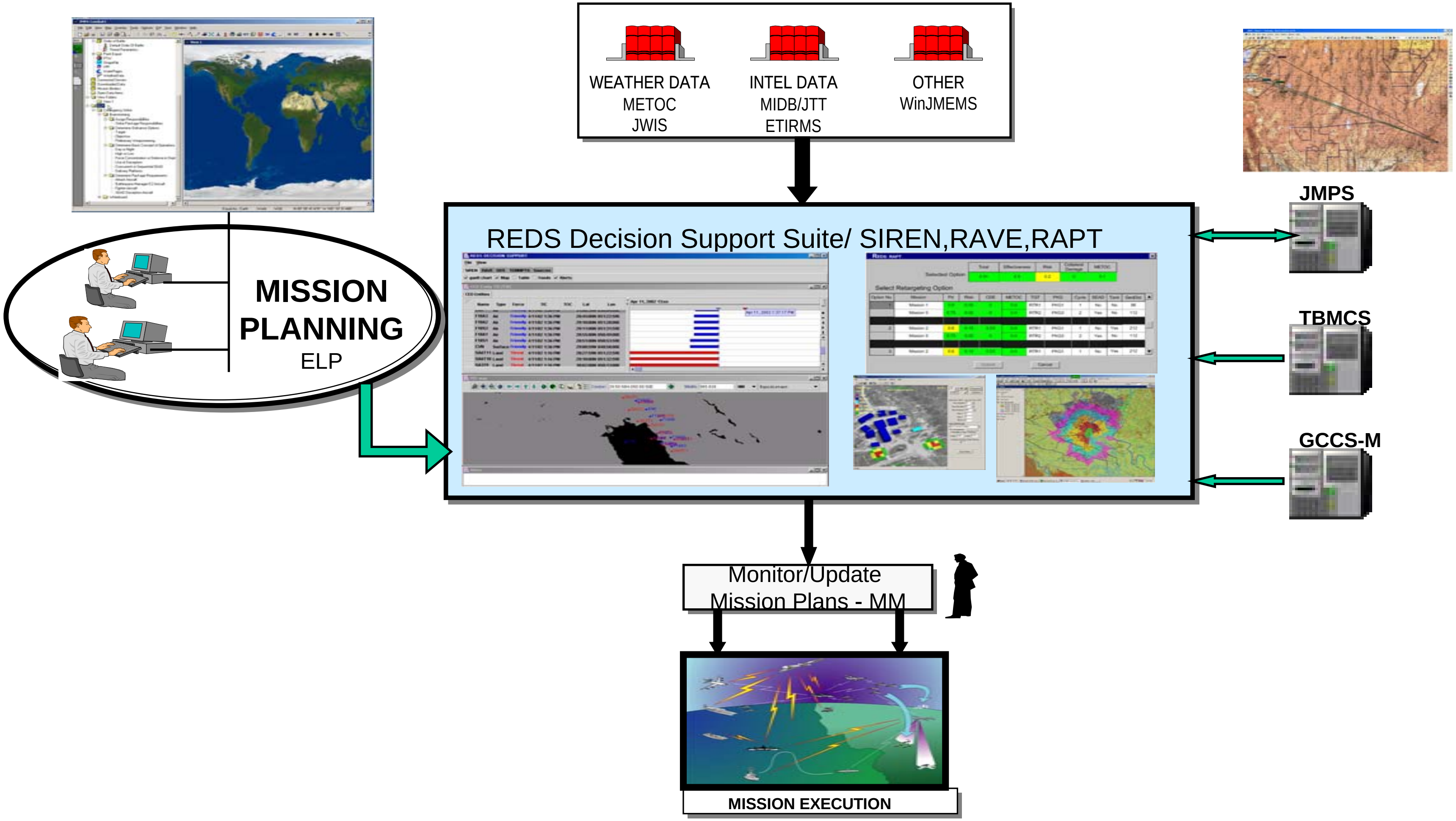
Real-time Targeting and Retargeting (RTR)



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- Sensor, Intelligence, ROE, and Environment Net (SIREN)
  - Monitor environment
  - Provide watchstander profiles
  - Manage prioritized target list
  - Assess changes
  - ID entities
  - Analyze ROE, Intelligence, Collateral Damage Tiers, Weather
  - Bring together static, planned, and real-time status information

