



Airspace Integration GBSAA

Ground Based Sense and Avoid

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UAS Airspace Integration Goal: <u>Target Level Of Safety (TLOS)</u> for UAS operations regarding their compliance with Part 91 operating rules for "see and avoid".



It is incumbent upon DoD to make the safety case to the FAA.

UAS NAS Access Capability Gaps



GBSAA

Provide a mitigation to "see and avoid" regulatory requirements through ground based sensors, procedures, and user interface



Army Unmanned Aerial Systems Current and Projected Inventory and Flight Hour Requirements (Total)



Note: JCOE Compile Data, in response to JROC Request, UAS Integration into the National Airspace Study, 2 June 2008

As of: 14 Apr 09

Current FAA restrictions for UAS flying in the NAS

9





UAS must have a Chase Aircraft ---or---Trained Observer Must remain with in 1 mile and 3000 feet of UAS.



Day light hours only

No Night operations



Joint UAS World Presence Through FY12 Restricted Airspace



Example of typical Army airfield located outside restricted airspace - Fort Bragg



PB(5W4)

Mackall AAF

Moore Co

MAAF Class D

Geological S

Google

Air transit tunnel through which a UAS may transit the NAS from one safe state to another.









- GBSAA is a first step towards an integrated solution
 - Supports immediate access
 - Supports all Groups of UAS and Services
- Part of the overarching plan includes ABSAA and Air Worthiness
- Partnership w/Joint Services and the FAA to achieve a final solution that supports all DoD

GBSAA Process



Zero Conflict Airspace (Sterile Airspace)



GBSAA Definition

A ground based means of detecting an airborne intruder and declaring a threat, in time to allow the UAS to adopt a safe state.



US Army TCM - UAS FAA UAS Sense and Avoid Workshops June 2009 UNCLASSIFIED







Early Radar Data



Long-term Track stats

- Measured blip/scan ratio for long-term tracks
- Random sampling of long-term tracks

Clutter Results

- Measured clutter VS ability to detect 1m² RCS target
- Measured subclutter visibility for sites

Early Radar Data - 1500 hrs

















1500 hrs - Altitude [m] AMSL











Clutter Results - Coverage Generation



The mean cmap magnitude was then subtracted from "SNR+N" curves to obtain expected signal-to-clutter curves per waveform and beam

Expected SNC curves compared to range-varying detection thresholds currently used to determine detectability of 1 m^2 target



Clutter Results - Coverage Generation



- SNC VS detection thresholds mapped to "binary" detect/no detect plot for 1 m² non-fluctuating target
- These plots were then overlaid on maps of the area
- Example detectability plot
 - Red indicates detectability on target
 - Blue indicates no detectability on target



Clutter Results - Coverage Generation



elmo, upper beam, az beam 11, 0 doppler, dwell 0 rcells

This gap in detection data relates to the lower clutter map magnitude:

Detectability Results





Jack Brian's Ranch



Comprehensive Coverage for 1 m^2 RCS Target









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