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Re: Aurora State Airport Master Plan Proposed Preferred Alternative Use of Modifications of Standards

Mr. Thomas, Mr. Beach, and Ms. Steffen:

Please share this letter with the ODAV and FAA design team, and enter it letter into the record for the Oregon Department of Aviation's (ODAV) proposed "Preferred Alternative" for the Aurora State Airport Master Plan.

We support Director Sugahara's statement that ODAV is willing to modify its Preferred Alternative for the Aurora Airport Master Plan to show a phased compliance with various standards, especially the Runway Object Free Area (ROFA). This letter is to especially remind all parties that a phased approach, iteratively working toward compliance, is completely consistent with, and part of the process for using the FAA's modification of standards process.

The FAA's directions for master planning and airport design clearly describe and allow the use of the modification of standards process, and it is appropriate that it be used for the Aurora Airport Master Planning effort. In fact, it is imminently reasonable because otherwise if the master plan describes a phased process to resolve issues of standards, for the process to be successful, it will need a modification of standards, so why wait to find out the answer? The master plan process is precisely when it should be applied for and resolved.

In service of the ODAV and FAA process to accomplish this, we have prepared a risk analysis based on FAA funded methodology, that shows a modification of

standards for the ROFA provides a completely acceptable level of safety. It shows that the risk of occurrence is that an occurrence would not occur within 275 years, which is more than twice as long as the FAA standard of acceptable risk is a 100-year period.

We should keep in mind that the actual history of mankind's successful creation of flying machines – dating to the first flight on December 17, 1903 in Kitty Hawk, North Carolina – represents a period of only 121 years. The risk analysis shows that the predicted risk to an incident at the edge of the Aurora Airport existing runway fence exceeds even this by 156 years. In the world of aviation that is many lifetimes – the FAA standards for ROFA's will have changed many times by that date.

Given that the new, incoming United States President is creating a Department of Government Efficiency that is intended to root out unreasonable use of federal funds, it will be appropriate to ensure that the final approved Aurora Airport Master Plan presents an efficient, reasonable, practical, and attainable plan of action. It cannot propose the expenditure of hundreds of millions of dollars to solve aviation issues that have an unlikely risk of happening, if at all, more than two hundred years from today. By then, it can reasonably be expected that the ROFA will be clear or some other design standard will have been imposed due to unimaginable changes in aircraft technology.

We request that the Aurora Airport Master Plan effort use the established standards that actually apply to all FAA funded master plans. It is important that the Aurora Airport planning effort be allowed the same opportunities that other airports around the United States are allowed, and not discriminated against.

Concerning when Modifications of Standards are allowed to be used, we note that the AC describing Airport Master Planning work, AC 150/5070-6B with Change 2, identifies below (yellow highlight added) that:

- The ALP should show all planned modification to the airport (they do not need to yet be approved); and

- The ALP narrative should discuss modifications to FAA Airport Design Standards (there is no prohibition to applying for the mod during the master planning work) and discuss the stages of development with sketches, which would include planned mods of design standards.

202. TYPES OF MASTER PLANNING STUDIES

c. **Airport Layout Plan Updates** – An update of the airport layout plan (ALP) drawing set should be an element of any master plan study. In fact, keeping the ALP current is a legal requirement for airports that receive Federal assistance. An update of the ALP drawing set will reflect actual or planned modifications to the airport and significant off-airport development. An accompanying ALP Narrative Report should explain and document those changes and contain at least the following elements:
1) Basic aeronautical forecasts.

2) Basis for the proposed items of development.

3) Rationale for unusual design features and/or modifications to FAA Airport Design Standards.

4) Summary of the various stages of airport development and layout sketches of the major items of development in each stage. An ALP drawing set update is an appropriate alternative to a full master plan whenever the fundamental assumptions of the previous master plan have not changed. If there have not been any major changes in airport activity or improvements that have had unanticipated consequences, a master plan update is not necessary. Another situation where only an ALP update would be appropriate is the examination of a single development item, such as runway safety area improvements. As indicated above, an ALP update will typically involve fewer elements than a full master plan study, including only the aviation demand forecasts, an assessment of facility requirements, a facility implementation and financing plan, and an airport layout plan drawing set. If additional steps are required to complete the ALP update, a full master plan study is probably a better choice.

