

# Runway Safety

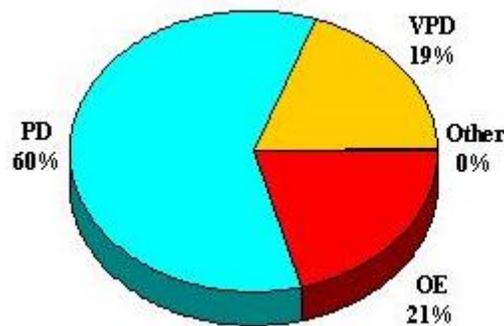
## An Airport Operator's Perspective

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A "Runway Incursion" is any occurrence at an airport with an Air Traffic Control Tower, involving an aircraft, vehicle, person, or object on the ground that creates a collision hazard or results in a loss of separation with an aircraft taking off, intending to take off, landing, or intending to land. For example, if an aircraft intending to land is sent around within one mile of the threshold due to an aircraft, vehicle, or pedestrian incurring on the runway, the incident is classified as a runway incursion. On the other hand, if the aircraft on final was sent around a mile or more from the threshold, the incident is classified as a surface incident.

In 1998 there were 325 runway incursions with 321 occurring in 1999. These numbers represent a significant increase from 186 runway incursions in 1993. In addition to the 321 runway incursions in 1999, there were approximately 1000 surface incidents where there was no loss of separation. Even with intense focus on the problem by the FAA and the aviation industry, the number of runway incursions in 2000 has jumped to 429.

Runway incursions are caused by pilot deviations (PD), vehicle/pedestrian deviations (V/VPD), and controller operational errors (OE). The pie chart below shows the percentage of runway incursions by category for 2000. As you can see, most of the runway incursions are caused by pilots while vehicle deviations and controller errors are fairly even.



**2000 Runway Incursions by Category**

| Type of Deviation                    | Percentage |
|--------------------------------------|------------|
| Pilot Deviation (PD)                 | 60%        |
| Vehicle/Pedestrian Deviation (V/VPD) | 19%        |
| Controller Operational Errors (OE)   | 21%        |
| Other                                | 0%         |

## **Reducing Runway Incursions**

Reducing runway incursions is one of FAA's top safety priorities. There are a number of runway incursion prevention efforts underway by the FAA. This document addresses the airport operator's opportunity to help reduce the potential for runway incursions and discusses runway incursion prevention measures airport operators should consider implementing in the following areas:

### **Airfield Marking, Lighting and Signs**

#### **A. Maintenance of Marking/Lighting/Signs**

1. Maintaining Pilot Visual Aids Operable and in Good Condition - Properly maintaining marking, lighting, and signs can reduce the potential for pilot confusion and possibly prevent a pilot deviation or runway incursion. Faded markings and inoperable signs or lighting could be listed as a factor contributing to an accident by the National Transportation Safety Board (NTSB). If you were to have a runway incursion accident at your airport, would the marking, lighting, and sign systems hold up under NTSB scrutiny?
2. Airport Self-Inspection Program - An effective airport Self Inspection Program is a key element for maintaining your airport in accordance with part 139 requirements.

#### **B. Latest Marking Standards:**

AC 150/5340-1J, Standards for Airport Markings, was issued April 29, 2005. The most significant changes in this revision to the marking standards included the following:

- Enhanced taxiway centerline for commercial service airports serving 1.5 million or more passengers a year. Compliance date is June 30, 2008
- Extension of hold line marking onto paved shoulder for all airports served by airport design groups 5 and 6.
- The enhanced taxiway and extended holdline is optional for all other airports.

Previous revisions to this Advisory Circular addressed the marking issues listed below. All Part 139 airports must be in compliance with these provisions at this time.

