Operational Safety on Airport During Construction

AC 150/5370-2F

Presented to: 4-States Airport Conference
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Date: September 25, 2012
Why?

Construction Operations on Airfield:
- Disrupts the normal airport environmental
- Increases risk to operating aircraft
- Impacts aeronautical operations (i.e. Capacity, approach procedures, navigational aids etc.)

Safety Planning:
- Balances operational safety while maintaining acceptable level of aeronautical operations
- Identifies and quantifies impacts and risk
- Allows for Establishment of mitigating actions and controls
CONSEQUENCES

Wingtip Conflict

Failure to identify and mitigate risk presented by construction activity can be costly in more than one way.
CONSEQUENCES

- Direct damage costs to aircraft and equipment can be extreme
- Indirect costs associated with airport operations and project delays may be indeterminate
CONSEQUENCES

WRONG RUNWAY TAKEOFF
Inadequate safety management controls can have deadly results
(Singapore Airlines, October 2000)
Addressing Impacts

Three main processes address operational safety during airfield construction activity

1. Construction Safety and Phasing Plans (CSPP)
2. Part 77 Aeronautical Evaluation (7460-1)
3. Safety Risk Management (SRM)

These separate processes are interrelated
Safety Risk Management (SRM)

SRM represents a process to:

1. Identify hazards
2. Analyze and Assess the associated risk
3. Implement safety strategies to mitigate risk

SRM for construction projects:

- Is a FAA internal process that requires Sponsor assistance
- Is presently only required at Large Hub airports
- Relies on CSPP information and safety controls
- Relies on Part 77 aeronautical study determination
Part 77 Study (7460-1)

- 14 CFR Part 77 requires a proponent of airfield construction provide separate notification to the FAA for the purpose of conducting an aeronautical study of individual objects, including both temporary and permanent objects.
- Notification is required regardless of funding source.
- Part 77 does not address preparation of a CSPP.
- Timing of studies is significant to CSPP development:
  - As part of CSPP development: allows for early identification of the aeronautical impacts and incorporation of safety measures.
  - After bids are received: unscheduled outages; unexpected loss of approach procedures; costly contract modifications.
Part 77 – Aeronautical Study

Temporary construction objects include:

- Access routes
- Staging areas
- Equipment
- Stockpiles
- Batch plants

Points-of-Interest

- Study select points
- Due diligence
Construction Safety & Phasing Plan

- A comprehensive safety management strategy that identifies and mitigates operational impacts due to construction activity on an active airfield.
- A CSPP establishes operational safety management strategies for *everyone* associated with the project including:
  - Contractor/Subcontractor
  - Construction Inspector
  - ARFF Personnel
  - Airport Operations
  - FBO/ Airlines
  - FAA ATCT
  - FAA Technicians
  - FAA Flight Procedures
CSPP Requirement

AIP and PFC Funded Projects:
– A CSPP is required for all construction activity within the Airport Operations Area (AOA)

Part 139 Airports (No Federal Funds)
– CSPPs represent an acceptable (and preferred) method of complying with Part 139 requirements during airfield construction

Non-Federally Funded Projects
– Preparation of a CSPP is a best practice for assuring operational safety
CSPP Preparation

- AC 150/5370-2F establishes CSPP standards
- Well planned CSPPs balance airport operations with construction costs
- Develop CSPP early in project design phase
- CSPPs evolve over the life of project
  - SPCD, Airspace Determinations, Changes
- Sponsor remains overall responsibility for safety on their airfield
CSPP - Clarifications

- A CSPP is more than a contract specification
  - It’s a Safety Management Strategy
  - Safety requirements/drawings are CSPP components

- OSHA Safety plans (§1926) do not represent an FAA CSPP or a SPCD

- Assigning liability is not a CSPP objective

- The CSPPs do not address development aspects of project (i.e. permanent marking)
  - Separate end-state development requirements from temporary state provisions
FHWA - Similarities

Transportation Management Plans (TMP)

“A transportation management plan (TMP) lays out a set of coordinated transportation management strategies and describes how they will be used to manage the work zone impacts of a road project.”

