

Hotspot Symbolology Standardization

Safety Risk Management Document Without Hazards



Version 1.0
June 7, 2021

Safety Risk Management Document Change Page

Date	Change Summary	Version Number
1/21/2020	Initial draft	0.1
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EXECUTIVE SUMMARY

Title: Hot Spot Symbology Standardization Safety Risk Management Document Without Hazards

Initiating Organization: Runway Safety Group, AJI-14

Safety Analysis Type: Operations

To avoid confusion for pilot users, Mission Support Services (AJV) Aeronautical Information Services, AJV-A, proposed the standardization of hot spot symbology and verbiage. The FAA defines a hot spot as a “location on an airport movement area with a history of potential risk of collision or runway incursion, and where heightened attention by pilots and drivers is necessary.” Generally, a hot spot location is a complex or confusing taxiway/taxiway intersection or taxiway/runway intersection. Hot spots are depicted on airport diagrams within chart supplements and the Terminal Procedures Publication as a variety of geometric shapes designated as “HS 1,” “HS 2,” and so forth. Currently, there is no standard shape to designate a hot spot; they are charted with a variety of squares, rectangles, circles, ovals, and ellipses with no pattern or consistency.

In addition to the aforementioned hot spots, some airports have marked wrong surface areas attributed to runway confusion as hot spots; they are currently depicted in a variety of ways. Wrong surface events attributed to runway confusion are an issue that is currently being addressed by the Air Traffic Organization (ATO) Safety and Technical Training (AJI) Runway Safety Group, AJI-14, the ATO Top 5 program, the FAA Safety Management System Committee, and the ALM Joint Safety Analysis and Implementation Team via The Commercial Aviation Safety Team. A wrong surface event attributed to runway confusion is defined as an aircraft lining up to, landing on, or departing from the incorrect runway, taxiway, or airport. There have also been numerous outreach and promotional efforts through the Top 5 and Runway Safety. Additionally, the ATO is deploying a software enhancement to Airport Surface Detection Equipment Model X to detect and alert to incorrect taxiway alignments. Despite these efforts, wrong surface events continue to occur frequently.

A Safety Risk Management panel convened on November 19 through 20, 2019, to examine the potential safety risk of changing hot spot symbology to use a standardized set of shapes and assigning common meanings to those shapes. Under the new system, all hot spots related to complex or confusing taxiways, taxiway intersections, or taxiway/runway intersections, will be designated with circles and ellipses. Areas that present significant potential for wrong surface events will be designated by cylinders. The panel did not believe there were any hazards associated with the proposed change of hot spot symbology standardization. The panel agreed that since the changes in hotspot symbology will be communicated among stakeholders and the process for identifying hotspots will not change, there are no new hazards introduced by this change. Ultimately, the standardization will improve safety through easier identification of potential issues in the airport environment. The remainder of this document details the panel’s deliberations regarding hotspot standardization.

SAFETY RISK MANAGEMENT DOCUMENT SIGNATURES

Title: Hotspot Standardization Symbolology Safety Risk Management Document Without Hazards

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SECTION 1. CURRENT SYSTEM

1.1 Introduction

The Federal Aviation Administration (FAA) defines a hot spot as a “location on an airport movement area with a history of potential risk of collision or runway incursion, and where heightened attention by pilots and drivers is necessary.” Generally, a hot spot location is a complex or confusing taxiway/taxiway intersection or taxiway/runway intersection. Hot spots are depicted on airport diagrams within chart supplements and the Terminal Procedures Publication (TPP) as a variety of geometric shapes designated as “HS 1,” “HS 2,” and so forth.

In addition to the aforementioned hot spots, some airports have marked wrong surface areas attributed to runway confusion as hot spots; they are currently depicted in a variety of ways. Wrong surface events attributed to runway confusion are an issue that is currently being addressed by the Air Traffic Organization (ATO) Safety and Technical Training (AJI) Runway Safety Group, AJI-14, the ATO Top 5 program, the FAA Safety Management System (SMS) Committee, and the ALM Joint Safety Analysis and Implementation Team via The Commercial Aviation Safety Team. A wrong surface event attributed to runway confusion is defined as an aircraft lining up to, landing on, or departing from the incorrect runway, taxiway, or airport. There have also been numerous outreach and promotional efforts through the Top 5. Additionally, the ATO is deploying a software enhancement to Airport Surface Detection Equipment Model X to detect and alert to incorrect taxiway alignments. Despite these efforts, wrong surface events continue to occur frequently.

1.2 Need for a Safety Risk Management Panel

To avoid confusion for pilot users, Mission Support Services (AJV) Aeronautical Information Services, AJV-A, proposed the standardization of hot spot symbology and verbiage. Currently, there is no standard shape to designate a hot spot; they are charted with a variety of squares, rectangles, circles, ovals, and ellipses with no pattern or consistency.

1.3 Scope of the Safety Risk Management Panel

A Safety Risk Management (SRM) panel convened on November 19 through 20, 2019, to examine the potential safety risk of changing hot spot symbology to use a standardized set of shapes and assigning common meanings to those shapes. Under the new system, all hot spots related to complex or confusing taxiways, taxiway intersections, or taxiway/runway intersections, will be designated with circles and ellipses. Areas that present significant potential for wrong surface events will be designated by cylinders.

Bounding the system is essential to ensuring a thorough SRM panel is conducted, and a 5M Model is a useful tool for identifying all of the factors involved in a system prior to searching for potential hazards and analyzing/assessing risk. For the safety risk analysis and assessment described in this SRM document, the 5M Model in Table 1.1 was applied.

Note that the original SRM panel had a larger scope that was subsequently revised based on stakeholder feedback. [Appendix A](#) contains the draft SRM document with the full

scope for record-keeping purposes. Note that this document was not signed and the change proponent does not intend to move forward with the changes that were removed from the scope of the assessment.

Table 1.1: 5M Model

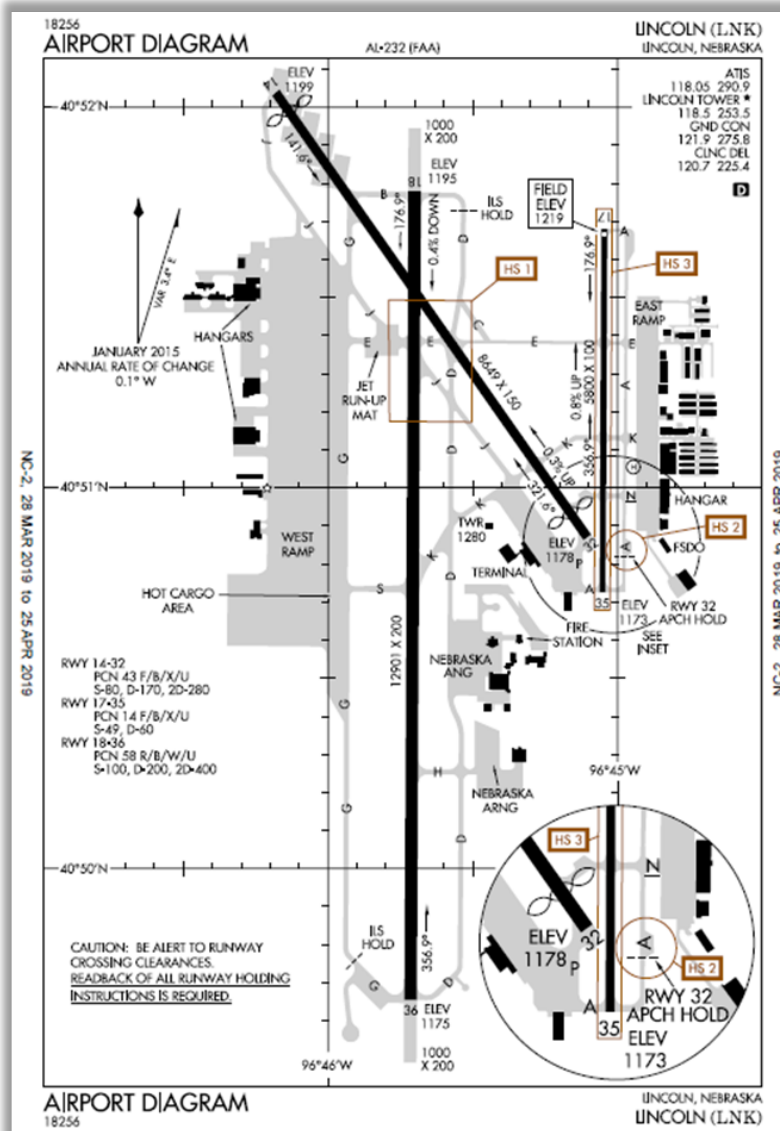
Mission: The clearly defined and detailed purpose of the NAS change proposal or system/operation being assessed	Standardize hot spot symbology on airport diagrams, chart supplements, and the TPP and assign meaning to standardized symbols.
(hu)Man: Operators, maintainers, and affected stakeholders	• Air traffic controllers • Pilots • Airport operations • Vehicle operators • Runway Safety • National Flight Data Center • National Geospatial Agency • Third-party charting services • Any unlisted chart users
Machine: Equipment used in the system	• Airport diagrams • Chart supplement • TPP
Management: Procedures and policies that govern the system's behavior	• Pilot operating procedures • Chart supplement • Aeronautical Information Manual • Aeronautical Information Publication (international) • Title 14 of the Code of Federal Regulations Part 61, CERTIFICATION: PILOTS, FLIGHT INSTRUCTORS, AND GROUND INSTRUCTORS
Media: The environment in which the system is operated/maintained	• NAS • Public access / Internet

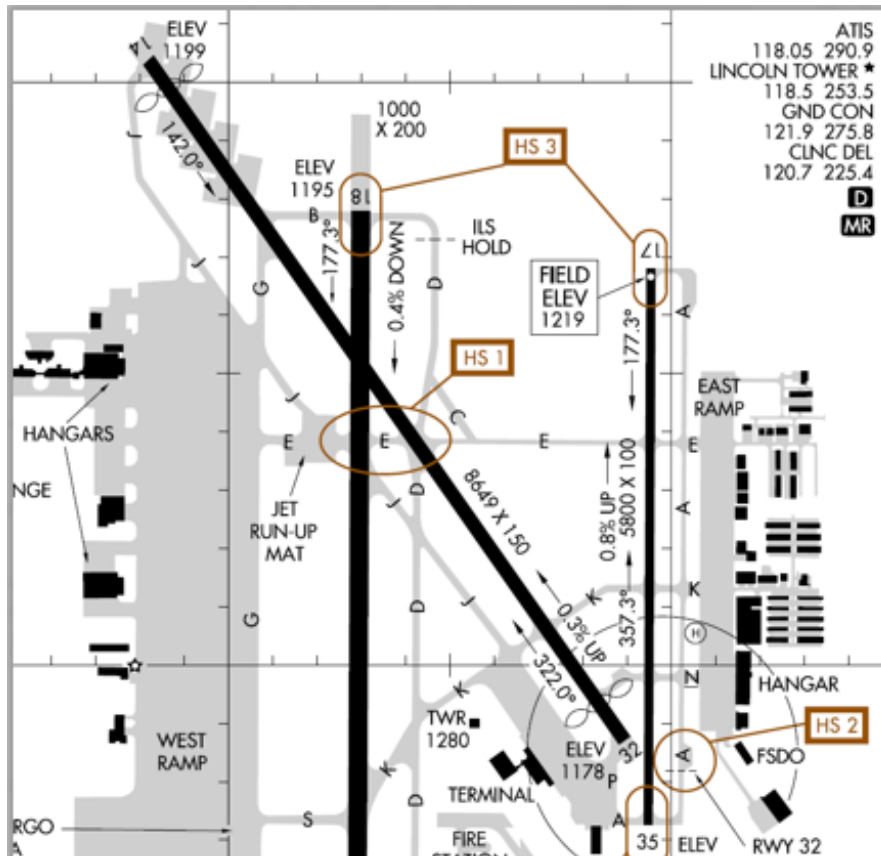
SECTION 2. DESCRIPTION OF CHANGE

As stated above, AJV-A proposed the standardization of hot spot symbology and meaning. The addition and standardization of this symbology will require training and education to ensure that pilots are current on all symbols and nomenclature. AJI-14 has worked with AJV-A to develop the proposed changes.

Note that while the figures below contain examples from specific airports, these changes are NAS wide.

Ground movement hot spot standardized symbology will be depicted as circles and ellipses. Wrong surface areas will be depicted as cylindrical-shaped hot spots. Any other shapes depicting hot spots will be eliminated. Below, Figure 2.1 displays current hot spot symbology, and Figure 2.2 shows the symbology per the proposed change. (Note: the small box that surrounds the “HS” symbol will remain on the airport diagrams.)





SECTION 3. HAZARD AND RISK ANALYSIS

3.1 Change Guidelines

To frame its analysis and assessment, the panel agreed that the following guidelines will govern future hotspot additions:

1. Communications about and promotion of the change will take place with all users prior to publication.
2. The process of identifying a hot spot will not change.
3. When symbols on airport diagrams are standardized, modified, or introduced, AJV-A will coordinate with AJI-14.
4. New hot spots will be coordinated with AJI-14 in the normal manner.
5. There will be no change in display technology.