205. MASTER PLAN REVIEW BY THE FAA

a. The recommendations contained in an airport master plan represent the views, policies and development plans of the airport sponsor and do not necessarily represent the views of the FAA. Acceptance of the master plan by the FAA does not constitute a commitment on the part of the United States to participate in any development depicted in the plan, nor does it indicate that the

proposed development is environmentally acceptable in accordance with appropriate public law. The FAA reviews all elements of the master plan to ensure that sound planning techniques have been applied. However, the FAA only approves the following elements of airport master plans:

1) ***Forecasts of Demand*** – The master plan forecast should be reviewed to ensure that the underlying assumptions and forecast methodologies are appropriate. Paragraph 704.h of this guidance should be used to determine consistency of the master plan forecast levels and the Terminal Area Forecast (TAF). Inconsistencies between the master plan forecast and TAF must be resolved, and the forecast approved, before proceeding with subsequent planning work.

2) ***Airport Layout Plan*** – All airport development at Federally-obligated airports must be done in accordance with an FAA- and sponsor-approved ALP. Furthermore, proposed development must be shown on an approved ALP to be eligible for Airport Improvement Program (AIP) funding. FAA approval of the ALP indicates that the existing facilities and proposed development depicted on the ALP conforms to the FAA airport design standards in effect at the time of the approval or that an approved modification to standard has been issued. Such approval also indicates that the FAA finds the proposed development to be safe and efficient.

801. FACILITY REQUIREMENTS - GENERAL

c. The requirements for new or expanded facilities reflect the unique circumstances of each airport, such as, but not limited to, the following:
1) Capacity shortfalls, which are commonly driven by growing demand.

2) Enhanced security requirements mandated by the Transportation Security Administration, including the flexibility to respond to changes in threat levels.

3) Updated standards developed and adopted by the FAA or other regulatory agencies, to correct existing non-standard conditions and eliminate existing modifications to standards. If there are approved modifications to standards, planners should review the reasoning that led to those adjustments. The facility requirements chapter should indicate if those deviations will continue or will be eliminated in the new master plan.

4) The airport sponsor's strategic vision for the airport. Such needs are typically associated with a sponsor's strategic business plan, mission statement, or similar plans that will require modification of the airport.

5) The outdated condition, arrangement, or functionality of existing facilities.

1008. DOCUMENTATION GUIDELINES

a. The requirements for documentation of the ALP drawing set must be determined with the airport sponsor and the reviewing agency or State agency. Documentation will typically

include a complete reduced-size set of the ALP drawing set and the accompanying text. The master plan will provide the narrative if the ALP is prepared as part of a master plan. If the ALP is prepared separately as an ALP Update, an ALP narrative is required. Then narrative will typically describe ALP development criteria and the rationale for the development shown on the ALP. Examples of these include airport reference code-related design criteria unique to specific areas of the airfield, or known or proposed modifications to FAA design standards. (See Section 202.c of this AC for further guidance on the ALP Narrative Report.)

Order 5300.1G Modifications to Agency Airport Design, Construction, and Equipment Standards

1.Purpose of this Order. This order establishes the process for the initiation, revision, coordination, and management of Modifications of Standards (MOS) applicable to airport design, construction material, and equipment projects. This order is the foundation of a web-based automated application of MOS. The automated application for submitting MOS is a step-by-step process facilitated within Airports Geographic Information System (AGIS).

2.Applicability. This order is applicable to all projects funded under the Airport Improvement Program (AIP) and Passenger Facility Charge (PFC) programs at all obligated airports, or as required to support any public approach procedure. Eligibility determinations under AIP or PFC are independent of any approval action for an MOS. New MOS requests initiated after March31, 2018, must use the automated MOS process. Manual MOS processing must follow applicable sections of this order as it applies to current regional procedures until the automated tool is accessible.

