

# **FAA Aviation Forecast Conference**

## **Next Generation Avionics**

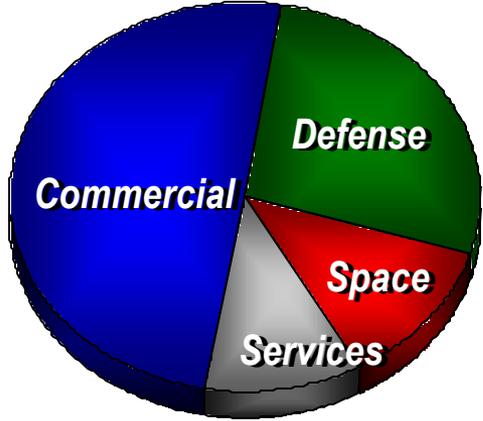
Dean Flatt

President

Honeywell Aerospace Electronic Systems

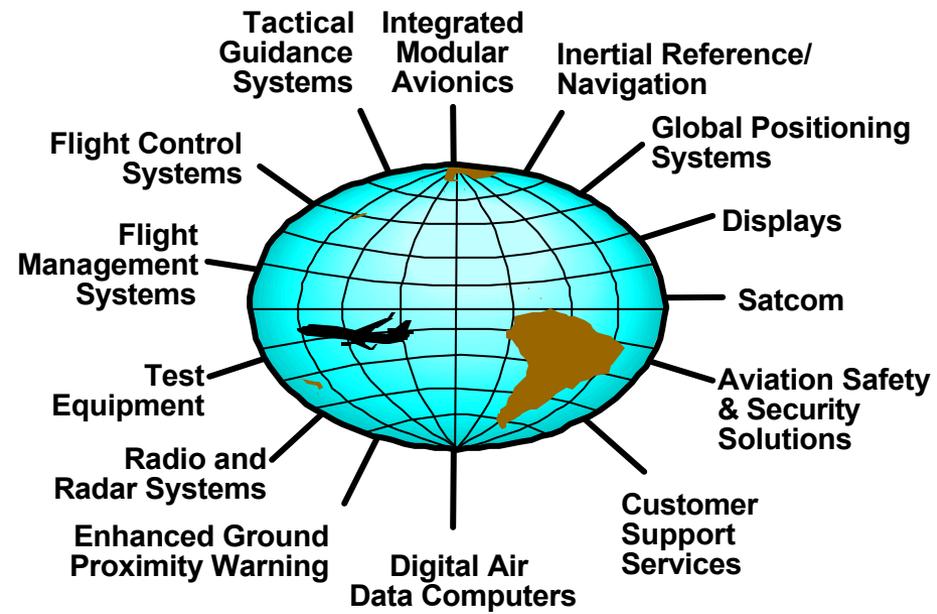
# Honeywell Aerospace Electronic Systems Profile

2002 Revenue \$4B

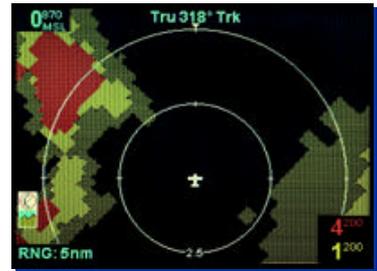


- Heritage of outstanding products
- Higher levels of integration
- Re-defining avionics solutions

## Broad Range of Products/Systems



*Redefining Integrated Systems*



*Pioneering Aviation Safety Technology*



*Precision Guidance Forefront*

# Game-Changing Technologies

# Focus Areas for Advanced Avionics Technologies

- *Integrated Systems*
- **Safety**
- **Knowledge Management**
- **Precision Guidance**
- **What Else?**

# Integrated Systems

- **Integrated avionics systems serve to improve safety and functionality while:**
  - Lowering weight
  - Using less power
  - Decreasing volume
  - Increasing reliability
- **Air Transport**
- **Regional Jets**
- **Business Jets**