3.2 Hazard Identification

3.2.1 Preliminary Hazard List

To explore the possible safety ramifications of the proposed changes, the panel developed a Preliminary Hazard List (PHL) per the ATO SMS Manual, April 2019. The panel captured the following PHL items, which are further detailed below:

1. Confusion over change
2. Meaning may not transfer to new symbols

3.2.2 PHL Validation

Item 1: The panel identified confusion about the change as a PHL item and discussed whether this confusion could lead to a hazard or qualify as a hazard itself. The panel determined that confusion due to the standardization of hot spot symbols is not a hazard but noted that confusion in general may be an issue with the other proposed changes, which have since been scoped out. Additionally, the planned outreach and education will familiarize users with the new standardized symbology and its meaning.

Item 2: The panel identified the loss of symbols' meaning as a PHL item. The panel discussed whether the planned communication outreach efforts would be sufficient in educating pilots. Ultimately, the panel decided that the fourth assumption (coordination with AJI-14 on new hot spots) would alleviate any concerns regarding the transfer of symbols' meaning. The change proponent also emphasized that the new symbols are meant to reinforce the meaning of different risks on the airport surface.

Ultimately, the panel did not identify any hazards related to the standardization of hot spot symbols.

3.3 Rationale for a Safety Analysis without Hazards

As described in Section 3.2.2, the panel agreed that since the changes in hotspot symbology will be communicated among stakeholders and the process for identifying hotspots will not change, there are no new hazards introduced by this change. Ultimately, the standardization will improve safety through easier identification of potential issues in the airport environment.

SECTION 4. SRM PANEL ATTENDEES

The SRM panel convened on November 19 through 20, 2019, to perform a thorough safety risk analysis and assessment. Subject Matter Experts (SMEs) from across the agency were invited to leverage their operational experience, and experts in the SRM process were present to maintain its integrity. Table 4.1 lists the panel participants for the November 19 through 20, 2019, SRM panel.

Table 4.1: SRM Panel Members, SMEs, Observers, and Facilitation Team

Name	Organization	Email	Phone	SRM	
				Yes	No
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*These attendees dialed into the SRM panel.

**APPENDIX A. MISALIGNMENT RISK SYMBOLOGY ON
AIRPORT DIAGRAM SAFETY RISK MANAGEMENT
DOCUMENT (2020)**

Misalignment Risk Symbolology on Airport Diagrams

Safety Risk Management Document



Version 0.5

April 15, 2020

Safety Risk Management Document Change Page

Date	Change Summary	Version Number
1/21/2020	Initial draft	0.1
1/30/2020	Technical edit performed	0.2
2/20/2020	Facilitation team review	0.3
3/18/2020	Panel comment adjudication	0.4
4/15/2020	Peer review comment adjudication	0.5

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EXECUTIVE SUMMARY

Title: Misalignment Risk Symbolology on Airport Diagrams Safety Risk Management Document

Initiating Organization: Runway Safety Group, AJI-14

Safety Analysis Type: Operations

The Safety and Technical Training (AJI) Safety Management Group, AJI-31, has been tracking and addressing wrong surface events since 2016. A wrong surface event is defined as an aircraft lining up to, landing on, or departing from the incorrect runway, taxiway, or airport. On average, there are 417 wrong surface event in the National Airspace System per fiscal year. In July 2017, Air Canada Flight 759 was cleared to land on runway 28R at San Francisco International Airport, but instead lined up on parallel taxiway C, where four air carrier airplanes were awaiting takeoff clearance. The aircraft descended to 59 feet above ground level before beginning to climb, narrowly missing the aircraft on the ground. Although the event described previously occurred during the nighttime, these wrong surface events largely occur during the daytime and in visual meteorological conditions, and the majority of the time, the pilot has read back the correct landing or departure clearance.

Wrong surface events are an issue that is currently being addressed by Air Traffic Organization (ATO) Runway Safety Group, AJI-14, the ATO Top 5 program, the Federal Aviation Administration (FAA) Safety Management System Committee, and the ALM Joint Safety Analysis and Implementation Team via The Commercial Aviation Safety Team. There have also been numerous outreach and promotional efforts through the Top 5 and Runway Safety. Additionally, the ATO is deploying a software enhancement to Airport Surface Detection Equipment Model X to detect and alert to incorrect taxiway alignments. Despite these efforts, wrong surface events continue to occur on a daily basis.

There has been a need to provide a more permanent awareness of wrong surface events, especially to General Aviation pilots, who comprise 83 percent of wrong surface events. To this end, the Runway Safety Team, a joint government / industry stakeholder group, proposed the addition of misalignment risk symbolology on airport diagrams, approach plates, chart supplements, and the Terminal Procedures Publication (TPP) to alert pilots to areas where wrong surface events are prone to occur. Misalignment risk is defined as aircraft lining up to land or depart on the wrong runway or on a taxiway. While some airports have already marked wrong surface areas as hot spots, they are currently depicted in a variety of ways. To better accommodate the addition of misalignment risk symbolology, the Runway Safety Team also proposed the standardization of hot spot symbolology and verbiage.

The FAA defines a hot spot as a “location on an airport movement area with a history of potential risk of collision or runway incursion, and where heightened attention by pilots and drivers is necessary.” Generally, a hot spot location is a complex or confusing taxiway/taxiway intersection or taxiway/runway intersection. Hot spots are depicted on

airport diagrams within chart supplements and the TPPs as a variety of geometric shapes designated as “HS 1,” “HS 2,” and so forth.

A Safety Risk Management panel convened on November 19 through 20, 2019, to examine the potential safety risk of the proposed changes associated with misalignment risk symbology. The panel found one hazard (MR-01): pilot confusion when attempting to interpret new symbols or terminology. The panel concluded that the hazard would pertain to only two of the proposed changes: (1) the addition of misalignment risk symbols (“MR”) on airport diagrams, chart supplements, and the TPP and (2) the addition of misalignment risk symbols (“H”) on approach plates. The panel did not believe this hazard would apply to the third proposed change of hot spot symbology standardization. Table ES.1 below presents a summary of the identified hazard, displaying the initial and predicted residual risk levels for the effect with the highest risk rating.

Table ES.1: Hazard Summary

Hazard ID	Hazard Description	Initial Risk	Predicted Residual Risk
MR-01	Pilot confusion when attempting to interpret new symbols or terminology	LOW (5C)	LOW (5D)

The panel set safety requirements to address hazard MR-01’s risk. These safety requirements are displayed in Table ES.2 below along with (1) each requirement’s associated organization(s) responsible for implementation and (2) a signature from a Point of Contact (POC) at that organization(s).

Table ES.2: Safety Requirement Summary

Safety Requirement	Associated Hazard ID	Organization(s) Responsible	POC Signature
Develop informational content communicating the proposed change to be distributed to pilot stakeholder groups	MR-01	AJI-14	
Develop informational content for controllers for short-term dissemination as well as long-term education	MR-01	• AJI-2 • AJT-2	
Consider feasibility of an alternate display symbol and location on the approach plate to make the change more effective and intuitive	MR-01	AJV-A	
Continue long-term development of airport-specific safety awareness videos	MR-01	AJI-14	
Propose inclusion of “hot spots” and new terminology for misalignment risk in the AIM, AIP, and PCG	MR-01	AJI-14	

A safety performance target, summarized in Table ES.3 below, was set to ensure that the predicted residual risk level is achieved.

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Table ES.3: Monitoring Plan Summary

Safety Performance Target	Associated Hazard ID
No more than one voluntary pilot report referencing a loss of situational awareness due to the change per three years.	MR-01

64

The remainder of this document details the panel's deliberations.

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SAFETY RISK MANAGEMENT DOCUMENT SIGNATURES

Title: Misalignment Risk Symbolology on Airport Diagrams Safety Risk Management Document

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Date

**Concurrence
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Approved By:

James Fee, Manager, Runway Safety Group,
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Date

Risk Accepted By:

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Date

Risk Accepted By:

Date

Approved By:

Maggie Geraghty, ATO Chief Safety Engineer
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Date

SECTION 1. CURRENT SYSTEM

1.1 Introduction

The Safety and Technical Training (AJI) Safety Management Group, AJI-31, has been tracking and addressing wrong surface events since 2016. A wrong surface event is defined as an aircraft lining up to, landing on, or departing from the incorrect runway, taxiway, or airport. On average, there is at least one wrong surface event in the National Airspace System (NAS) per day. In July 2017, Air Canada Flight 759 was cleared to land on runway 28R at San Francisco International Airport, but instead lined up on parallel taxiway C, where four air carrier airplanes were awaiting takeoff clearance. The aircraft descended to 59 feet above ground level before beginning to climb, narrowly missing the aircraft on the ground. Although the event described previously occurred during the nighttime, these wrong surface events largely occur during the daytime and in visual meteorological conditions, and the majority of the time, the pilot has read back the correct landing or departure clearance.

Wrong surface events are an issue that is currently being addressed by the Air Traffic Organization (ATO) Runway Safety Group, the ATO Top 5 program, the Federal Aviation Administration (FAA) Safety Management System (SMS) Committee, and the ALM Joint Safety Analysis and Implementation Team via The Commercial Aviation Safety Team. There have also been numerous outreach and promotional efforts through the Top 5 and Runway Safety. Additionally, the ATO is deploying a software enhancement to Airport Surface Detection Equipment Model X to detect and alert to incorrect taxiway alignments. Despite these efforts, wrong surface events continue to occur on a daily basis.

1.2 Need for a Safety Risk Management Panel

There has been a need to provide a more permanent awareness of wrong surface events, especially to General Aviation (GA) pilots, who comprise 83 percent of wrong surface events. To this end, the Runway Safety Team, a joint government / industry stakeholder group, proposed the addition of misalignment risk symbology on airport diagrams, approach plates, chart supplements, and the Terminal Procedures Publication (TPP) to alert pilots to areas where wrong surface events are prone to occur. Misalignment risk is defined as aircraft lining up to land or depart on the wrong runway or on a taxiway. To better accommodate this change, the Runway Safety Team also proposed the standardization of hot spot symbology and verbiage.

The FAA defines a hot spot as a "location on an airport movement area with a history of potential risk of collision or runway incursion, and where heightened attention by pilots and drivers is necessary." Generally, a hot spot location is a complex or confusing taxiway/taxiway intersection or taxiway/runway intersection. Hot spots are depicted on airport diagrams within chart supplements and the TPPs as a variety of geometric shapes designated as "HS 1," "HS 2," and so forth.

1.3 Scope of the Safety Risk Management Panel

A Safety Risk Management (SRM) panel convened on November 19 through 20, 2019, to examine the potential safety risk of the proposed changes associated with misalignment

risk symbology. Bounding the system is essential to ensuring a thorough SRM panel is conducted, and a 5M Model is a useful tool for identifying all of the factors involved in a system prior to searching for potential hazards and analyzing/assessing risk. For the safety risk analysis and assessment described in this SRM document, the 5M Model in Table 1.1 was applied

Table 1.1: 5M Model

Mission: The clearly defined and detailed purpose of the NAS change proposal or system/operation being assessed	Standardize hot spot symbology as well as create/identify terminology/symbology for misalignment risk on airport diagrams, chart supplements, approach plates, and the TPP. Misalignment risk identifies areas prone to aircraft landing, departing, or aligning on the wrong surface.
(hu)Man: Operators, maintainers, and affected stakeholders	• Air traffic controllers • Pilots • Airport operations • Vehicle operators • Runway Safety • National Flight Data Center • National Geospatial Agency • Third-party charting services • Any unlisted chart users
Machine: Equipment used in the system	• Airport diagrams • Chart supplement • Approach plates • TPP
Management: Procedures and policies that govern the system's behavior	• Pilot operating procedures • Chart supplement • Aeronautical Information Manual (AIM) • Aeronautical Information Publication (AIP) (international) • Title 14 of the Code of Federal Regulations Part 61, CERTIFICATION: PILOTS, FLIGHT INSTRUCTORS, AND GROUND INSTRUCTORS
Media: The environment in which the system is operated/maintained	• NAS • Public access / Internet

SECTION 2. DESCRIPTION OF CHANGE

As stated above, the Runway Safety Team proposed the addition of symbology on airport diagrams, approach plates, chart supplements, and the TPP to alert pilots to areas where wrong surface events are prone to occur. The Runway Safety Team also proposed standardizing hot spot symbology. The addition and standardization of this symbology will require training and education to ensure that pilots are current on all symbols and nomenclature. The Runway Safety Group, AJI-14, has worked with Mission Support Services (AJV) Aeronautical Information Services, AJV-A, to develop the proposed changes.

Because this proposal includes three distinct changes, this section will cover each individual change separately.

Note that, at the beginning of the SRM panel, the change proponent delivered a briefing to panel attendees to describe the proposed changes; this briefing can be found in [Appendix A](#). Also, note that while the figures in the subsections below contain examples from specific airports, these changes are NAS wide.

2.1 Standardization of Hot Spot Symbols

Hot spot symbology will be standardized as circles or ellipses; any other shapes depicting hot spots will be eliminated. Below, Figure 2.1 displays current hot spot symbology, and Figure 2.2 shows the symbology per the proposed change. (Note: the small box that surrounds the “HS” symbol will remain on the airport diagrams.)