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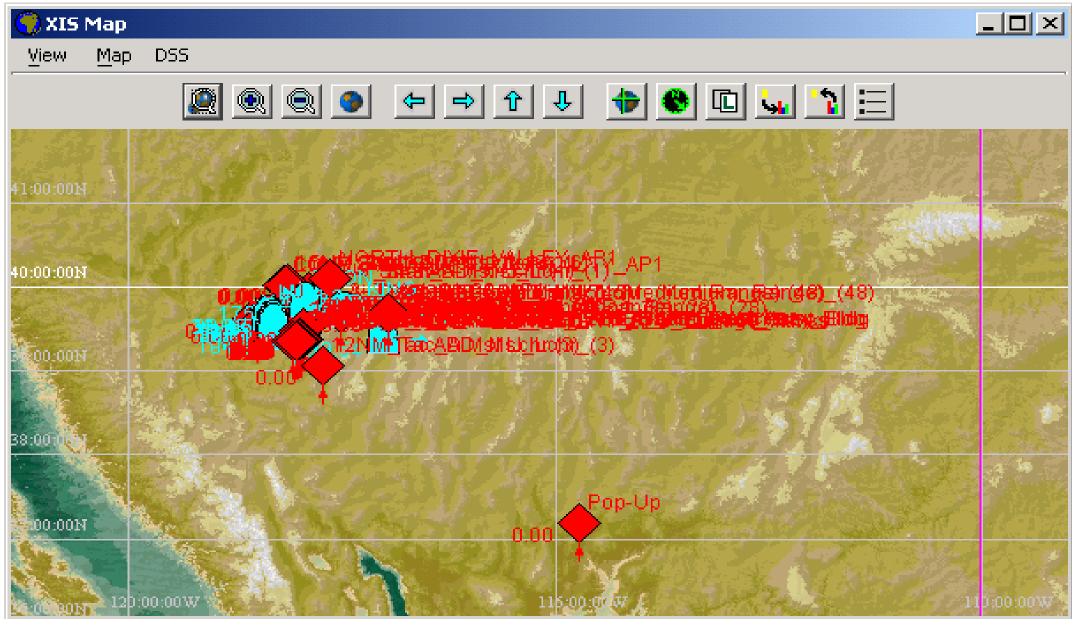

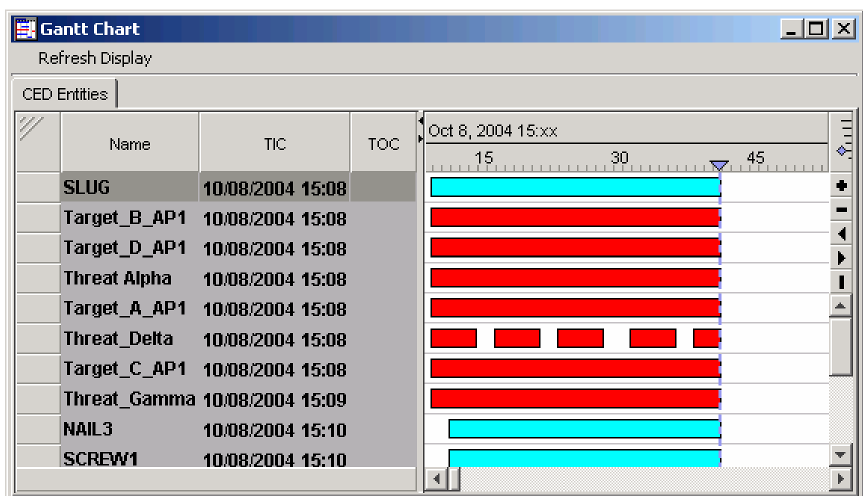

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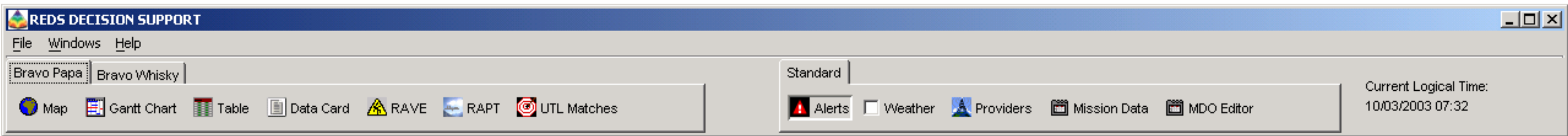

