REDAC / NAS Ops

Review of FY 2019 Proposed Portfolio

Runway Incursion Reduction Program (RIRP) 1A01A

September 2018

Federal Aviation Administration

Runway Incursion Reduction Program (RIRP)

RIRP is a program under the NextGen Advanced Technology Development & Prototyping Division (ANG-C), funded by the Office of Runway Safety (AJI-14) to investigate, develop, test, evaluate, and deploy runway incursion prevention technologies.

RIRP Collaborations

- Runway Safety Council (Public/Private working group)

- Surface Safety Group (Public/Private working group)

  - Surface Safety Initiatives Team

- 2015 Runway Safety Call to Action mitigations

FAA Surface Safety Initiative Team (SSIT) Portfolio

Existing Technology Investments

Potential to cover approximately _50 airports_ with:

ASDE 3/AMASS

ASDE-X (SMR)   **ASDE-X (SMR) with RWSL**

ASDE-X (ASDE-3)   **ASDE-X (ASDE-3) with RWSL**

ASSC   **ASSC with RWSL**

Provide conflict detection and alerting

- *direct to controller*

- *and direct to pilot/ vehicle operator*

FAA Runway Incursion Reduction Program Research

Potential to cover approximately _25 airports_ with no technology and highest rates of runway safety events.

Build on existing success to continue providing conflict detection and alerting

- *direct to controller*

- *and direct to pilot/ vehicle operator*

Concept Development

Surface Memory Aids required at all remaining _446 towered airports_

Leverage speech recognition as an enhancement to memory aids.

SURFACE SAFETY INITIATIVES TEAM VISION
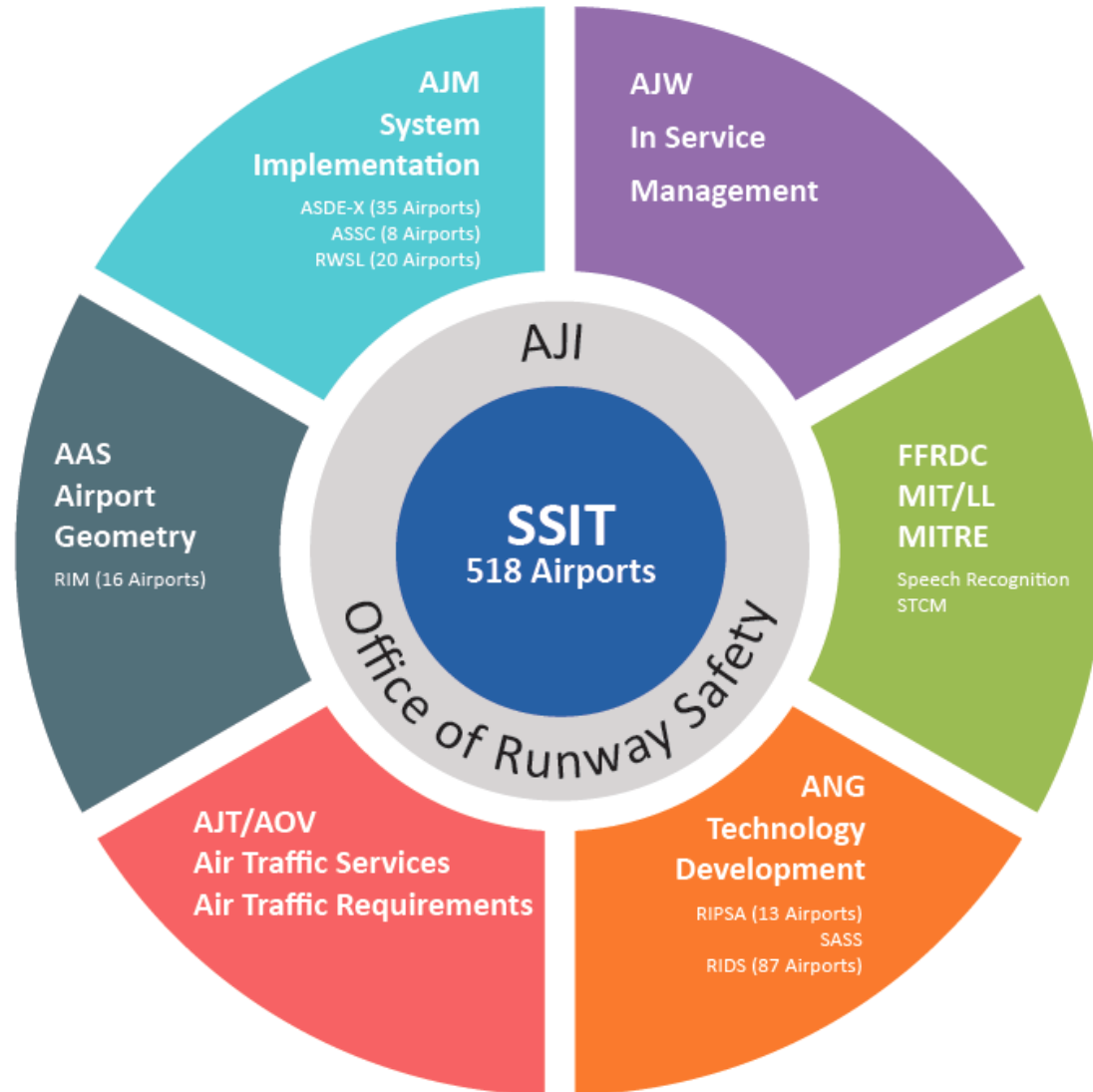
External and Internal Analysis (Current)

