



Federal Aviation Administration

Memorandum

Date: November 2, 2007

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To: All Regions

Attn: Regional Airports Division Managers

Subject: Engineering Brief No. 72A

Positive Identification Of Runways For Landing

This Engineering Brief provides guidance for identifying situations where a taxiway could be mistaken for a runway and provides mitigation strategies for dealing with the problem. These standards and recommendations will be incorporated into changes in several Advisory Circulars, including 150/5300-13, *Airport Design*, 150/5340-30, *Design And Installation Details For Airport Visual Aids*, and 150/5340-1, *Standards for Airport Markings*. In the interim, due to a number of recent incidents, use this guidance for addressing the problem.

While implementation of mitigation strategies are optional and require careful consideration of each individual case, all efforts should fall within these guidelines to maintain a nationally consistent and economic solution to the problem.

This is a revision to the original Engineering Brief 72 issued on January 17, 2007. It adds a reference to the report by the William J. Hughes Technical Center that provides much of the supporting documentation. It also adds recommendations for improving the visual contrast between taxiways and the intended runway by:

- (1) Using artificial turf to hide the squared-off end of taxiways that could be mistaken for a runway threshold, and
- (2) Using a surface sealer/rejuvenator as an economical means of increasing the visual contrast of the intended runway.

ENGINEERING BRIEF NO. 72A

POSITIVE IDENTIFICATION OF RUNWAYS FOR LANDING

November 2, 2007

PURPOSE: This Engineering Brief (1) provides guidance for identifying situations where a taxiway might be mistaken for the intended runway; and (2) outlines recommended strategies for preventing and reducing the chances of lining up, approaching, or landing on an unintended taxiway. Preventive measures are described as a three-tier strategy that can be implemented in stages depending upon the need for corrective action. The level of effort needed to prevent unintended taxiway landings will depend upon the specific situation, but all efforts should fall within these guidelines to maintain a nationally consistent and economical solution to the problem.

BACKGROUND: Some airports are experiencing problems with pilots mistakenly identifying parallel taxiways for adjacent runways. Occasionally these pilots have actually landed on the taxiway. On other occasions, the pilot is forced to make a last minute maneuver to either re-align with the runway or to terminate the approach and try again. In any case, this situation adds to controller workload, presents unnecessary distractions, and creates an avoidable risk. Regardless of the specific cause of each incident, there are some measures that airports can do to minimize the likelihood of this sort of occurrence. Recommendations for identifying problem areas and for implementing preventive measures are based on work done by Mitre Corporation and the Airport Safety Technology Research and Development Section, AAR-411. Report number DOT/FAA/AR-TN07/54, *Identification Techniques to Reduce Confusion Between Taxiways and Adjacent Runways* provide additional background, test results and analysis. This report is available through the National Technical Information Service (NTIS), Springfield Virginia 22161.

RECOMMENDATIONS:

1. Identifying Potential Problem Areas

Not all incidents of landing on taxiways can be prevented by measures under the control of the airport. Indeed, some recent incidents defy all logic as to why they occur and are unlikely to be affected by any marking, lighting or airport layout initiatives. Other incidents seem to have some common underlying factors that may indicate the need to take some action. These factors are: (1) visual contrast of the taxiway compared to the runway; (2) natural lighting conditions at the airfield; and (3) the existence of parallel runways.

a. Visual Contrast

Pilots naturally expect the runway to be the dominant visual feature when preparing to land. The decision process is based on expectations and experience that is built up over time and is typically done with little analysis. A taxiway, instead of the runway, can be the dominant visual feature when: (1) the taxiway pavement appears to be as wide (or wider) than the intended runway, and (2) when the visual contrast of the taxiway pavement with the surrounding environment exceeds that of the runway.

Paved shoulders, when added to the width of a standard taxiway, can make the taxiway appear much wider than it actually is. FAA airport design standards permit a taxiway with paved shoulders to be nearly as wide as a runway that does not have paved shoulders.