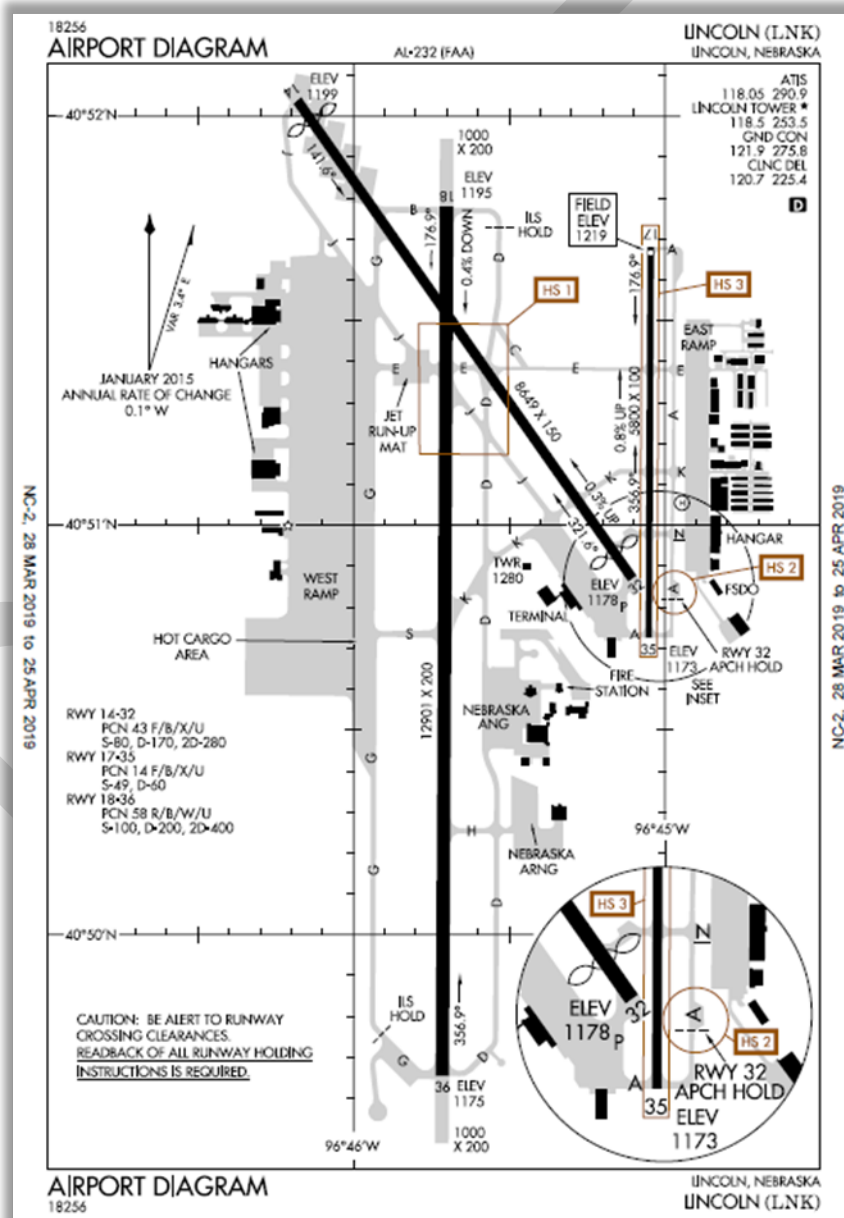


Figure 2.1: Current Hot Spot Symbolology

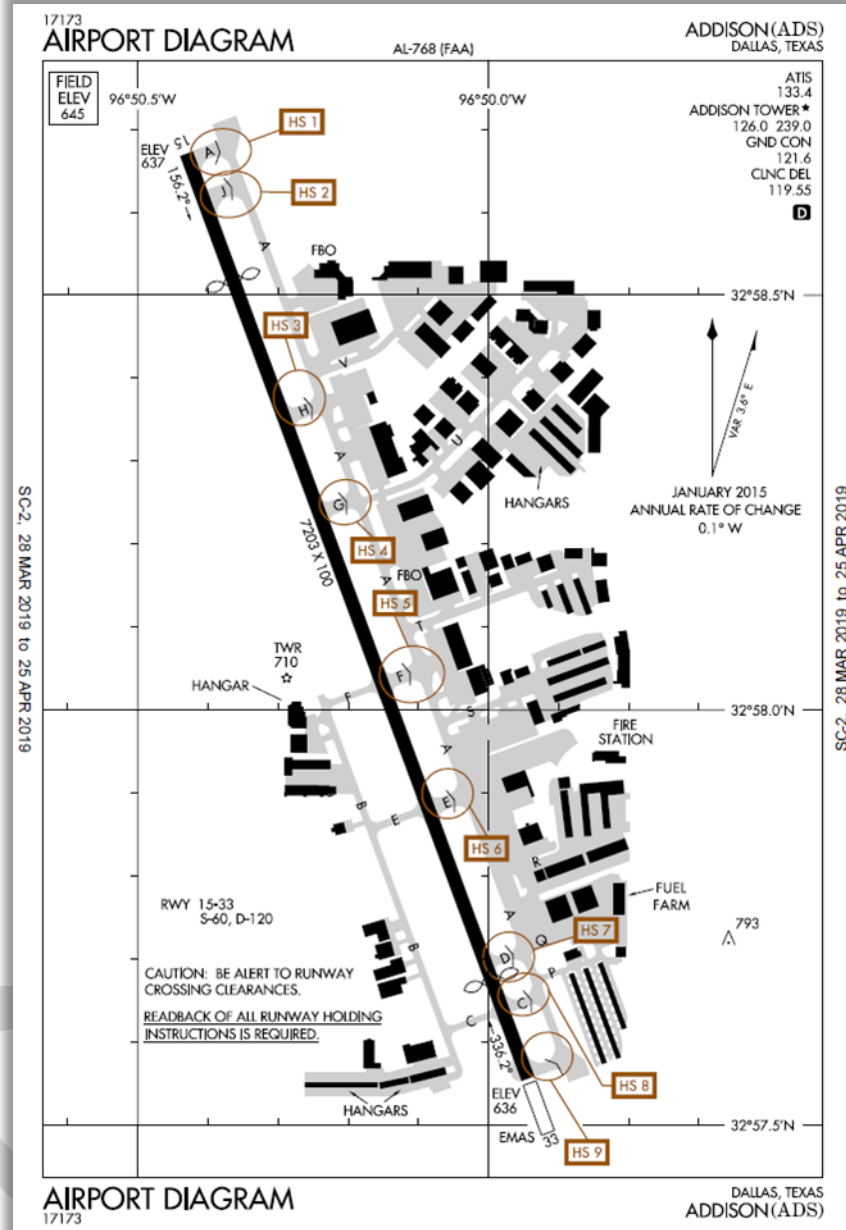


Figure 2.2: Proposed Hot Spot Symbolology

2.2 Addition of Misalignment Risk Symbols ("MR") on Airport Diagrams, Chart Supplements, and the TPP

Runways that pose a risk for a misalignment will be identified by an "MR" symbol. Below, Figure 2.3 displays the current airport diagram at Lincoln Airport (LNK) in Lincoln, Nebraska, and Figure 2.4 displays the LNK airport diagram per the proposed change. These figures highlight the following two changes: (1) "HS 1" is identified by an ellipse rather than a rectangle and (2) "HS 3" is renamed "MR 1" and identified by cylinders rather than one long rectangle.

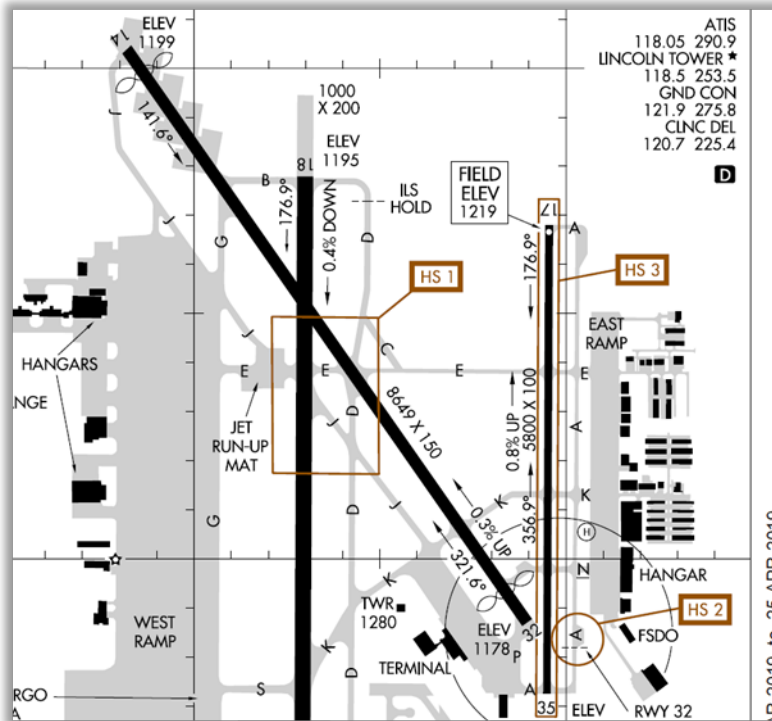


Figure 2.3: Current LNK Airport Diagram

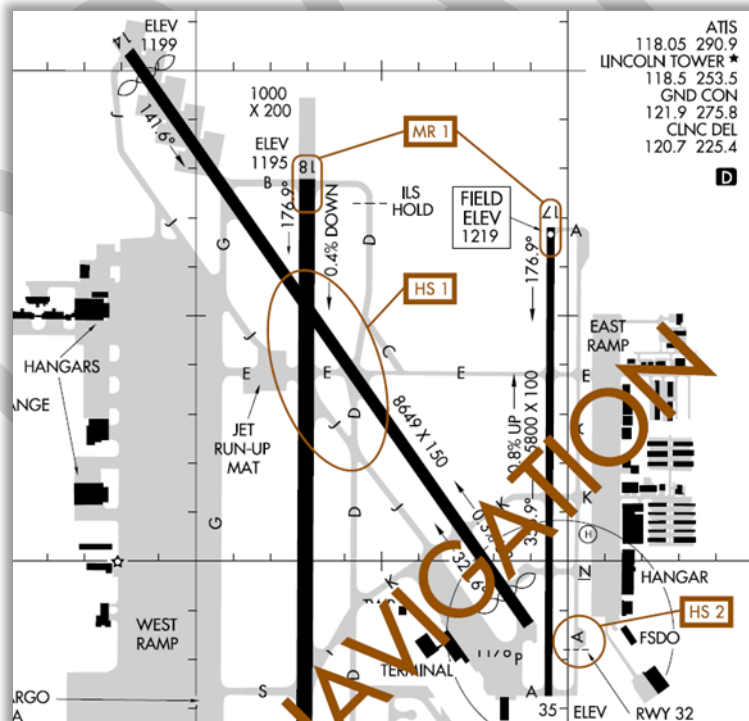


Figure 2.4: Proposed LNK Airport Diagram

Chart supplements and the TPP will also be updated with “MR” symbols and misalignment risk nomenclature. Below, Figure 2.5 displays the current chart supplement at LNK, and Figure 2.6 displays the LNK chart supplement per the proposed change.

- | | |
|------|--|
| HS 1 | Rwy 18–36, Rwy 14–32 and Twy D, Twy E and Twy J all intersect with each other in a small area. Angles of intersection can make sighting t/c difficult. |
| HS 2 | Rwy 32 apch holding position is located on Twy A, immediately past the Twy A run up area. |
| HS 3 | Risk of pilot confusion b/n Rwy 17–35 and Rwy 18–36 on apch. |

Figure 2.5: Current LNK Chart Supplement

Suggested revision for MR 1:

Misalignment Approach Risk: Pilot confusion risk b/n apch end of Rwy 17, Twy A, apch end of Rwy 18, and Twy G on apch.

Figure 2.6: Proposed LNK Chart Supplement

Below, Figure 2.7 displays the current TPP at LNK, and Figure 2.8 displays the LNK TPP per the proposed change.

LINCOLN, NE
LINCOLN (LNK)

- | | |
|------|--|
| HS 1 | Complex int of rwys and twys. |
| HS 2 | Apch holding position on twy near run up area. |
| HS 3 | Rwy 17-35 and Rwy 18-36 confusion risk. |

Figure 2.7: Current TPP at LNK

Suggested revision for MR 1:

Misalignment Risk: Rwy 17-35 and Rwy 18-36.

Figure 2.8: Proposed TPP at LNK

2.3 Addition of Misalignment Risk Symbols (“H”) on Approach Plates

An “H” symbol will be added to approach plates to indicate that pilots should review the airport diagram for hot spots at their destination airport.¹ Below, Figure 2.9 displays the proposed addition of the “H” symbol to the Honolulu International Airport approach plate.