- Roles and responsibilities
- Project Description
- Existing vs. temporary conditions
- Work Zone Impact Assessment
- Work Zone Management Strategies
  - Temporary Traffic Control
  - Maintenance of Traffic
  - Traffic Control Devices
- TMP Monitoring Requirements
- Contingency Plans
CSPP Elements

CSPP is a self-contained document the Sponsor incorporates into their bid package

Chapter 2 outlines required CSPP elements

- Project Description/Scope
- Coordination
- Phasing
- Affected Areas
- Navaid Protection
- Contractor Access
- Wildlife Management
- FOD Management
- Hazardous Material
- Notifications

- Inspections
- Underground Utilities
- Penalties
- Special Conditions
- Visual Aids
- Marking/Signing Access
- Hazard Marking/Lighting
- Protection of Aeronautical Areas and Surfaces
- Limitations
# CSPP Organization

Elements can be grouped into 3 categories

## Project Information *(Scope/Description/Conditions)*

- Description
- Phasing/Sequencing
- Coordination
- Existing vs. Temporary

## Safety Requirements *(Controls/Safety Provisions)*

- Navaid Protection
- Contractor Access
- Wildlife Management
- FOD Management
- Hazardous Material
- Notifications
- Inspections
- Underground Utilities
- Penalties
- Special Conditions
- Visual Aids
- Access Signage
- Site Access
- Hazard Marking/Lighting
- Limitations
- Protection of Areas
- Navaid Locations

## Safety Drawings *(Graphical representations)*

- Phase Limits
- Areas/Surfaces (RSA)
- Haul Routes
- Temporary markings
- Staging Area
- Navaids Locations

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Federal Aviation Administration

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CSPP’s Role in Bid Package

PROJECT MANUAL

- CSPP becomes a section in the Project Manual

SAFETY REQUIREMENTS (CONTROLS/PROVISIONS)

- Establish provisions in a clear, concise and complete manner

SAFETY DRAWINGS

- Graphically depict work areas, airport surfaces, critical areas, staging area, haul routes, etc.
- Drawing notes should complement those CSPP safety provisions that are critical for field personnel actions
- Drawing safety notes should use the same organizational structure headings as the CSPP document
Safety Provisions

Safety provisions should clearly establish who has responsibility for a given provision

1) Use active voice instead of passive voice
   “Barricades must be inspected daily”

2) Establish definitive requirements as opposed to making broad generic statements
   “Contractor must be restricted from entering an airport area that would be hazardous to aircraft”

3) Apply plain language techniques such as heading, lists, and short sentences

4) Avoid run-on sentences

5) Avoid large blocks of text
Safety Notes

GENERAL NOTES

1. AIRPORT AND FAA SHALL GENERATE AND ISSUE NOTAMS BASED ON CONTRACTOR CONSTRUCTION SCHEDULE AND FACILITY IMPACTS.

2. CONTRACTOR SHALL COORDINATE WITH AIRPORT OPERATIONS PERSONNEL A MINIMUM OR 24 HOURS PRIOR TO THE ISSUANCE OF ALL NOTAMS RELATED TO THE PROJECT

3. 12. LOW PROFILE BARRICADES WITH FLASHING RED LIGHTS TO BE USED FOR ALL PAVEMENT CLOSURES. CONES TO BE UTILIZED TO ESTABLISH LIMITS OF CONSTRUCTION HAUL

4. THE CONTRACTOR SHALL KEEP THE PROJECT SITE AND VEHICLES CLEAN, EMPLOYING A "CLEAN AS YOU GO" APPROACH THROUGHOUT THE PROJECT.

5. THE PROJECT PLANS SHOW THE ENTRY POINT(S), BARRICADES, CONTRACTOR’S STAGING AREA, EMPLOYEE’S PRIVATE VEHICLE PARKING AREA, AND WORK AREA. THE CONTRACTOR

6. CONTRACTOR VEHICLE MARKING AND LIGHTING IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR. THE AIRPORT WILL NOT PROVIDE MARKINGS OR LIGHTS.

7. FOOD SCRAPS MUST BE COLLECTED FROM CONSTRUCTION PERSONNEL ACTIVITY. ANY ACTIVITY TAKING PLACE THAT CREATES A STANDING BODY OF WATER MUST BE REMEDIED WITHIN 24 HOURS.