*Airplane Information Management System*



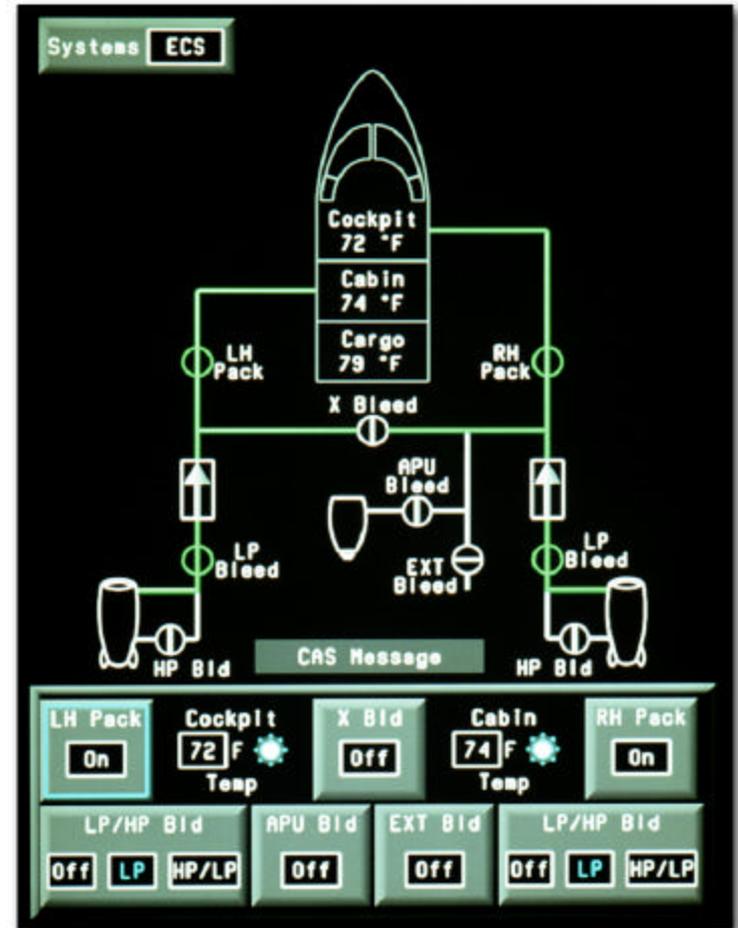
*Epic Integrated Avionics System*



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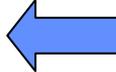
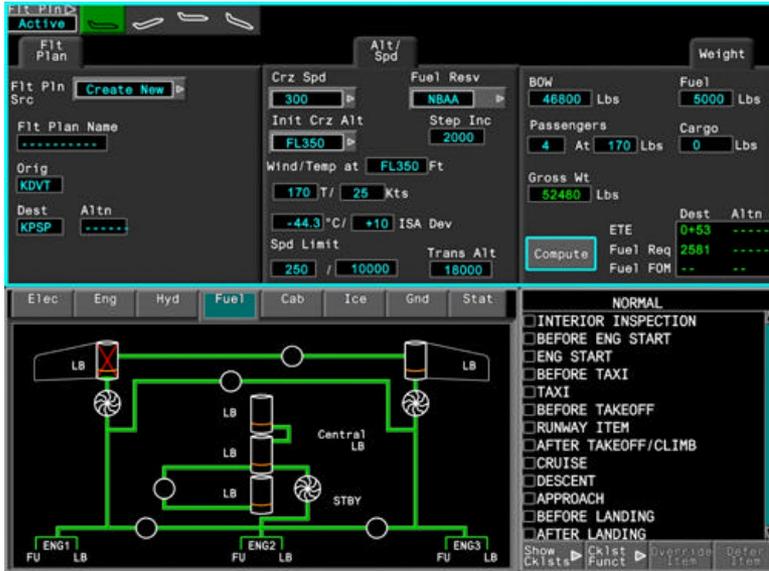
# Integrated Systems

- **Aircraft Utilities Integration**
  - Industry partnerships allow for 3rd party integration of utility systems into the avionics cabinet
  - Control of aircraft utility systems through integrated human-machine interface
  - Increased aircraft reliability by removing parts from the aircraft



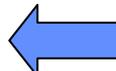
**Utility Integration Provides Additional Aircraft Savings**

# Integrated Systems: Improved HMI



## Phase of flight awareness

- Reduction in the number of steps to modify aircraft direction, altitude, speed
- Elimination of Flight Management System Control Display Unit



## Aircraft systems status awareness

- Visual representation of aircraft systems

## Aircraft environment awareness

- Visual representation of aircraft vertical and lateral position relative to flight plan, terrain, weather and traffic



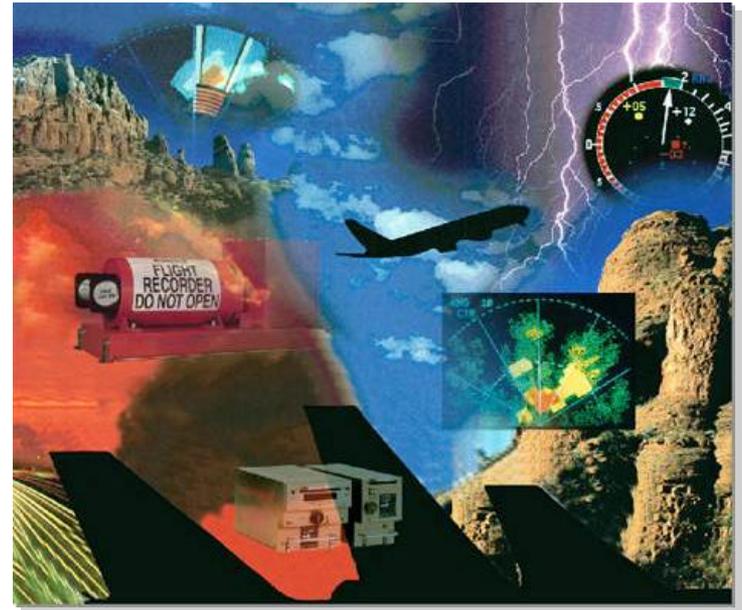
**Improved Safety Through Enhanced Situational Awareness**

# Focus Areas for Advanced Avionics Technologies

- Integrated Systems
- *Safety*
- Knowledge Management
- Precision Guidance
- What Else?

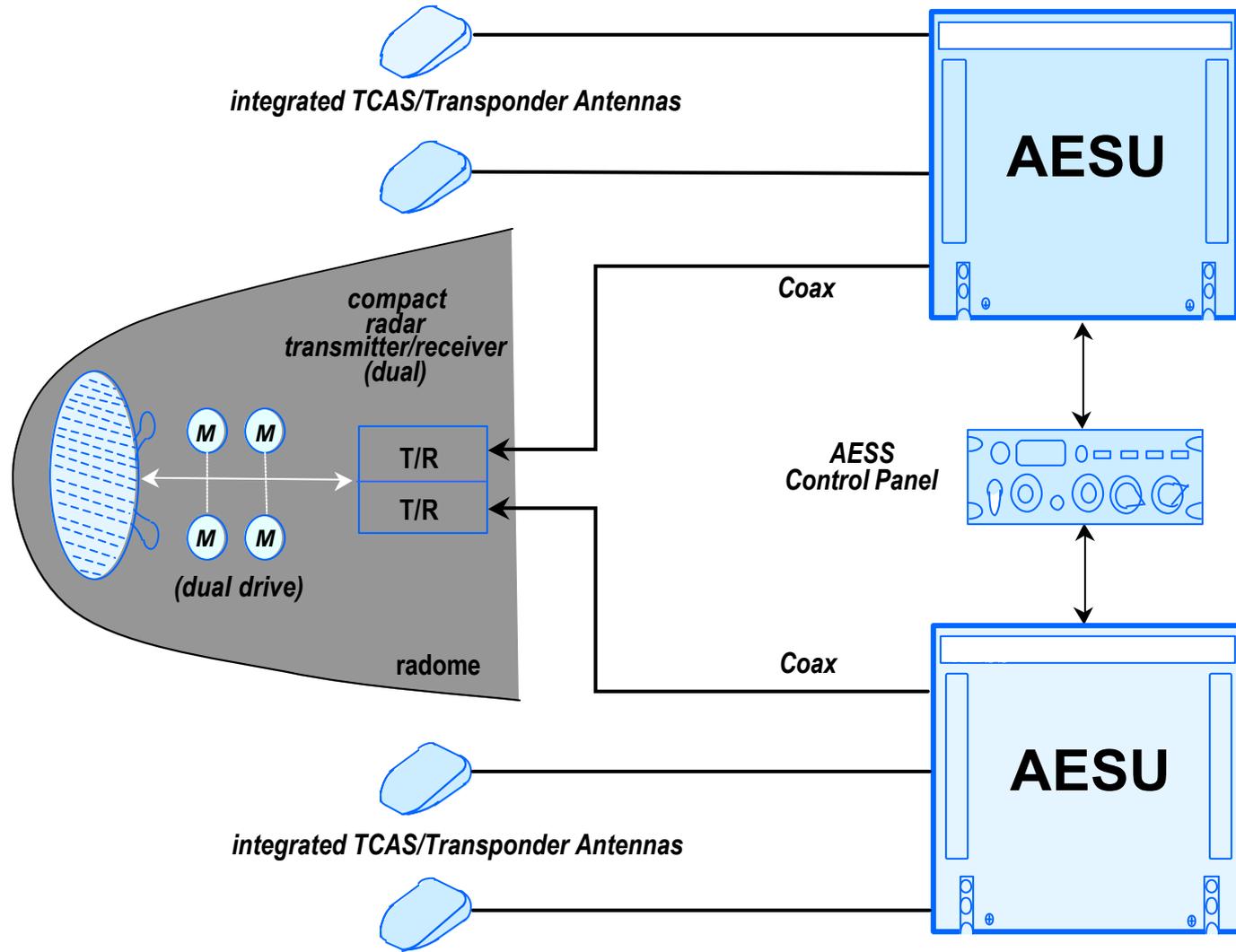
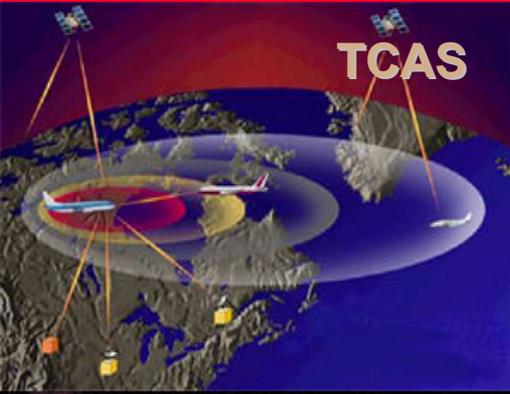
# Proven Leader Aviation Safety Products

