

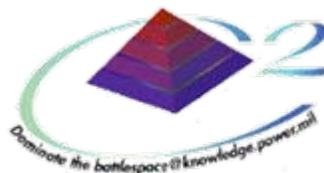


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# REALTIME EXECUTION DECISION SUPPORT (REDS)



## Dynamic Decision Support For Time Critical Targeting



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CCRTS 2006



# REALTIME EXECUTION DECISION SUPPORT

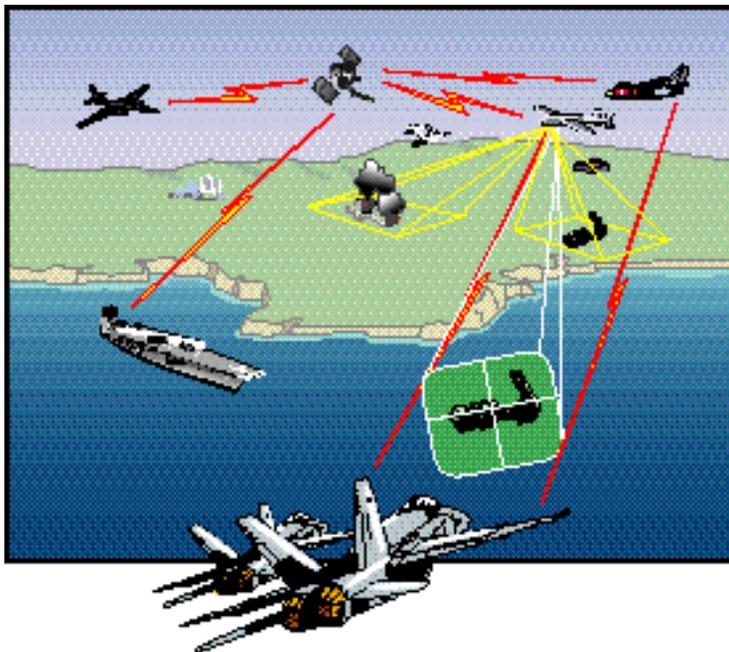


**Mission Statement Objective:** To respond in real time to dynamic targeting situations by providing warfighters a capability to do rapid mission replanning, mission execution, and combat assessment utilizing in-theater assets.



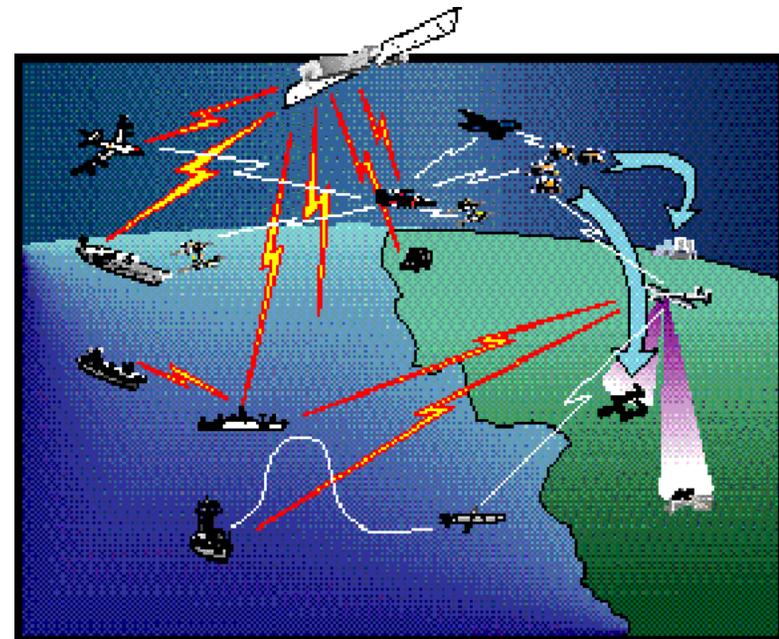


# REALTIME EXECUTION DECISION SUPPORT



## WITHIN STRIKE AREA

(Sanctuary Planned and Defined)



## BEYOND STRIKE AREA

(Strike Package Moved well beyond initially planned environment)



