MITRE-TRITON
-April 2013 TRB #4
Three Main MITRE Work Areas for FY13

1. Airspace Characterization
   - US “Offshore” Areas (Initial)
   - US Oceanic Airspace (Enhanced)

2. AI Operations Development
   - NATOPS, NATIPS, etc.
   - Operational Scenarios
   - M&S Support

3. Airspace Access Strategies
   - Hi-Level Operational Doctrines
   - Mission Planning Guidance
   - ORM Rationale for Due Regard

Focus of Today
2 new tools
- Curtain Charts
- Stop Light “Plus”
Overview of FY13 Airspace Characterization

“Offshore Airspace”
“Oceanic Airspace”

Objectives:
- Locate “breakpoints” between random domestic traffic patterns and well-behaved oceanic
- Identify offshore airspace where Triton can more easily operate due regard
- Correlate airspace features with actual usage (for Access Strategy)

Data Sources - Terminal & En Route Radars
- Radar Position Data with Flight Info Tags

Objectives:
- Identify Oceanic airspace where Triton can more easily operate due regard
- Provide objective, data-driven outputs for
  - Safety Case
  - Access Strategies
  - M&S support

Data Sources – ATOP-Based Oceanic Centers
- Position Report, CPDLC, and Flight Plan Messages

Approx. 200 nm. (from coastline)
US Coast
Offshore Characterization (1)

How Close To Shoreline Can Triton Operate Under Due Regard?

- Examine coastal radar data for Pacific, Atlantic

Radar-Derived IFR Tracks Of US West Coast - 21 August 2012
Airspace usage and traffic behavior can be associated with airspace, route, and surface features.
Offshore Characterization (4)

34N Curtain
Offshore Characterization (5)

Curtain Charts Provide A Way To Look At The Vertical Airspace Picture
Motivations for Enhancing Stop Light Charts

- Earlier Stop Light Charts were strictly “proof-of-concept” visualization aids
  - Collapsed a lot of data onto 2-D picture
    - Altitudes
    - Time Windows
  - 1deg x 1deg squares
  - Involved some subjective weighting of encounter exposure
  - Not readily extensible to other analyses
    - “Airspace Volume” Perspective

- Needed enhanced analytical tool (Stop Light Plus – “SLP”)
  - Characterize airspace from *UAV-in-airspace perspective*
  - Extensible to other analyses and purposes (e.g. Access Strategy)
Overall Approach in “Stop Light Plus”

Focus on “UAV-in-airspace” perspective
- Examine how “proximate” air traffic would appear to (UAV) observer at a location in the airspace
  - Within specified range of a lat/lon
  - Within specified distance from an altitude
- *Not to be confused with NMAC volume
  - Substantially larger than NMAC volume (and even TCAS or ADS-B volumes)

Develop that perspective at frequent lat/long/altitude intervals
- Considerable overlap of “proximity pucks” is desirable
Analysis of Each Intruder for Each Puck

Created Record

- Aircraft Information (ID, Type, VFR/IFR, Equipage*)
- \((x,y,z,t)_1, (x,y,z,t)_2\)
- \((x,y,z)\)' avg. velocity vector
- Track angle
- Slant range at CPA
- Altitude separation at CPA
- Intruder speed, RCS, bearing, equipage
- Conditional/Cumulative reports
- Many more possibilities

“Intruder”
(From traffic data)
Influence of Puck Overlap

- Intruder’s influence on puck is unique to that puck
- Each puck (UA) traffic perspective is unique from all others
- Closer puck spacing provides finer granularity of results
Advantages of SLP Approach

- Allows for comprehensive statistical looks at the airspace
  - Objective data describing UAV-in-airspace perspective
  - Easy identification of hot spots and cold spots
    - As input to M&S and Mission Planning/AVO tools
  - Easy examination (“windowing”) of area & time of interest
    - Geographic area
    - Altitude slices
    - Time periods (e.g., by minute, hour, day, month, or year)

- Enables estimation of encounter exposure without requiring
  - Realistic, pre-determined UA scenarios
  - Full Monte Carlo encounter modeling simulation runs

- Provides more-finely resolved data for better graphical depiction
  - Indices can be used individually or in weighted combinations
  - Permits color-coded graphics (with animation) for visualizations
Next Steps

- **Provide accelerated SLP example for Analysis Team (May 13)**
  - Atlantic “WATRS” Region (ATOP Data)

- **Provide analysis of offshore airspace for Atlantic and Pacific (Sep 13)**
  - Airspace usage w/in 200 nm of both coasts – two, one-week periods
  - Identify “low usage” offshore airspace using curtain chart graphics
  - Capture key relationships to airspace usage

- **Provide analysis of Atlantic/Central East Pacific Oceanic Areas (Sep 13)**
  - SLP analysis using one year’s worth of ATOP data
  - Statistical analysis & identification of hot spots and low usage volumes
  - Graphical depictions of pertinent parameters (e.g., density)
  - Incorporate observations into Access Strategy document

- **Issue: The need to obtain and analyze foreign air traffic data**
  - Focus on IOC mission areas if possible