- **Little to No Collaboration Across Lines of Business**
- **Numbers Based Analysis**
- **No Comprehensive Strategy**

Formulation of a Business Strategy (Planned)

- **Collaboration Across Lines of Business. To include Union and Industry Stakeholders**
- **SMS – Risk Based Analysis**
- **Implement Runway Safety Roadmap**

Portfolio Management

(Surface Safety Technology)

- **Enhancements to Existing Technology in the NAS**
- **Right size, Right Site for Emerging Technology**

AJI

Office of Runway Safety

SSIT
518 Airports

AJM
System
Implementation
ASDE-X (35 Airports)
ASSC (8 Airports)
RWSL (20 Airports)

AJW
In Service
Management

FFRDC
MIT/LL
MITRE
Speech Recognition
STCM

ANG
Technology
Development
RIPSA (13 Airports)
SASS
RIDS (87 Airports)

AJT/AOV
Air Traffic Services
Air Traffic Requirements

AAS
Airport
Geometry
RIM (16 Airports)

Federal Aviation
Administration

Runway Safety Roadmap

2003-2011

AIRPORT SURVEILLANCE DETECTION EQUIPMENT – MODEL X

- 35 SITES

ASDE-X

2013-2020

AIRPORT SURFACE SURVEILLANCE CONCEPT

- 8 SITES

ASSC

SURFACE ENHANCEMENTS

2018-2020

- ASDE-X TAXIWAY ARRIVAL ALERTS
- ASSC TAXIWAY ARRIVAL ALERTS
- RWSL CONVERGING RUNWAY OPERATIONS (PROPOSED)

RWSL

2008-2020

RUNWAY STATUS LIGHTS

- 20 SITES

RIRP

Federal Aviation Administration

Runway Safety Roadmap

SURFACE SAFETY OUTLOOK

RIDs

RIPSA

SAFRE

FUTURE AT RUNWAY SAFETY

2018-2020

RUNWAY INCURSION DEVICES

- BASELINE PROGRAM (87 SITES) FOR DEPLOYMENT OF MEMORY AIDS

2019-2022 (PHASE I)

RUNWAY INCURSION PREVENTION THROUGH SITUATIONAL AWARENESS

- NON-COOPERATIVE SURVEILLANCE FOR RIGHT SITE, RIGHT SIZE SOLUTIONS
- LOCALIZED DIRECT TO PILOT INDICATOR

2021-2025 (PHASE II)

SITUATIONAL AWARENESS FOR RUNWAY ENTRANCES

- INTEGRATION OF COOPERATIVE SURVEILLANCE/SPEECH INTO RIPSA TECHNOLOGIES

CURRENT TECHNOLOGY DEVELOPMENT INITIATIVES

- ADS-B ONLY
- SASS
- SPEECH RECOGNITION
- TAXI CONFORMANCE MONITORING

RIRP Current Initiatives

- Small Airport Surveillance Sensor (SASS)