5. Definitions

e.Modification of Standards (MOS). Any deviation from, or addition to standards, applicable to airport design, material, and construction standards, or equipment projects resulting in an acceptable level of safety, useful life, lower costs, greater efficiency, or the need to accommodate an unusual local condition on a specific project through approval on a case-by-case basis.

7.Background. Laws, regulations and Airport Sponsor Grant Assurances require compliance with current FAA standards. The following provisions require an airport to meet FAA standards:

c.Obligated Airport. Title 49 U.S.C. § 47107(a)(16) and Grant Assurance No. 29, *Airport Layout Plan*, require the airport to maintain an up-to-date Airport Layout Plan (ALP) depicting existing and future airport facilities as referenced in paragraph 12.b. AC 150/5070-6, *Airport Master Plans*, establishes standards for ALPs, which includes the requirement to identify unusual design features and/or modifications to FAA Airports design standards. FAA approval of an ALP indicates the existing or proposed development depicted on the ALP conforms to FAA airport design standards or that an approved modification to standards has been issued.

12.Documentation.

a.All records pertaining to the MOS, including documents, pictures, and/or approval letters,will be maintained within the Airports GIS MOS Tool.

b.The airport must update the ALP to reflect approved modifications of airport design standards. The airport must include in the ALP a table listing the approved MOS. The table must include the approval letter dates and identify associated airspace review case numbers.

In addition, we note that AC 150/5300-13B Airport Design, Change 1, identifies below (yellow highlight added) that:

- Mods are intended for cases where an unusual local condition for a specific project maintains an acceptable level of safety, and we have prepared a draft mod (attached to this letter) for use of the project, which shows that occurrences are predicted to only occur in 275 or more years, which satisfies the FAA's standard for acceptable safety; and

- There is no established FAA prohibition from requesting the mod now, during the planning process.

1.5 **Definitions.**
60. *Modification of Standards.* Any approved deviation from published FAA standards applicable to an airport design, construction, or equipment project that is necessary to accommodate an unusual local condition for a specific project while maintaining an acceptable level of safety and performance. FAA Order 5300.1 establishes FAA policy for administering requests for modification of standards.
Chapter 2. DESIGN PRINCIPLES

2.8 **Modification of Standards.**
Site-specific conditions may make it impractical to meet all FAA design standards at an airport. The FAA considers, on a case-by-case basis, modifications to design standards that result in an acceptable level of safety and efficiency. Specific operational controls may be necessary to establish an acceptable level of safety for operation of aircraft at the airport. FAA Order 5300.1 establishes FAA policy for administering airport requests for modification of standards. See paragraphs 2.4 and 2.5.

2.8.1 The FAA views an approved modification of standards as an interim measure intended to mitigate unique site-specific conditions. Unless the FAA explicitly states otherwise in the approval action, the FAA expects airports with approved modifications to pursue ways to meet design

standards. This may occur incrementally over time or at such time it becomes practical to correct the non-standard condition.

2.8.2 The FAA will not consider any request to modify design standards associated with the following:

1. RSA dimensions
2. OFZ dimensions
3. Approach or departure surface dimensions
4. Standards established within a regulation (e.g., stopway, clearway).

2.8.3 An airport seeking FAA approval of modification to a design standard submits a request using the Modification of Standards application tool within the Airport Data and Information Portal (ADIP) at https://adip.faa.gov. The FAA relies on the following information, in part, to determine the acceptability of a modification to FAA design standards:

1. Information on the standard proposed for modification.
2. Description of proposed modification and why the airport cannot meet standards.
3. Statement addressing how modification will provide an acceptable level of safety, economy, durability, and workmanship.
4. Listing of any special operational measures necessary to accommodate the modification.

2.4 **Addressing Non-standard Airport Conditions.**
The FAA expects airport owners to address non-standard conditions through the airport planning process. The FAA acknowledges that conformance to current standards is not always practical. However, the FAA expects airports to continue to investigate mitigation measures, whether in one or multiple phases, and correct the non-standard conditions over time.
1.The FAA expects implementation of new or revised standards to occur through the planning process.
2.If there is an explicit or immediate safety deficiency for a non-standard condition, the FAA expects airport owners to prioritize the mitigation of the safety deficiency using the current standard.
3.Inconvenience does not represent an acceptable justification for non-conformance to standards.
4.Justifications based on impractical conditions do not represent a permanent justification for non-conformance to standards.