# REALTIME EXECUTION DECISION SUPPORT



## 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**

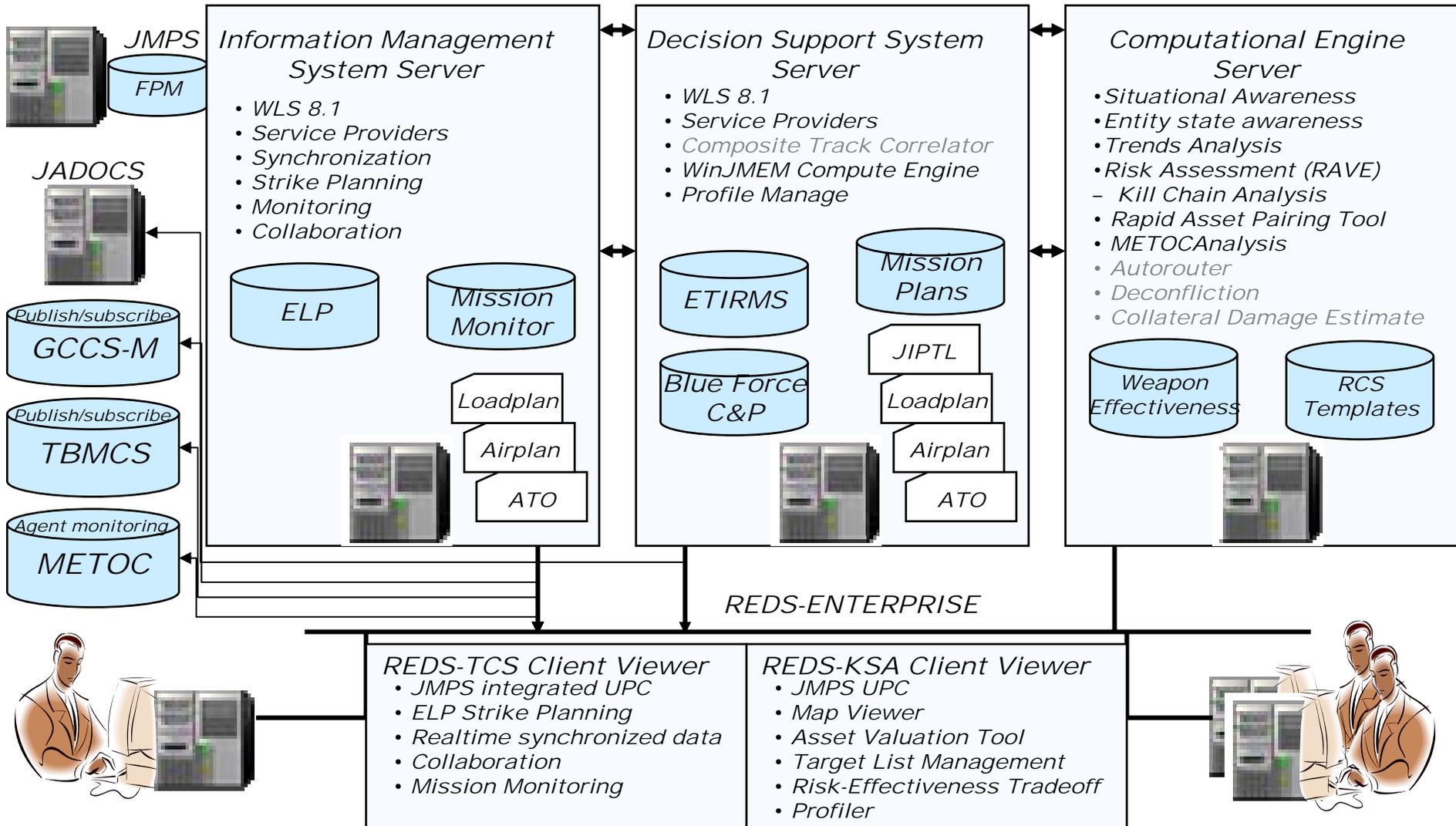
- Fully integrated suite of scalable applications
- Mission Management & Enhanced Situational Awareness
- Tailored Information Dissemination/Sharing/Assurance
- Predictive analysis/deconfliction/multiple weapon target pairing solutions



# REALTIME EXECUTION DECISION SUPPORT



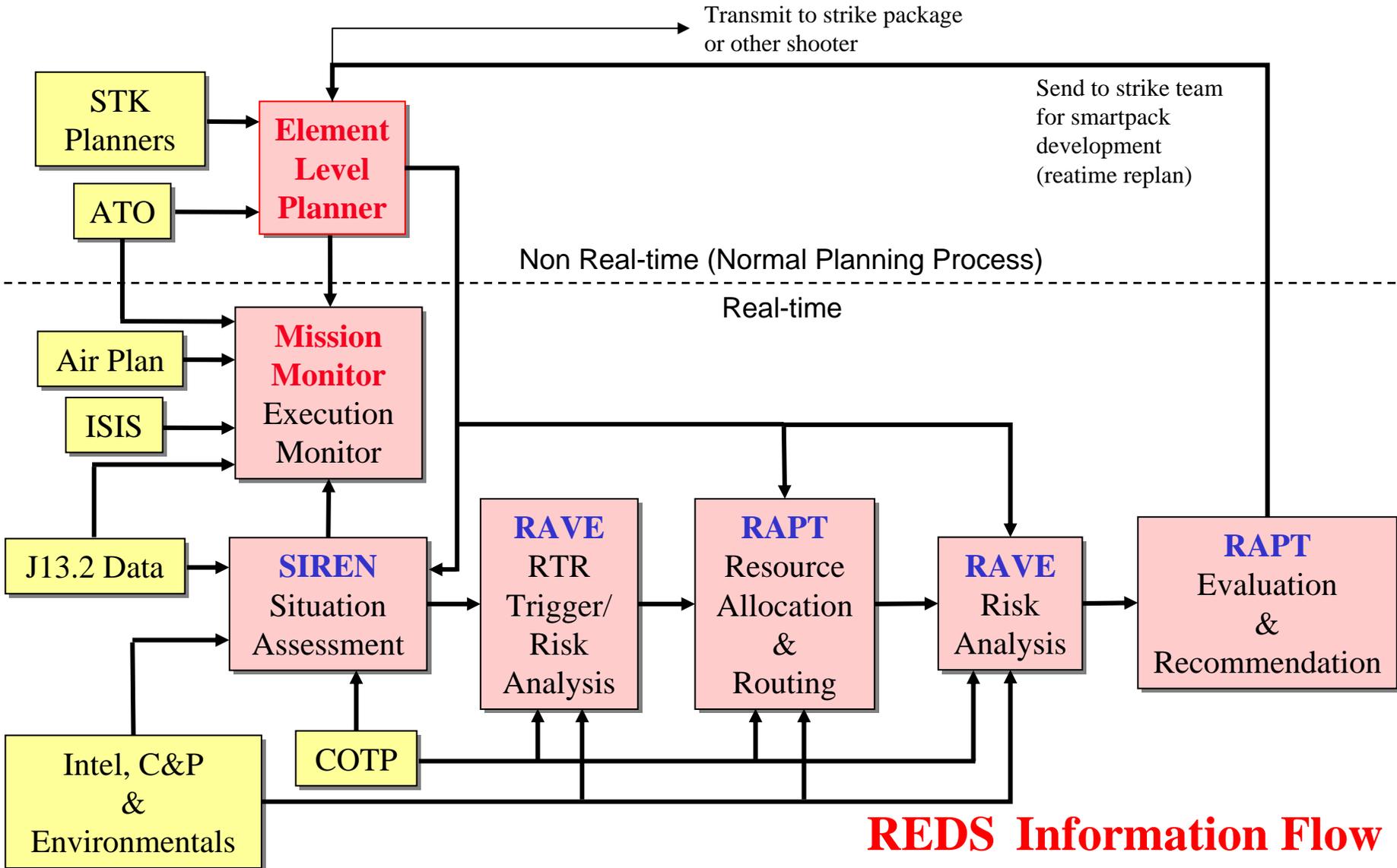
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## REDS Architecture



# REALTIME EXECUTION DECISION SUPPORT





# REALTIME EXECUTION DECISION SUPPORT



- **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 Planning System (JMPS) Framework.