HONOLULU, HAWAII			AL-754 (FAA)		19171	
APP CRS 042°		Rwy Idg 6952	RNAV (GPS) RWY 4L			
		TDZE 10	DANIEL K INOUE INTL (HNL) (PHNL)			
		Apt Elev 13				
RNP APCH.						
Circling Rwy 22R NA at night. Circling NA for Cats A and B northwest of Rwy 8L and 22R. Circling NA for Cats C, D, and E north of Rwy 8L-26R. Circling NA to Sea Lanes 4W, 8W, 22W, and 26W.			MISSED APPROACH: Climb to 500 then climbing right turn to 3000 direct ALANA and hold.			
D-ATIS 127.9 251.15		HCF APPROACH 118.3 269.0		HONOLULU TOWER 118.1 257.8 123.9 273.575 (Rwy 8R/26L)		
		GND CON 121.9 348.6		CLNC DEL 121.4 281.4		

Figure 2.9: Depiction of “H” Symbol in Approach Plates

2.4 Communication Outreach Plan

AJI-14 will work with the Office of Communications to develop materials for educating and training all users of FAA charts (e.g., GA pilots, commercial pilots, and airport managers) on the proposed changes. The proposed changes will also be presented at an Aeronautical Charting Forum. AJI-14 will also work with Runway Safety Action Teams and the Surface Safety Group Outreach and Education program.

SECTION 3. HAZARD AND RISK ANALYSIS

3.1 Change Guidelines

To frame its analysis and assessment, the panel agreed that the following guidelines will govern future misalignment risk hotspots:

1. Communications about and promotion of the change will take place with all users prior to publication.
2. A clear definition of misalignment risk will be included in the change.
3. Misalignment risk areas will be data driven.
4. The process of identifying a hot spot will not change.
5. When symbols on airport diagrams are standardized, modified, or introduced, AJV-A will coordinate with AJI-14.
6. New hot spots and misalignment risk areas will be coordinated with AJI-14 in the normal manner.

¹ The panel facilitators noted there is a possibility that the “H” symbol may become a different letter at some point in the future; however, as this was unknown and unforeseeable at the time the panel convened, the facilitators stressed that the panel should complete its analysis and assessment about the “H” symbol.

- 199 7. Misalignment risk will be defined in the chart supplement and TPP.
200 8. There will be no change in display technology.

201 **3.2 Hazard Identification**

202 **3.2.1 Preliminary Hazard List**

203 To explore the possible safety ramifications of the proposed changes, the panel
204 developed a Preliminary Hazard List (PHL) per the ATO SMS Manual, April 2019. In an
205 effort to reduce confusion surrounding the proposed changes, the panel split the PHL
206 into three sections based on the different individual changes. The panel captured the
207 following PHL items, which are further detailed below:

208 **Change 1: Standardization of Hot Spot Symbols**

- 209 1. Confusion over change
210 2. Meaning may not transfer to new symbols

211 **Change 2: Addition of Misalignment Risk Symbols (“MR”) and Nomenclature on 212 Airport Diagrams, Chart Supplements, and the TPP**

- 213 1. New symbol/nomenclature could cause confusion
214 a. Pilots might not read the text defining misalignment risk, or they might
215 assume that they already understand the meaning of the “MR” symbol
216 2. A “one size fits all” approach may introduce mitigation where it is not needed

217 **Change 3: Addition of Misalignment Risk Symbols (“H”) on Approach Plates**

- 218 1. Chart clutter
219 2. Added confusion due to the location of the symbols
220 3. “H” also identifies helipads
221 4. Lack of consistency
222 5. “H” is not intuitive to a misalignment problem
223 6. Variety of pilot opinion

224 **3.2.2 PHL Validation**

225 **Change 1: Standardization of Hot Spot Symbols**

226 **Item 1:** The panel identified confusion about the change as a PHL item and discussed
227 whether this confusion could lead to a hazard or qualify as a hazard itself. The panel
228 determined that confusion due to the standardization of hot spot symbols is not a
229 hazard but noted that confusion in general may be an issue with the other proposed
230 changes.

231 **Item 2:** The panel identified the loss of symbols’ meaning as a PHL item. The panel
232 discussed whether the planned communication outreach efforts would be sufficient in
233 educating pilots. Ultimately, the panel decided that the sixth assumption (coordination
234 with AJI-14 on new hot spots and misalignment risk areas) would alleviate any concerns
235 regarding the transfer of symbols’ meaning.

236 Ultimately, the panel did not identify any hazards related to the standardization of hot
237 spot symbols.

238 **Change 2: Addition of Misalignment Risk Symbols (“MR”) and Nomenclature on**
239 **Airport Diagrams, Chart Supplements, and the TPP**

240 **Item 1:** The panel identified the new misalignment risk symbols/nomenclature as a PHL
241 item. The panel agreed that pilot confusion about the new symbols/nomenclature is
242 possible—pilots might not read the text defining misalignment risk, or they might
243 assume they already understand the meaning of the “MR” symbol. Therefore, the panel
244 classified this item as a hazard (it became hazard MR-01: pilot confusion when
245 attempting to interpret new symbols or terminology).

246 During the discussion, a representative of the Allied Pilots Association (APA) pointed
247 out that pilots do not typically use the term “risk” when speaking about safety hazards.
248 The representative explained that most pilots use the term “threat” and suggested that
249 “misalignment risk” be changed to “misalignment threat.” The change proponent noted
250 this suggestion, but the panel facilitators reminded the panel that the proposed change
251 includes the “MR” symbol. The panel continued to assess the change as proposed.

252 **Item 2:** The panel identified a “one size fits all” approach introducing a mitigation where
253 it is not needed as a PHL item. The panel reasoned that implementation of the
254 proposed change may assist some airports but be unnecessary at others. The panel
255 agreed that the sixth assumption (coordination with AJI-14 on new hot spots and
256 misalignment risk areas) would address this concern.

257 **Change 3: Addition of Misalignment Risk Symbols (“H”) on Approach Plates**

258 The panel facilitators noted there is a possibility that the “H” symbol may become a
259 different letter at some point in the future; however, as this was unknown and
260 unforeseeable at the time the panel convened, the facilitators stressed that the panel
261 should complete its analysis and assessment about the “H” symbol.

262 Several of the pilot Subject Matter Experts (SMEs) raised concerns about the location
263 and meaning of the “H” symbol on approach plates. A representative of APA explained
264 that most pilots may not notice the symbol if it is placed in the header of approach
265 plates. The pilot SMEs agreed that the symbol would be best placed in the sketch view
266 of the approach plates. The panel agreed to document this recommendation.

267 The panel discussed whether the “H” symbol’s addition to / location in the approach
268 plate header may lead to a hazard. The pilot SMEs agreed that it would be more
269 ineffective than hazardous, but they also recognized that there may be some confusion
270 due to the new symbol. Panel members decided that this confusion could lead to a
271 pilot’s loss of situational awareness. Pilot loss of situational awareness was classified in
272 the Hazard Analysis Worksheet (HAW) as an effect to hazard MR-01.

273 The panel noted that all of the PHL items related to the addition of misalignment risk
274 symbols on approach plates relate to pilot confusion. Again, the panel agreed to

275 classify pilot confusion as a hazard (hazard MR-01 pertains to changes 2 and 3).
276 Further discussion about each individual PHL item for this change is detailed below.

277 **Item 1:** The panel identified chart clutter as a PHL item, but it was not specifically added
278 to the HAW. Rather, the panel believed that pilot confusion, as captured by hazard
279 MR-01, encapsulated this item.

280 **Item 2:** The panel identified confusion due to the location of the symbols on approach
281 plates as a PHL item. This item is encapsulated by hazard MR-01.

282 **Item 3:** The panel identified the fact that “H” also represents helipads as a PHL item,
283 but it did not include this item specifically in the HAW. Rather, hazard MR-01
284 encapsulates this item, and the change proponent noted the feedback.

285 **Item 4:** The panel identified the lack of consistency between the “MR” and “H” symbols
286 as a PHL item, but it did not include this item specifically in the HAW. Rather, the panel
287 determined that hazard MR-01 encapsulates this item.

288 **Item 5:** The panel identified the fact that some may fail to intuitively understand that the
289 symbol “H” signals a misalignment problem as a PHL item. The panel determined that
290 this item could be considered confusion, and thus it was captured by hazard MR-01.

291 **Item 6:** The panel identified the pilots’ differing interpretations of the symbols as a PHL
292 item. The panel ultimately decided that this item did not qualify as a cause, hazard, or
293 effect, so the item was not added to the HAW.

294 **3.2.3 Hazard MR-01**
295 After identifying and classifying the PHL items, the panel identified one hazard. The
296 formal identification of this hazard is as follows: **MR-01: Pilot confusion when**
297 **attempting to interpret new symbols or terminology.** The panel agreed that this
298 hazard would apply to both the second change (addition of misalignment risk symbols
299 (“MR”) and nomenclature on airport diagrams, chart supplements, and the TPP) and the
300 third change (addition of misalignment risk symbols (“H”) on approach plates).

301 **3.3 Causes**
302 The panel validated the following cause, which is applicable to both individual changes:
303 creation of misalignment risk terminology and symbology.

304 **3.4 System State**
305 The panel defined the following system state: when taxiing, landing, or departing at
306 airports where a misalignment risk has been charted, during all weather conditions and
307 hours of the day.

3.5 Controls

The panel defined the following controls for hazard MR-01:

1. Chart legend
2. FAA chart user guide
3. Pre-flight planning

The panel considered adding Standard Operating Procedures (SOPs) as a control, but a pilot SME explained that pilots would not have time to review an entire SOP in the event of confusion. Another pilot SME explained that GA pilots would not have an SOP.

3.6 Effects: Severity and Likelihood

The panel discussed the following effects for hazard MR-01:

1. Pilot loss of situational awareness
2. Increased pilot workload

The panel considered the potential effects of pilot confusion but ultimately decided that the worst credible effect would be a pilot's loss of situational awareness. The panel also determined that an increased pilot workload might result from the confusion, but this effect was not carried through the HAW, as the panel found this effect to simply be a precursor to a loss of situational awareness.

Pilot Loss of Situational Awareness

In discussing the severity of a pilot's loss of situational awareness, the panel referred to Table 3.3, Severity Table, of the SMS Manual. A pilot SME asked the panel where pilot confusion would fall on the table. In response, the panel considered a possible scenario in which a new GA pilot flies at night in poor weather conditions, and the panel determined that there might be a need for this pilot to resort to a go-around. Per the "Flight Crew" row of Table 3.3, "circumstances requiring a flight crew to initiate a go-around" equate to a severity classification of Minimal (5). The panel further determined that a pilot may be initially confused by the new symbols or nomenclature, but it would not drive the pilot to anything more than a temporary loss of situational awareness. The panel felt that this type of situation already exists in the NAS today, and the change would not significantly increase the present risk.

Due to a lack of sufficient data (note that the proposed change is new, and currently, data does not exist), the panel chose to refer to Table 3.6: Calendar-Based Likelihood of the Effect Definitions, of the SMS Manual while discussing the likelihood of a Minimal (5) pilot loss of situational awareness. Leveraging the knowledge of the present SMEs, three panel members supported a likelihood of Extremely Remote (D), citing the first and fifth guidelines as their reasoning. Three panel members supported a likelihood of Remote (C); these panel members recognized that the first and fifth guidelines may assist in mitigating the frequency of pilot confusion, but they ultimately supported a likelihood of Remote (C) in an effort to be conservative. Finally, one panel member supported a likelihood of Probable (B), explaining that because there was not enough data for more than a speculative analysis, a Probable (B) likelihood would be safest.

This panel member also explained that pilots might face significant difficulty in determining what the new symbols and terms mean, which could lead to greater and more frequent confusion.

In an effort to prioritize safety and remain conservative, the panel elected to choose a likelihood of Remote (C), or less than once per three months and equal to or more than once per three years. The panel agreed that given the identified controls, instances of a pilot being unaware of a change might be more than once every three months. It also felt that these instances happen more often than reported. A severity level of Minimal (5) and likelihood of Remote (C) equate to an initial risk level of **LOW (5C)**.

3.7 Initial Risk Summary

Table 3.1 summarizes the risk analysis and assessment, and Figure 3.1 shows the corresponding initial risk level on the ATO SMS risk matrix.

Table 3.1: Initial Risk Summary

Hazard ID	Hazard Description	Cause	Effect	Initial Risk
MR-01	Pilot confusion when attempting to interpret new symbols or terminology	Creation of misalignment risk terminology and symbology	Pilot loss of situational awareness	LOW (5C)

Severity Likelihood	Minimal 5	Minor 4	Major 3	Hazardous 2	Catastrophic 1
Frequent A	Low	Medium	High	High	High
Probable B	Low	Medium	High	High	High
Remote C	MR-01 Low	Medium	Medium	High	High
Extremely Remote D	Low	Low	Medium	Medium	High
Extremely Improbable E	Low	Low	Low	Medium	High* Medium

*Risk is high when there is a single point or common cause failure.

Figure 3.1: Initial Risk Matrix

3.8 Risk Treatment

The panel set the following safety requirements for hazard MR-01:

1. Develop informational content communicating the proposed change to be distributed to pilot stakeholder groups
2. Develop informational content for controllers for short-term dissemination as well as long-term education
3. Determine an alternate display symbol and location on the approach plate to make the change more effective and intuitive
4. Continue long-term development of airport-specific safety awareness videos
5. Include “hot spots” and new terminology for misalignment risk in the AIM, AIP, and Pilot Controller Glossary (PCG)

The panel also proposed the following safety recommendation:

1. Provide Flight Standards Service further operational research and human factors evaluation before proceeding with the misalignment risk effort.

3.9 Predicted Residual Risk

The panel examined the projected impact of the safety requirements on the effect of hazard MR-01 by determining the effect’s predicted residual risk level.