In conclusion, we request that ODAV and FAA allow Aurora Airport to use the established process of modification of standards to resolve certain issues at the airport, where they are expressly permitted, and not expressly denied as options.

The FAA's modification of standards process is wisely set up precisely for such a condition as what we find at Aurora Airport – LET'S USE IT.

Respectfully submitted,

Aron Faegre, AIA, PE
Aron Faegre Airport Planning and Design

Attachment: Proposed modification of standards risk analysis document for use at Aurora Airport
dated October 5, 2024.

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Aurora State Airport (UAO)
Proposed Modification of
Runway Object Free Area (ROFA) Design Standards

Prepared by: Aron Faegre, AIA, PE
Aron Faegre Airport Planning & Design

October 5, 2024

This memorandum provides an analysis and methodology by which a Modifications of FAA Airport Design Standards (MOS) at the Aurora State Airport (UAO), for the Runway Object Free Area (ROFA) can be justified as:

> "… resulting in an acceptable level of safety, useful life, lower costs, greater efficiency, or the need to accommodate an unusual local condition on a specific project through approval on a case-by-case basis." - FAA Order 5300.1G, page 1.

as defined and permitted under FAA Order 5300.1G Modifications to Agency Airport Design, Construction, and Equipment Standards[1].

1. BACKGROUND

The Aurora State Airport is surrounded by farm lands, near Aurora, Oregon, at the northern end of Marion County. It primarily serves aviation businesses involved with:

- emergency medical transport[2],
- aviation heavy-lift helicopter fire-fighting and power line construction companies, and for military (for which fixed wing aircraft are essential for support),[3]
- business jets for numerous major national corporations based within 10 miles,

[1] FAA Order 5300.1G Appendix A specifically gives FAA Office of Airport (ARP) and Region the authority to issue a MOS for Runway Object Free Areas. The Order can be downloaded at: https://www.faa.gov/documentLibrary/media/Order/order-5300-1G-modifications-to-standards.pdf .

[2] Regional headquarters for Life Flight Network, with bases all over Oregon, Washington, Idaho, Montana, and Nevada.

[3] Columbia Helicopters, Helicopter Transport Services, Wilson Construction, companies that work internationally with headquarters at Aurora Airport. Many of the companies have annual contracts with state and federal agencies to provide major support for fighting fires, as well as for humanitarian relief work world-wide. Some of these companies have U.S. military contracts for repair and rebuilding of military aircraft at the Aurora site. The use of the Aurora Airport runway is essential to all of these companies for rapid providing of crews, equipment, and repairs to helicopters in active service of fighting fires, moving power lines, or doing rescue, relief, or humanitarian work.

- aircraft manufacturing for the S-LSA (Special Light-Sport Aircraft) and kit-build industry[4], and
- other general aviation aircraft using the airfield for business, pilot training, and recreational flying.

There is no scheduled air service using the airport. The State of Oregon Department of Aviation (ODAV) owns, governs, and manages the public lands of the airport. Most of the business aircraft based at the airport access the runway via through-the-fence permits with ODAV.

Flights by based business jets, such as a Challenger 300, dictate that the Airport Reference Code is C-II. Due to the geometry of the existing site, the airport does not meet current FAA design standards for the ROFA, due primarily to adjacent Highway 551 to the west of the runway.

Most recently ODAV's planned solution[5] to meeting these standards ("Refined Preliminary Alternatives Summary", by Century West Engineering, dated July 31, 2024) is one of only two options:

- relocate the highway further west, (which involves acquiring both private residential and commercial properties further west), or
- relocate the runway, taxiway, and control tower east (which involves acquiring many acres of existing private property already developed with hangars, taxilanes, and aprons for aviation uses) and demolishing numerous large 40,000 square foot aviation hangars along the taxiway.