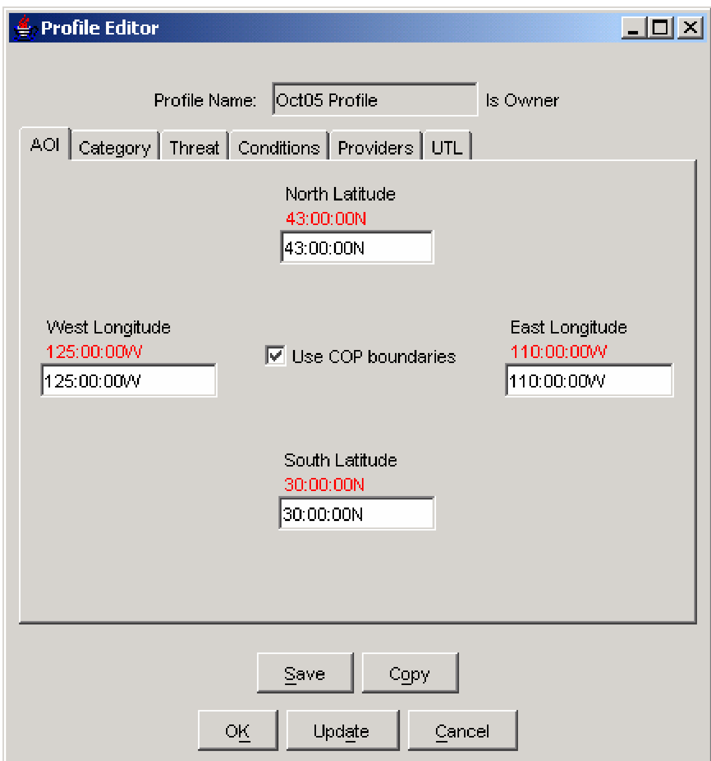

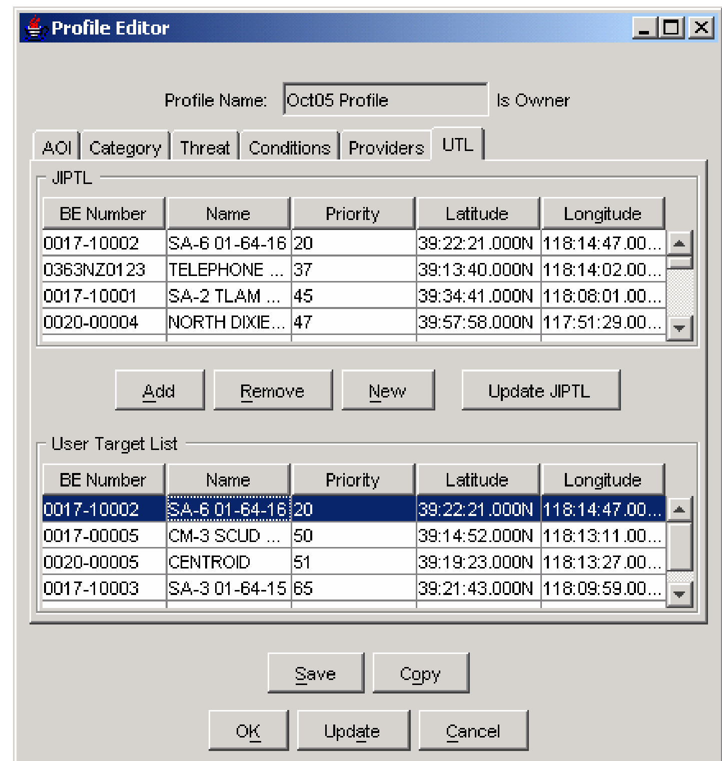

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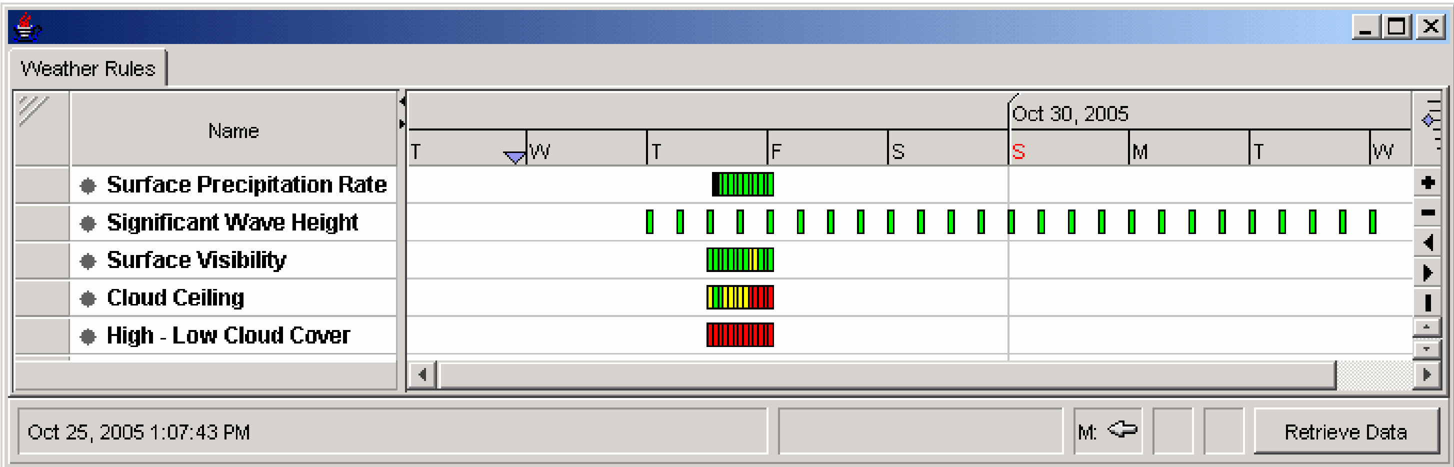

