

# Data Link-Supported Low-Cost Airspace Alerting and Avoiding System

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MITRE Sponsored Research

The logo for the MITRE Technology Program, featuring a stylized graphic of stacked blocks in yellow, orange, and blue on the left, and the text "MITRE Technology Program" in yellow on the right.

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# Problem

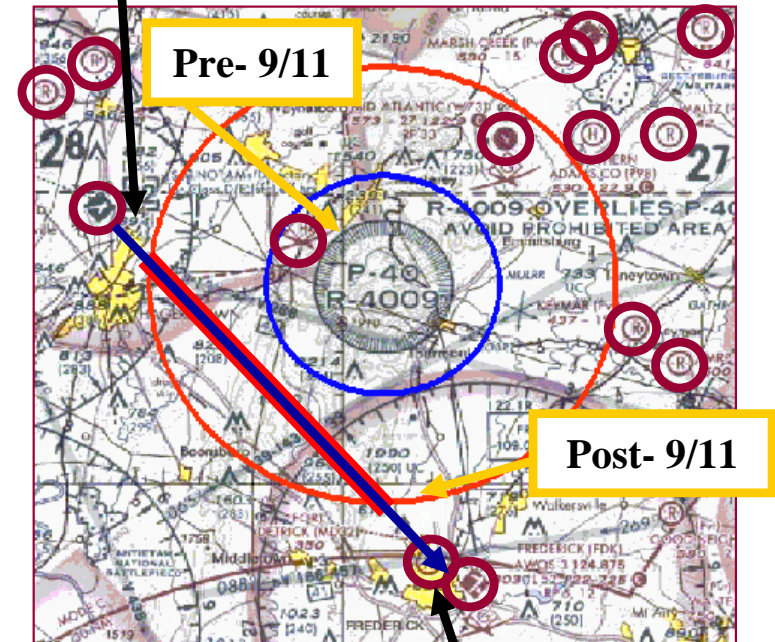
- **Since 9/11:**
  - Increased number of Temporary Flight Restrictions (TFRs) in National Airspace System
  - Increased impact on users and Air Traffic Control
- **TFRs...**
  - May be of fixed dimensions or may be “no loitering” zones
  - May be time variant, with minimal prior notification (e.g., Presidential travel)
- **Inadvertent TFR violations:**
  - Expend enforcement resources better directed to deliberate hostile actions (e.g., limited number of intercept aircraft available for any one incident)
  - Delay air traffic and create situations that might be exploited by hostile forces

# Background

- After 9/11 event, TFRs were established around many “sensitive” areas, including Camp David, MD
- These TFRs complicate routine flights from General Aviation (GA) airports (e.g., from Hagerstown, MD to Frederick MD)
- TFRs may also disrupt activities in other GA operational environments (e.g., glider ports and sky diving sites, as shown in the illustration)