- Runway and taxiway markings must have glass beads to enhance the visibility of the markings at night.
- Holding position markings must have glass beads and be highlighted in black on light colored pavement.
- Non-movement area boundary markings must have glass beads and be highlighted in black on light colored pavement.
- Old markings no longer needed must be physically removed rather than obscured with black or gray paint.
- Double size holding position markings and ILS holding position markings are required at part 139 airports and all airports with an air traffic control tower

## C. Standardization of Marking/Lighting/Signs

**Monitoring Construction for Compliance with FAA Standards** - Strong emphasis by FAA on standardization of marking, lighting, and signage began in the late 1980s as a result of accidents where non-standard marking, lighting and signage were listed by the NTSB as factors contributing to the accident. Part 139 was revised effective January 1988 and required certificated airports to install signs. Airport operators were also required to meet FAA standards for airfield marking & lighting systems and have an FAA approved Sign Plan in their Airport Certification Manuals/Specifications.

During the early to mid 1990s, Airport Certification Inspectors began identifying non-standard marking, lighting, and signage for corrective actions during annual certification inspections. For the most part, non-standard marking, lighting, and signs were identified and corrected through AIP projects during the 1990s. However, we continue to have some problems with non-standard marking, lighting, and signs being installed at airports during AIP construction projects. Therefore, during and after construction projects, airport self-inspection personnel should be checking for compliance to FAA standards for marking, lighting, and signage. The FAA should be contacted if non-standard marking, lighting, or signs are found.

It is sometimes difficult to determine proper signage at complex intersections during the design phase. Even though FAA's review of project plans & specifications results in compliance with the standards, the resulting signs or markings may still appear misleading or confusing in some instances. Modification to signs may be necessary.

In addition to monitoring construction activity for compliance with FAA standards, airport personnel should also be on the lookout for pilot visual aids that may provide misleading or confusing guidance related to marking/lighting/signage around the construction area. Construction barricades at the boundaries of construction areas need to be clearly visible both day and night. In addition, existing signs and lights should be covered or disabled to avoid providing conflicting visual aids for closed areas.

Airport personnel need to be knowledgeable of part 139 requirements, FAA marking, lighting and signage standards, and the construction project safety plan. The following Advisory Circulars should be made available to airport personnel for reference.

AC 150/5340-1J, Standards for Airport Markings

AC 150/5340-30 Airport Visual Aids (includes edge lights, centerline lights and low visibility taxiway lighting systems)

AC 150/5340-18D, Standards for Airport Sign Systems

AC 150/5345-44F, Specifications for Taxiway and Runway Signs

AC 150/5370-2E, Operational Safety on Airports During Construction

## **Problem Intersections**

### **A. Analyzing Problem Intersections**

Generally, problem intersections are those that have extra wide pavement, acute angles, more than two intersecting taxiways, runway/runway/taxiway intersections, and hold positions where pilots are not expecting a hold position. The RIAT participants try to determine the nature of the problem area and possible corrective measures. RIAT participants will examine problem intersections at the airport for the following:

- Adequacy of existing visual aids
- Confusing visual aids
- The need for additional visual aids or enhancements to visual aids
- The need to relocate, cant or removed existing signs or markings
- Possible pavement reconfigurations for longer term correction

Changes or enhancements to existing marking and signage are the most common recommendations made to mitigate problem intersections. The recommendations are normally incremental, starting with marking enhancements that are relatively easy to implement. Additional recommendations may be made depending on the extent of the problem and the risk factors involved.

Any changes to airport marking, lighting, or signage must be in accordance with FAA standards as much as possible. If any non-standard application of FAA standards is necessary, FAA airport certification staff will work with airport operators to document any non-standard marking, lighting, or signage in the Airport Certification Manual (ACM) that is recommended as a runway incursion prevention measure. Changes to signage will also trigger the requirement to revise the FAA approved Sign Plan to maintain currency of the ACM.

If an airport operator is considering additional changes to marking, lighting, or signs outside the Runway Incursion Action Team process, these changes will need to be coordinated with the FAA Airports Division airport certification staff.