- **Today's Federated Systems**
  - Traffic Collision Avoidance System
  - Weather Radar
  - Enhanced Ground Proximity Warning System
- **Near-term integration**
  - All primary safety avionics integrated into single system (AESS)
  - Previously airline selectable - now "basic" on the aircraft



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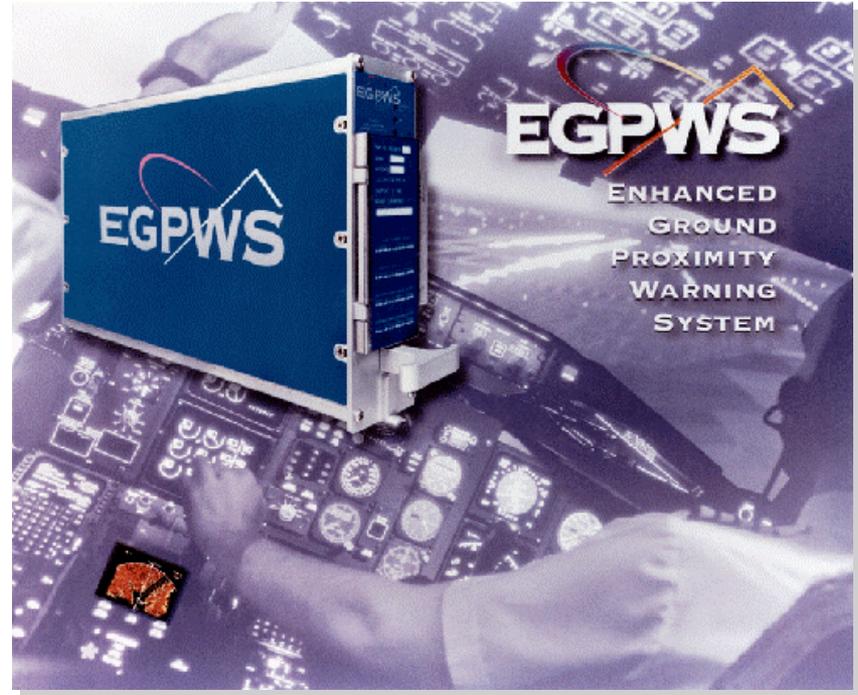
# AESS - The Future of Surveillance



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# New Products that Advance Aviation Safety

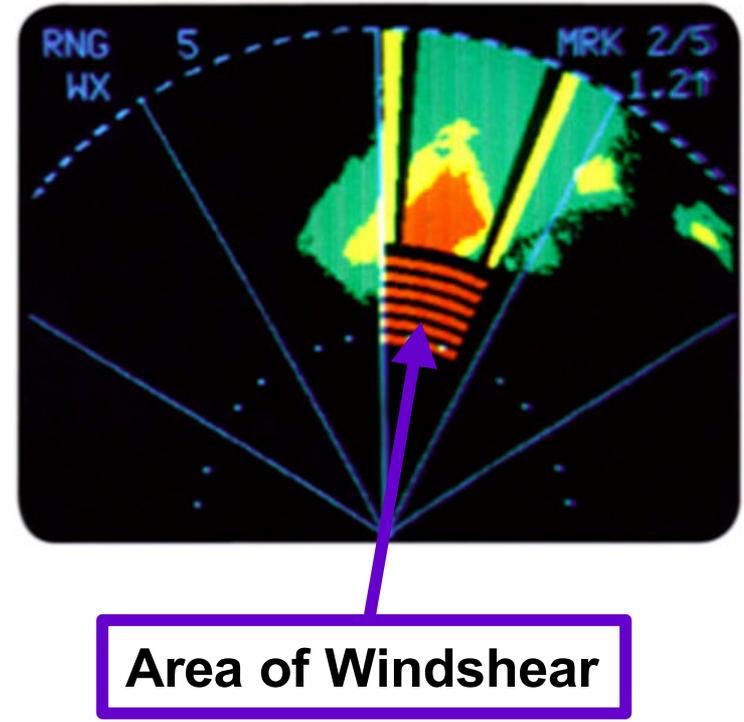
- Windshear detection weather radar
- Runway awareness and alerting system
- Terrain and man-made obstacle avoidance systems



***Leading Safety Innovation for the Near Future***

# Next Generation Weather Radar

- **Advanced technologies and signal processing enables:**
  - Automatic antenna tilt
  - Advanced turbulence detection and display
  - New, forward looking windshear detection and alerting
  - Future Clear Air Turbulence detection and alerting