Hagerstown, MD

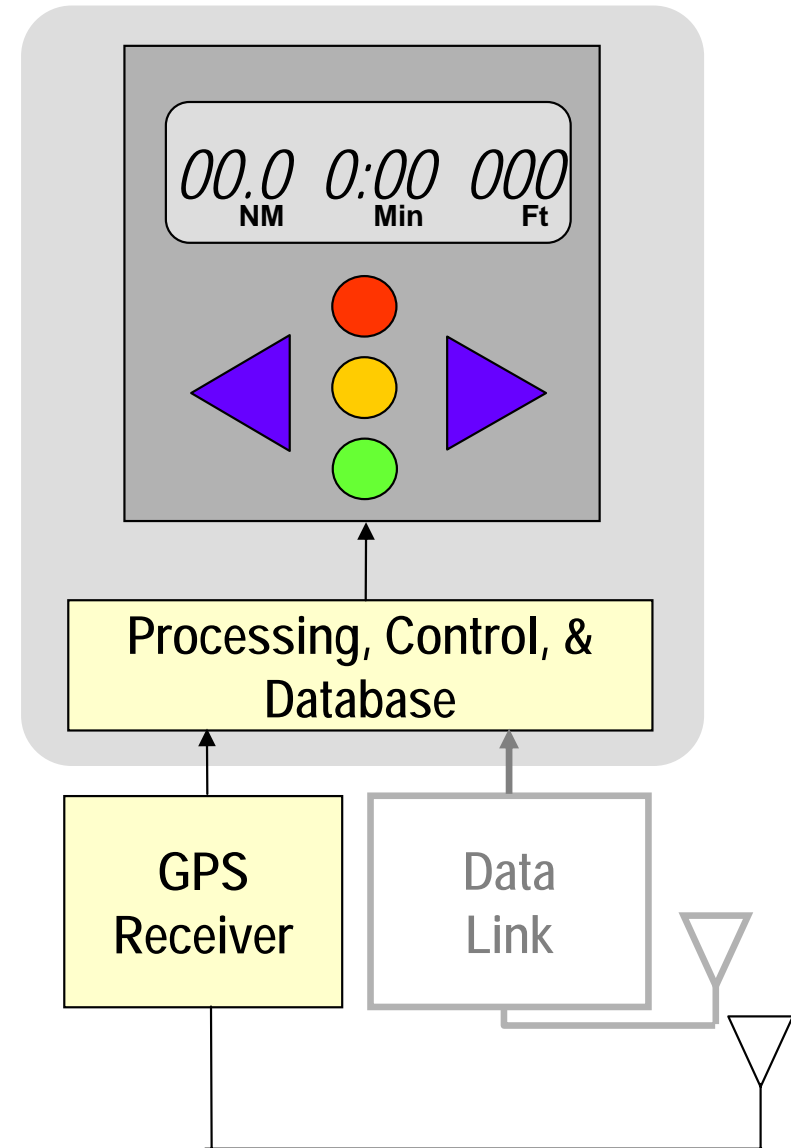
Camp David, MD TFR



Frederick, MD

# Objective

- **Research topic: low-cost, real-time situational awareness device useful for avoiding restricted airspace and other sensitive areas**
- **“Lowest cost” practical system**
  - Implemented on PDA to permit rapid prototyping
  - Data link integration allows “on-the-fly” updates
- **Alerting/avoidance algorithms support implementation on other devices/systems (e.g., moving map navigators)**



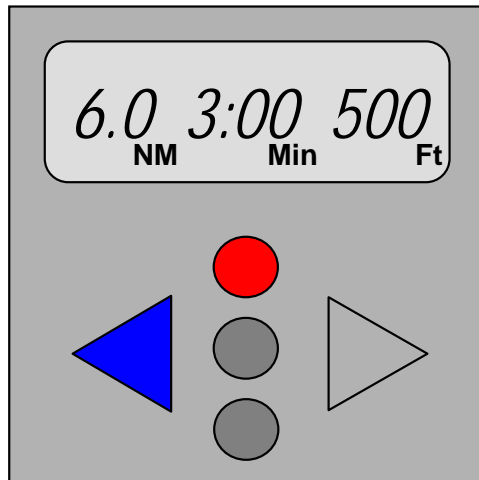
# Activities

- **Airspace Alerting and Avoidance System**
  - **Concept development**
  - **Algorithm development**
  - **Functional prototype development and testing**
  - **Data link development and testing**
- **Technology Transfer**
  - **Early feasibility assessment with key user groups**
  - **Briefs/demos to wide range of potential developers and end users**

# Highlight

- **Tech transfer to NASA Small Aircraft Transportation System contractor**
- **A3S system featured in demonstration of small aircraft 'Digital Dashboard' at Centennial of Flight celebration**