### **B. Enhancing Pilot Visual Aids**

Common RIAT recommendations that have been made to enhance marking, lighting, and signs are as follows:

Enhancing the visibility of a runway hold position on a taxiway where pilots have had difficulty discerning the location of the hold position.

- Repaint the hold position marking to double size dimensions using glass beads and highlight the marking in black.
- Install a surface painted hold position sign.
- Install Runway Guard Lights.
- Install a 2nd hold position sign on the right side of the taxiway.
- Install an in-pavement runway guard light system.

Enhancing the visibility of a taxiway route where pilots have problems following the assigned taxi route.

- Highlight the taxiway centerline in black.
- Repaint the taxiway centerline to a 12 inch width and highlight in Black.
- Install a surface painted taxiway direction sign on the taxiway pavement prior to the turn.
- Install a surface painted location sign after the turn.
- Make changes to existing signs where appropriate to reduce confusion to pilots.
- Install supplemental signs to clarify the taxiway route.
- Install taxiway centerline lights.

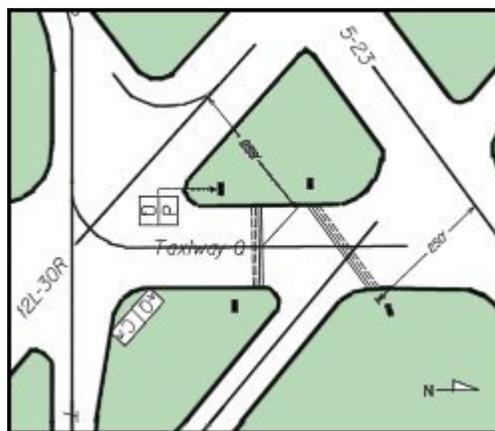
### **C. Pavement Reconfigurations:**

Wide pavement areas intersecting runways at acute angles are normally problem intersections. Pavement reconfigurations are costly, but may be the only effective way to mitigate some problem intersections. Pavement reconfigurations as a runway incursion prevention measure normally receive a high priority for AIP funding when recommended by a Runway Incursion Action Team.

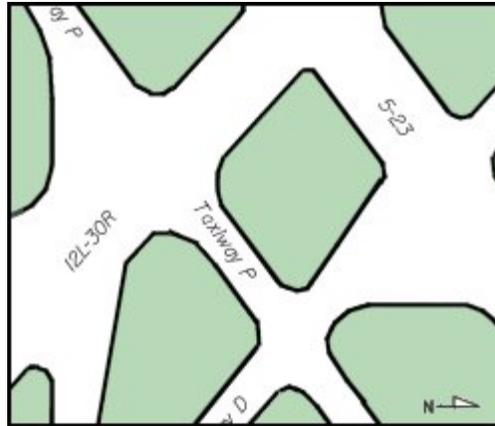
To initiate AIP action on this process, airport operators must amend the Airport Capital Improvement Program (ACIP) to include the reconfiguration project. The Airport Layout Plan may also need to be revised if the project is not already included.

Below is an example of a pavement reconstruction project at Des Moines International Airport that eliminated a problem intersection. Taxiway Quebec was a former runway that resulted in a wider than normal taxiway pavement intersecting two runways at an acute angle. The reconstruction project eliminated the Taxiway Quebec pavement and extended Taxiway Papa through the intersection. This AIP funded project was already planned by DSM, however, a Runway Incursion Action Team recommended that the project be given higher priority. Completion of the project changed the intersection from a complex intersection to a typical intersection.

### **Example of Intersection Reconfiguration**



**Before**



After

## Ground Vehicle Operations

### A. V/PD Definition:

A Vehicle/Pedestrian Deviation (V/PD) by definition is a vehicle or pedestrian incursion resulting from a vehicle operator, non-pilot operator of an aircraft, or pedestrian (includes bicycles) who deviates onto the movement area without ATCT authorization.