# Runway Incursions

- **1977, Tenerife**
  - Most Fatal Aviation Accident
  - Two Boeing 747s
  - 583 Fatalities

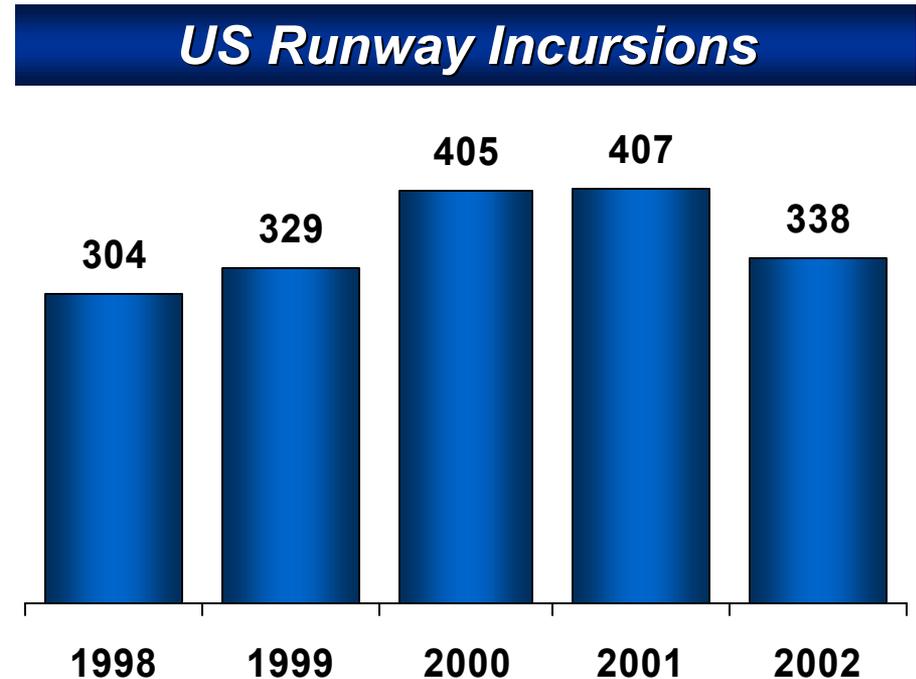
## *More Recently...*

- **2000, Taipei, Taiwan**
  - Boeing 747 hit crane
  - 83 Fatalities
- **2001, Milan, Italy**
  - MD-87 & Business Jet
  - 118 Fatalities

***A Growing Cause of Aviation Fatalities***

# Runway Incursions - A Major Safety Issue

- Not a new problem
- Rate / trend is increasing
- Multiple causal factors
  - Human error
  - situational awareness
- Training and procedural efforts will help...
  
- But, technology will have its role to reduce risk
  - Improve situational awareness
  - Help trap human error



*“An average of one runway incursion per day, and one close call every 10 days”*

*Source: US DOT Top Management Challenges, 1/21/03*

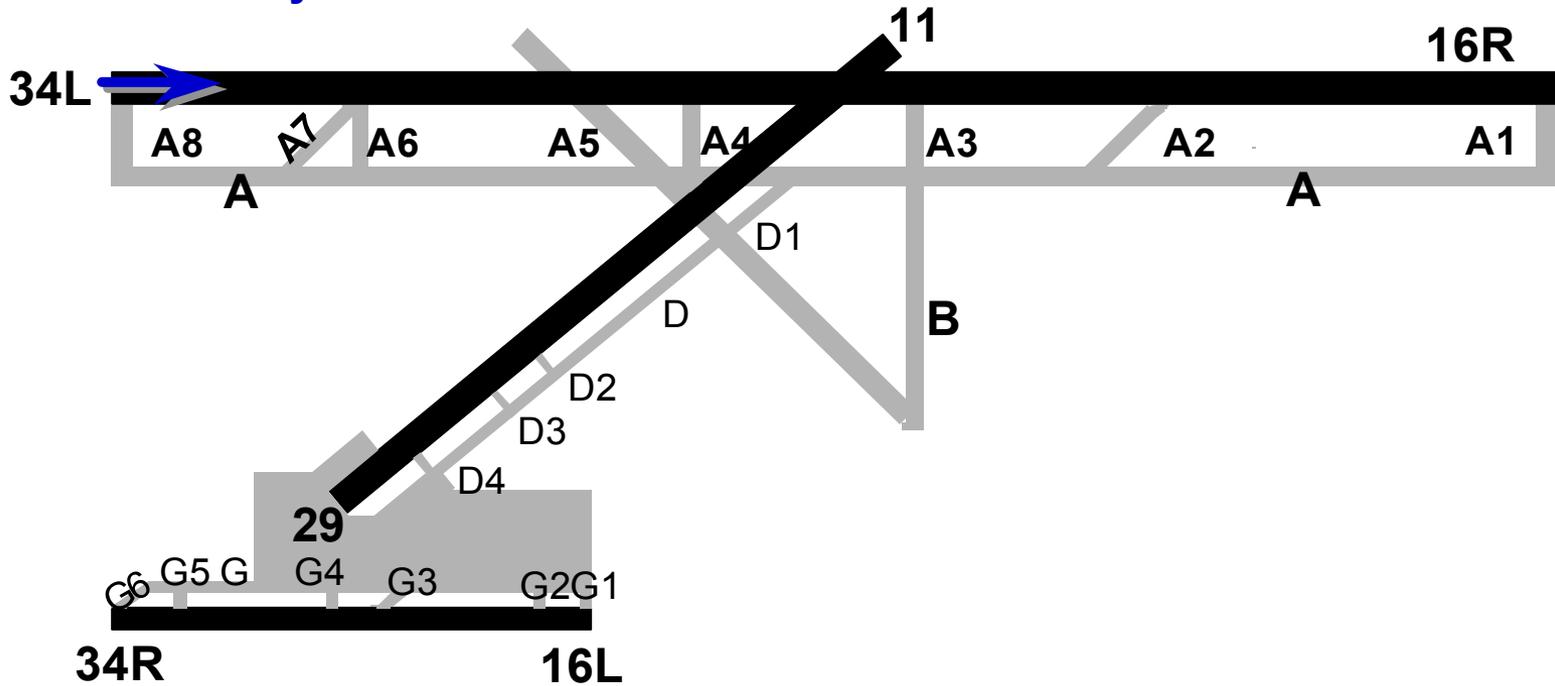
***Need A Solution NOW !***

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# Runway Awareness and Alerting System