Both options have very high financial and environmental costs (probably in the greater than $100 million range), which would make them difficult to ever be implemented. If this master plan is approved as currently planned, and one of these options were not implemented, then ODAV and FAA have reported that the airport would only receive maintenance funding and no additional safety improvement funds. This would result in the airport not keeping pace with the aviation industry standards of safety. The second option (moving the runway, control tower, and demolishing hangars), If implemented, would in addition force closure of many of the major medical transport and fire-fighting facilities on the airport, and would put many of the airport's 1,500 employees out of jobs.

It is noted that in the 2012 Airport Layout Plan (ALP), approved (signed) by both ODAV

[4] Van's Aircraft www.vansaircraft.com the international leader in S-LSA produced aircraft.
[5] Refined Preliminary Alternatives Summary document dated July 31, 2024 by Century West Engineer can be downloaded at: https://publicproject.net/files/UAOAMP/uao-refined-preliminary-alternatives-summary-1-.pdf?d952c4adef .

and FAA, the airport also had the same Runway Design Code (RDC) status of C-II and listed a MOS as the solution to the non-standard ROFA limitation on the west property line. At that time there was consensus between ODAV and FAA that a MOS was a reasonable solution.

This memorandum provides the evidence to show that the 2012 ALP was a good approach to resolution of the ROFA, and that it can reasonably be continued. This report demonstrates that there is an acceptable level of safety through modifying the ROFA standard for the specific deviation to standards located on the west side of the runway.

FAA standards for different airports ROFA's vary from 250 foot width, to an 800 foot width, depending on aircraft type using the airport. As will be shown below, the primary reason justifying the modification is that the going from B-II to C-II category is just where the 500-foot required ROFA width changes to an 800-foot wide required ROFA - yet this is the same width required for all RDC category aircraft all the way to E-VI -Portland International Airport, San Francisco Airport, and every other international airport in the country. UAO will never have the larger size of aircraft those airports accommodate – Boeing 737's to Boeing 777's – so a slight reduction in width on the west side provides a level of safety appropriate for UAO, which will always serve only much smaller aircraft.

Modifications of standards for ROFA's are common at even large national airports. For example, recently several MOS were adopted at San Jose International Airport for deficiencies in the ROFA, as well as for runway-taxiway separations, and for runway object free areas[6]. It even appears that Portland International Airport (PDX) may have their airport perimeter fence, the shoulder of NE Marine Drive, and improper grading within the 400-feet area from runway centerline, at the northeast corner of the ROFA for Runway 10L.

This memorandum provides the detailed technical background and mathematically calculated justification, needed for the FAA and ODAV to again approve a MOS for the ROFA at Aurora State Airport.

2. MOS PROCESS

The process for gaining a modification of standards is provided in FAA AC 150/5300-13B Airport Design[7] in Section 2.8. It states, and we provide commentary after each paragraph as

[6] Norman Y. Mineta San Jose International Airport Runway Incursion Mitigation/Airfield Design Standards Analysis, November 27, 2017. Justification for ROFA modifications in this document were often simply the practical and cost issues of modifying major adjacent highways, similar to what is at issue in a much smaller Aurora Airport.
[7] FAA AC 150/5300-13B Airport Design Available free on line at:
https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC-150-5300-13B-Airport-Design-Chg1.pdf

to acceptability:

2.8 ***Modification of Standards.***

Site-specific conditions may make it impractical to meet all FAA design standards at an airport. The FAA considers, on a case-by-case basis, modifications to design standards that result in an acceptable level of safety and efficiency. Specific operational controls may be necessary to establish an acceptable level of safety for operation of aircraft at the airport. FAA Order 5300.1 establishes FAA policy for administering airport requests for modification of standards. See paragraphs 2.4 and 2.5.

This memorandum provides this information and finds that no specific operational controls are necessary, see comments on paragraph 2.4 below.

2.8.1 The FAA views an approved modification of standards as an interim measure intended to mitigate unique site-specific conditions. Unless the FAA explicitly states otherwise in the approval action, the FAA expects airports with approved modifications to pursue ways to meet design standards. This may occur incrementally over time or at such time it becomes practical to correct the non-standard condition.