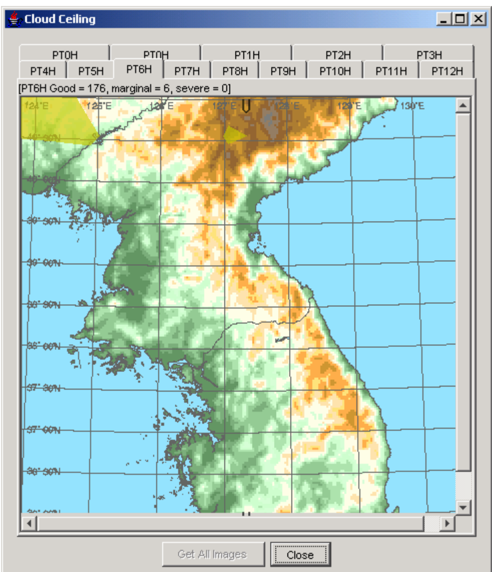

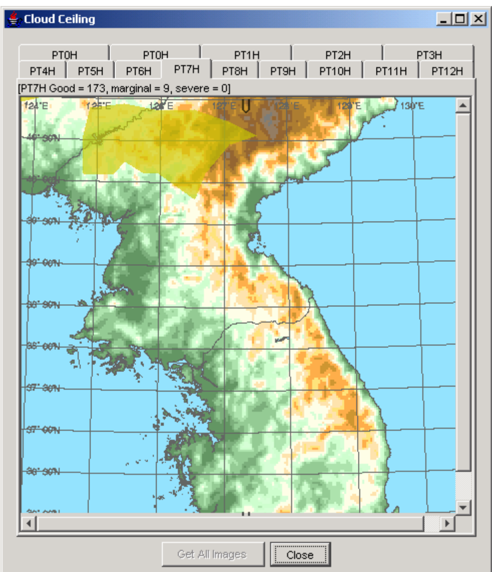

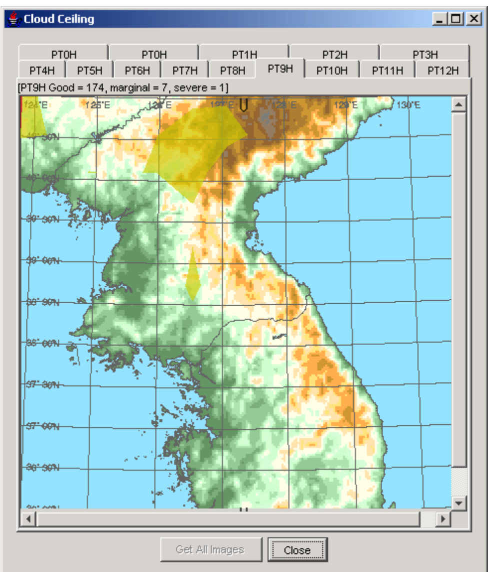

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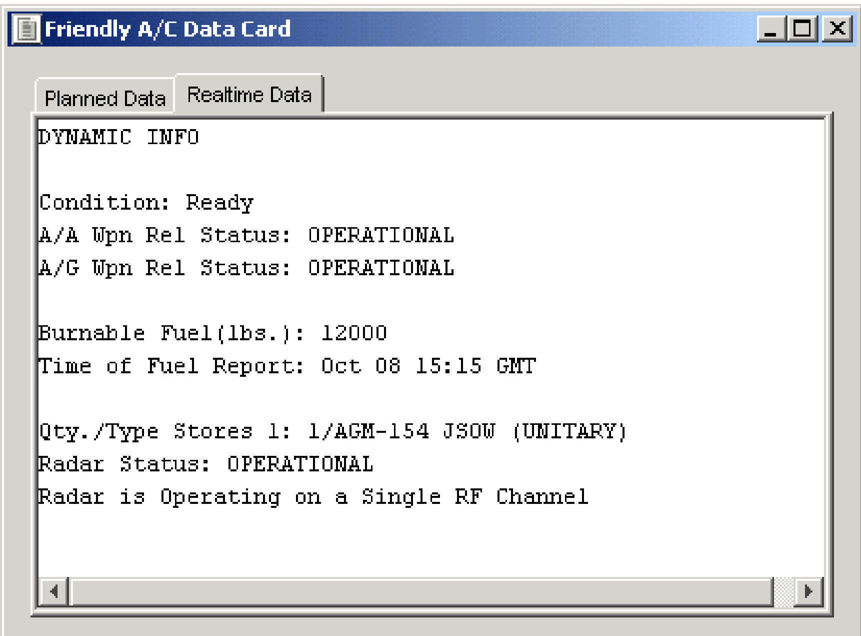