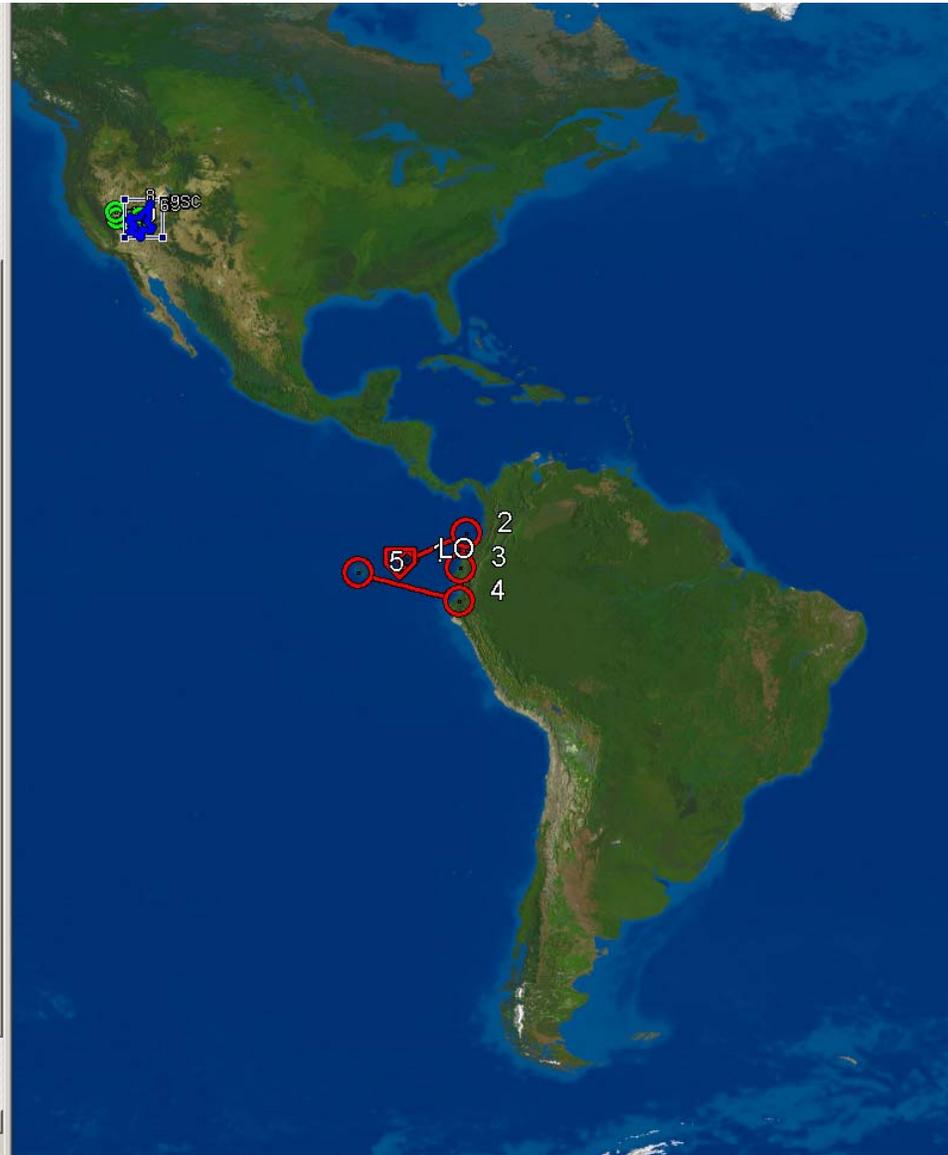
# REALTIME EXECUTION DECISION SUPPORT



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example.drx

- Electronic Chum
- Element Level Planner
- Enable Mission Binders
- GPS Trail
- Grid Lines
- Images
- JNL JTIDS
- Laydown Files
- Local Points
- Local Routes
  - F18SEAD - msn01-64-15-240730Z.jrt
  - King - msn01-64-17.jrt
  - Nail - msn01-64-10-040815ZDEC.jrt
  - Route.jrt
  - Route1.jrt
  - Route2.jrt
  - RouteAP.jrt
  - Sledge - msn01-64-12-040815ZDEC.jrt
  - Switch - msn01-64-13-041115ZDEC.jrt
  - Tron - msn01-64-16.jrt
- Manual Chum
- Mission Monitor
- Order of Battle
  - Default Order Of Battle
  - Threat Parametrics
- Point Export
- PTW
- ShapeFile
- VPF
- WaterPages
- WeatherData
- Mission Binders
- Connected Servers
- Element Level Planner**
  - ELPFile1.xml
    - TASKING
    - RESEARCH
    - ASSIGN RESPONSIBILITIES
    - DETERMINE ORDNANCE OPTIONS
    - DETERMINE BASIC CONCEPT OF OPS
    - DETERMINE STRIKE ROUTES
    - DETERMINE DECEPTION ROUTES
    - DETERMINE FIGHTER REQUIREMENTS
    - DETERMINE SEAD WINDOW REQUIREMENT
    - DETERMINE PACKAGE REQUIREMENTS
    - DETERMINE TANKING REQUIREMENTS
    - COORDINATE STRIKE PLAN
    - DETERMINE ROE CLARIFICATION REQUIREMENT
- Open Data Items
  - ELPFile1.xml
  - F18SEAD - msn01-64-15-240730Z.jrt
  - Route1.jrt





# REALTIME EXECUTION DECISION SUPPORT



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**Active View:** Graphical, Tabular, Document

