

**Runway Incursion  
Joint Safety Implementation Team**

**IMPLEMENTATION PLAN  
FOR  
Air Traffic Control Training**

**Statement of Work:**

The purpose of this project is to ensure thorough training of basic air traffic control skills, resource management skills, situational awareness, and teamwork, through the use of high-fidelity tower simulators, memory aids, On the Job Training (OJT), and Computer Based Instruction (CBI).

**Lead Organization for Overall Project Coordination (LOOPC):** FAA, ATS-1

**Safety Enhancement 1: (SE-46)** Aviation safety will be improved by controllers exposure to updated training programs and course curriculums designed to improve the level of knowledge, skill and higher proficiency that supports and enhances system efficiency, increasing safety by fostering a higher level of situational awareness.

**Accident Prevention Index:** (To be completed by JIMDAT)

**Total Resource Requirements:**

- Output 1: Organizational time of approximately six labor-months and workgroup cost of approximately fifty thousand dollars.
- Output 2: Organizational time of approximately one labor-year and workgroup cost of approximately fifty thousand dollars.
- Output 3: Organizational time of approximately one labor-year and workgroup cost of approximately fifty thousand dollars.

**Completion Date:** 24 months after CAST "G" level approval

**Output 1:**

Survey nationally available resources and requirements for use of memory aids, techniques, and tools.

**Resources:** ATX-1 (LOOC), ATP-1

**Timeline:** 12 Months

**Actions:** Determine best practices by evaluating findings of above survey. Distribute to field.

**Performance Goals & Indicators for Safety Enhancement/Output:**

- Goal: Produce a "Best Practices" list concerning use of memory aids, techniques, and tools.
  - Indicator: Reduced rate/number of runway incursions where controller memory lapse was a factor

**Output 2:**

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Develop training regarding the limitations of memory; develop ways to supplement memory capabilities.

**Resources:** ATX-1 (LOOC), AAR-1

**Timeline:** 24 Months

**Actions:** Research current course curriculums in the area of memory enhancement for use in air traffic training. Explore methods to optimize controller's memory.

Existing research shows that memory issues play a major role in many accidents/incidents. There have been, and are, continuous research efforts to examine causal factors associated with errors. In the "Controller and Pilot Error in Airport Operations: A review of Previous Research and Analysis of Safety Data". Page 31, para. 5.2.1 dated January 2001, "Memory Lapses" The most common contributing factor, occurring in 27 percent of the operational errors and deviations examined, was the controller "forgetting" something. In 15 percent of the reports, the controller has forgotten about an aircraft (such as one that had been cleared to land and one holding at the end of the runway). In 3 percent of the operational errors and deviations examined, the controller forgot that there was a vehicle on the runway. In an additional 5 percent of the cases, the controller forgot the runway was closed. Other memory failures accounted for an additional 4 percent of the incidents examined." Additionally, MITRE Report No. MTR 98W0000033, MITRE, McLean, VA: "This report, with its appendices that contain the controller's original responses, is a gold mine of tower controller opinion on equipment, training, procedures, and more. The report is quite lengthy (300 pages plus appendices) but its organization makes it look easy to locate specific topics." The Office of Air Traffic Training (ATX) has the course curriculums addressing memory enhancements, and could conduct any necessary cost analysis to ensure proper funding be appropriated.

**Performance Goals & Indicators for Safety Enhancement/Outputs:**

- Goal: Administer training to all tower controllers covering limitations of memory and methods of supplementing memory capabilities.
  - Indicator: Reduced rate/number of runway incursions where limitations of memory or memory lapse were factors

**Output 3:**

Examine current course curriculums for tower controllers to ensure emphasis on scanning techniques, anticipated separation, and prioritization of control actions.

**Resources:** ATX-1 (LOOC), AAR-1

**Timeline:** 12 Months

**Actions:** Analyze and modify course curriculums as necessary to achieve above goals.

**Performance Goals & Indicators for Safety Enhancement/Outputs:**

- Goal: Emphasize scanning techniques, anticipated separation, and prioritization of control actions during controller training.
  - Indicator: Reduction in rate/number of runway incursions caused by controller error through heightened situational awareness and better prioritization of control actions.

**Safety Enhancement 2: (SE-47)** Aviation safety will be improved by increased teamwork in the tower cab environment. All tower controllers will receive a course similar to CRM for pilots: Air Traffic Teamwork Enhancement (ATTE).

