

**Controlled Flight Into Terrain
Joint Safety Implementation Team**

**Implementation Plan
for
Terrain Avoidance Warning System (TAWS)**

Statement of Work: (SE-1)

Controlled flight into terrain (CFIT) - accidents, where a properly functioning aircraft under the control of a fully qualified and certificated crew is flown into terrain with no apparent awareness on the part of crew, could be substantially reduced or eliminated with the installation of TAWS equipment. Manufacturers of turbine aircraft and air carriers operating turbine aircraft under FAR Part 121 should install TAWS equipment on the entire U.S. air carrier fleet and establish procedures for its use.

Lead Organization for Overall Coordination:

AVR-1

Outcomes:

Substantially reduce or eliminate the CFIT accident rate by improving pilot situational awareness with respect to terrain avoidance by establishing appropriate procedures for the installation and use of TAWS. Procedures must include proper flight crew reaction in regard to TAWS aural and visual warnings.

Outputs:

- A rule to require TAWS in all FAR Part 121 aircraft
 - Resources: FAA (ARM, AIR, AFS, AGC, APO), Associations, Manufacturers
 - Timeframe: Final Rule expected 1st Quarter 2000
 - Actions: AIR-130 to draft and publish final rule
- A TAWS TSO
 - Resources: FAA (ARM, AIR, AFS, AGC, APO), Associations, Manufacturers
 - Timeframe: Final TSO expected 4th Quarter 1999
 - Actions: AIR-130 to draft and publish final TSO
- A manufacturing standard practice of installing TAWS equipment in all newly manufactured aircraft used under FAR Part 121
 - Resources: Manufacturers, FAA (AIR, AFS)
 - Timeframe: 1st Quarter 2001
 - Actions: Manufacturers apply for TC's / amended TC's and approval by AIR

- A completed retrofit program including certification and installation of TAWS equipment in existing aircraft
 - Resources: Operators (ATA, RAA, NACA, CAA member airlines, and others), Manufacturers, FAA (AIR)
 - Timeframe: 1st Quarter 2005
 - Actions: Operators and Manufacturers applying for STC's / amended TC's and approval by AIR
- A comprehensive system to support TAWS including installation, maintenance, training and use of TAWS equipment in FAR Part 121 air carrier operations
 - Resources: FAA (AIR, AFS) Manufacturers, Operators, Associations
 - Timeframe: 4th Quarter 2000
 - Actions: System to support TAWS
 - Certification of EGPWS 4th Quarter 1997
 - STCs granted As Required
 - No FAA field approvals (AFS-300 Policy Letter) 2nd Quarter 1999
 - Operating guidance issued
 - AFM requirements 1st Quarter 2001 (newly manufactured)
 - 1st Quarter 2005 (existing)
 - Advisory Circular AFS-200 1st Quarter 2002
 - Handbook Bulletin AFS-200 1st Quarter 2002
 - Maintenance guidance issued
 - Advisory Circular FAR Part 25 ANM-100 1st Quarter 2001
 - Advisory Circular FAR Part 23 ACE-100 1st Quarter 2004
 - Metrics for validation of TAWS project effectiveness (metrics)
 - Resources: FAA (AIR, ANM), Associations, Airlines
 - Timeframe: 3rd Quarter 1999
 - Actions: AIR-130/ANM-100 to develop metrics and reporting methodology

Relationship to Current Aviation Community Initiatives:

- TAWS rule now in final development stages, public comments being resolved
- TAWS TSO now in final development stages, public comments being resolved
- Aircraft manufacturers including Boeing and Airbus now including TAWS as standard equipment on new production airplanes
- ATA member airlines currently implementing voluntary program to equip all of their airplanes with TAWS equipment. (The program is expected to be substantially completed during 2003, affecting approximately 4300 aircraft, over 90% of all passenger and cargo aircraft in the US operating under FAR Part 121.)
- Voluntary TAWS equipage of airplanes operated by non-ATA members and by operators subject to rules other than FAR Part 121 also underway (FAR Parts 91, 135, 125 and U.S. Registered Aircraft operating under FAR Part 129)

Performance Goals & Indicators for Outcomes/Outputs:

- Goal: Elimination of CFIT accidents in U.S. and for all U.S. operators
 - Indicator: FAR Part 121 air carrier CFIT accident rate drops to zero
- Goal: Installation of TAWS equipment in all aircraft operated under FAR Part 121
 - Indicator: Certification of TAWS equipment for all FAR Part 121 aircraft
 - Indicator: 100% equipage of FAR Part 121 aircraft fleet
- Goal: Final TSO
 - Indicator: Final TSO issuance
- Goal: Final rule
 - Indicator: Final rule issuance
- Goal: Compliance with final rule
 - Indicator: Annual reports showing percentage of fleet in compliance
- Goal: A comprehensive system to support TAWS in FAR Part 121 air carrier operations
 - Indicator: FAA feedback regarding field approval process
 - Indicator: FAA and industry feedback regarding TAWS implementation