**Local Routes:** F18SEAD - msn01-64-15-240730Z.jrt, King - msn01-64-17.jrt, Nail - msn01-64-10-040815.jrt, Route1.jrt, Route2.jrt, RouteAP.jrt, Sledge - msn01-64-12-040815.jrt, Switch - msn01-64-13-041115.jrt, Tron - msn01-64-16.jrt

**Manual Chum:** Mission Monitor

**Order of Battle:** Default Order Of Battle, Threat Parameters

**Point Export:** PTW, ShapeFile, VPF, WaterPages, WeatherData

**Mission Binders:** Connected Servers

**Element Level Planner:** ELPFile1.xml, TASKING (Strike Package Identification Information, Develop Objective and Tasking), RESEARCH, ASSIGN RESPONSIBILITIES (Assign Responsibilities), DETERMINE ORDNANCE OPTIONS, DETERMINE BASIC CONCEPT OF OPS, DETERMINE STRIKE ROUTES, DETERMINE DECEPTION ROUTES, DETERMINE FIGHTER REQUIREMENTS, DETERMINE SEAD WINDOW REQUIREMENT, DETERMINE PACKAGE REQUIREMENTS, DETERMINE TANKING REQUIREMENTS, COORDINATE STRIKE PLAN, DETERMINE ROE CLARIFICATION REQUIREMENT

**Open Data Items:** ELPFile1.xml\*, F18SEAD - msn01-64-15-240730Z.jrt\*, Route1.jrt

**View Folders:** View 2 (Route1.jrt, F18SEAD - msn01-64-15-240730Z.jrt\*)

**Strike Package Identification Information:**

Package Information	AIRPLAN Information	Planning Team Information	Planning File Information
Mission Date: July 12, 2004	Mission Evt #: [Dropdown]	Strike Team ID: [Dropdown]	ELP File Name: [Text Box]
Time Zone: GMT (Z)	Launch (Date - Time): July 12, 2004	Strike Lead: [Dropdown]	ELP File Location: [Text Box]
ATO PKG ID: [Text Box]	Recovery (Date - Time): July 12, 2004	Planning Location: [Dropdown]	Collaboration Co...: [Text Box]
		Planning Start (Date - Time): July 12, 2004	

**ELP Whiteboard:** [Blank Whiteboard Area]

**Status Bar:** Equal Arc Earth 16 km WGE N 11° 38' 32.79" W 125° 44' 07.06"



# REALTIME EXECUTION DECISION SUPPORT



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The screenshot displays the JMPS (Joint Mission Planning System) interface. The main window is titled "JMPS - [View 2 - F18SEAD - msn01-64-15-240730Z.jrt\*]". The interface is divided into several sections:

- Left Panel (Active View):** Contains a tree view of mission planning elements. The "Element Level Planner" is expanded, showing a hierarchy of tasks such as "TASKING", "RESEARCH", "ASSIGN RESPONSIBILITY", "DETERMINE ORDNANCE", "DETERMINE BASIC CONCEPT OF OPS", "DETERMINE STRIKE ROUTES", "DETERMINE DECEPTION ROUTES", "DETERMINE FIGHTER REQUIREMENTS", "DETERMINE SEAD WINDOW REQUIREMENT", "DETERMINE PACKAGE REQUIREMENTS", "DETERMINE TANKING REQUIREMENTS", "COORDINATE STRIKE PLAN", and "DETERMINE ROE CLARIFICATION REQUIREMENT".
- Top Panel (ELP Whiteboard):** A central panel for mission planning parameters, divided into four columns:
  - Package Information:** Mission Date: July 12, 2004; Time Zone: GMT (Z); ATO PKG ID: [Empty]
  - AIRPLAN Information:** Mission Evt #: [Dropdown]; Launch (Date - Time): July 12, 2004; Recovery (Date - Time): July 12, 2004
  - Planning Team Information:** Strike Team ID: [Dropdown]; Strike Lead: [Dropdown]; Strike Lead IP: [Text]; Planning Location: [Dropdown]; Planning Start (Date - Time): July 12, 2004
  - Planning File Information:** ELP File Name: [Text]; ELP File Location: [Text]; Collaboration Co...: [Text]
- Bottom Panel:** A map showing a geographical area, likely the Mediterranean Sea and surrounding landmasses.



# REALTIME EXECUTION DECISION SUPPORT



The screenshot displays a mission planning software interface. On the left is a tree view with the following structure:

- Manual Chum
  - Structure of Battle
    - Default Order Of Battle
    - Threat Parametrics
  - Point Export
  - PTW
  - ShapeFile
  - VPF
  - WaterPages
  - WeatherData
- Mission Binders
- Connected Servers
- Element Level Planner
  - ELPFile1.xml
    - TASKING
    - RESEARCH
    - ASSIGN RESPONSIBILITIES
      - Assign Responsibilities
    - DETERMINE ORDNANCE OPTIONS
    - DETERMINE BASIC CONCEPT OF OPS
    - DETERMINE STRIKE ROUTES
    - Timeline
    - DETERMINE DECEPTION ROUTES
    - DETERMINE FIGHTER REQUIREMENTS
    - DETERMINE SEAD WINDOW REQUIREMENT
    - DETERMINE PACKAGE REQUIREMENTS
    - DETERMINE TANKING REQUIREMENTS
    - COORDINATE STRIKE PLAN
    - DETERMINE ROE CLARIFICATION REQUIREMENT
- Open Data Items

The map on the right shows a satellite view of the Pacific Ocean region, with a blue box labeled 'Agsc' in the upper left and a red line connecting five numbered points (1-5) in the lower right. Point 1 is labeled 'LO'.

The bottom section is a 'Time Line' window with a menu bar (File, View, Edit, Add, Format, Window, Help) and search icons. It contains a table with the following data:

Category	07:00	08:00
General		
F18SEAD - m...		