Three panel members agreed that the risk level would not change after the implementation of the safety requirements. These panel members reasoned that the safety requirements will not bring the changes into the purview of the majority of pilots and that pilots currently have too much guidance, so the suggested safety requirements would not sufficiently change how pilots interpret the new symbols or nomenclature.

Four panel members agreed that the risk level would fall to **LOW (5D)**—a decrease in likelihood from Remote (C) to Extremely Remote (D), or less than once per three months, and equal to or more than once every three years, per Table 3.6 of the SMS Manual. These panel members agreed that the safety requirements would help prevent a large amount of pilots from being uninformed before assessing their charts and briefs, thereby decreasing the likelihood of the hazard.

Because the majority of panel members supported a predicted residual risk of **LOW (5D)**, the residual risk level was recorded in the HAW accordingly and the panel members’ disagreement noted.

Below, Table 3.2 summarizes the risk treatment, and Figure 3.2 shows the corresponding predicted risk levels on the ATO SMS risk matrix.

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Table 3.2: Predicted Residual Risk Summary

Hazard ID	Hazard Description	Cause	Effect	Predicted Residual Risk
MR-01	Pilot confusion when attempting to interpret new symbols or terminology	Creation of misalignment risk terminology and symbology	Pilot loss of situational awareness	LOW (5D)

Severity Likelihood	Minimal 5	Minor 4	Major 3	Hazardous 2	Catastrophic 1
Frequent A	Low	Medium	High	High	High
Probable B	Low	Medium	High	High	High
Remote C	Low	Medium	Medium	High	High
Extremely Remote D	Low	Low	Medium	Medium	High
Extremely Improbable E	Low	Low	Low	Medium	High* Medium

*Risk is high when there is a single point or common cause failure.

Figure 3.2: Predicted Residual Risk Matrix

3.10 Safety Performance Targets

Safety performance targets were set to verify whether the predicted residual risk level is achieved. The panel agreed upon the following safety performance target: no more than one voluntary pilot report referencing a loss of situational awareness due to the change per three years.

403 **3.11 HAW**

404

Table 3.3: HAW

1.	2.	3.	4.	5.	6.	7.	8.
Hazard ID	Hazard Description	Cause(s)	System State(s)	Controls	Control Justification	Effect	Severity
MR-01	Pilot confusion when attempting to interpret new symbols or terminology	Creation of misalignment risk terminology and symbology	When taxiing, landing, or departing at airports where a misalignment risk has been charted; 24/7/365; all weather conditions	• Chart legend • FAA chart user guide • Pre-flight planning	• Describes the meaning of symbols and terminology • Provides explanation on meaning of hot spots and chart symbols and verbiage • Familiarizes the pilot with planned flight	• Pilot loss of situational awareness resulting from increased pilot workload	Minimal (5)

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9.	10.	11.	12.	13.	14.	15.	16.
Severity Rationale	Likelihood	Likelihood Rationale	Initial Risk	Safety Requirements	Organization(s) Responsible for Implementing Safety Requirement	Predicted Residual Risk	Safety Performance Targets
Pilot may be initially confused, but it would not drive the pilot to anything more than a temporary loss of situational awareness. The panel felt that this type of situation already exists in the NAS today, and the change would not significantly increase the present risk.	Remote (C)	Given the controls listed, panel members felt that the instances of a pilot being unaware of a change might be less than once per three months and equal to or more than once per three years. It also felt that these instances happen more often than are reported.	LOW (5C)	1. Develop informational content communicating the proposed change to be distributed to pilot stakeholder groups 2. Develop informational content for controllers for short-term dissemination as well as long-term education 3. Consider feasibility of an alternate display symbol and location on the approach plate to make the change more effective and intuitive 4. Continue long-term development of airport-specific	1. AJI-14, 2. AJI-2, AJT-2 3. AJV-A 4. AJI-14 5. AJI-14	LOW (5D)	No more than one NAS-wide voluntary pilot report referencing a loss of situational awareness due to the change per three years

				safety awareness videos 5. Propose inclusion of “hot spots” and new terminology for misalignment risk in the AIM, AIP, and PCG			
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SECTION 4. MONITORING PLAN

To determine whether the safety performance target is being achieved, the monitoring activities displayed below will be enacted.

Table 4.1: Monitoring Plan

Monitoring Plan		
1.	Safety Performance Target	No more than one voluntary pilot report referencing a loss of situational awareness due to the change per three years.
2.	Hazard ID(s)	MR-01
3.	Initial Risk	LOW (5C)
4.	Safety Requirements	1. Develop informational content communicating the proposed change to be distributed to pilot stakeholder groups 2. Develop informational content for controllers for short-term dissemination as well as long-term education 3. Consider feasibility of an alternate display symbol and location on the approach plate to make the change more effective and intuitive 4. Continue long-term development of airport-specific safety awareness videos 5. Propose inclusion of “hot spots” and new terminology for misalignment risk in the AIM, AIP, and PCG
5.	Organization Responsible for Implementing Safety Requirements	1. AJI-14, stakeholder groups (NBAA, EAA, AOPA, ALPA, A4A, RAA, and other as identified by AJV-A) 2. AJI-2, AJT-2, NATCA 3. AJV-A 4. AJI-14 5. AJI-14
6.	Predicted Residual Risk	LOW (5D)
7.	Monitoring Point(s) of Contact	• Giovanni DiPierro, AJI-141
8.	Monitoring Activities	Collect reports on pilot loss of situational awareness due to confusion over misalignment risk symbology and terminology via the Confidential Information Sharing Program. Work with stakeholder groups to distribute surveys between three and six months following implementation of the change in an effort to gauge pilot reception of the change.
9.	Monitoring Start Date	Immediately following implementation of the change
10.	Reporting Frequency	Every three months
11.	Reporting Duration	At least three years

SECTION 5. SRM PANEL ATTENDEES

The SRM panel convened on November 19 through 20, 2019, to perform a thorough safety risk analysis and assessment. SMEs from across the agency were invited to leverage their operational experience, and experts in the SRM process were present to maintain its integrity. Table 5.1 lists the panel participants for the November 19 through 20, 2019, SRM panel.

Table 5.1: SRM Panel Members, SMEs, Observers, and Facilitation Team

Name	Organization	Email	Phone	SRM	
				Yes	No
Change Proponent					
Christine Madden	Runway Safety, AJI-14	christine.madden@faa.gov	(202) 267-8343	☒	☐
Ray German	Runway Safety, AJI-14	raymond.german-jr@faa.gov	(781) 238-7784	☒	☐
Panel Members					
Tom Candelario	Runway Safety, AJI-14	thomas.candelario@faa.gov	(907) 271-1615	☒	☐
Freddie James*	Office of Airports, ARP	freddie.james@faa.gov	(202) 267-8792	☒	☐
Margit McKee	Runway Safety, AJI-14	margit.mckee@faa.gov	(847) 294-7484	☒	☐
Aimee McCormick	Runway Safety, AJI-14	aimee.mccormick@faa.gov	(404) 305-6466	☒	☐
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John Moser*	PASS	john.moser@faa.gov	(330) 492-3872	☒	☐
Bridget Singratankul	NATCA	runwaysafety@natca.net	(210) 240-4777	☒	☐
Brent Walker	Airport Mapping Sub-Team B, AJV-A	brent.d.walker@faa.gov	(202) 267-5210	☒	☐
SMEs					
Scott Dehart*	WNCO	scott.dehart@wnco.com	(469) 603-4352	☒	☐
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Alex Gertzen*	NBBA	agertsen@nbaa.org	(202) 737-4477	☒	☐
Sophia Ghezai*	A4A	sghezai@airlines.org	(202) 626-4031	☐	☐
Steve Jangelis*	ALPA	steve.jangelis@alpa.org	(954) 234-8954	☒	☐
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Calvin “Buddy” Lott*	Flight Standards, AFS-200	calvin.lott@faa.gov	(817) 689-8752	☒	☐
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Facilitation Team					
Aaron Easter	GGTI/AJI-31	aaron.ctr.easter@faa.gov	(571) 970-1942	☒	☐

Ed Snyder	GGTI/AJI-314	edward-l.ctr.snyder@faa.gov	(202) 267-1698	☒	☐
Kelsey Sydney	AJI-314	kelsey.sydney@faa.gov	(202) 267-4442	☒	☐

*These attendees dialed into the SRM panel.

DRAFT

1 APPENDIX A. FLIGHT STANDARDS MEMBER DISSENT

Title: February 16, 2021- Hotspot Symbolology Standardization Safety Risk Management Document Without Hazards & April 15, 2020 Misalignment Risk Symbolology on Airport Diagrams Safety Risk Management Document

Misalignment Risk SRM Panel Flight Standards Member Dissent per 5.4.4.8
[ATO "SMS Manual April 2019]

The work of the "Misalignment Risk Symbolology on Airport Diagrams SRMP" (Nov 2019) on standardizing hotspot symbolology will improve chart presentations of these safety focus points on airports. There are, however, problematic issues regarding the proposed introduction of the Misalignment Risk concept to instrument procedure charts and airport diagrams, or other charts.

The original draft report from the 2019 November meeting and MITRE follow-up, and the final February 16, 2021 document present a limited portion of the flight operations difficulties with the "Misalignment Risk" concept, but need to have the complete industry and FAA Flight Standards flight operations perspective. The nature of wrong surface operations analysis to date does not support the "misalignment risk" concept as a workable solution. [See data from Attachment 1: AJI Hot Spot Standardization [POWERPOINT] Aeronautical Charting Meeting, October 28, 2020, presented by AJI-141

Therefore, the Flight Standards panel member is filing a letter of dissent, in accordance with the Air Traffic SRM process. This dissent is intended to highlight first the need for more thorough data analysis of wrong surface events. That analysis will enable a more accurate determination of root causes to wrong surface operations, to enable fact based improved hazard mitigations and workable solutions. The unclear handling of "Misalignment Risk" subject matter in the February 16, 2021 report also necessitates presenting this dissent. The hope is to promote developing a more thorough picture of the potential shortfalls of a "Misalignment Risk" concept approach to trying to reduce wrong surface operations. We need to avoid picking a solution that is not fully vetted in the flight operations community.

The Initial Risk Summary draft 2020 report from the November 2019 SRMP provides the statement below as the panel focus during the risk analysis and assessment proposal about wrong surface operations:

1. To summarize briefly, MR-01 focused on: “Pilot confusion when attempting to interpret new symbols or terminology” (See SRMD Report April 15, 2020 Appendix A, attachment to February 16, 2021 SRMD report)

The February 16, 2021 SRM document may infer that the “Misalignment Risk” is basically another hot spot, although treatment of it is not clear. This panel member provides this dissent partly in answer to that apparent lack of clarity. The “Misalignment Risk” concept proposal is very different from the work to date with hot spots.

2.1.3 [ATO SRM PANEL PROCESS ELEMENT]: Identify potential hazards and analyze and assess safety risk in ATO operations and NAS equipment: There are possible gaps in the hazard analysis of the November 2019 SRMP, and the MITRE follow-up work. [See detail in Attachment 2 the ALPA-AOPA-APA-NBAA letter, and Attachment 3 ACM CG-20-02 minutes from the October 28, 29 2020 meeting]].

A high-level look at the inputs of SRMP subject matter experts from November 2019 includes the following factors that may significantly impact this SRMP analysis:

- The panel presentation and incident data discussion of the wrong surface operations revealed uncertain root causes. (Depicted in Attachment 1: the 3 slides titled “Wrong Surface Statistics, then Wrong Surface Landings and the slide titled Approaches and Departures). A carefully designed flight operations/human factors safety analysis will help better determine root causes. The results may enable confirming the efficacy of this proposed solution. Or it may help provide better cockpit pilot/aircrew alternatives to reduce such incidents.
- There was apparent confusion among non-flying panel members about an underlying contributing cause to wrong surface pilot operations- demonstrated in a sensed need from the Runway Safety Group for more

chart notes. The panel flight operations representatives identified basic pilot navigation errors as a primary contributing cause. Such navigation errors develop from many factors, just a few of which are low experience, ambiguities with chart interpretation and unique unfamiliar airport geographic features. More focus on correcting pilot navigation errors will contribute to reducing wrong surface incidents.

- A key focus of the senior experienced pilots that assisted the SRMP is the following reality: every approach and landing, and taxi event made by flight crews is a misalignment risk. To mitigate wrong surface operations the majority of commercial carriers and military flight operators require every navigation source in the cockpit be properly set to local NAVAIDS for the arrival airport runway while referring continually to the appropriate procedure chart. Crews then continually cross check nav aids during approach and landing to help prevent a wrong surface landing.
- During taxi events these operators require continual navigation with an accurate taxi chart to help reduce taxi incidents.
- Better use of these basic navigation mitigations by other NAS aircraft operators would contribute to realizing reduced wrong surface events.

2.1.4 Safety Assurance: Identifying and Closing Safety Gaps:

UNKNOWN TERM: The term “Misalignment risk” is completely foreign to flight and cockpit terminology. Simply put, something like “Wrong Runway/ surface Threat,” intuitively has meaning to a pilot. The “misalignment risk” concept introduces a major unknown term never used in the cockpit, while “wrong runway/surface” immediately has meaning to crews.