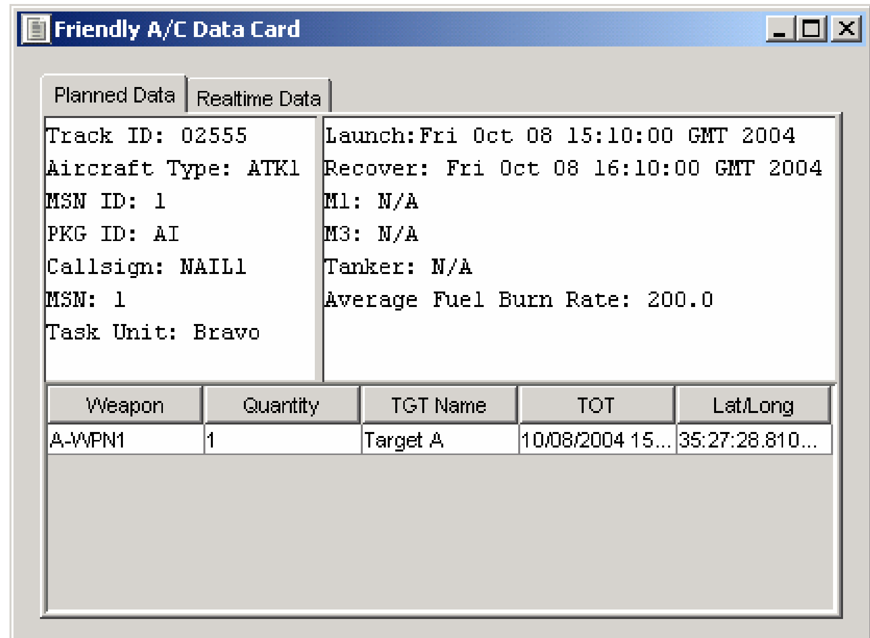

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- Risk Assessment and Validation Engine (RAVE)
  - Determines risk to blue entities in the COP
  - Provides risk-based trigger function to RAPT
  - Validates threat capability based on situational and a priori information
  - Provides a mechanism for displaying risk evaluations in real time
  - Quantifies deconfliction, platform state, predicted state, and threat state
  - Analyzes risk on planned routes
  - Shows risk history for post analysis

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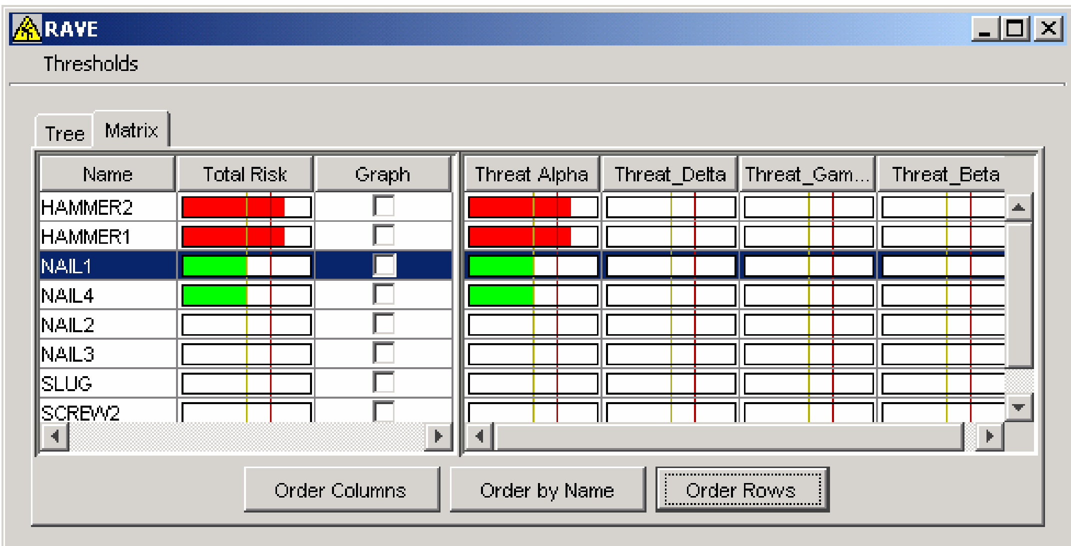