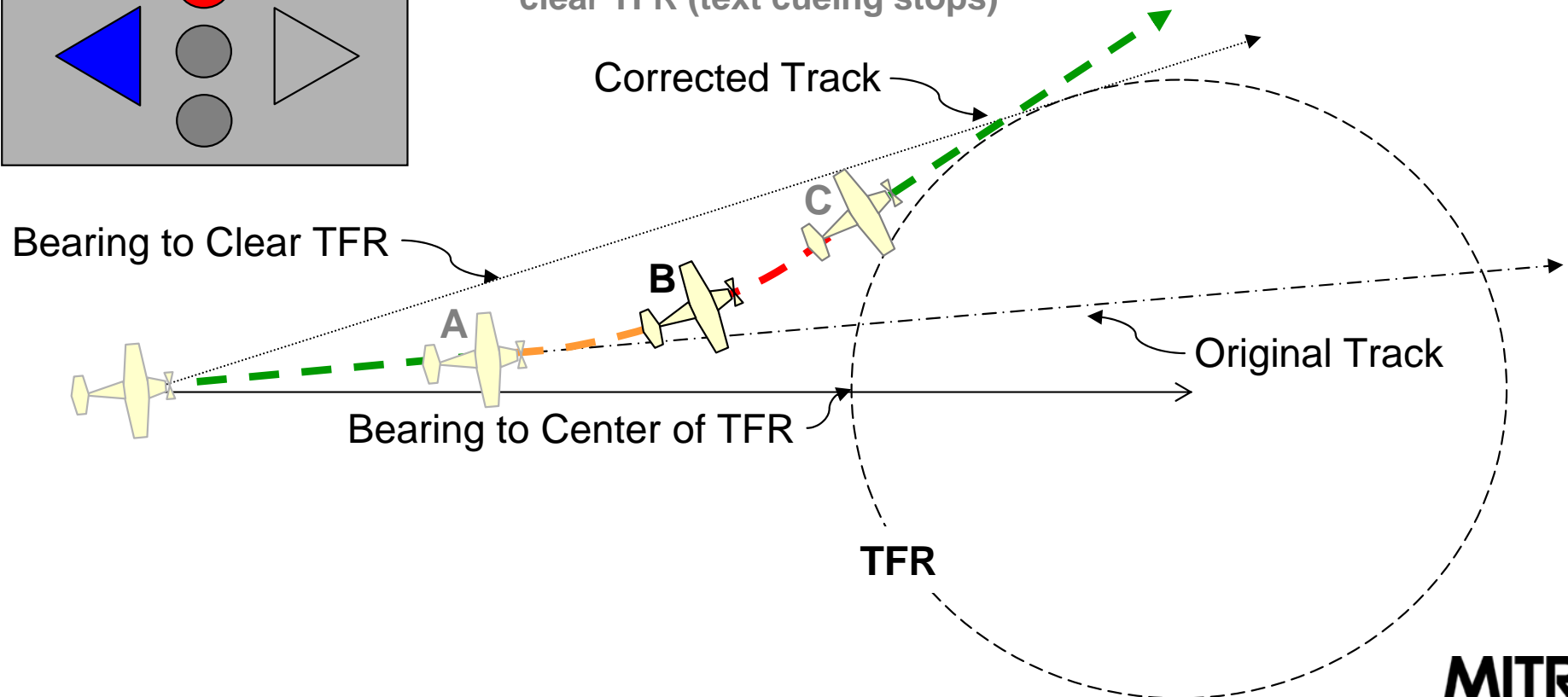
# Demonstration: TFR Avoidance



Position A: Pilot alerted to proximity (5 min: steady orange with arrow, audio alert); left turn required to avoid TFR (text cueing starts)

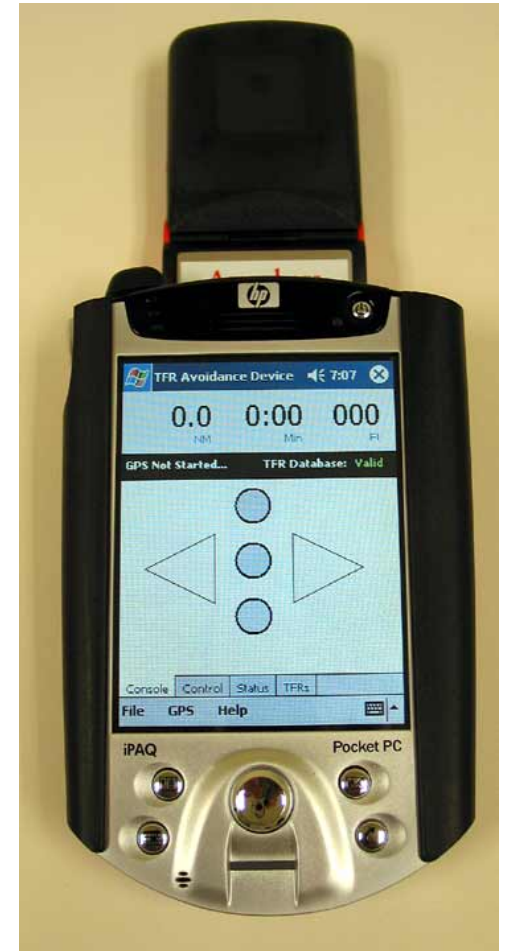
Position B: Pilot alerted to close proximity (3 min: steady red with arrow, second audio alert); further left turn required to avoid TFR

Position C: Alert canceled; pilot advised that current course will clear TFR (text cueing stops)



# Impacts

- **A3S software under license by NASA Small Aircraft Transportation System contractor**
  - Demo'd alerting and avoidance function at Centennial of Flight (Kitty Hawk, NC)
  - Full integration with contractor's airborne situational awareness suite is in progress.
- **Additional licensing agreements in discussion**
- **Invitation from Experimental Aircraft Association to brief A3S at AirVenture 2004 (Oshkosh, WI)**



**PDA-Based  
Functional Prototype**

# Future Plans



- **Integration with airborne data links to achieve dynamic database update capability**
- **Continued human factors testing to determine optimum display configurations**
- **Technology transfer: Key metric is transfer to at least one software developer and one avionics developer by EOY 2004**
- **Possible application for patents on display concepts, algorithms, and overall system function**