Below the table is a horizontal timeline with several red diamond markers and labels: '07:00:00 F18SEAD OFF', 'JMBSEAD ON', 'JMPSREPTIMRSRPTWRP', and 'CalcPISUMPSRPTTurn'.



# REALTIME EXECUTION DECISION SUPPORT



## 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



# REALTIME EXECUTION DECISION SUPPORT



## 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

SQUADRON	SQUADRON NAME	ALPHA CODE	TAIL/ SERIESNO	LAUNCH TIME	RECOVERY TIME	MISSION TYPE	NUMBER OF AC	MISSION NUMBER	CALL SIGN
VF-32	GYPSEY	A	100						
VF-32		1A1		1100	1200	ACM	2	default	GYPSEY
VF-32		2A1		1200	1330	TARPS	2	default	GYPSEY
VF-32		2A2		1200	1330	TCT	2	default	GYPSEY
VF-32		3A1		1330	1500	FCF B	1	default	GYPSEY
VF-32		4A1		1500	1630	TCT	2	default	GYPSEY
VF-32		5A1		1630	1800	AAW-EX	2	default	GYPSEY
VMFA-312	CHECK	B	200						
VMFA-312		1B1		1100	1200	ACM	2	default	CHECK
VMFA-312		1B2		1100	1200	ASMD	1	default	CHECK
VMFA-312		2B1		1200	1200	YO-YO FCF C	1	default	CHECK
VMFA-312		2B2		1200	1330	BMB	2	default	CHECK
VMFA-312		3B1		1330	1500	BMB	4	default	CHECK
VMFA-312		4B1		1500	1630	BMB	2	default	CHECK
VMFA-312		5B1		1630	1800	BMB	3	default	CHECK
VMFA-312		5B2		1630	1800	ASMD	1	default	CHECK
VFA-37	RAGIN	C	300						
VFA-105	CANYON	D	400						
VAQ-130	ZAPPERS	E	500						
VAW-126	CLOSEOUT	F	600						
VS-22	VIDAR	G	700						
HS-7	DUSTY	J	610						
VRC-40	RAWHIDE	K	040						
SERVICES	SERVICES	M	-						