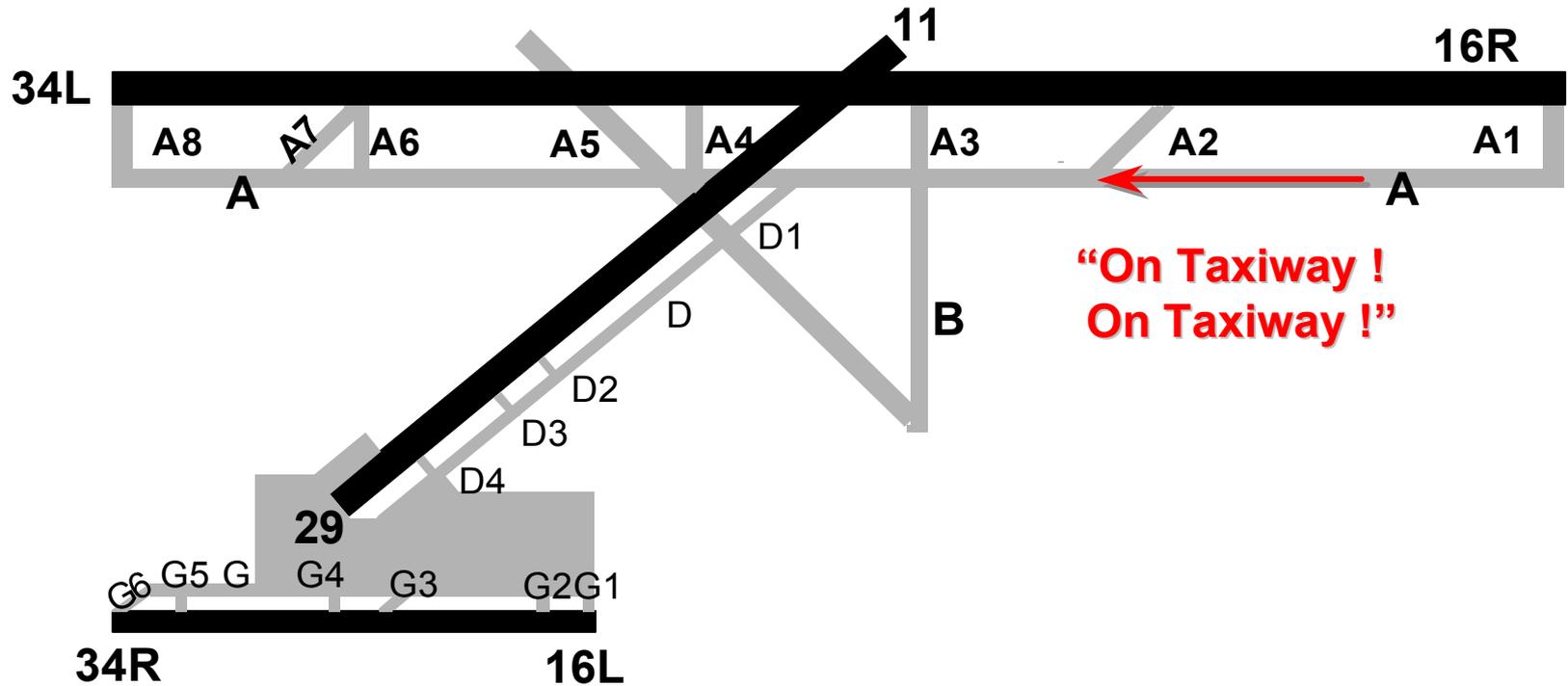
## Aligned on Runway

“On Runway Three-Four Left”



# Runway Awareness and Alerting System

## Takeoff on a Taxiway



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# Runway Awareness and Alerting System

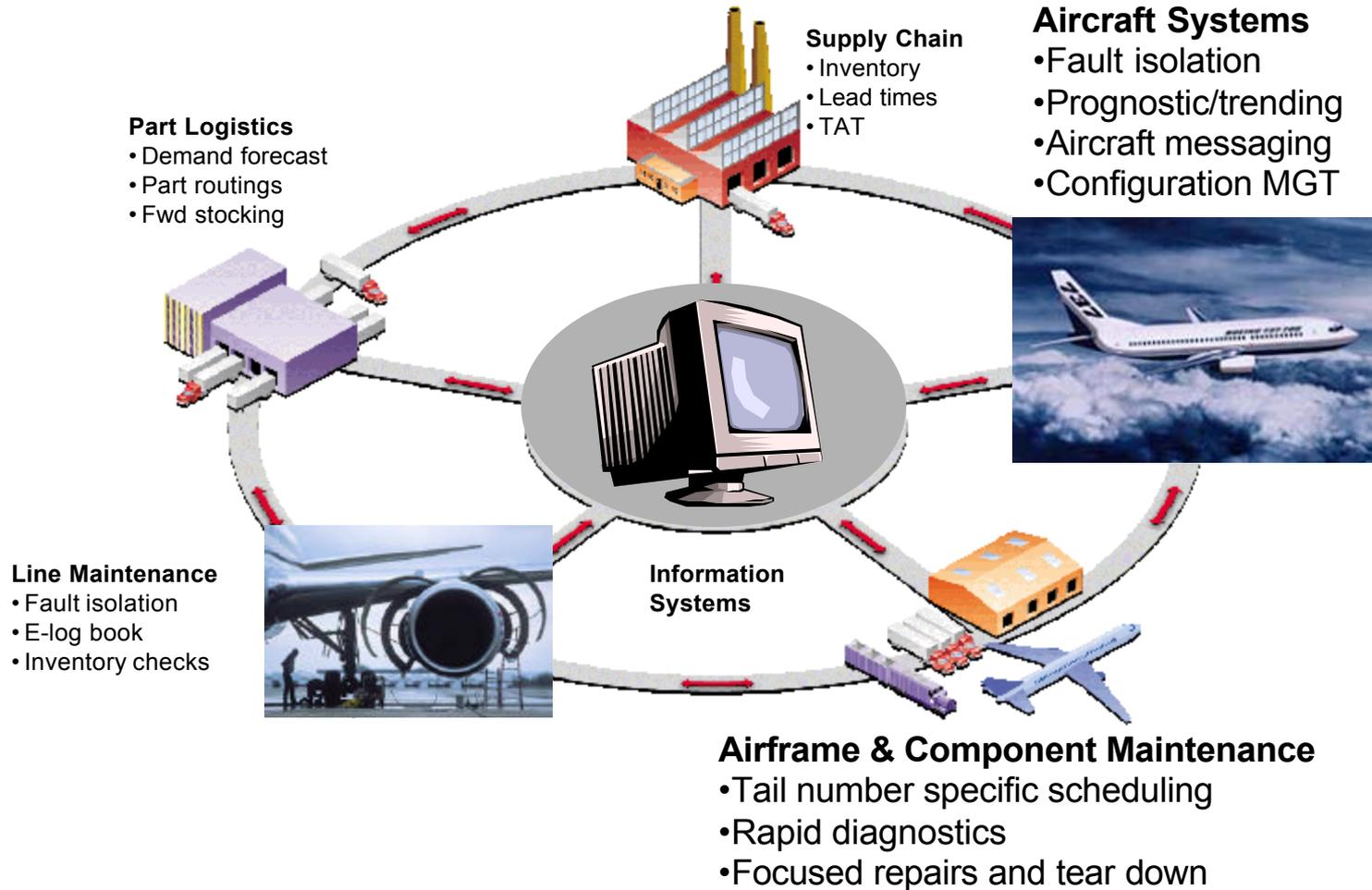
- **Runway Awareness and Alerting System advises of:**
  - **Airborne**
    - ◆ “Approaching runway ABC”
    - ◆ “Approaching short runway”
  - **On the ground**
    - ◆ “Approaching runway ABC”
    - ◆ “On runway ABC”
    - ◆ “Intersection departure”
    - ◆ “Insufficient runway”
    - ◆ “Extended hold on runway”
    - ◆ “On taxiway” when speed is greater than 40 knots
    - ◆ “NNN (distance) remaining” on aborted take-off