CHART CLUTTER DIFFICULTIES: Within the flight operations community today there is growing concern with chart clutter. That clutter demonstrates a known safety gap. The Aeronautical Charting Meeting team has a growing record over recent years from their meetings of the problems with chart clutter. Placing a misalignment risk warning on approach plates and other charts potentially increases the ambiguities pilots and crews handle.

Chart notes and symbols are growing in number on already increasingly cluttered charts. It would be of help to have flight operations human factors experts analyze the efficacy of the proposed misalignment warnings, or any other potential charting change. The threat of unintended consequences is greater on today's charts due to clutter, and is evidenced in the ACM history record of increasing chart clutter caused problems.

NECESSARY TRAINING CONSEQUENCES: It is possible that some of the panel members may think a misalignment risk warning is essentially just a hot spot. That position may lead to a conclusion that no other systematic follow-up on safety ramifications is necessary beyond just putting the hot spot warning on charts.

Because the "misalignment risk" warning constitutes a completely foreign term for cockpit crews, extensive training of its meaning would be needed. Simply put, something like "Wrong Runway/ surface Threat" intuitively has meaning to a pilot, and would involve quicker learning.

A warning is a must know pilot certification and pilot competency/recurrent checking subject. During checking and certification events pilots not knowing the specifics of this warning will likely fail a ground oral exam, or whatever approach, or associated portion of an IFR competency check for 61.58, or 121 or 135 and 91K.

FOREIGN CARRIERS: Additionally, part 129 operators from foreign air carriers would be faced with major training burdens, particularly with the language barrier. All associated guidance documents would need to be updated. There is also a realistic minimum of a two year training tail that would be necessary to fully inform the 141, 142, 135 and 121 training worlds. That includes the aviation universities, the general aviation designee community, and so forth. In reality these are not just more hot spots. For flight operations crews.

BROAD BASED CONCERNS: Representatives associated with this SRM panel from AFS-200, AFS-400, ALPA, NBAA, AOPA, NATA A4A, United Air Lines, APA, SWAPA and other flight operations stakeholders have expressed many of the concerns, and others that are summarized in this document. (See attachment 2,

Industry Letter March 6, 2020 ALPA, AOPA, APA, NBAA) (See also attachment 3, ACM-CG 20-02, Meeting Minutes)

IN SUMMARY: This Flight Standards panel member recommends more thorough flight operations based analysis and coordination with industry experts before settling on a definite action designed to reduce wrong surface operations.

Respectfully Submitted,

Bruce McGray Flight Standards SRMP Member

Attachment 1: AJI Hot Spot Standardization [POWERPOINT] Aeronautical Charting Meeting, October 28, 2020, presented by AJI-141

Attachment 2: March 6, 2020 Industry Letter ALPA, AOPA, APA, NBAA

Attachment 3: **Government/Industry Aeronautical Charting Meeting (ACM)**

Meeting 20-02, ACM-CG 20-02, 20-02-345 Wrong Surface Hot Spots presented by AJI-141

2 **APPENDIX B. ACRONYMS**

3	A4A	Airlines for America
4	AFS	Safety Standards
5	AIM	Aeronautical Information Manual
6	AIP	Aeronautical Information Publication
7	AJI	Safety and Technical Training
8	AJT	Air Traffic Services
9	AJV	Mission Support Services
10	ALPA	Air Line Pilots Association
11	AOPA	Aircraft Owners and Pilots Association
12	APA	Allied Pilots Association
13	ATO	Air Traffic Organization
14	EAA	Experimental Aircraft Association
15	FAA	Federal Aviation Administration
16	GA	General Aviation
17	HAW	Hazard Analysis Worksheet
18	LNK	Lincoln Airport
19	NAS	National Airspace System
20	NATCA	National Air Traffic Controllers Association
21	NBAA	National Business Aviation Association
22	PASS	Professional Aviation Safety Specialists
23	PCG	Pilot Controller Glossary
24	PHL	Preliminary Hazard List
25	POC	Point of Contact
26	RAA	Regional Airline Association
27	SME	Subject Matter Expert
28	SMS	Safety Management System
29	SOP	Standard Operating Procedures
30	SRM	Safety Risk Management
31	TPP	Terminal Procedures Publication
32	WNCO	Southwest Airlines

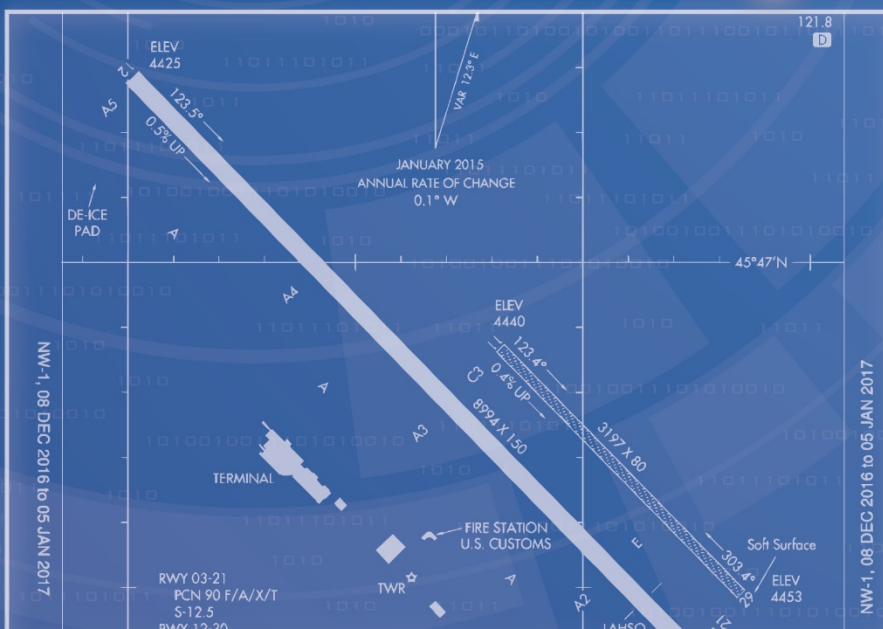
APPENDIX B. HOT SPOTS VERBIAGE AND SYMBOLS PRESENTATION



Hot Spot Standardization

Aeronautical Charting Meeting

October 28, 2020



**Federal Aviation
Administration**

Overview

Background

Definition of Hot Spots

Wrong Surface Statistics

Working Group Members

Purpose of Standardization

Standardized Shapes

Sample Airport Diagrams

First Airports for Update

Outreach and Education



Background

- Runway Safety Hot Spots first appeared in commercially prepared airport diagrams/charts.
- One of the earliest published hot spots appeared in Jeppesen to alert pilots of a misalignment risk for departing Runway 7L at McCarren International Airport (LAS)
- Initially, hot spots were circles, ovals, and polygon designed to capture the area of confusion. At times they encompassed more than one intersection that contributed to surface events.



Background

- Due to the absence of standards, multiple different shapes were being added to the airport diagrams creating confusion.
- AJV Charting Office developed and proposed a standardized symbology to the already existing hot spots.
- A working group was created to ensure collaboration/agreement among all stakeholders.



Hot Spot Definition

458

AIRPORT DIAGRAMS

HOT SPOTS

An “Airport surface hot spot” is a location on an aerodrome movement area with a history or potential risk of collision or runway incursion, and where heightened attention by pilots/drivers is necessary.

A “hot spot” is a runway safety related problem area on an airport that presents increased risk during surface operations. Typically it is a complex or confusing taxiway/taxiway or taxiway/runway intersection. The area of increased risk has either a history of or potential for runway incursions or surface incidents, due to a variety of causes, such as but not limited to: airport layout, traffic flow, airport marking, signage and lighting, situational awareness, and training. Hot spots are depicted on airport diagrams as open circles or polygons designated as “HS 1”, “HS 2”, etc. and tabulated in the list below with a brief description of each hot spot. Hot spots will remain charted on airport diagrams until such time the increased risk has been reduced or eliminated.

Hot Spots address:

- Data-driven Runway Safety-related events
- Airport layout
- Traffic flow
- Signage, Markings and Lighting
- Situational Awareness

Provide benefit by:

- Depicting high risk areas
- Heightened awareness
- Increase situational awareness
- Identify mitigation needs through charting



Hot Spot Definition

As shown in the:

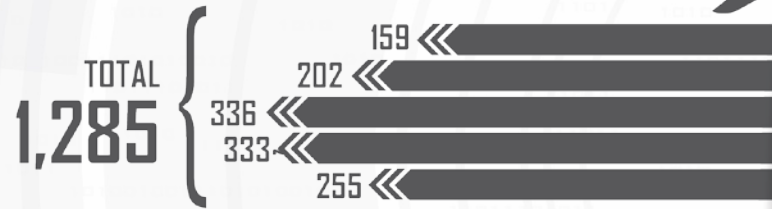
- Chart Supplement
- Terminal Procedures Publication

Wrong Surface Statistics

ARRIVALS

&

DEPARTURES



*226 18%

1,046 81%

86%

11%

87%

865

87%

** 11%

8%

420

93%

6%

26%

* Arrival: 13 MIL Event
Departure: 4 MIL Event

** Arrival: Assault Strip 1, Dirtroad 1, Grass 4, Gravel 1,
Helipad 3, Under Run 2, Ramp 1, Over Run 1,
Decommissioned Runway 2
Departure: Floatpond 3, Ramp 18, Waterline 7,
Sealane 1

OF EVENTS DURING

FY16

FY17

FY18

FY19

FY20

OF FACILITIES WITH
THREE OR MORE EVENTS

COMMERCIAL EVENTS

GENERAL AVIATION EVENTS

% OF ATC FACILITY
LEVEL 9 OR LOWER INVOLVED

% OF EVENTS THAT
INVOLVED ANOTHER AIRCRAFT

% OF EVENTS THAT OCCURRED
DURING DAYTIME OPERATIONS

ACTUAL LAND OR DEPART

WRONG RUNWAY

WRONG TAXIWAY

WRONG AIRPORT

ATTEMPTED LAND OR DEPART

WRONG RUNWAY

WRONG TAXIWAY

WRONG AIRPORT



TOTAL 851

116

17% 144 *

83% 703

90%

13%

93%

694

89%

6% **

N/A

157

79%

21%

N/A



Wrong Surface Landings and Approaches

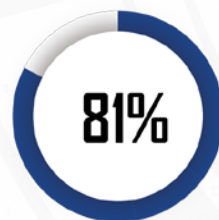
10,000+

Wrong Surface
Landing/Approach Reviewed
Reports

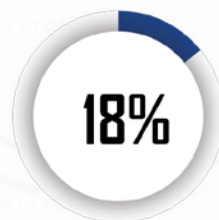
1,285



**Total Wrong Surface
Landings/Approaches**



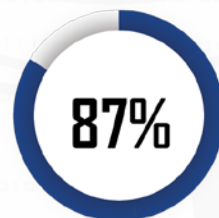
INVOLVED
GENERAL
AVIATION



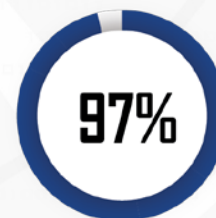
INVOLVED
COMMERCIAL
AIRCRAFT



EVENTS
OCCURRED AT
LEVEL 9 ATCT
AND LOWER



OCCURRED
DURING
DAYLIGHT
HOURS



OCCURRED WITH A
VISIBILITY OF 3
STATUTE MILES
OR GREATER

Wrong Surface Departures

7,500+

Wrong Surface
Departure Events

851



**Total Wrong Surface
Departures**

83%

INVOLVED
GENERAL
AVIATION

17%

INVOLVED
COMMERCIAL
AIRCRAFT

5%

90%

EVENTS
OCCURRED AT
LEVEL 9 ATCT
AND LOWER

93%

OCCURRED
DURING
DAYLIGHT
HOURS

ATC ERROR BASED ON
THOSE EVENTS TAGGED AS
OI IN RUNWAY SAFETY
(746 OF 800 IN RST)

Agency and Industry Working Group Members

Giovanni Dipierro, AJI, Runway Safety Group Manager

Raymond German, AJI, Runway Safety

Christine Madden, AJI, Runway Safety

Maria DeRosa, AJI, Runway Safety

Tom Frakes, AJI, Runway Safety

Chris Diggons, AJI, Runway Safety

Bridget Singratanakul, NATCA Runway Safety Rep

Brent Walker, AJV, Aeronautical Information Services

Jeff Lamphier, AJV, Aeronautical Information Services

Nicholas DeLotell, AFS, Flight Standards

Joseph Foresto, AFS, Flight Standards

Steven Debban, ARP, Office of Airports HQ

Lisa Caldwell, AJT, Air Traffic Terminal

Alex Gertsen, NBAA

Jeffrey Sedin, ALPA

Bill Whyte, RAA

Andrew Sousa, ALPA

Adam Williams, AOPA

Robert Meder, NAFI

Karen Kalishek, NAFI



Purpose of Standardizing Hot Spots

Provide consistent symbology and verbiage for existing Hot Spots used for navigating the airport environment

Hot Spots offer a visual aid in reducing risk and providing mitigation for confusing areas on the airport surface:

- Surface-Based Hot Spots
- Misalignment Risk Hot Spots

Standard Hot Spot Shapes

Ground movement Hot Spots



Circle and an Ellipse

Misalignment Risk Hot Spots



Cylinder

Airport Diagram

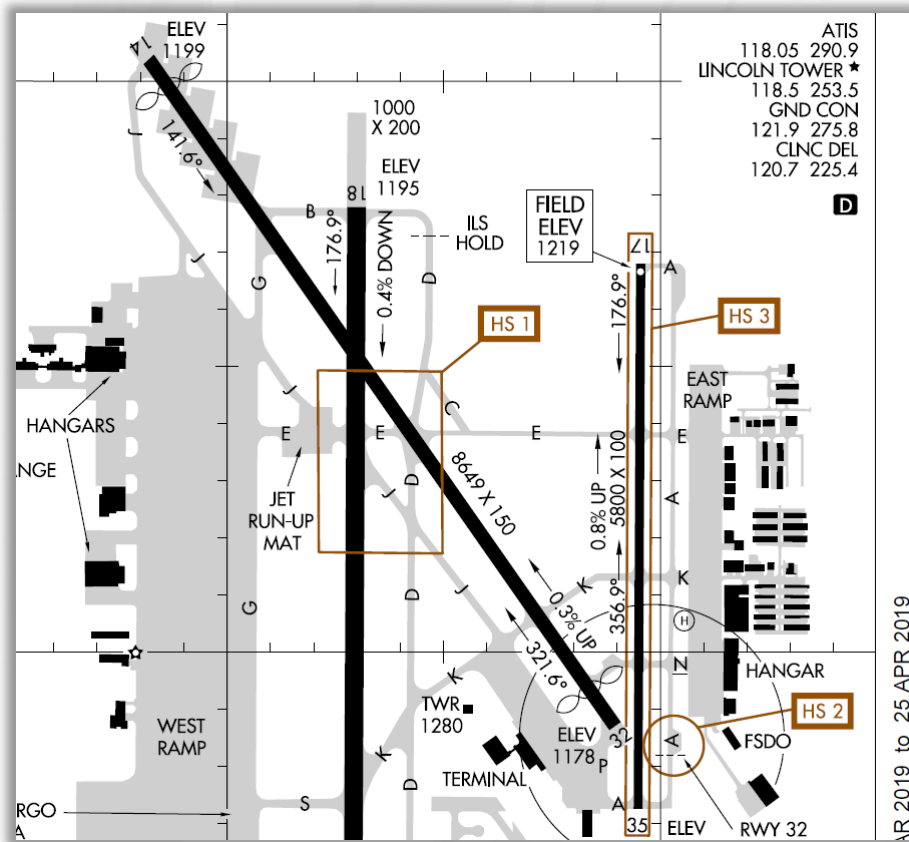
Current Version

- Runways
- Taxiways
- Movement areas
- Building outlines
- Projection lines
- Leader lines from text
- Lines under text