COORDINATION

1. CONTRACTOR SHALL COORDINATE WITH AIRPORT OPERATIONS PERSONNEL A MINIMUM OR 24 HOURS PRIOR TO THE ISSUANCE OF ALL NOTAMS RELATED TO THE PROJECT

NOTIFICATION

1. AIRPORT AND FAA SHALL GENERATE AND ISSUE NOTAMS BASED ON CONTRACTOR CONSTRUCTION SCHEDULE AND FACILITY IMPACTS.

HAZARD MARKING AND LIGHTING

1. LOW PROFILE BARRICADES WITH FLASHING RED LIGHTS TO BE USED FOR ALL PAVEMENT CLOSURES. CONES TO BE UTILIZED TO ESTABLISH LIMITS OF CONSTRUCTION HAUL

FOREIGN OBJECT DEBRIS

1. THE CONTRACTOR SHALL KEEP THE PROJECT SITE AND VEHICLES CLEAN, EMPLOYING A "CLEAN AS YOU GO" APPROACH THROUGHOUT THE PROJECT.

WORK SITE ACCESS and USE

Vehicle/Pedestrian

1. THE PROJECT PLANS SHOW THE ENTRY POINT(S), CONTRACTOR’S STAGING AREA, EMPLOYEE’S PRIVATE VEHICLE PARKING AREA, AND WORK AREA.

WILDLIFE

1. ANY ACTIVITY THAT CREATES A STANDING BODY OF WATER MUST BE REMEDIED WITHIN 24 HOURS.
Coordination

Address both the design phase discussions as well as the construction phase safety provisions

Design Development Phase

- Pre-design – Summarize operational safety considerations
- SRM Panel – Summarize mitigating measures from SRMD

Construction Contract Requirements

- Points of Contact
- Daily Briefings/Weekly Progress meetings
- Changes to Scope and Schedule (FAA Project Manager)
- FAA Service Offices (ATCT, Tech. Ops, Flight Procedures)
Phasing

The coordination helps establish acceptable phasing

For each phase, address elements such as:

- Areas closed to aircraft
- Schedule/durations
- Critical work
- Constraints (i.e. work hours)
- Staging Areas
- Sequencing Information
- Work Areas
- Pavement Closures
- Navaid Impacts
- Haul Routes

Safety Drawings

- Graphically depict the phasing elements for each phase
- Prepare separate drawing for each phase

Use charts and tables to convey phasing information
<table>
<thead>
<tr>
<th>Phase</th>
<th>Days</th>
<th>Significant Work</th>
<th>Sequence Info</th>
</tr>
</thead>
</table>
| 1     | 75   | - Mobilization, taxiway pavement closures  
|       |      | - Demolition of Taxiway A from Sta. 2+00 to 10+00  
|       |      | - Subgrade preparation, base installation and paving.  
|       |      | - Install temporary marking  
|       |      | - Install edge lighting  | - Commences at NTP  
|       |      | - All work in Phase 1 must be complete prior to commencing Phase 3 |
| 2     | 20   | - Close Runway 3-21  
|       |      | - Demolition of connector taxiway A1  
|       |      | - Subgrade preparation, base installation and paving.  
|       |      | - Install temporary marking  
|       |      | - Install edge lighting  | - Ph 2 may occur simultaneously with Phase 1.  
|       |      | - Complete all work within 14 consecutive days.  
|       |      | - Re-open Runway 3-21 at completion of phase 2 |
| 3     | 45   | - Relocate barricades.  
|       |      | - Re-open Taxiway A between Sta. 2+00 and 10+00.  
|       |      | - Demolition of Taxiway A from Sta. 10+00 to 16+00  
|       |      | - Subgrade preparation, base installation and paving.  
|       |      | - Install temporary marking  
|       |      | - Install edge lighting  | - Commence work in this phase only after all work in Phases 1 and 2 are complete. |
| 4     | 21   | - Intermittent closure along length of project  
|       |      | - Application of final pavement marking  
|       |      | - Project site clean-up.  | - Commence work in this phase only after all work in previous phases is complete. |
# Phasing Bar Chart

<table>
<thead>
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<th>Element</th>
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<th>June</th>
<th>July</th>
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<td>Phase 4</td>
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Impacts to Areas and Operations