# Focus Areas for Advanced Avionics Technologies

- **Integrated Systems**
- **Safety**
- ***Knowledge Management***
- **Precision Guidance**
- **What Else?**

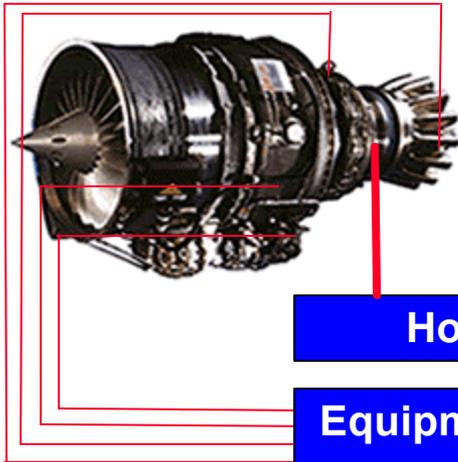
# Knowledge Management

## Information Flow



# Knowledge Management Value Proposition

## Data from the Equipment / Operator...



Hours / Cycles

Equipment Operational Data

Configuration & Configuration Changes

- Logbook
- Service bulletins
- Removals / replacements

Airline Schedules

- Heavy maintenance
- Flight schedules



## ... Allows Greater Value Creation

### Better Maintenance Decisions

- Best trade-off between time on wing and avoiding catastrophic failure
- Shorter, more focused maintenance events

### ▶ **Reduced Lifecycle Costs**

- Line Maintenance
- Cost of Dispatch Delays
- Lower Secondary Damage
- Improved Work Scoping

### Greater Predictability

- Know more precisely, farther in advance, when maintenance events are required

### ▶ **Lower Supply Chain Costs**

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# MEMS - What Is It? What's So Key?

## What is MEMS?



27 cubic inch RLG IMU



2 cubic inch MEMS IMU



**MEMS – Micro Electromechanical Systems**

An inertial sensor on a silicon chip

## What are MEMS benefits?

- 90% size reduction, 75% cost reduction and required ruggedness
- The expectation is that the technology will:
  - Be used in very high volumes
  - Be used across all performance ranges
  - Be tightly integrated with GPS for enhanced performance
  - Create large, new opportunities

## What are MEMS opportunities?

- MEMS solutions fit existing needs and creates new opportunities
  - Guided, small, rugged projectiles
  - Industrial and transportation requiring small size, low cost, performance
  - Micro UAVs need small size, low cost
- The first supplier to meet the DOD's missile/projectile needs will be positioned for all performance ranges

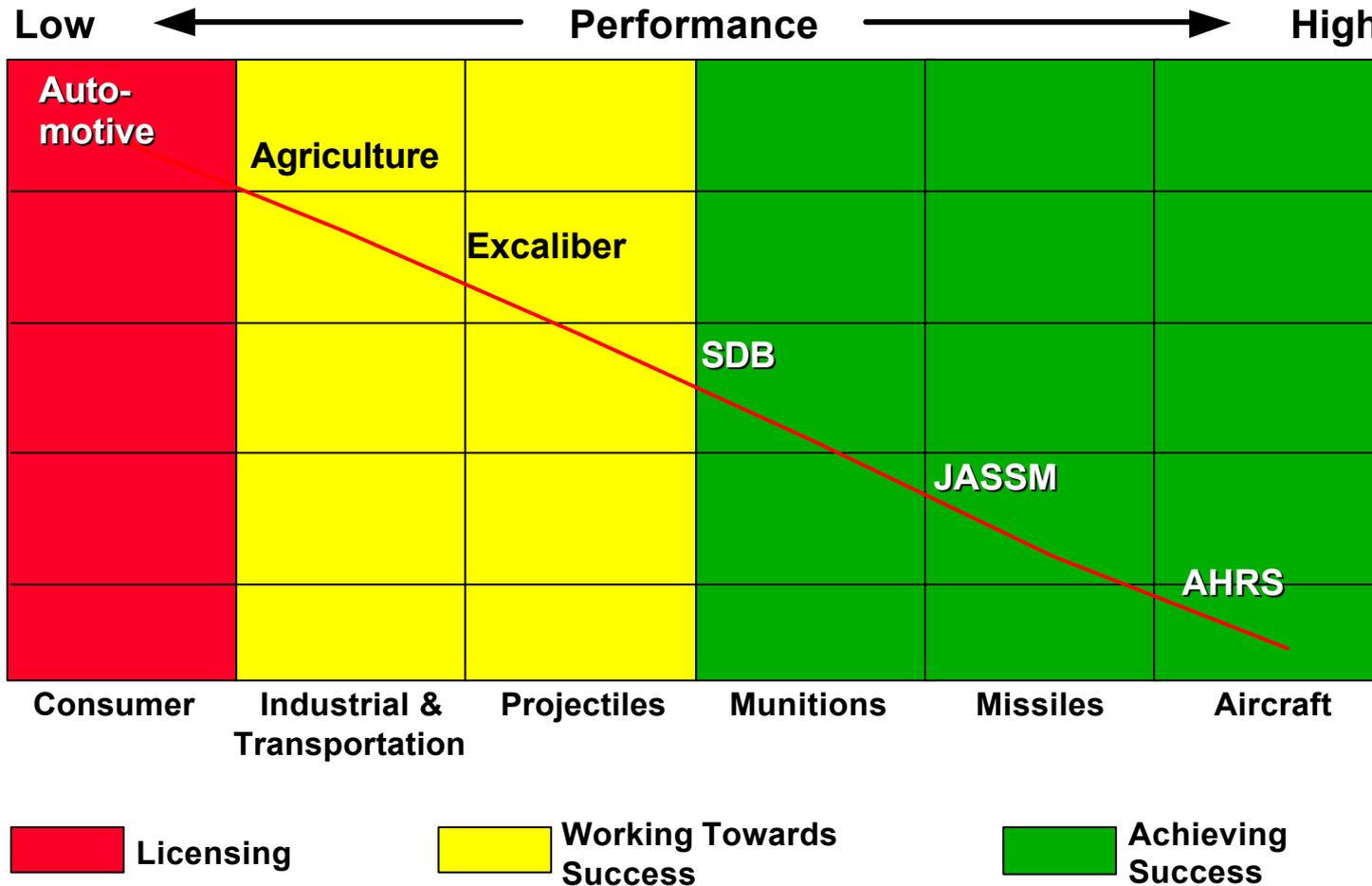
## Where will MEMS be used?