New pavement sections are typically the dominant visual feature for approaching aircraft. New asphalt pavement will appear much darker than older asphalt pavement, and new concrete pavement will clearly be lighter in color compared to older concrete pavement on the airport. New taxiway pavement is even more prominent if the taxiway appears to have a squared-off (rather than rounded) entrance resembling a runway threshold. Therefore, recent taxiway pavement construction, including only the addition of paved shoulders can make the taxiway the dominant visual feature.

b. Natural Lighting Conditions

Glare or reflection from the sun can make it difficult to clearly identify pavement markings and other features that would otherwise be needed to identify the intended runway. Wet conditions can increase reflection, and hazy conditions can further reduce positive runway identification. Note that these conditions only apply during daylight hours when the pilot is operating under visual procedures. Instruments and approach lighting systems negate these problems during periods of darkness and limited visibility. The period from mid-November through March for landings to the south is particularly troublesome for airports in northern latitudes.

c. Parallel Runways

Depending upon the visual contrast of the pavements and natural lighting conditions, parallel taxiways can be confused with parallel runways. For example, pilots instructed to land on runway 34R are looking for a runway to the right of runway 34L (or 34C, etc.). Taxiways can be mistaken for parallel runways particularly when they appear to be evenly spaced with respect to the parallel runways. For example, runways 16L, 16C, and taxiway T at Seattle-Tacoma International appear to be evenly spaced to approaching aircraft. The runways are 800 feet apart while the taxiway is another 600 feet from runway 16C. Under these circumstances, it is not immediately obvious which of the right-hand pavements (runway 16C or taxiway T) is actually runway 16C.

2. Mitigation Measures

Efforts to reduce the likelihood of an unintended landing on a taxiway should be viewed as a three-tiered approach. The first tier is to alert the pilot to initially select the correct runway prior to visual contact with the airport. This is done through education and notification to pilots to take particular care when identifying the correct runway. The second tier supports the pilot's initial visual selection of the landing runway. This tier applies to straight-in landing procedures where the pilot breaks out of cloud cover and is transitioning from instrument to visual conditions. It also applies to straight-in visual and circling approaches when the pilot turns to the final approach to the runway. Second tier mitigation is intended to allow the pilot to correct an initial erroneous runway selection and complete a successful landing on the intended runway. The final tier is a last-resort effort to prevent actual landing on the taxiway. It is designed to alert the pilot that the selected pavement is a taxiway in time to allow the pilot to pull up and make a new approach to the runway.

a. Initial Selection

Although pilot education is probably the best strategy to insure selection of the correct runway for landing, this option is usually only implemented when it is clear that a problem exists. Pilots can be notified of problems with proper runway selection through the Automated Terminal Information System (ATIS), Notice to Airman (NOTAM) and notations on official FAA airport diagrams. Messages usually take the following form: "Do not mistake taxiway ____ for landing surface." More information in the form of safety bulletins can also be provided through the FAA regional office or

organizations such as the Airline Pilots Association (ALPA). Once a problem becomes apparent, pilot notification and education is the best and most effective option for preventing incidents.

b. Visual Selection

High-intensity, omni-directional REILs (Runway End Identifier Lights) are the best option to assist the pilot in selecting the proper runway end at a distance that is sufficient (about 4.5 nautical miles for a straight-in approach) to allow the pilot to execute a seamless transition to the runway. Omni-directional lights are superior to directional REILs because they are readily visible even when the aircraft is well off of the runway centerline, as would be the case that might lead to a taxiway landing. They are also effective for circling approaches for the same reason—they can be easily seen well before the aircraft lines up with the runway.

Runways with existing directional REILs can be retrofitted with additional omni-directional REILs provided that an interlock is added to prevent the omni-directional REILs from operating while the directional REILs are in operation. Approach lighting systems should have a similar interlock with the omni-directional REILs. High-intensity, omni-directional REILs should not be operated at night because they could distract air traffic control personnel or other aircraft. If daytime use of the lights becomes a distraction, baffles can be constructed to block the lights from pre-selected quadrants. Each parallel runway should be fitted with omni-directional REILs if there is any possibility a taxiway could be mistaken for an unlit runway.