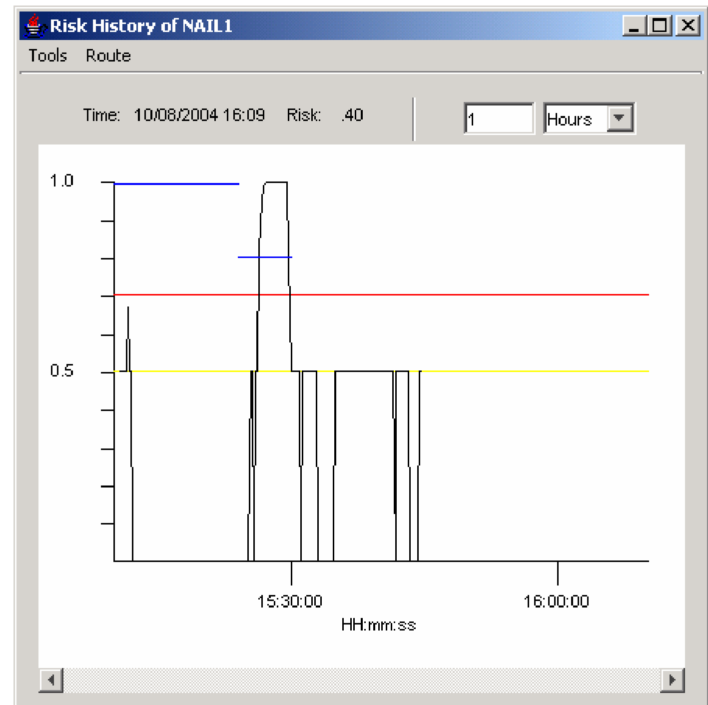

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- Rapid Asset Pairing Tool (RAPT)
  - Dynamically reallocates assets based on changing environment
  - Assessment is multi modal
  - Recommends retasking options
  - Minimizes risk while maximizing effectiveness
  - Also considers target priority, target time-windows, carrier cycle persistence, fuel and distance constraints, and mission integrity
  - Incorporates a time to decide and time on target functional countdown
  - Reallocates SEAD
  - Passes options to ELP for repackaging for transmission to Aircraft

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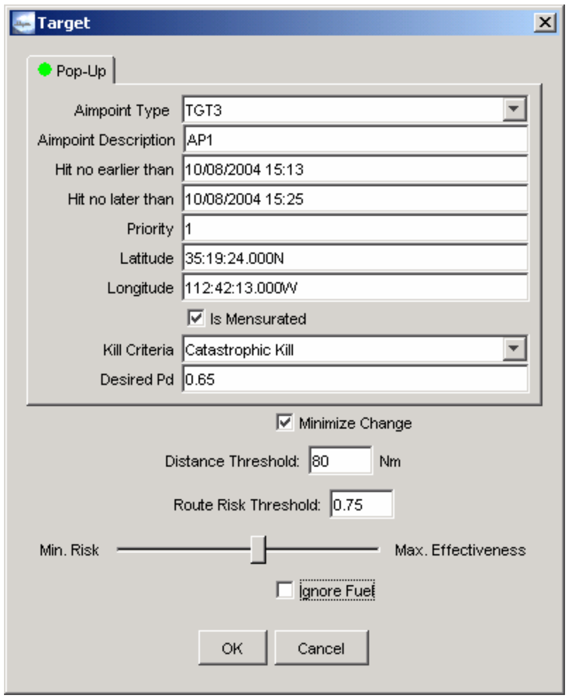