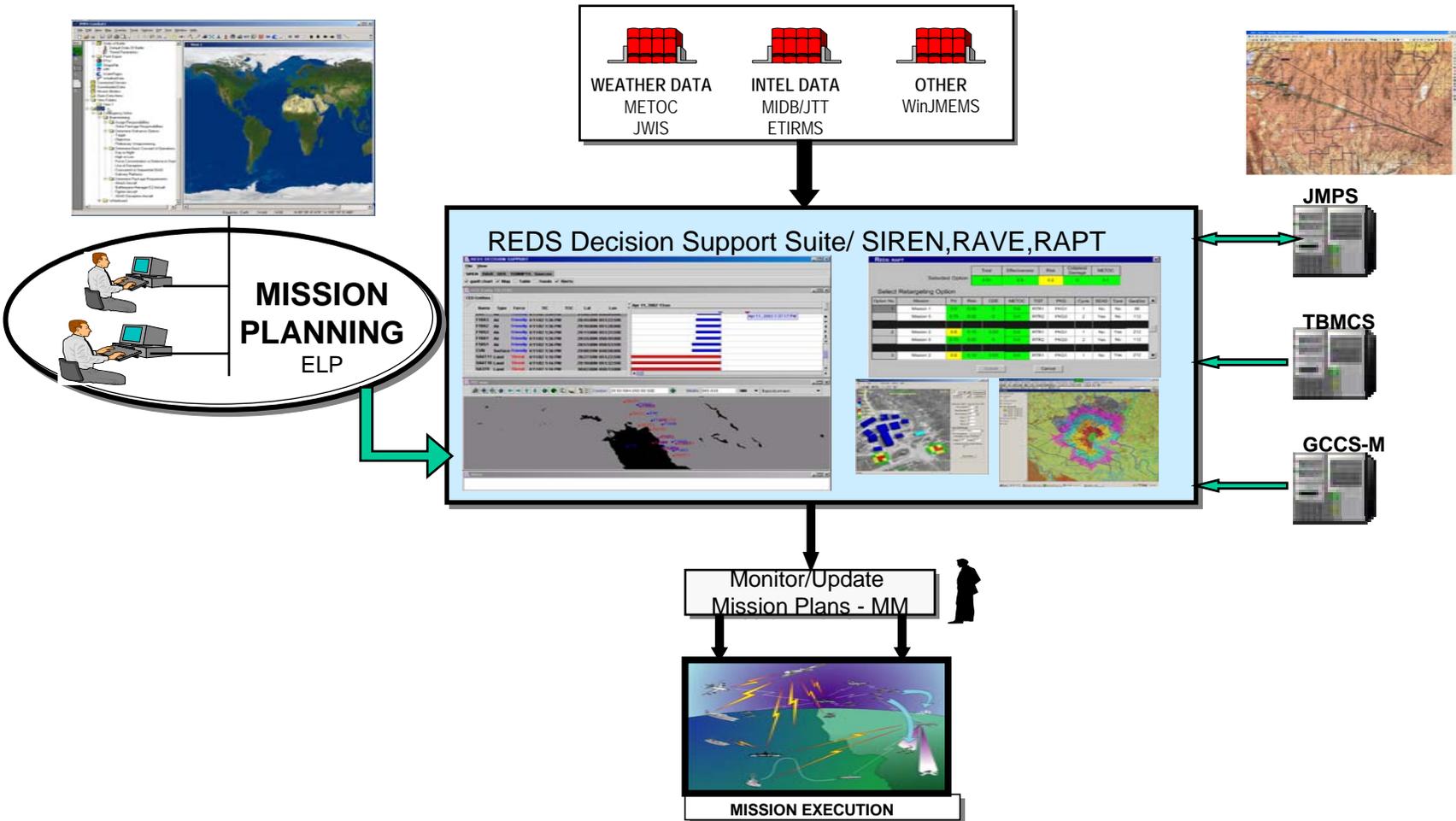




# REALTIME EXECUTION DECISION SUPPORT



## Real-time Targeting and Retargeting (RTR)





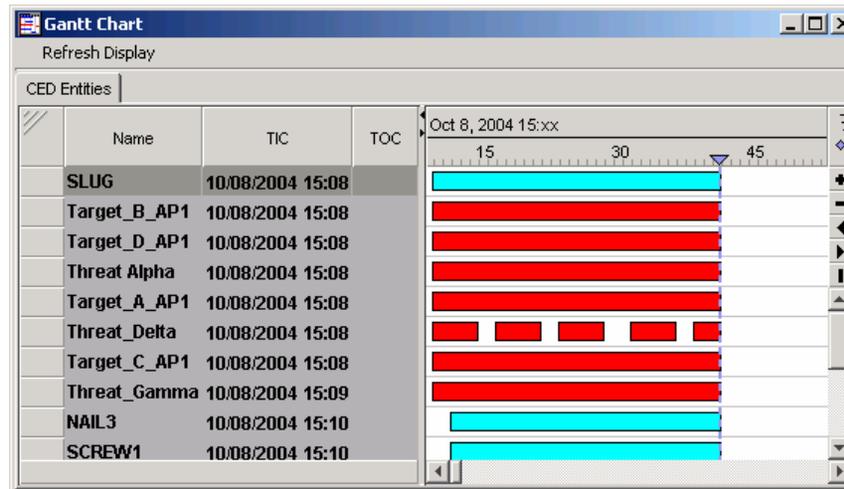
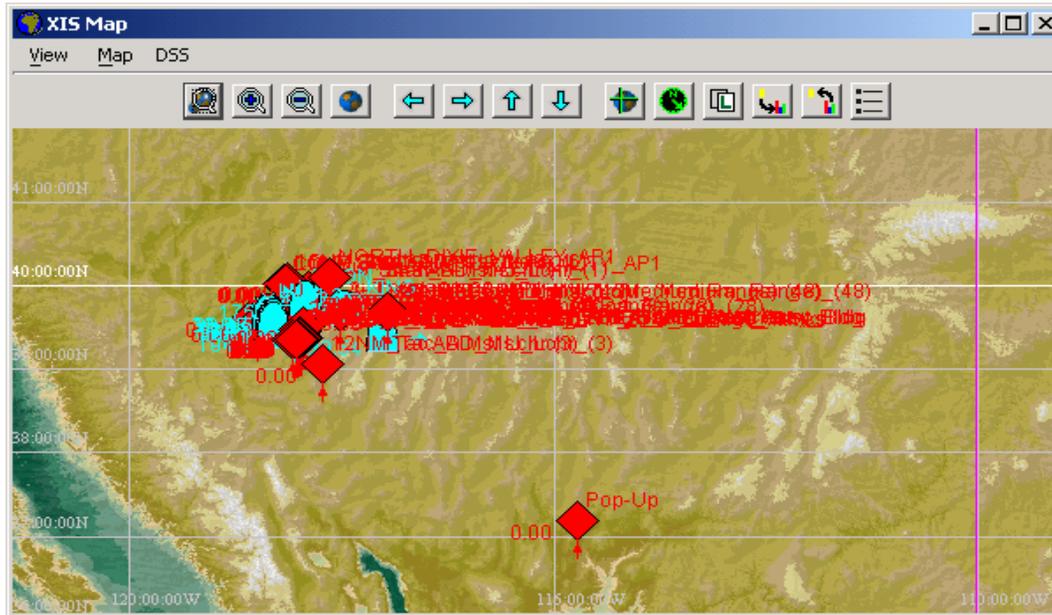
# REALTIME EXECUTION DECISION SUPPORT



- 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



# REALTIME EXECUTION DECISION SUPPORT





# REALTIME EXECUTION DECISION SUPPORT



REDS DECISION SUPPORT

File Windows Help

Bravo Papa Bravo Whisky

Map Garrit Chart Table Data Card RAVE RAPT UTL Matches

Standard Alerts Weather Providers Mission Data MDO Editor

Current Logical Time: 10/03/2003 07:32

Profile Editor

Profile Name: Oct05 Profile Is Owner

AOI Category Threat Conditions Providers UTL

North Latitude  
43:00:00N  
43:00:00N

West Longitude  
125:00:00W  
125:00:00W

East Longitude  
110:00:00W  
110:00:00W

South Latitude  
30:00:00N  
30:00:00N

Use COP boundaries

Save Copy

OK Update Cancel

Profile Editor

Profile Name: Oct05 Profile Is Owner

AOI Category Threat Conditions Providers UTL

JIPTL

BE Number	Name	Priority	Latitude	Longitude
0017-10002	SA-6 01-64-16	20	39:22:21.000N	118:14:47.00...
0363NZ0123	TELEPHONE ...	37	39:13:40.000N	118:14:02.00...
0017-10001	SA-2 TLAM ...	45	39:34:41.000N	118:08:01.00...
0020-00004	NORTH DIXIE...	47	39:57:58.000N	117:51:29.00...