Testing has shown that pavement marking is not effective for assisting runway identification for straight-in approaches. In order for this option to work, the pilot would first need to recognize that the markings are associated with a taxiway, and then re-direct a visual search to find the proper runway. Tested markings are only discernable inside 2 nautical miles and they can easily become unreadable due to glare from the sun.

Properly sized taxiway marking can be effective for circling approaches during visual conditions. Pilots on the downwind and base legs should be able to easily see and recognize a properly sized taxiway marking. See below for specific recommendations for taxiway marking.

Taxiways with a rectangular-shaped entrance that appear to be a runway threshold from the air can be mitigated economically by placing artificial turf to hide the right-angle corner and make it appear to be a normal curved entrance. The artificial turf should not be placed on the paved taxiway shoulder but only on pavement that extends beyond the normal shoulder width for the taxiway. See Figure 3 for a diagram of the typical placement for artificial turf. Coordinate artificial turf installation with the Airport Engineering Division, AAS-100 to obtain the latest technical guidance for material and installation procedures. Technical requirements for the installation of artificial turf in the airfield environment can be found in Advisory Circular 150/5370-15, *Airside Applications for Artificial Turf*.

Older asphalt runways often become a light-gray color with age and may not provide the expected visual contrast when compared to nearby taxiways with newer asphalt pavement. Consider remarking or resurfacing older runways. Surface treatments (e.g. coal-tar sealer/rejuvenator in accordance with FAA Engineering Brief No. 44A.) provide visual contrast and may provide an economical improvement that extends pavement life, increases the visibility of the runway markings and makes the pavement appear to be new “black top” from the air.

c. Taxiway Identification

If the first two mitigation efforts do not work, then the pilot needs to clearly understand that the pavement is a taxiway prior to landing. There are two recommended alternatives for providing

positive taxiway identification to the pilot: (1) apply a "TAXI" marking on the taxiway, or (2) install a lighted "X" off the approach end of the taxiway.

As described above, a TAXI marking could be an effective aid to avoid lining up on the taxiway during a circling approach. It would also allow the pilot to clearly identify the pavement as a taxiway before completing a landing touchdown. The general dimensions and location of the TAXI marking are shown on the attached drawings. The markings should extend across the entire pavement including any paved shoulder as shown on the drawings. The color of the marking is yellow with a one foot wide black border along the sides of each letter and a four (4) foot border on the tops and bottoms.

A lighted "X" (normally indicating a closed runway) should be considered as a desirable alternative to the TAXI marking whenever the runway is used primarily for straight-in approaches and in situations where glare from natural lighting can obscure the marking. The lighted "X" should meet the requirements of AC 150/5345-55, *Lighted Visual Aid To Indicate Temporary Runway Closure*, except that the installation can be permanent rather than portable as described by the AC. Install the unit on the taxiway centerline as close as possible to the beginning of the taxiway pavement making certain that it is not an obstruction to the runway, and is not located inside the runway or taxiway safety area.