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**Accident Prevention Index:** (To be completed by JIMDAT)

**Total Resource Requirements:**

FAA estimates that the cost to provide ATTE training to all tower controllers at eleven million dollars.

**Completion Date:** 36 months after CAST "G" level approval

**Output:**

Require all tower controllers to complete course 55051 "Air Traffic Teamwork Enhancement" (ATTE).

**Resources:** AAT-1 (LOOC)

**Timeline:** 36 months.

**Actions:** Administer course to all tower controllers.

**Performance Goals & Indicators for Safety Enhancement/Outputs:**

- Goal: Enhanced teamwork in the operational quarters.
  - Indicator: Reduced rate/number of runway incursions caused by operational errors.

**Safety Enhancement 3:** (SE-48) Aviation safety will be improved by the controller workforce being trained with state-of-the-art technology (high fidelity simulators).

**Accident Prevention Index:** (To be completed by JIMDAT)

**Total Resource Requirements:**

- Cost estimates: 3 million dollars per simulator with 2 software adaptations; support infrastructure; airport configuration software could be \$250,000 or more for each additional adaptation.
- Travel costs to/from simulator locations for controllers.

The Office of Air Traffic System Requirements Service (ARS) is tasked as the research advocate of Air Traffic Services with managing research leading to the life cycle procurement of technology into the National Airspace System (NAS). Cost benefit analysis is a major part of this organization. Below are a few of many available options:

1. Rental of simulator time from existing facilities (ie: NASA/Ames Future Flight Central)
2. Purchase of equipment (This technology is currently available).
3. Re-tool and/or upgrade existing equipment (simulators at the FAA Tech Center and Mike Monroney Academy).

**Completion Date:** 48 months after CAST "G" level approval

**Output:**

Develop high fidelity tower simulators to support mandatory, recurrent proficiency training for all tower controllers to reduce runway incursions.

**Resources:** AAT-1 (LOOC), ARS-1

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**Timeline:** 48 months

**Actions:** Conduct a research study using a high-fidelity tower simulator to determine benefits of use for training controllers in this type of environment. If research indicates this type of training increases controller proficiency and enhances safety, then identify training objectives and system requirements of simulators. Procure Simulators.

**Performance Goals & Indicators for Safety Enhancement/Outputs:**

- Goal: Sharpen basic controller skills, reinforce good habits and practices, simulate unusual situations and weather conditions, and simulate error scenarios to find other solutions by using high fidelity tower simulators to train all tower controllers.
  - Indicator: Reduction in rate/number of runway incursions caused by controller error through higher levels of proficiency and increased situational awareness.

**Relationship to Current Aviation Community Initiatives:**

- FAA Order 7110.65 (Air Traffic Procedures)
- FAA Order 7210.58 (Runway Safety Program)
- Runway Safety Program's '10 Near Term Initiatives for Reducing Runway Incursions'
  - NATCA-FAA workgroups established to address:
    - Enhanced Operational Tower Controller Training
    - Memory Enhancement Techniques Training for Tower Controllers
- FAA and Industry regional runway safety workshops
- NASA's Ames Research Center high fidelity tower simulator "Future Flight Central" has been used to model scenarios using several different airport configurations to determine impact of: procedural changes, construction of new runways/taxiways, tower relocations, integration of new technology, capacity measures, controller workload, surface flow optimization, and noise studies.
- John A Volpe National Transportation Systems Center, "Human Factors for ATCSs: A User's Manual for Your Brain", Kim Cardosi, 1999
- MITRE Report No. MTR 98W0000033, Mitre, McLean, VA, Sept. 1998
- John A Volpe National Transportation Systems Center, "Controller and Pilot Error in Airport Operations: A review of Previous Research and Analysis of Safety Data", January 2001

**Programmatic Approach:**

*Organizational Strategy*

The Runway Incursion JSIT identified Terry Shell, NATCA, as the JSIT project lead for Air Traffic Control Training. The project lead will act as a point of contact to assist with the implementation of the activities outlined in this plan. Implementation of this project is viewed as a shared responsibility and tasks will be divided between the FAA and organizations/persons in industry. The Lead Organization for Overall project Coordination (LOOPC) is ATS-1. The Lead Organizations for Output Coordination (LOOC) are identified in each Output of this Implementation Plan. The roles and responsibilities of the LOOPC and LOOC are described in the CAST approved JSIT Process Document.