Gun-hard ruggedness

***MEMS Fuels Future Precision Guidance Growth***

# MEMS Inertial Guidance Has Many Applications



***Viability Technology for Both Commercial and Defense***

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# Focus Areas for Advanced Avionics Technologies

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# Auto-Recovery from Terrain and Obstacles

## *Purpose:*

Help the Pilot in recovery from Flight into Terrain, Obstacles, Prohibited Areas, or Landing Short

*There have been many tragic CFIT Accident examples of either late or inappropriate Pilot Response to GPWS*

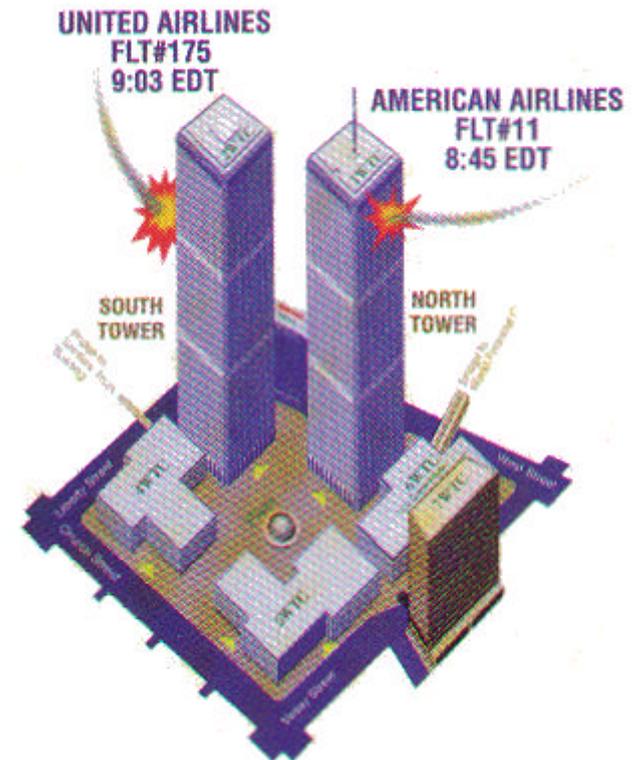
- **Continual Analysis of REAL WORLD accidents/incidents**
- **Improve EGPWS Performance and Integrity**
- **Benefits of Improved EGPWS Performance and Integrity**
  - Improved aural-visual alert/warnings
  - Enabling Auto-Recovery
  - Enabling a Terrain Resistant Aircraft

***Auto-recovery Can Make the Aircraft Resistant to Flight Into Terrain, Obstacles, or Landing Short***

# September 11, 2001 - Aircraft Safety Changes

## *World Trade Center Buildings\**

- **American Airlines flight 11**
  - “Caution! Obstacle!” - 37 seconds
  - “Obstacle! Pull Up!” - 17 seconds
- **United Airlines flight 175**
  - “Caution! Obstacle!” - 40 seconds
  - “Obstacle! Pull Up!” - 23 seconds