Figure 1. TAXI Marking Location

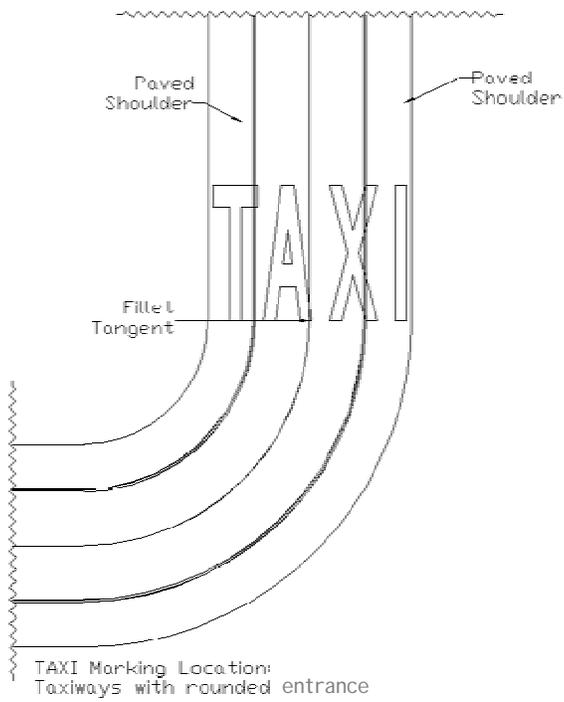
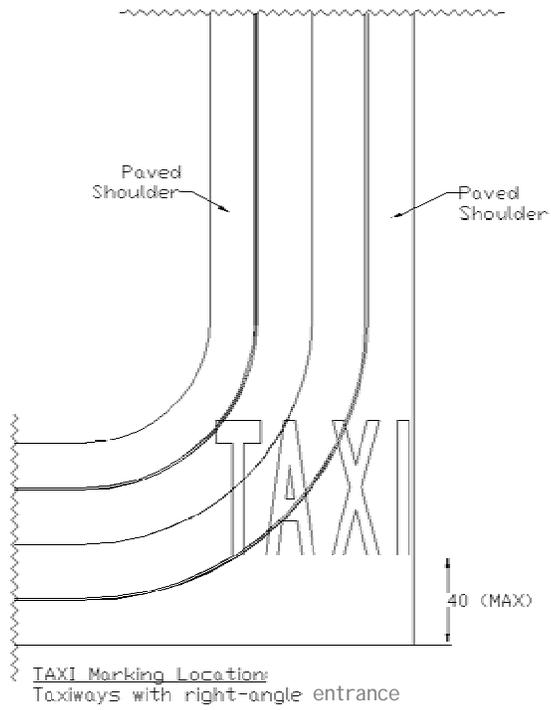
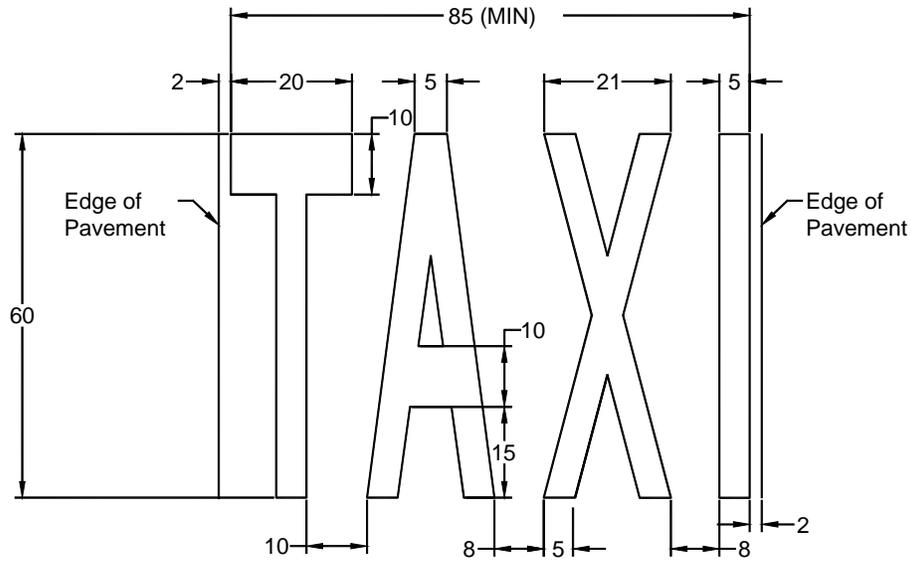


Figure 2. TAXI Marking Dimensions



Note: These are minimum dimensions (in feet). If the existing taxiway plus paved shoulder is not wide enough to accommodate these markings, then provide a paved pad or wider shoulder in the area where the marking is to be installed.

Figure 3. Artificial Turf Installation to Eliminate Runway-like “Thresholds”