Identify impacts to airfield operations due to construction activity by addressing existing state and temporary state conditions

- Address both direct impacts (Taxiway closure) and indirect impacts (ARFF route, Airport Maintenance)
- Establish mitigating measures (i.e. limit aircraft)
- Best Practice: Operational Impact Table
## Operational Impact Table

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</table>
Protection of Navaids

Identify existing navigational aid (NAVAID) equipment and temporary impacts due to construction activity

- Impacts to FAA owned equipment fall into 2 categories:
  - Physical relocation of equipment (Reimbursable Agreement–1 Yr)
  - Temporary Outage (Submit SES form 45 days in advance)

- Establish requirements for the protection of existing equipment and the underground cables (P.I.P)

- Pothole locations of possible conflict (i.e. Vacuum truck)

- Graphically depict critical areas and underground cable locations on Safety Drawings
# Navaid Facility Table

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<th>Facility</th>
<th>FC</th>
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<th>Phase 3</th>
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</table>
Protection of Airport Surfaces

Address requirements and restrictions to protect active airport surfaces such as:
- Safety areas
- Object Free area
- Obstacle Free Zone
- Runway approach and departure surfaces

Graphically depict surfaces on safety drawings

Emphasize V/PD avoidance (Part 139)

V/PD - Unauthorized access by a vehicle or pedestrian
Incursion – Incorrect presence of vehicle/person in landing area
Surface Incident – Unauthorized access onto active taxiway
Protection of Airport Surfaces

Runway Safety Area
- No construction operations in an active RSA
- Safety Area criteria must be met. No open excavations
- Erosion control measures to limit rutting, surface variations

Runway Object Free Area
- No parking of idle equipment
- Limit stockpiling of material to absolute necessity (7460-1)

Obstacle Free Zone
- Avoid penetration by equipment or material

Runway approach/departure surfaces
- Must be clear of all objects (equipment, material, etc.)
- Closure of Runway - Preferred approached
- Relocated Threshold – Portion closed to landings and departures
- Displaced Threshold – Publishing temporary declared distances
Protection of Airport Surfaces

**Taxiway Safety Area**
- No construction operations in an active TSA
- Safety Area criteria must be met
- No open excavations (i.e. trenches)
- TSA limits may be temporarily adjusted if aircraft type restricted
- Erosion control measures to limit rutting, surface variations

**Taxiway Object Free Area**
- No construction operations in active TOFA or TLOFA
- Higher risk of wingtip conflict than ROFA
- Object free area limits may be temporarily adjusted if aircraft restricted.
- Recommend establishing setback flags/stakes to address aircraft taxiing adjacent the work area
Work Site Access and Use

- **Vehicle/Pedestrian Requirements**
  - Employee parking (outside of AOA)
  - Equipment parking (not in OFA)
  - Training (Part 139: Driver and employee)
  - Haul Roads (Minimize interaction with Aircraft)

- **Airfield Communication Protocols**

- **Security** — Guards, Maintaining Perimeter

- **Stockpiles**
  - Not in Safety areas. Limited in Object Free Areas
  - Graphically depict on Safety Drawings

- **Work Area Limits** — Delineate with Flags, lathes, etc.
Hazard Marking and Lighting

Purpose
Hazard marking serves the following purposes

- Limits access of aircraft to hazardous areas
- Limits access of work personnel to active aircraft operational areas
- Delineates limits of hazardous and critical areas.

The Challenge
How to know what purpose a device is serving?

- Answer – Device Type and Spacing
- Apply device type and spacing that addresses the most restrictive condition for the highest plausible risk
- Spacing based upon what is being prohibited
Hazard Marking & Lighting

Aircraft

Requirements

• Low Mass
• Frangible (if fixed to pavement)
• Less than 18” in height
• Spacing?
  – Lights every 10’

Restrictions

• Only semi flush closure marker allowed in safety area
• Do not locate barricades in active safety areas
Hazard Marking & Lighting

Pedestrians

Requirements
• Interconnected (0’)

Limitations

Safety Areas
  – Not Allowed

Within Object Free Area
  – Less that 18” and low mass

Beyond Object Free Area
  – Limited Restrictions
Hazard Marking & Lighting Vehicles