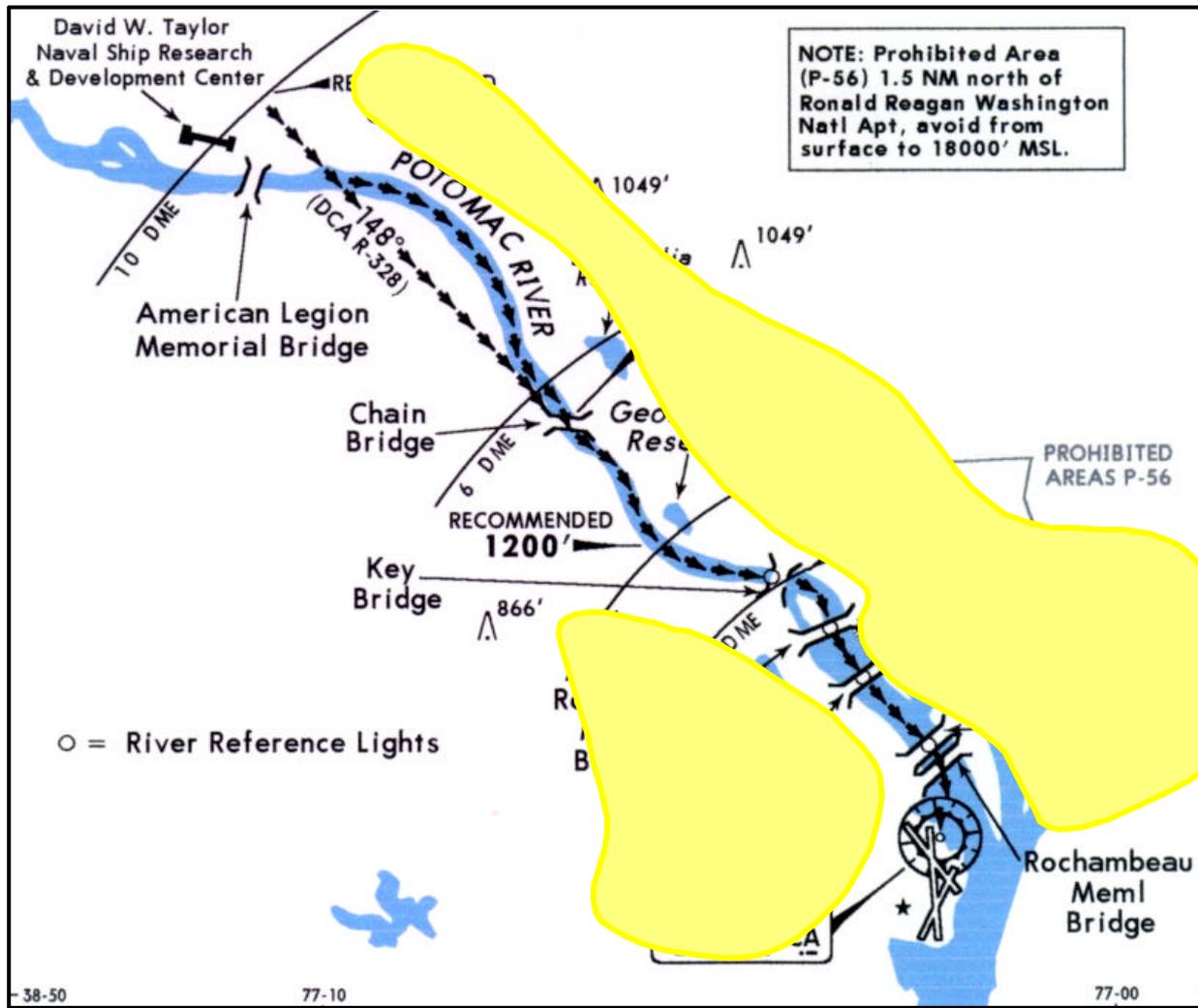


\* *Current Database includes all buildings over 30 Meters AGL in height*

***Recovery Can be Automated***

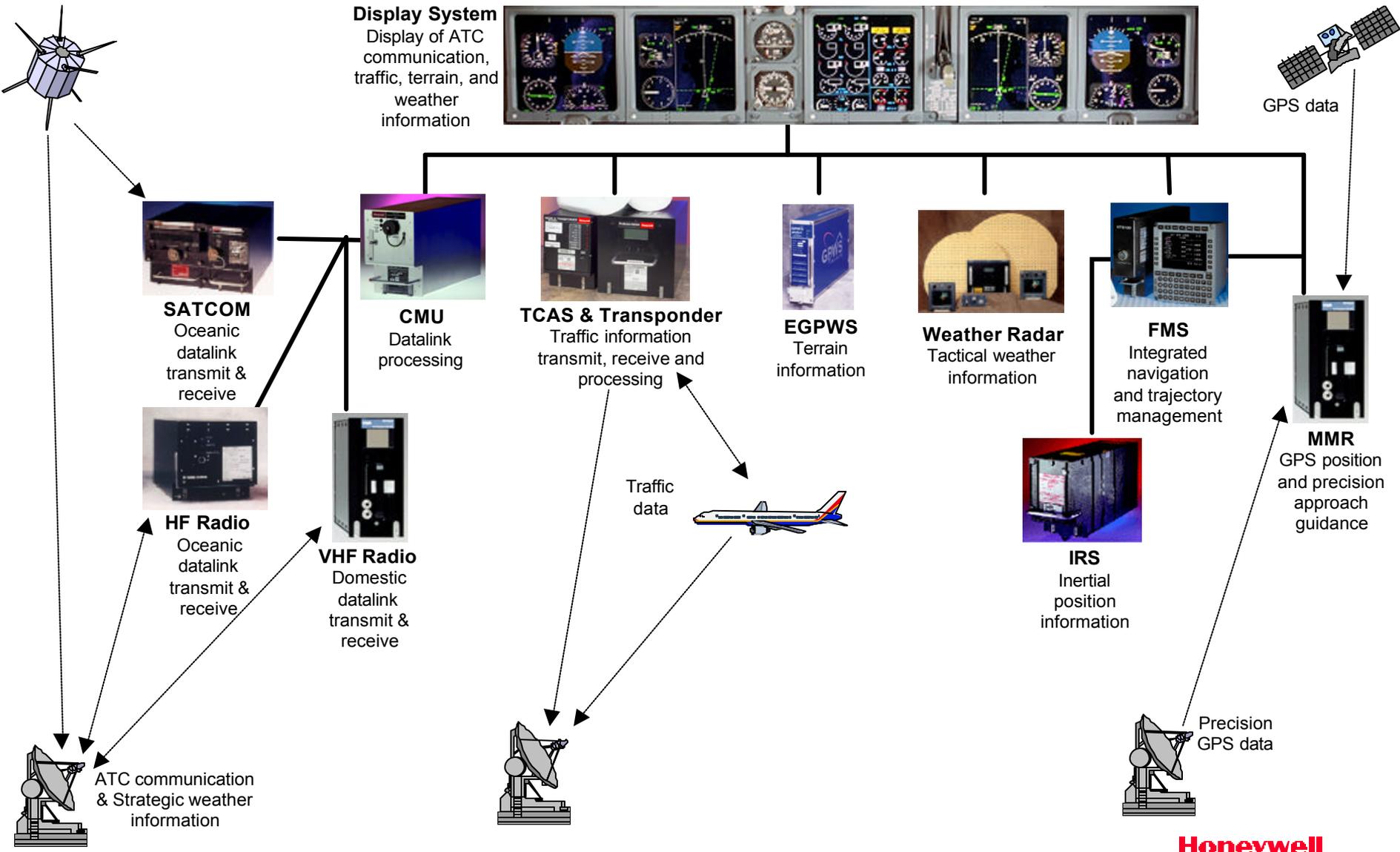
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# Auto-Pullup – Prohibited Areas Database



**Prevent Penetration of Prohibited Airspace**

# Free Flight Airborne Architecture



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