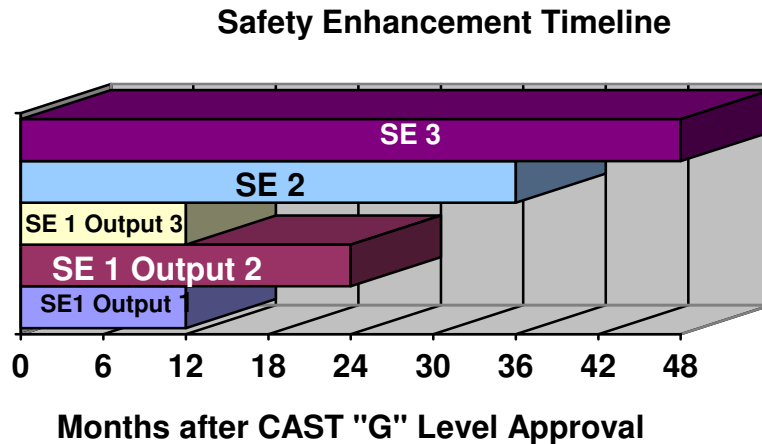
*Implementation Activities*

- The FAA, in addressing several NTSB Safety Recommendations and the interventions later identified by the Runway Incursion JSAT established the Office of Runway Safety (ARI).
- ARI, in concert with industry partners, continues an awareness campaign using Letters to Airmen, Examiner Updates, Safety Bulletins, Websites, GENOTS, and other means of communication.

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- Workgroups have already been initiated by ARI/ATP to address elements of this project as follows:
  - The Enhanced Operational Tower Controller Training workgroup is addressing Safety Enhancement 1, output 3 in a new CBI (computer based instruction) lesson for tower controllers, which also emphasizes prevention of runway incursions
  - The Memory Enhancement Techniques Training for Tower Controllers workgroup will address Safety Enhancement 1, outputs 1 & 2
- ATX, in conjunction with all regional training specialists, continues to offer ATTE on a sporadic basis as funds allow. This effort is too limited; CRM needs to be provided to all controllers.

### **Key Products and Milestones:**



### **Risk Description:**

- General opposition to change. This applies to both the controllers and system users.
- High cost to provide all tower controllers with a three-day course (ATTE).
- High costs associated with studies and research of high fidelity simulators.
- Difficulty of finding ways to mitigate limitations of human memory that can be adapted nationally; currently many methods are developed at the local facility level or by individuals to better address specific needs
- Continued trend of increasing runway incursions due to controller error

### **Risk Mitigation Plan:**

- ARI will continue its runway safety awareness campaign: educating controllers and pilots through bulletins, websites, and mailings.
- The ATTE course itself can have a positive impact on cultural change in the workforce. The course can also be used as a vehicle for modules covering a range of subjects (such as use of memory aids); this in itself makes it a valuable tool for delivering training. Although little raw data exists, ATTE has been a factor in reducing operational errors in many facilities.
- Training simulations can present scenarios rarely, if ever, encountered during routine OJT. Industry has already proved the worth of simulator training for pilots: it saves money, time, and aircraft wear-and-tear. Unusual weather conditions, pilot errors, and controller errors can be simulated in a tower environment and learned from without pain.
- Recurrent training in simulators can be geared to whatever training objectives are desired. Simulators can provide the means to analyze situations from different angles, and demonstrate the validity of several different solutions.

### **Impact on Non - Part 121 or International Applications:**

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These Safety Enhancements improve FAA controller training and will not impact system users directly.

Historically the United States air traffic control system leads the world. By refocusing our training efforts, and modernizing methods and technologies to accomplish this, we will continue to set standards for the world to follow.

Coordination with ICAO is continuous. While ICAO has its own safety agendas, it stays in touch with FAA and routinely exchanges information. FAA is also a member of MAPCOG (the Multi-agency Air Traffic Services Procedures Coordination Group, formed with NAVCANADA and EUROCONTROL); this group polls all countries for their input on changes to the ICAO handbook (PANRAC, Procedures for Air Navigation Services, Rules of the Air and Air Traffic Service, Doc. 4444-RAC/501).