The FAA and ODAV can work with Oregon Department of Transportation on master planning future revisions to State Highway 551 so that it can be corrected "at such time it becomes practical." Also, there are potential options where ODAV and ODOT could jointly agree to relocate the airport perimeter fence closer to Highway 551, which could be an "incrementally" established improvement.

2.8.2 The FAA will not consider any request to modify design standards associated with the following:

- *RSA dimensions*
- *OFZ dimensions*
- *Approach or departure surface dimensions*
- *Standards established within a regulation (e.g., stopway, clearway).*

The ROFA is not one of these.

2.8.3 An airport seeking FAA approval of modification to a design standard submits a request using the Modification of Standards application tool within the Airport Data and Information Portal (ADIP) at https://adip.faa.gov. The FAA relies on the following information, in part, to determine the acceptability of a modification to FAA design standards:

- *Information on the standard proposed for modification.*
- *Description of proposed modification and why the airport cannot meet standards.*
- *Statement addressing how modification will provide an acceptable level of safety, economy, durability, and workmanship.*
- *Listing of any special operational measures necessary to accommodate the modification.*

This document was prepared to provide the analysis needed for ODAV to submittal for the MOS per Section 2.4.

> *2.4 Addressing Non-standard Airport Conditions.*
> *The FAA expects airport owners to address non-standard conditions through the airport planning process. The FAA acknowledges that conformance to current standards is not always practical. However, the FAA expects airports to continue to investigate mitigation measures, whether in one or multiple phases, and correct the non-standard conditions over time.*

It is important to re-emphasize the above statement, that the FAA here "acknowledges that conformance to current standards is not always practical." Further, per this paragraph, the current master planning activity is the appropriate place for this analysis and the formal establishment of a MOS for the ROFA. This report and analysis identifies intermediate steps that can be taken, such as relocating the airport perimeter fence, that will iteratively move the airport closer to compliance.

This analysis utilizes an FAA established safety analysis methodology to show that the MOS provides an acceptable level of safety. The study found no special measures needed to accommodate the modification.

3. METHODOLOGY

In 2011, the Transportation Research Board (TRB) released Airport Cooperative Research Program (ACRP) Report #51 – Risk Assessment Method to Support Modifications of Airfield Separation Standards. The ACRP is funded by the Federal Aviation Administration (FAA). Report #51 is used to support the ROFA MOS requested at Aurora State Airport.

The proposed ROFA MOS is modeled in this report in accordance with Appendix A – Risk Assessment Methodology of ACRP Report #51[8].

This report uses risk plots, along with the annual number of operations, to analyze the cumulative risks associated with Runway to Object Separations. The operations numbers at UAO are taken from the current draft Master Plan, and are numbers already approved by the FAA in a letter[9] to ODAV dated November 15, 2023 (corrected January 23, 2024). For sake of a conservative analysis, we are using the most distant forecast projects for the year 2041, which are:

- 90,231 total operations all RDC categories, of which
- 862 operations are of RDC C-II and D aircraft

[8] ACRP Report #51 – Risk Assessment Method to Support Modifications of Airfield Separation Standards is available free on line at: https://nap.nationalacademies.org/catalog/14501/risk-assessment-method-to-support-modification-of-airfield-separation-standards

[9] Federal Aviation Administration (FAA) Aurora (UAO Aviation Activity Forecast Approval Airport Improvement Program Grant Number 3-41-0004-022-2021 available at: https://publicproject.net/files/2024-01/Aurora-Airport/uao-forecast-approval-20231115-corrected-20240123.pdf?57af6c19b7

For operations involving the runway, per the methods of Report #51, the risk is analyzed based on three distinct phases of flight:

a. Landing - Airborne Phase
b. Landing - Ground Phase
c. Takeoff

The separation distance from the runway centerline to an object is used with the associated risk plot to calculate the risk of collision per operation.

The risk of collisions per operation is then analyzed along with the number of annual airport operations for the appropriate phase of flight to determine the predicted frequency of occurrence. The frequency of occurrence is used to determine the FAA likelihood level using Table A-3 from ACRP Report #51 which is shown below:

Table A-3. FAA likelihood levels (FAA, 2010).