- Runway Incursion Prevention through Situational Awareness (RIPSA)

- Surface Taxi Conformance Monitoring (STCM)

Small Airport Surveillance Sensor (SASS)

Small Airport Surveillance Sensor (SASS) Overview

- SASS is a "proof-of-concept" research project to determine if candidate technology is feasible

    - End result: Technology transfer to industry

- SASS provides low-cost secondary surveillance for small airports

    - Goal: Accurate surface surveillance (30ft) and airborne surveillance out to 20nm or greater

- Technology investigated:

    - Phase I: Mode S Passive

    - Phase II: Mode S Active

    - Phase III: ATCRBS (Air Traffic Control Radar Beacon System)

- Target airports

    - GA airports with Class D airspace towers

SASS Overview (continued)

Key design features

- Highly accurate, low-cost phased array (non rotating antenna)

- Low cost commercial off-the-shelf signal processing equipment

- State-of-the-art digital signal processing leveraged from prior Department of Defense research

Research conducted by

- Massachusetts Institute of Technology's Lincoln Laboratory at Hanscom Field (KBED)
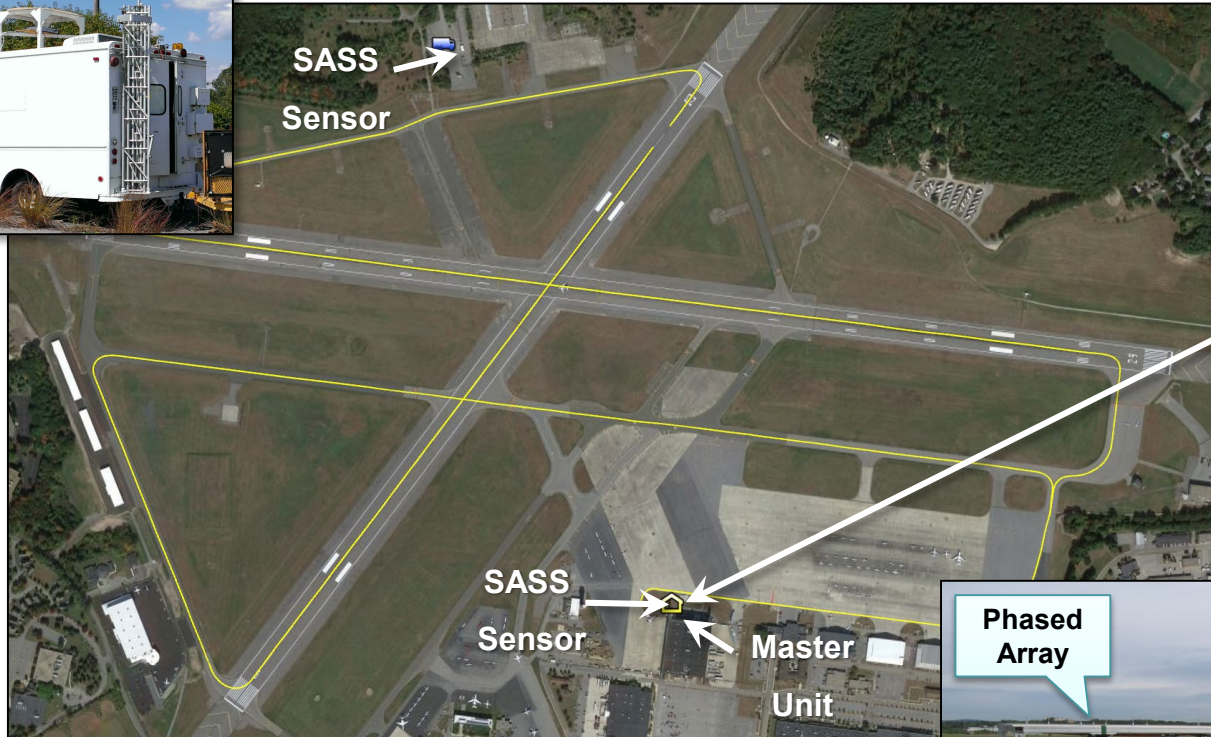
SASS System Diagram
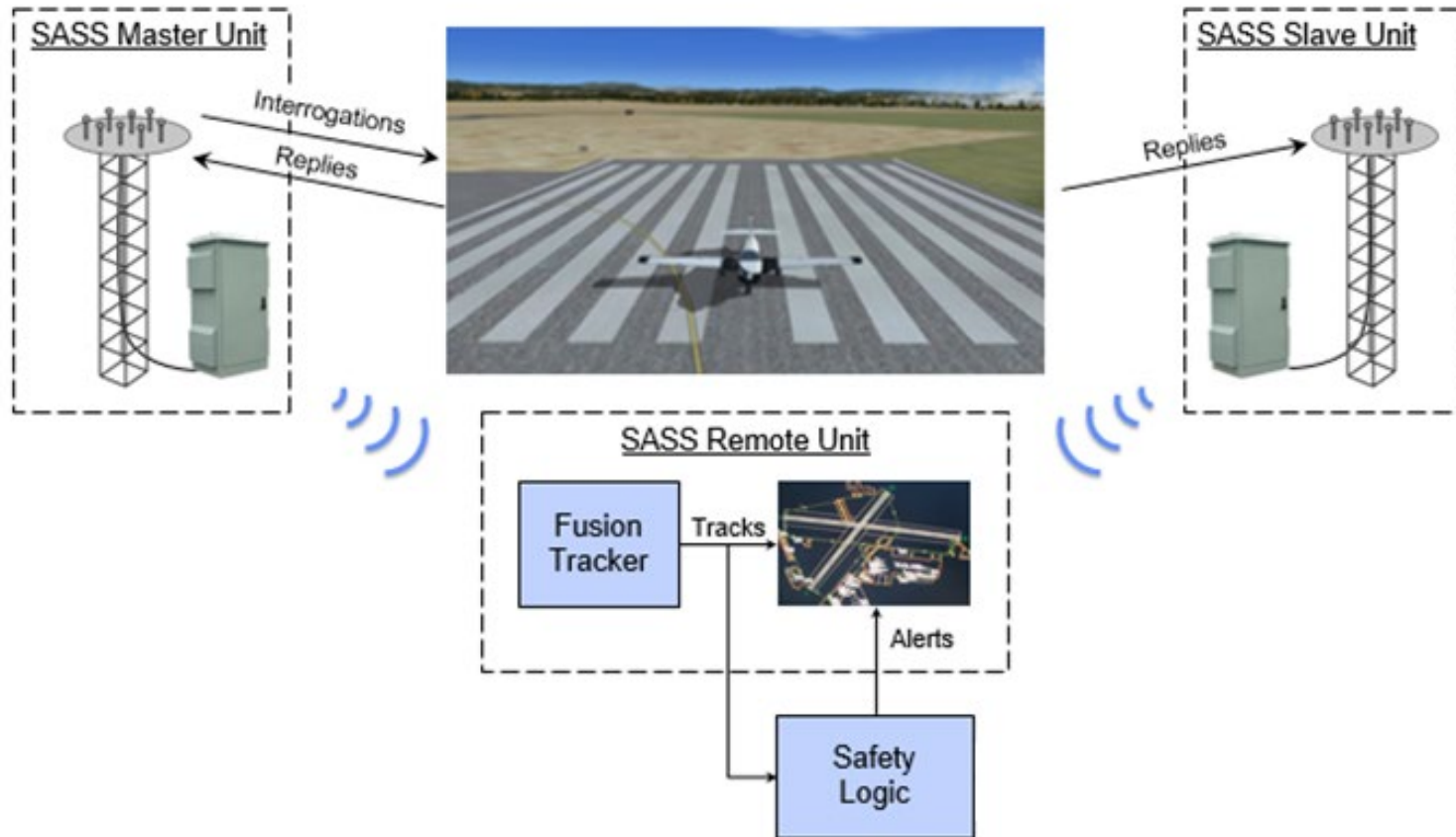
- Provides transponder-based surveillance of airport surface and nearby airspace