Add Remove New Update JIPTL

User Target List

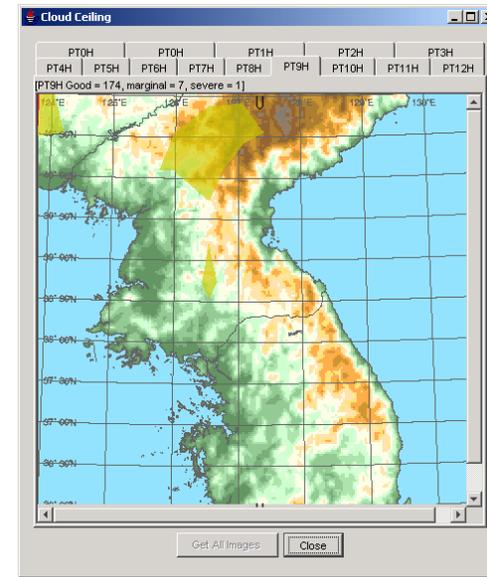
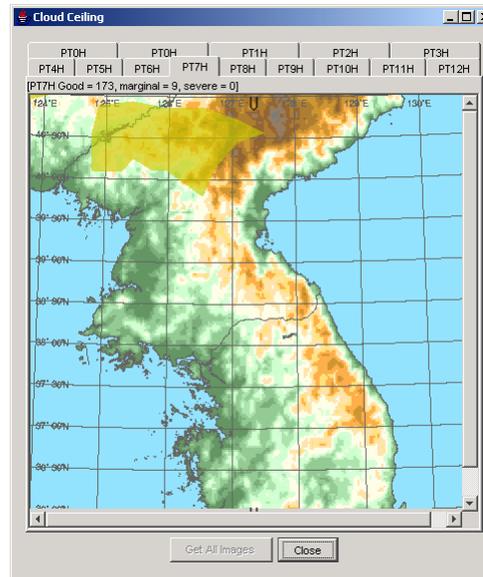
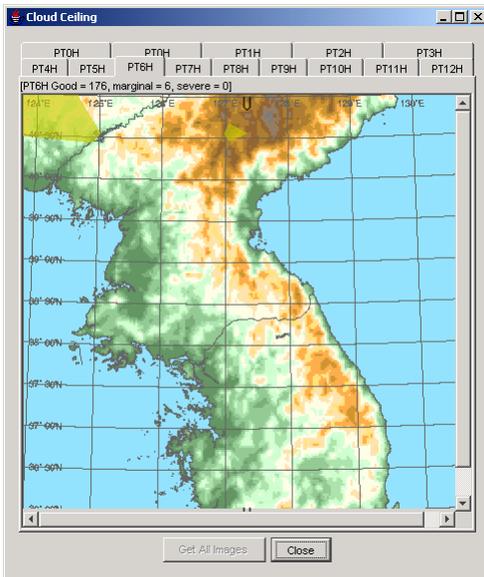
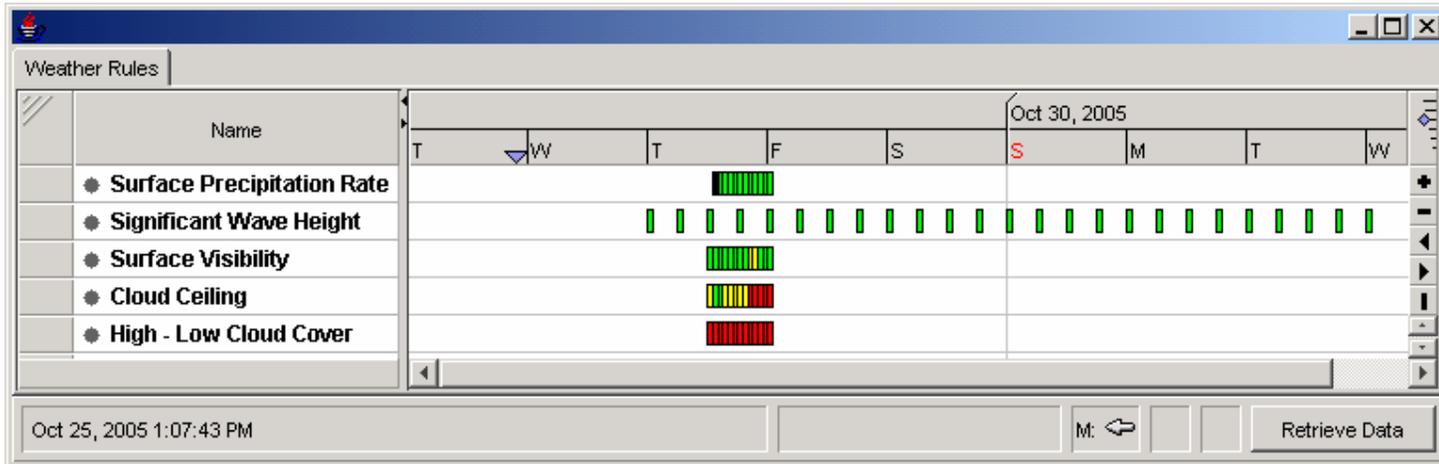
BE Number	Name	Priority	Latitude	Longitude
0017-10002	SA-6 01-64-16	20	39:22:21.000N	118:14:47.00...
0017-00005	CM-3 SCUD ...	50	39:14:52.000N	118:13:11.00...
0020-00005	CENTROID	51	39:19:23.000N	118:13:27.00...
0017-10003	SA-3 01-64-15	65	39:21:43.000N	118:09:59.00...

Save Copy

OK Update Cancel



# REALTIME EXECUTION DECISION SUPPORT





# REALTIME EXECUTION DECISION SUPPORT



**Friendly A/C Data Card**

Planned Data | Realtime Data

DYNAMIC INFO

Condition: Ready

A/A Wpn Rel Status: OPERATIONAL

A/G Wpn Rel Status: OPERATIONAL

Burnable Fuel(lbs.): 12000

Time of Fuel Report: Oct 08 15:15 GMT

Qty./Type Stores 1: 1/AGM-154 JSOW (UNITARY)

Radar Status: OPERATIONAL

Radar is Operating on a Single RF Channel

**Friendly A/C Data Card**

Planned Data | Realtime Data

Track ID: 02555      Launch: Fri Oct 08 15:10:00 GMT 2004

Aircraft Type: ATK1      Recover: Fri Oct 08 16:10:00 GMT 2004

MSN ID: 1      M1: N/A

PKG ID: AI      M3: N/A

Callsign: NAIL1      Tanker: N/A

MSN: 1      Average Fuel Burn Rate: 200.0

Task Unit: Bravo

Weapon	Quantity	TGT Name	TOT	Lat/Long
A-WPN1	1	Target A	10/08/2004 15...	35:27:28.810...