### B. V/PD Investigation Process

1. When a V/PD occurs, the local ATCT completes a Preliminary V/PD Report (4 page form).
2. An Airport Certification Inspector issues a Letter of Investigation to the airport operator.
3. The airport operator conducts an investigation of the V/PD and sends a report to the FAA.
4. The Airport Certification Inspector reviews the report and determines appropriate action, which is either a close-out with no action, Letter of Correction, Warning Letter, or possible Civil Penalty.
5. The Airport Certification Inspector completes a V/PD Investigation Report. (2 page form) and distributes copies to FAA Washington HQ, Regional Divisions, Airport Operator and ATCT.

### C. Enhancing Ground Vehicle Operations

Ground vehicle operations can be enhanced through implementing the following measures:

- Establish a formal driver's training program if not already in place.
- Conduct recurrent driver training & monitor tenant training programs.
- Restrict ground vehicle operations on the runways to only those which are necessary.

- Prevent inadvertent entry onto the movement area by unauthorized persons. Install "No Trespassing" and "Restricted Area" signs at AOA access points and lock AOA gates.
- Install signs on service roads at runway safety area boundaries to prevent inadvertent entry into a runway safety area or runway.
- Implement additional signs and measures to prevent inadvertent access onto active movement areas by construction vehicles. A Sample Construction Guidebook developed by the Spirit of St. Louis Airport addresses construction ground vehicle operations and is available for download on the Central Region Airports Division web site.
- Construct new service roads around runways where vehicles routinely cross runways. (High priority for AIP funding)
- In conjunction with the ATCT, monitor vehicle runway crossings where service roads are available to ensure that the vehicle operations across runways are necessary and not just a matter of convenience.

#### **D. Improving Ground Vehicle Training Programs**

Ground vehicle training programs currently in place at airports vary from only on-the-job training to comprehensive formal training programs with license requirements. Most of the part 139 airports with air traffic control towers already have formal ground vehicle training programs to meet the requirements of part 139.329(e). Formal vehicle training programs generally involve a two tiered level of training for drivers who only operate on the apron area and a much more extensive training program for drivers that operate on the movement area. Having a formal vehicle-training program will help you ensure that all vehicle operators receive comprehensive training.

Part 139.329(e) requires that each certificate holder shall "ensure that each employee, tenant, or contractor who operates a ground vehicle on any portion of the airport that has access to the movement area is familiar with the airport's procedures for the operation of ground vehicles and the consequences of noncompliance". Part 139 does not specifically require a formal ground vehicle-training program, however, most airport operators have established a formal training program to ensure that ground vehicle operators are properly trained. If you do not have a formal training program in place, it is highly recommended that a formal ground vehicle training program be established to enhance the safety of ground vehicle operations

An airport driver's guidebook specific to your airport is a necessary element of a formal ground vehicle-training program. If you do not already have an airport driver's guidebook, you can start with one of the Sample Ground Vehicle Guidebooks available off the Central Region Airports Division web. The airport ground vehicle guidebooks on the web site have been made available from four Central Region airports. Downloading one or more of these guidebooks will be a good starting point for developing a ground vehicle guidebook specific to your airport.

The FAA has published a ground vehicle training guidebook titled, "[Airport Ground Vehicle Operations](#)". This guidebook has colored pictures and diagrams covering airport basics, airfield signs & markings, and radio communications. The guidebook can be used in ground vehicle training programs and can be obtained by contacting your Airport Certification Inspector.

Another important element of a formal ground vehicle-training program is recurrent training. Recurrent training is necessary to ensure that vehicle operators remain familiar with vehicle procedures and any changes related to ground vehicle operations that occurred in the previous year. Seasonal vehicle operators, such as airline employees who drive deicing equipment to remote deicing pads or those who operate snow removal equipment, need to receive recurrent training just prior to the start of snow and ice conditions. Recurrent training also places more emphasis on the importance of safe ground vehicle operations in addition to addressing changes.