- Passively and actively interrogates surface and airborne non-ADS-B aircraft
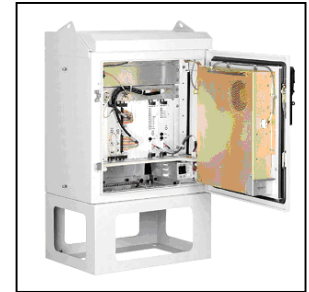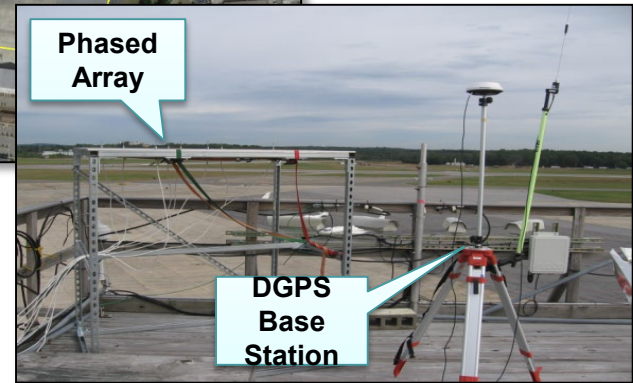
Hanscom Field Sensor Units

Phased Array

SASS Sensor

SENSIS RTU Interrogator (GFE)

SASS Sensor

Master Unit

Phased Array

DGPS Base Station

SASS Timeline

- FY14: Performed Engineering Study for SASS aperture design

- FY15: Conducted proof-of-concept data collection at Hanscom Field

- FY16: Conducted passive Mode-S Surface & Airborne Surveillance Proof of Concept

- CY17: Conducted active Mode-S Surface & Airborne Surveillance Proof of Concept

- CY18: Software refactoring

- CY19: Conduct ATCRBS Surveillance Proof of Concept; Initiate SASS Technology Transfer to Industry

- CY20: Complete SASS Technology Transfer to Industry

Runway Incursion Prevention through Situational Awareness (RIPSA)

# Runway Incursion Prevention through Situational Awareness (RIPSA)

- Surveillance Performance and RI Risk reduction analysis:
  - Examine airport layout with relation to errors
  - Construct runway incursion scenarios with relation to errors
  - Identify existing runway incursion trends at individual airports and the root causes
  - Determine surveillance functionalities necessary to mitigate incursions based on scenario and error analysis

- Evaluate performance of potential surveillance solutions:
  - Release Market Survey to Industry
  - Identify Technologies useful for RI mitigation focusing at runway-taxiway intersections
  - Research annunciation methods to increase communication to controller/pilot

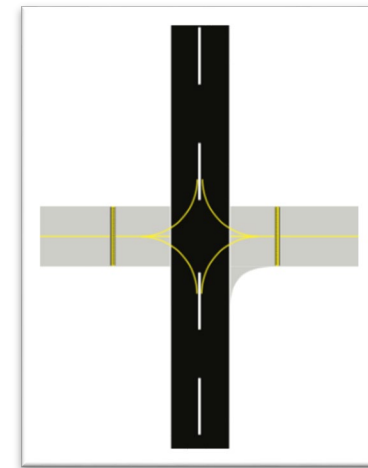# RIPSA - Evaluate Performance of Potential Surveillance

RIPSA will research "direct to pilot" safety systems capable of providing localized detection capabilities for all aircraft or vehicles at RI hotspot locations, such as hold short lines at runway-taxiway intersections
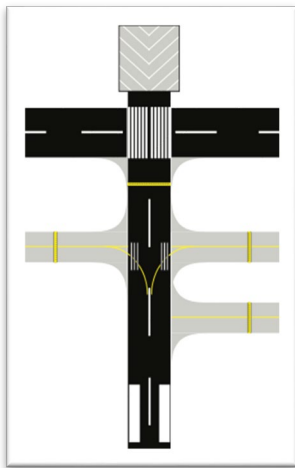
Converging Runways
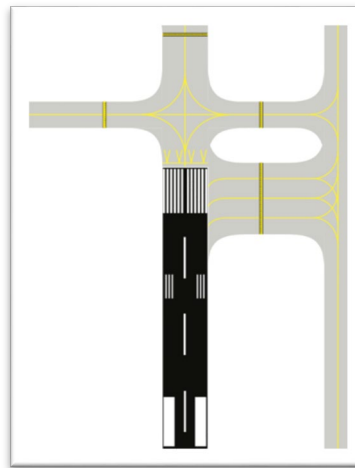
Runway with Multiple, Converging Taxiway Intersections