	General	Airport Specific	ATC Operational	
			Per Facility	NAS-wide
Frequent A	Probability of occurrence per operation is equal to or greater than 1×10^{-3}	Expected to occur more than once per week or every 2,500 departures (4×10^{-4}), whichever occurs sooner	Expected to occur more than once per week	Expected to occur every 1–2 days
Probable B	Probability of occurrence per operation is less than 1×10^{-3}, but equal to or greater than 1×10^{-5}	Expected to occur about once every month or 250,000 departures (4×10^{-6}), whichever occurs sooner	Expected to occur about once every month	Expected to occur several times per month
Remote C	Probability of occurrence per operation is less than 1×10^{-5} but equal to or greater than 1×10^{-7}	Expected to occur about once every year or 2.5 million departures (4×10^{-7}), whichever occurs sooner	Expected to occur about once every 1–10 years	Expected to occur about once every few months
Extremely Remote D	Probability of occurrence per operation is less than 1×10^{-7} but equal to or greater than 1×10^{-9}	Expected to occur once every 10–100 years or 25 million departures (4×10^{-8}), whichever occurs sooner	Expected to occur about once every 10–100 years	Expected to occur about once every 3 years
Extremely Improbable E	Probability of occurrence per operation is less than 1×10^{-9}	Expected to occur less than once every 100 years	Expected to occur less than once every 100 years	Expected to occur less than once every 30 years

Note: Occurrence is defined per movement.

Source: ACRP Report #51

The key takeaway from Table A-3 is that for a specific airport, if the likelihood of incidence is less than once every 100 years it is considered a “Extremely Improbable” Class E occurrence.

A Hazard Severity Classification is then assigned based on the worst credible outcome of an incident. Since the ACRP method is based on wingtip separation, the report states that: “From the point of view of risk and based on the records of incidents and accidents,

the worst credible consequence expected for wingtip collisions of two taxiing aircraft is aircraft damage" (ACRP Report #51 page 19). A similar aircraft damage expectation would be a wingtip collision with the airport perimeter fence, which is the ROFA limitation examined in this report.

The Hazard Severity Classifications were determined in accordance with Table A-4 FAA Severity Definitions from ACRP Report #51 and are shown below:

Table A-4. FAA severity definitions (FAA, 2010).

Hazard Severity Classification				
Minimal 5	**Minor 4**	**Major 3**	**Hazardous 2**	**Catastrophic 1**
No damage to aircraft but minimal injury or discomfort of little consequence to passenger(s) or workers	- Minimal damage to aircraft; - Minor injury to passengers; - Minimal unplanned airport operations limitations (i.e. taxiway closure); - Minor incident involving the use of airport emergency procedures	- Major damage to aircraft and/or minor injury to passenger(s)/ worker(s); - Major unplanned disruption to airport operations; - Serious incident; - Deduction on the airport's ability to deal with adverse conditions	- Severe damage to aircraft and/or serious injury to passenger(s)/ worker(s); - Complete unplanned airport closure; - Major unplanned operations limitations (i.e. runway closure); - Major airport damage to equipment and facilities	- Complete loss of aircraft and/or facilities or fatal injury in passenger(s)/ worker(s); - Complete unplanned airport closure and destruction of critical facilities; - Airport facilities and equipment destroyed

Source: ACRP Report #51

Then, using both the FAA likelihood level and the Hazard Severity Classification the risk is then analyzed using Figure A-1 FAA Risk Matrix from ACRP Report #51, shown below:

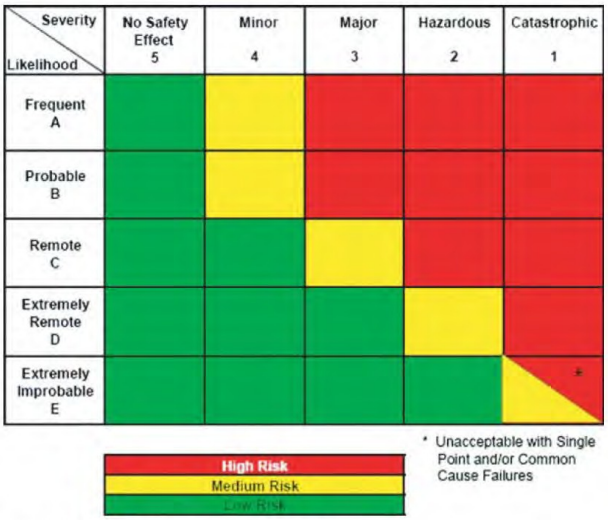


Figure A-1. FAA risk matrix (FAA, 2010).