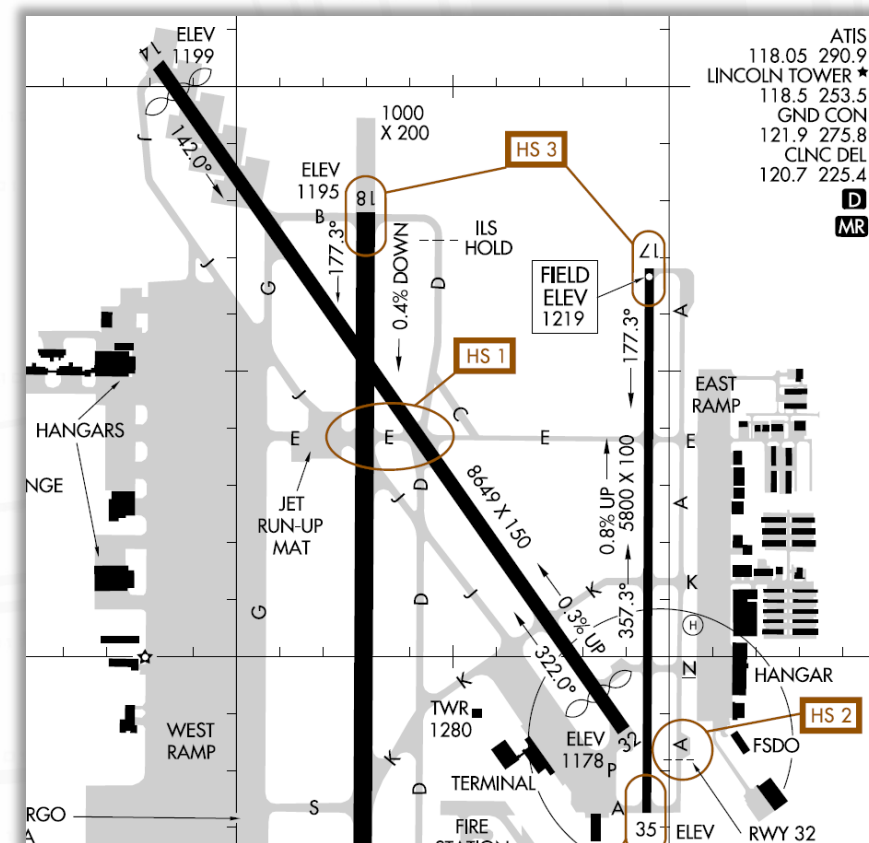


LINCOLN (LNK) LINCOLN, NEBRASKA

CURRENT

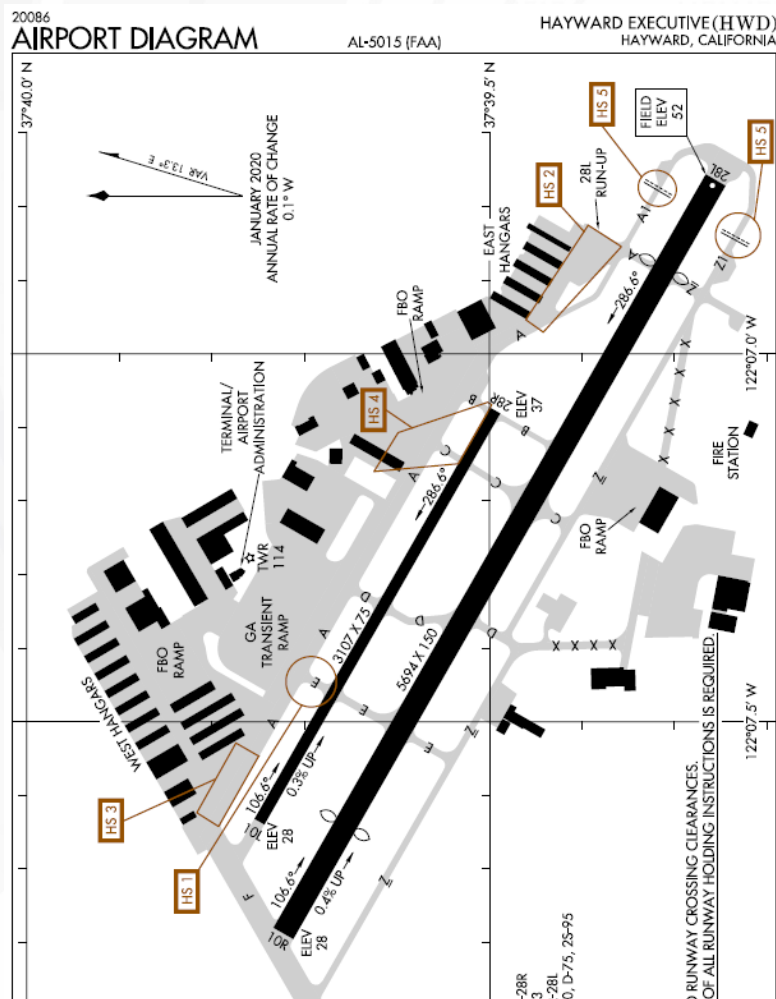


PROPOSED

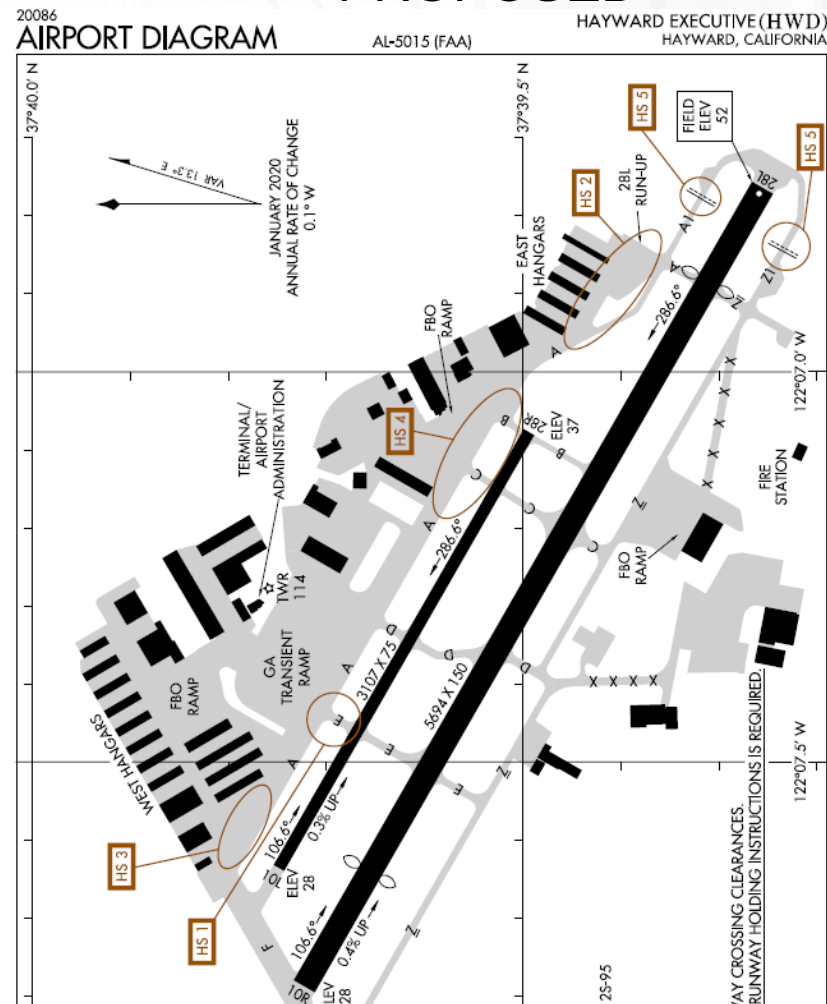


HAYWARD EXECUTIVE (HWD) HAYWARD, CALIFORNIA

CURRENT



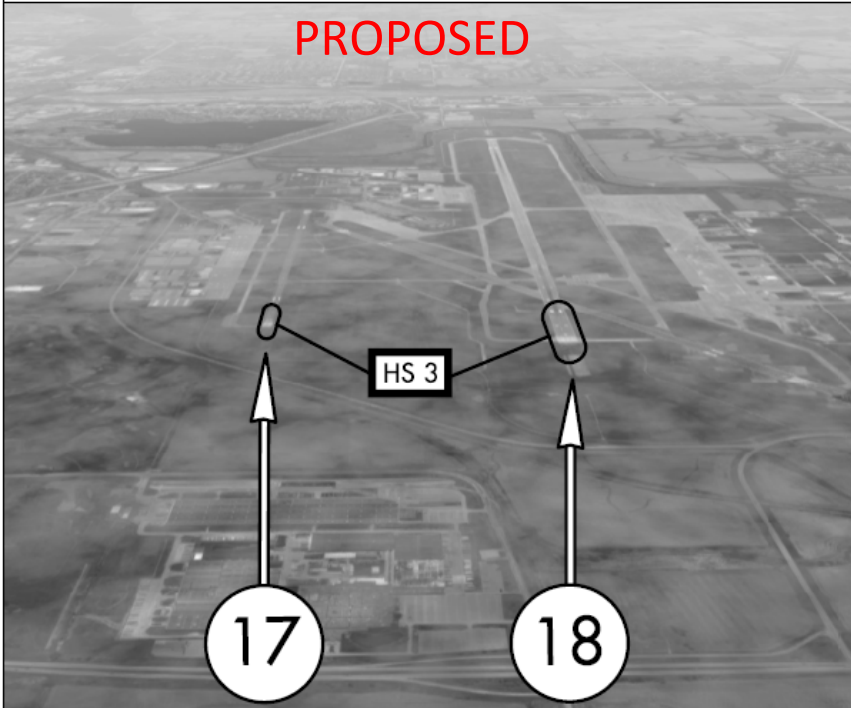
PROPOSED



LINCOLN (LNK) ARRIVAL ALERT

Landing South Misalignment Risk
Rwy 17 and Rwy 18

PROPOSED



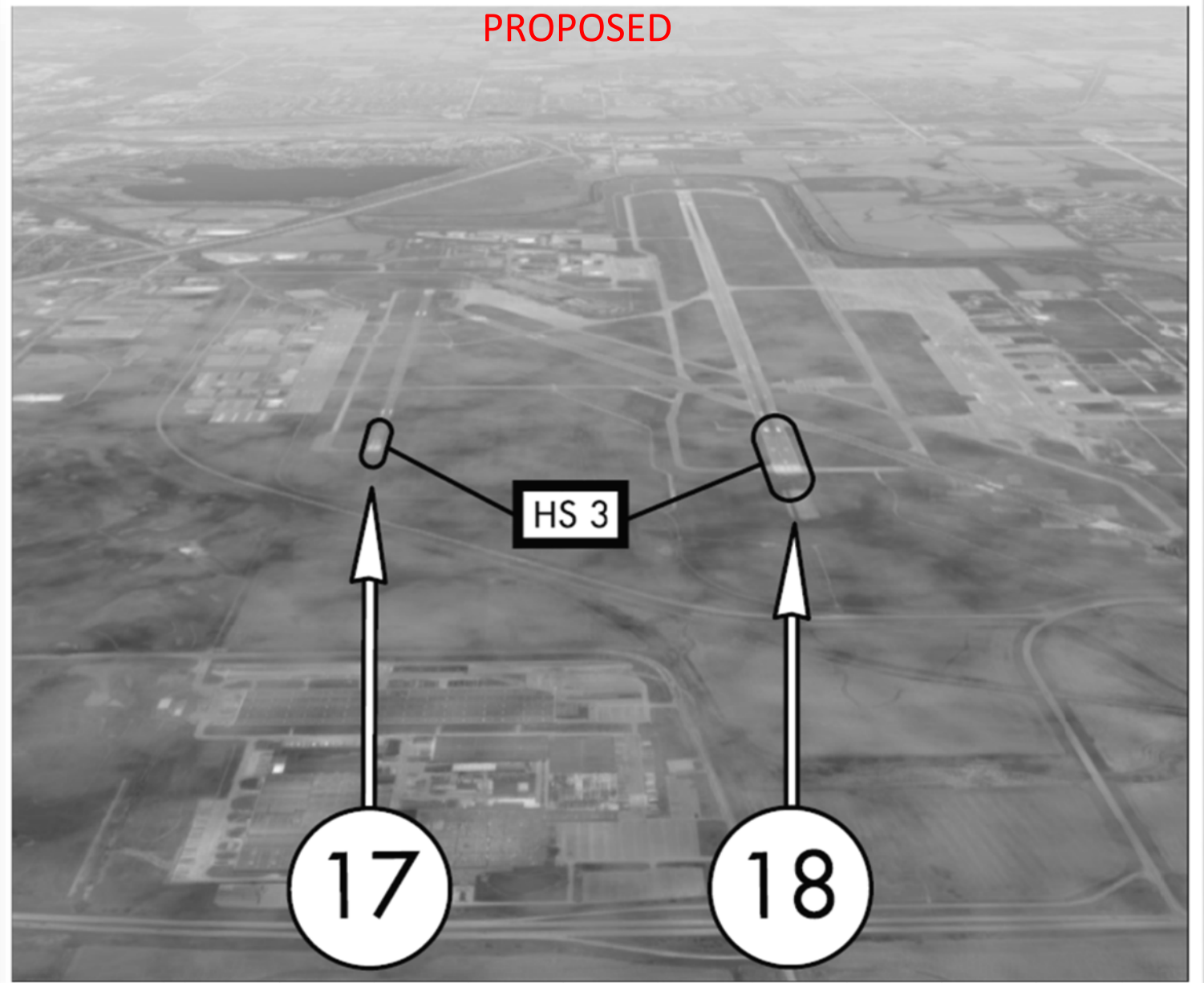
Pilots arriving on Rwy 17 need to be aware that Rwy 17 is 550 feet farther down the approach than Rwy 18.

Not for Navigation

LNK Airport manager, (555) 555-5555

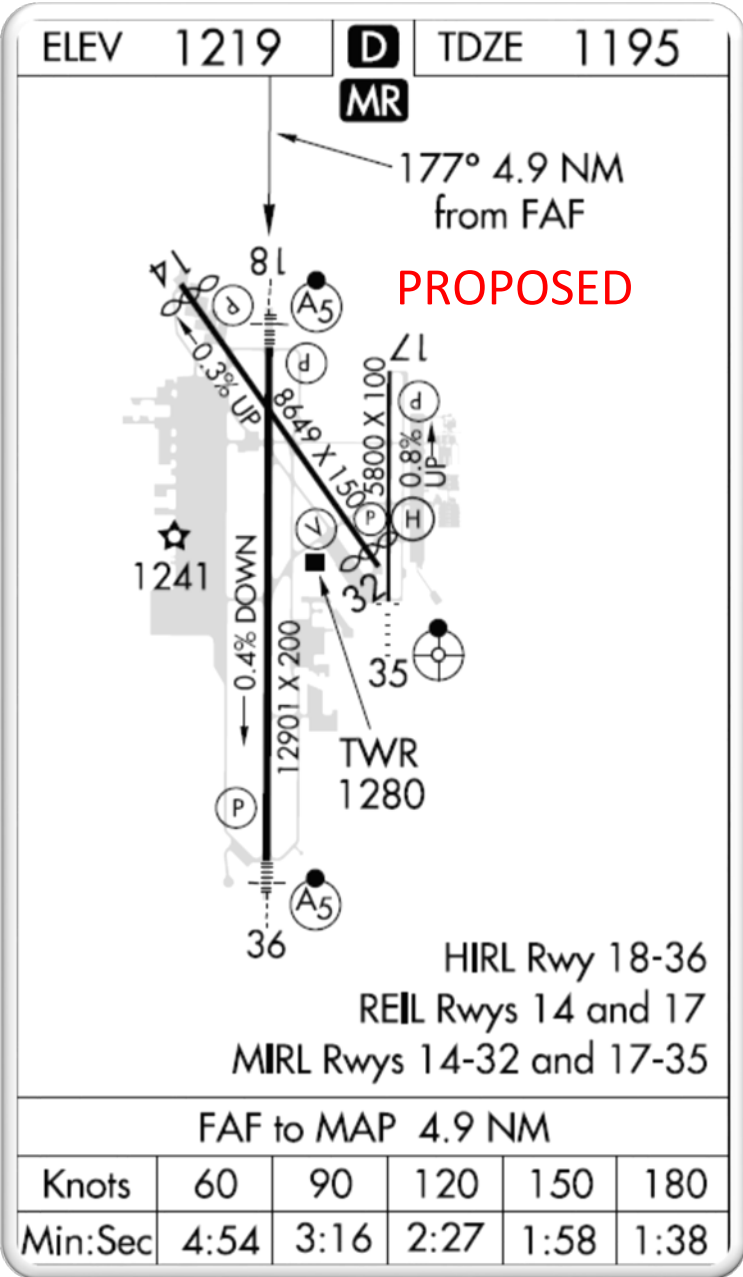
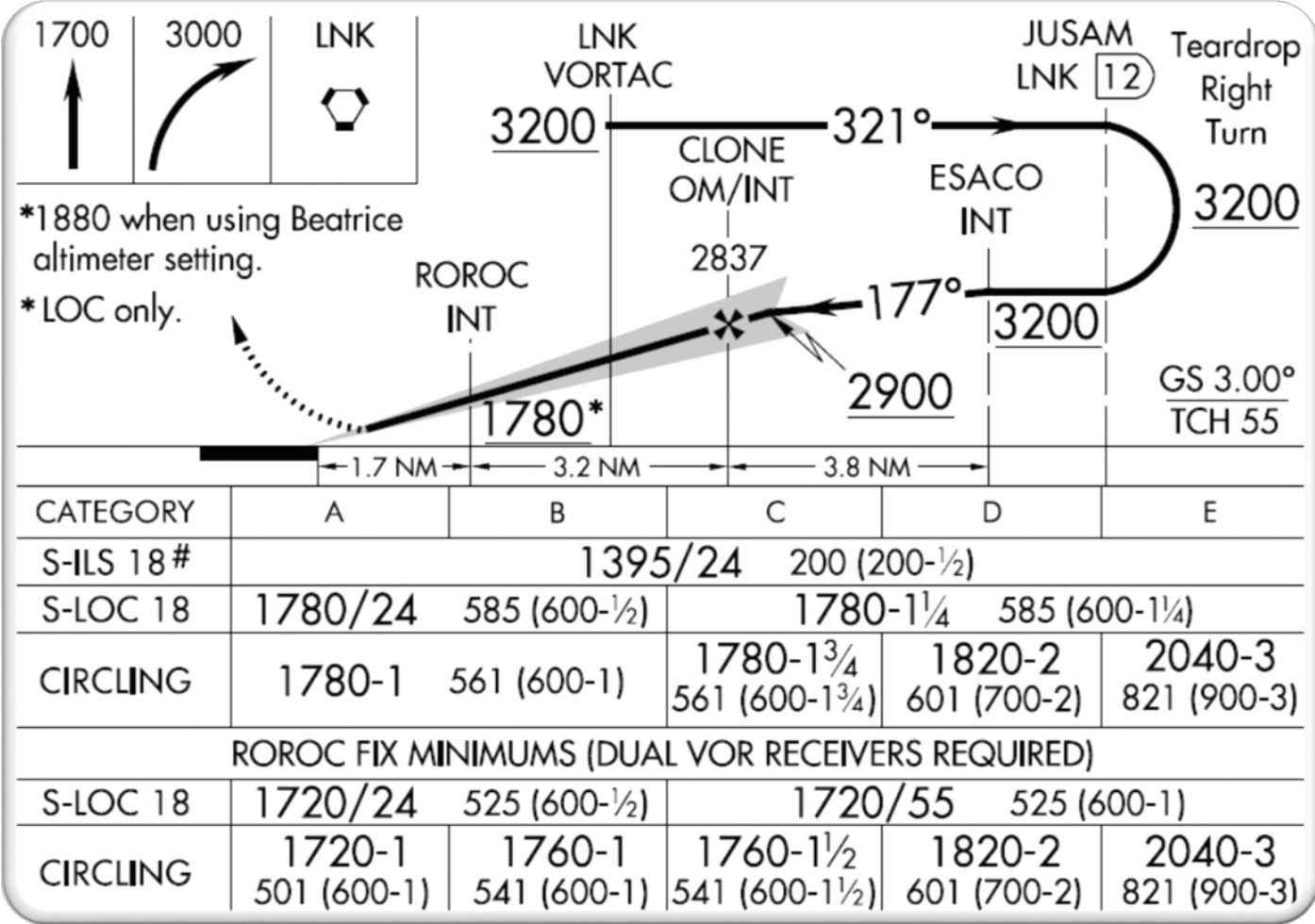
Effective 10 SEP 2020 to 8 SEP 2022

PROPOSED



LINCOLN (LNK)

LINCOLN, NEBRASKA



First Airports to be Updated With Standard Symbolology

Airports with Existing Arrival Misalignment Risk Hot Spots

Tucson, AZ (TUS)
Reno, NV (RTS)
Phoenix, AZ (PHX)
Palm Springs, CA (PSP)
Reid-Hillview, San Jose, CA (RHV)
Rochester, NY (ROC)
Honolulu, HI (HNL)
Idaho Falls, ID (IDA)
Peach Tree DeKalb, GA (PDK)
Dallas McKinney National, TX (TKI)
Flying Cloud, MN (FCM)
Lincoln, NE (LNK)
Kansas City, MO (MCI)

Airports with ground movement Hot Spots only

Grand Junction Regional, CO (GJT)
Santa Rosa, CA (STS)
Victorville, CA (VCV)
Colorado Springs, CO (COS)
Las Vegas, NV (LAS)
Seattle Boeing Field, WA (BFI)
Groton, CT (GON)
Richmond, VA (RIC)
Fort Myers, FL (RSW)
Fort Lauderdale, FL (FLL)
Orlando, FL (ORL)
Veterans Airport, IL (MWA)
Ohio State, OH (OSU)
Central Wisconsin, WI (CWA)
Salt Lake City, UT (SLC)
Mason City, IA (MCW)
Littlerock, AR (LIT)
Valley International, TX (HRL)
Houston Hobby, TX (HOU)
San Marcos Regional, TX (HYI)
Willow Run, MI (YIP)



Outreach and Education

- Working with the FAA Office of Communications (AOC) on several outreach efforts, as outlined as a result of the SRMP, to be completed prior to publication.
 - One-pager and a presentation to be communicated via:
 - FAA Flight Standards FFAST Blast
 - Agency stakeholders (AJT, ARP, NATCA, PASS, etc.)
 - Industry stakeholders (ALPA, NBAA, RAA, AOPA, NAFI, etc.)
 - Runway Safety website
 - Single-topic video describing the updates via the From the Flight Deck (FTFD) series
 - Update existing affected FTFD videos
- Participating in the National Association of Flight Instructors (NAFI) Mentor LIVE webinar
- Continuing work with Aeronautical Charting (AJV) to ensure Chart Supplements, Approach Plates and Arrival Alert pages are all defined and outlined in those publications
- Collect data and analyze Wrong Surface events at the affected airports



Questions

Are there any questions?

APPENDIX C. ACRONYMS

A4A	Airlines for America
AFS	Safety Standards
AJI	Safety and Technical Training
AJT	Air Traffic Services
AJV	Mission Support Services
ALPA	Air Line Pilots Association
APA	Allied Pilots Association
ATO	Air Traffic Organization
EAA	Experimental Aircraft Association
FAA	Federal Aviation Administration
NAS	National Airspace System
NATCA	National Air Traffic Controllers Association
NBAA	National Business Aviation Association
PASS	Professional Aviation Safety Specialists
PHL	Preliminary Hazard List
RAA	Regional Airline Association
SME	Subject Matter Expert
SMS	Safety Management System
SRM	Safety Risk Management
TPP	Terminal Procedures Publication
WNCO	Southwest Airlines