Requirements
• Spacing; do not exceed 4ft

Limitations

Safety Areas
– Not allowed

Within Object Free Area
– Less than 18” and low mass

Beyond Object Free Area
– Limited restrictions
Hazard Marking & Lighting
Excavations/Stockpiles

Requirements

- Spacing – Comply with OSHA §1926
- Obstruction light/Retro-reflective tape

Limitations

Safety Areas
- Not allowed

Within Object Free Area
- Less than 18” and low mass

Beyond Object Free Area
- Limited restrictions
Barricade Spacing Example

Proximity of work area to barricade location and active aircraft movement area is a key spacing factor.
Barricade – Apron Construction

- Aircraft should first encounter low profile/low mass barricade
- Recommend creating safety buffer zone
**Apron Barricades – Buffer Zone**

- Separate barricades for aircraft and work force
- Low profile barricades at Taxilane Safety Area
- Work area devices at Taxilane OFA edge

**Aircraft Barricade**
- Low Profile-Low Mass Barricade w/Flashers

**Construction Crew Barricade**
- Outside of Taxilane OFA, Highway Type Barricades are Permitted

**Work Area**

**Buffer Zone**

**Taxilane Safety Area**

**Temporary Taxilane Centerline**

**Taxilane Object Free Area**
Access Route - Marking & Signing

Address requirements for delineating airfield access routes

- Channelizer
- Signage
- Limitations (SA and OFA)
Visual Aids – Runway/Taxiway

Incorporate contract provision for temporary marking, lighting and signage for affected airfield pavements

- Closed Runway
- Partially Closed Runway
- Displaced Threshold
- Closed Taxiway

- De-energize lights and signs that do not serve a purpose during temporary state
- Include appropriate graphic details within safety drawings
- Establish maintenance requirements
Visual Aids – Closed Runway

If taxiing operations still occur across a closed runway, the hold position signs must remain in operation.
Debris Management

Incorporate requirements to monitor and remove debris from airfield pavement due to a construction operations

- Tracked on mud and rock
- Slurry dust
- Wind blown material
- Sweepers/brooms
- Tarp trucks
- Water truck
- SPCD Element (How?)
Hazardous Material

identify hazardous materials sources and establish protocols for spill recovery

- Fuel/Lube trucks
- Hydraulic systems
- Spill Notification
- Containment
- Restrict areas for fueling and equipment maintenance
- MSDS Sheet readily available
- SPCD Element
Notifications

Establish notification requirements for conditions impacting normal airport operations.

- NOTAM issuance
  - Advance Coordination and Procedures
- Part 77 Notification (Cranes)
  - Equipment not addressed during design phase notification
- NAVAID Outages
  - 45-day event notice, 7-day notice, 72-hour confirmation
- Airport Operations Protocols
  - Phase transition
- ARFF Operations
- Emergency Response (911?)
Inspection

Address inspection responsibilities for both the contractor and the airport

- Identify responsible individuals
- Frequency of Inspections
  - Daily and evening checks, storm events, Shutdown periods
- Appendix 4 Checklist
  - Barricade placement, Flasher operation, FOD, Idle equipment outside of OFA, NOTAMS, Drop-offs, Communications....
- Requirement for immediate corrective action
- Re-opening pavement to aircraft operations
Underground Utilities

Address identification and protection of underground utilities to avoid unscheduled outages

- Part 139 requirement
- Identifying location of underground cables should occur in design phase
- Identify utility information on safety drawings (location, depth, type)
- Contractor should Locate and mark before starting trenching operations
- Protection Requirements (Steel plates, split duct, encasement)
- Notification procedures for cut cables
Penalties

Address provisions for imposition of penalties for non-compliance with safety requirements

- Not necessarily a monetary fine
- Immediate removal from work area
- Loss of driving privileges
- Revoke their SIDA badge
- Suspend all construction activities
- Detention by Airport Security/LEO
Special Provisions

Address provisions for special circumstances that reasonably may occur at the airport

• Low visibility
• Rain/Snow Events
• Aircraft emergency
• Life safety emergencies
• Visit by POTUS or other dignitaries
• Employee conduct and V/PD
Wildlife

Controls for minimizing wildlife attractants due to construction activity

• Grass height
• Food/Debris
• Ponding water
• Maintain fence and gate
• Notification Requirements