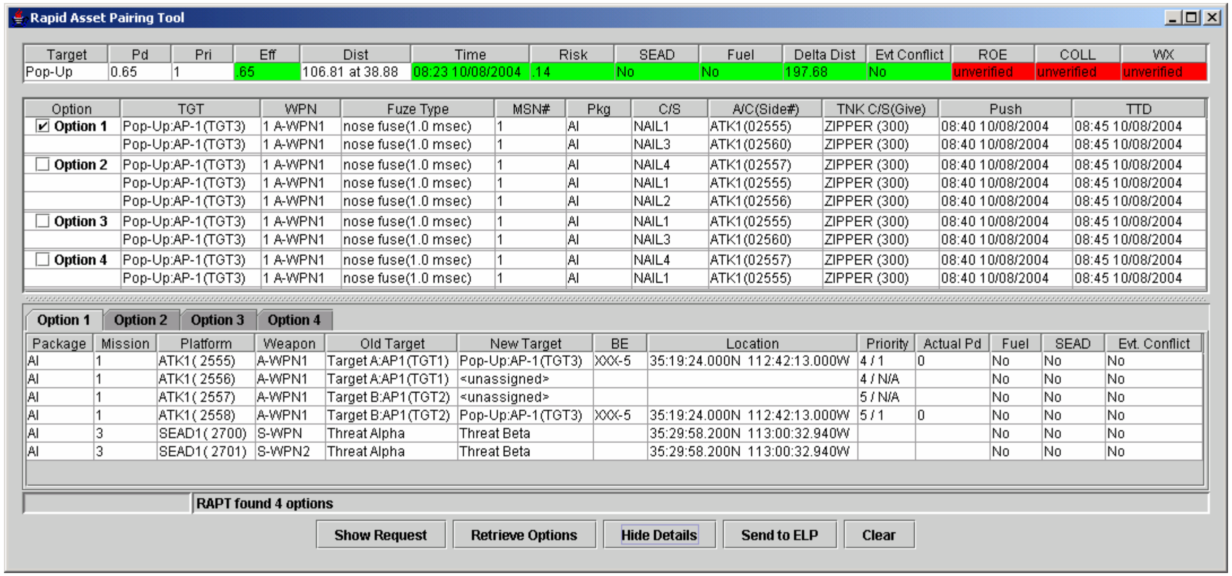

Target	Pd	Pri	Eff	Dist	Time	Risk	SEAD	Fuel	Delta Dist	Evt Conflict	ROE	COLL	WX
Pop-Up	0.65	1	.65	106.81 at 38.88	08:23 10/08/2004	.14	No	No	197.68	No	unverified	unverified	unverified

Option	TGT	WPN	Fuze Type	MSN#	Pkg	C/S	A/C(Side#)	TNK C/S(Give)	Push	TTD
☑ Option 1	Pop-Up:AP-1(TGT3)	1 A-WPN1	nose fuse(1.0 msec)	1	AI	NAIL1	ATK1(02555)	ZIPPER (300)	08:40 10/08/2004	08:45 10/08/2004
	Pop-Up:AP-1(TGT3)	1 A-WPN1	nose fuse(1.0 msec)	1	AI	NAIL3	ATK1(02560)	ZIPPER (300)	08:40 10/08/2004	08:45 10/08/2004
☐ Option 2	Pop-Up:AP-1(TGT3)	1 A-WPN1	nose fuse(1.0 msec)	1	AI	NAIL4	ATK1(02557)	ZIPPER (300)	08:40 10/08/2004	08:45 10/08/2004
	Pop-Up:AP-1(TGT3)	1 A-WPN1	nose fuse(1.0 msec)	1	AI	NAIL1	ATK1(02555)	ZIPPER (300)	08:40 10/08/2004	08:45 10/08/2004
	Pop-Up:AP-1(TGT3)	1 A-WPN1	nose fuse(1.0 msec)	1	AI	NAIL2	ATK1(02556)	ZIPPER (300)	08:40 10/08/2004	08:45 10/08/2004
☐ Option 3	Pop-Up:AP-1(TGT3)	1 A-WPN1	nose fuse(1.0 msec)	1	AI	NAIL1	ATK1(02555)	ZIPPER (300)	08:40 10/08/2004	08:45 10/08/2004
	Pop-Up:AP-1(TGT3)	1 A-WPN1	nose fuse(1.0 msec)	1	AI	NAIL3	ATK1(02560)	ZIPPER (300)	08:40 10/08/2004	08:45 10/08/2004
☐ Option 4	Pop-Up:AP-1(TGT3)	1 A-WPN1	nose fuse(1.0 msec)	1	AI	NAIL4	ATK1(02557)	ZIPPER (300)	08:40 10/08/2004	08:45 10/08/2004
	Pop-Up:AP-1(TGT3)	1 A-WPN1	nose fuse(1.0 msec)	1	AI	NAIL1	ATK1(02555)	ZIPPER (300)	08:40 10/08/2004	08:45 10/08/2004

Package	Mission	Platform	Weapon	Old Target	New Target	BE	Location	Priority	Actual Pd	Fuel	SEAD	Evt. Conflict
AI	1	ATK1(2555)	A-WPN1	Target A:AP1(TGT1)	Pop-Up:AP-1(TGT3)	XXX-5	35:19:24.000N 112:42:13.000W	4 / 1	0	No	No	No
AI	1	ATK1(2556)	A-WPN1	Target A:AP1(TGT1)	<unassigned>			4 / N/A		No	No	No
AI	1	ATK1(2557)	A-WPN1	Target B:AP1(TGT2)	<unassigned>			5 / N/A		No	No	No
AI	1	ATK1(2558)	A-WPN1	Target B:AP1(TGT2)	Pop-Up:AP-1(TGT3)	XXX-5	35:19:24.000N 112:42:13.000W	5 / 1	0	No	No	No
AI	3	SEAD1(2700)	S-WPN	Threat Alpha	Threat Beta		35:29:58.200N 113:00:32.940W			No	No	No
AI	3	SEAD1(2701)	S-WPN2	Threat Alpha	Threat Beta		35:29:58.200N 113:00:32.940W			No	No	No

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- REDS is built on an enterprise middleware layer
  - Distributed Transaction Management
  - High Availability
  - On Demand Scalability
  - Dynamic Workload Balancing
  - Transaction Queuing
  - Event Brokering
  - Security
  - Application Parallelization
  - Reliable Messaging
  - Platform Independance

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- Major Benefits
  - One-of-a-kind situational assessment capability that reduces operator fatigue and provides multiple decision-makers with continuous, easily assimilated information to support operational requirements.
  - Risk analysis that provides a unique threat validation and assessment capability to continuously compare and monitor Blue force assets. Through the validation engine, users are able to adjust to emerging situations before problems arise.
  - Decision support that facilitates optimal weapon-target pairing of available, in-theatre assets. This re-planning decision aid expedites the re-planning process to dynamically allocate available strike assets based on the changing battle-space.
  - Retrieval and fusing of operational and tactical battle-space information through distributed real-time and near real-time sources.