Runway with Intersecting Taxiway

RIPSA Program Timeline

- FY16: Site assessments at 13 candidate airports

- FY17: Initiate Program Plan development

- FY18: Finalize Candidate Site(s) & Initiate Technology(s) Selection

  - Release of Market Survey (https://faaco.faa.gov/index.cfm/announcement/view/29900)

  - Respondents response to Market Survey

  - Review Market Survey Responses

  - Develop Requirements

- FY19: IGCE and Technology Solicitation & Procurement

  - Release RFP for Technology

  - Contract Award(s)

- FY20: Technology installation at candidate airport(s)

- FY20/21: Operational test and evaluation

- FY22: Site Removal and Restoration/ AMS Documentation / Technology Transfer

Surface Taxi Conformance Monitoring (STCM)

Surface Taxi Conformance Monitoring (STCM)

Mission:

Conduct research to determine if cockpit and/or tower-based Taxi Conformance Monitoring systems can be developed to reduce Runway Incursions (RI) that result from taxi errors

- Use electronic devices to monitor pilot compliance with taxi clearances
- Goal is to catch taxi errors before they escalate into an RI
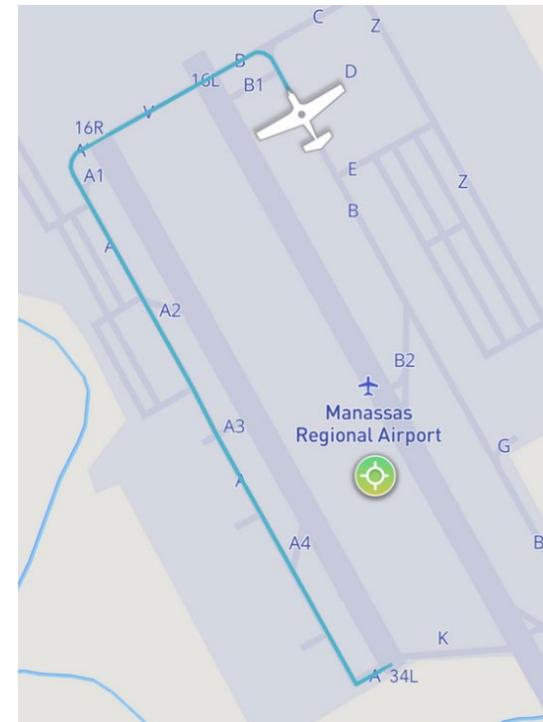
Surface Taxi Conformance Monitoring (STCM)

Phase 1 (CY18)

- Develop report on identified state-of-the-art capabilities in Surface Taxi Conformance Monitoring (STCM) technology used around the world.
    - Identify initial list of existing technologies
    - Research characteristics of each technology
    - Develop table of functions associated with each technology
    - Draft description of technologies that support taxi conformance

- Develop shortfall analysis report identifying Runway Incursions that may be prevented by various STCM concepts at controlled airports in the NAS.
    - Identify initial subset of RI from Volpe database that may benefit from taxi conformance monitoring
    - Assess those RI and corresponding data fields
    - Complete Inter-Rater-Reliability, code RI database
    - Characterize the extent to which the various surface monitoring technologies might potentially mitigate these RIs

Phase 2 (CY19)

- Research capabilities needed to digitize taxi route instructions
- Research airport surface database requirements for taxi conformance monitoring

RIRP Overview Capabilities

People:

- Program Manager: Ben Marple
- Support Contractors: GEMS Inc., Veracity Eng., DOT Volpe Center

Laboratories:

• MIT/LL:

- Safety Logic and Technology Development
- System Requirements Development

•MITRE:

- Benefit Estimation Methodology
- Research / Data Mining
- Human Factors