Programmatic Approach:

Organizational strategy

The CFIT JSIT identified Jerry Tegen ACE-203 (816-426-5003) as the JSIT project lead for TAWS. The project lead will continue to work with the TAWS rule making team until the final rule is issued. Thereafter, the project lead will coordinate implementation activities outlined in the Implementation Plan and will provide progress reports to the CFIT JSIT. Implementation is viewed as a shared responsibility and tasks will be divided between the FAA and organizations in industry. The FAA offices of primary responsibility (OPR) for the regulatory and certification tasks are AFS-200 and AIR-100, respectively. The office of primary responsibility for industry should be ATA.

Implementation activities

In collaboration with industry the FAA will monitor FAR Part 121 air carrier installation and operation of TAWS equipment through the existing certification and approval processes. The FAA will invite feedback from FAA and industry in respect to TAWS implementation. Taking advantage of the experiences and lessons learned in the field, the FAA and its industry partners will generate guidance as appropriate in support of TAWS. An essential part of the monitoring process will be that the FAA and its industry

partners implement reporting processes. Periodic reports will provide data for meaningful measures against project goals (metrics).

Key Products and Milestones:

- TAWS equipment certification - *COMPLETED*
- TAWS NPRM - *Issued August 26, 1998*
- NPRM public comments resolved - *Spring, 1999*
- OST review - *4th Quarter 1999*
- OMB review - *1st Quarter 2000*
- TAWS final rule issued - *1st Quarter 2000*
- Advisory Circular AC-20.xx for TAWS - *1st Quarter 2002*
- TAWS final rule, 100% compliance - *1st Quarter, 2005*
- FAA STC approval process: *Approximately 95% complete*
- Industry feedback regarding TAWS implementation progress: develop uniform reporting format - *3rd Quarter 1999*
- TAWS TSO issued for public comment - *2nd Quarter 1998*
- TSO public comments resolved - *2nd Quarter 1999*
- TSO issued - *4th Quarter 1999*
- Validation of TAWS project effectiveness - *Metrics to be developed 3rd Quarter 1999*
- Advisory Circular AC-25.xx for TAWS- *1st Quarter 2001*
- Advisory Circular AC-23.xx for TAWS - *1st Quarter 2004*
- Final TAWS report - *2nd Quarter 2006*

Plan and Execution Requirements:

FAA, ATA, and other stakeholders must commit to adequate levels of staffing and funding to support TAWS implementation. In particular, budget must address manpower needs created by meeting TAWS implementation requirements. Permanent or temporary staff must be added to backfill where the TAWS project has caused vacancies; travel must be funded; and new processes associated with metrics must be funded, such as contract support for handling feedback and analysis of data. If additional guidance materials become necessary for FAA inspectors or industry users, manpower and funding must be adequate to meet those needs. People and funds allocated to TAWS implementation must not be reassigned apart from TAWS.

The total FAR Part 121 cost—including certification costs, retrofit costs, and incremental TAWS costs for newly manufactured aircraft delivered between 1999 and 2008—would be approximately \$328.3 Million.

Risk Description:

- Delay of Final Rule - mixing various levels of users with competing interest.
 - Economic burden for low end users
 - Challenging validity of FAA Safety Data
 - Alternative means - potential use of other technologies
- Delay of final rule compliance
 - Lack of FAR Part 145 Repair Stations capacity
 - Lack of TAWS equipment

Risk Mitigation Plan:

Pending successful completion of rule making that would require TAWS, the FAA and industry will continue to encourage voluntary equipage with TAWS of all FAR Part 121 air carrier airplanes.

The TAWS rule making team is examining every practical means of achieving the safety gains promised by TAWS within the rule proposed. The team is considering possible adjustments to address the valid concerns expressed in comments from conscientious writers.

Impact on Non-FAR Part 121 or International Applications:

The rule prescribes criteria for other than FAR Part 121 operators.

Coordination with international organizations such as ICAO and JAA is continuous. While those organizations have their own agendas addressing CFIT accident reduction, they stay in touch with the CFIT JSIT and routinely exchange safety agenda information with the CFIT JSIT.

Impacts and risks identified by the CFIT JSIT are conveyed to other organizations as appropriate, such as the general aviation CFIT JSAT.