- Future Work
  - Evolve to graphical representations of data provided
  - Handle complex choreography between SEAD and attack missions
  - Incorporate tanking assignments in RAPT
  - Predictive modeling

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Extra Slides

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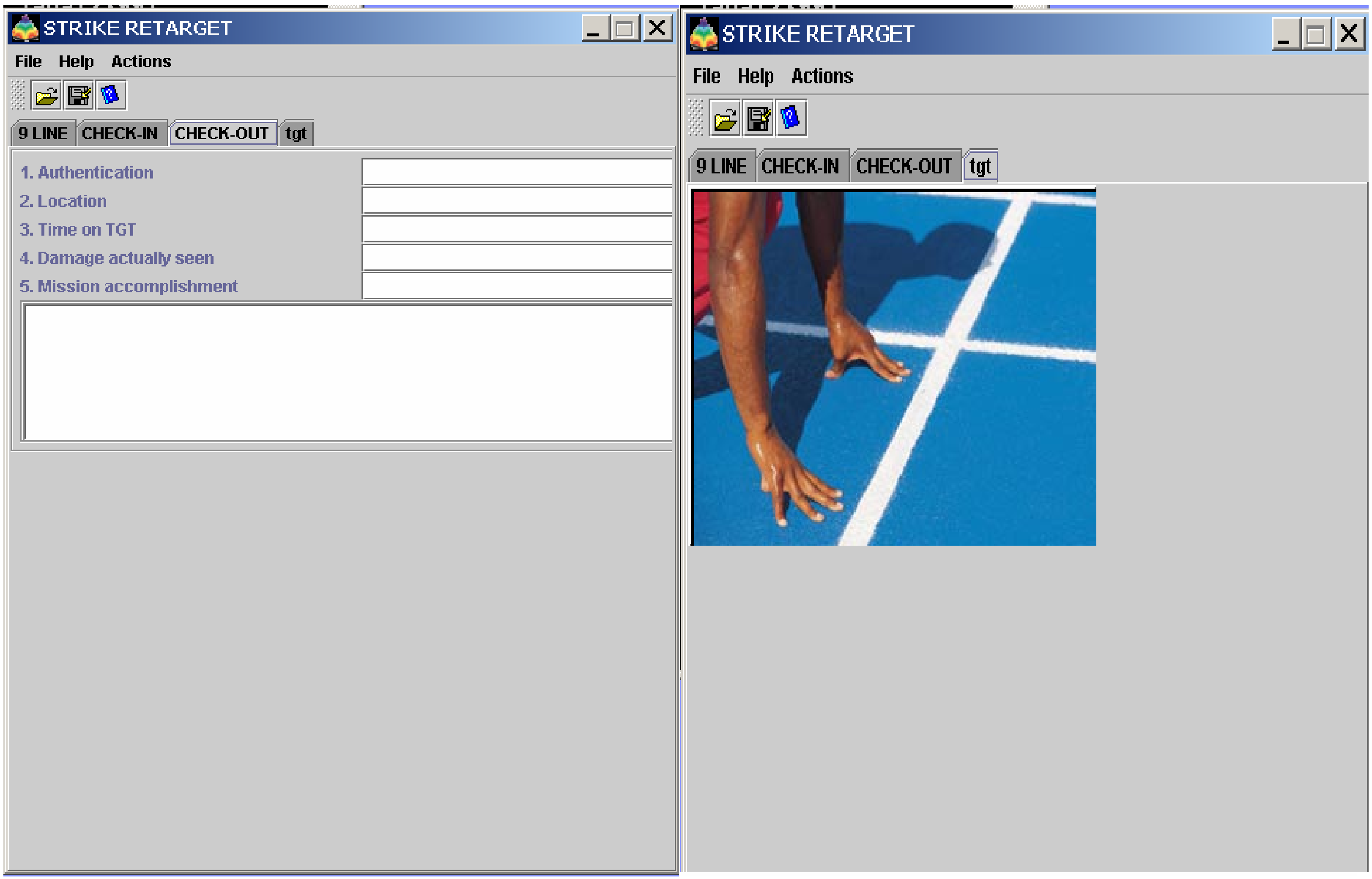

SmartPacks for transmission to aircraft

ELP & MM JMPS UPC Integration