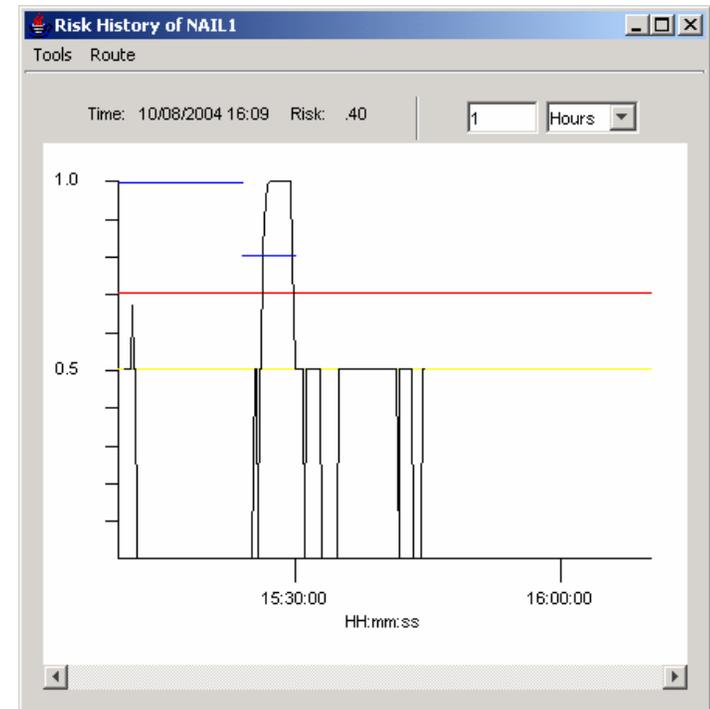
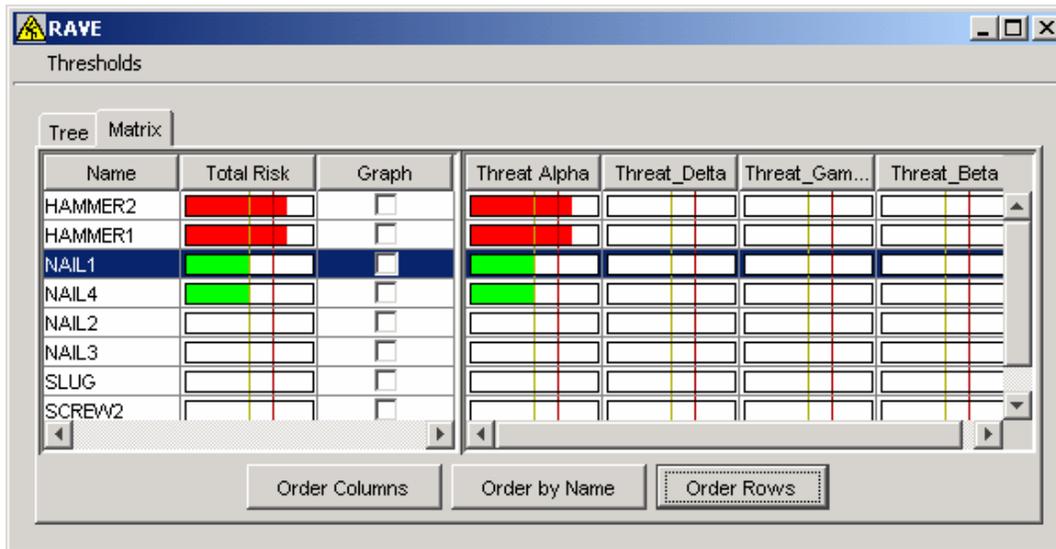
# REALTIME EXECUTION DECISION SUPPORT



- 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



# REALTIME EXECUTION DECISION SUPPORT





# REALTIME EXECUTION DECISION SUPPORT



- 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



# REALTIME EXECUTION DECISION SUPPORT



**Target**

Pop-Up

Aimpoint Type: TGT3

Aimpoint Description: AP1

Hit no earlier than: 10/08/2004 15:13

Hit no later than: 10/08/2004 15:25

Priority: 1

Latitude: 35:19:24.000N

Longitude: 112:42:13.000W

Is Mensurated

Kill Criteria: Catastrophic Kill

Desired Pd: 0.65

Minimize Change

Distance Threshold: 80 Nm

Route Risk Threshold: 0.75

Min. Risk  Max. Effectiveness

Ignore Fuel

OK Cancel

**Rapid Asset Pairing Tool**

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
<input checked="" type="checkbox"/> 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
<input type="checkbox"/> 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
<input type="checkbox"/> 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
<input type="checkbox"/> 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

Option 1	Option 2	Option 3	Option 4									
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

RAPT found 4 options

Show Request Retrieve Options Hide Details Send to ELP Clear



# REALTIME EXECUTION DECISION SUPPORT



- 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 Independence



# REALTIME EXECUTION DECISION SUPPORT



- 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.



# REALTIME EXECUTION DECISION SUPPORT



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



# REALTIME EXECUTION DECISION SUPPORT





# REALTIME EXECUTION DECISION SUPPORT



*SPAWAR  
Systems Center  
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## Extra Slides



# REALTIME EXECUTION DECISION SUPPORT



The image displays two side-by-side screenshots of the "STRIKE RETARGET" software interface. Both windows have a title bar with the text "STRIKE RETARGET" and standard window controls (minimize, maximize, close). Below the title bar is a menu bar with "File", "Help", and "Actions". Underneath the menu bar are three icons: a folder, a document, and a blue square with a white symbol. Below these icons are four buttons: "9 LINE", "CHECK-IN", "CHECK-OUT", and "tgt".

The left window shows a form with five numbered fields, each with a corresponding input box:

1. Authentication
2. Location
3. Time on TGT
4. Damage actually seen
5. Mission accomplishment

The right window shows the same interface but with a photograph of a person's hands on a blue track surface instead of the form fields.

SmartPacks for transmission to aircraft



# REALTIME EXECUTION DECISION SUPPORT



## ELP & MM JMPS UPC Integration