Source: ACRP Report #51

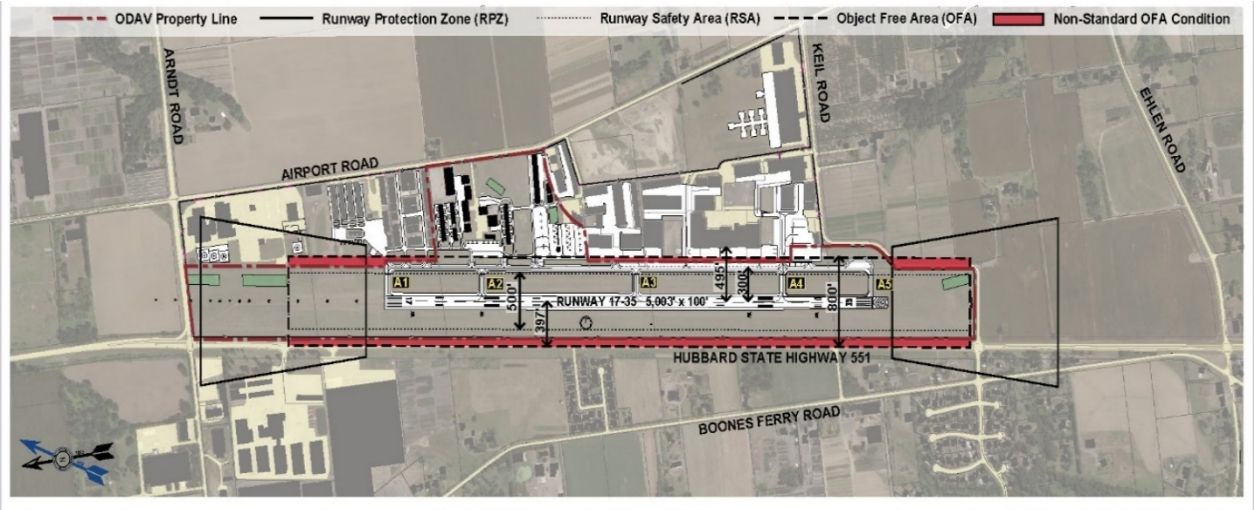
Based on Figure A-1 if the incident is Extremely Improbably (i.e. more than 100 years probability) the risk is considered “Low,” except for an incident considered catastrophic. We will use these graphs to evaluate the results from the detailed risk analysis of UAO below.

4. UAO ANALYSIS

In 2012 Master Plan and ALP established the UAO runway RDC, given existing based aircraft, as C-II, up from a B-II. The required ROFA width of a B-II runway is 500 feet centered on the runway. As it turns out, any runway of higher RDC than a B-II requires 800 feet in width. Thus, the UAO required C-II ROFA width is 800 feet centered on the runway. This 800-foot width is the standard used for aircraft ranging from a Challenger 300 business jet to the largest Boeing 777 or even the largest military aircraft. The 2012 approved ALP lists the ROFA deviation as a modification to standards, since the airport perimeter fence and Highway 551 were within the ROFA.

The UAO forecast of operations predicts that by the year 2041 there will be 90,230 annual operations at the airport, of which 862 would be an RDC above the B-II category. Thus, the 89,368 operations by B-II or lesser category clearly are operating well within ROFA safety standards, as the existing runway to road separations provide more than the 500-foot required width. It is just the 862 operations that need to be analyzed for ROFA safety relative to the required 800-foot width.

The deficiencies in the existing Runway OFA at UAO are shown in the Figure below:



UAO Figure A: Highway 551 Shown as ROFA Deviation Object
Source: Century West Engineers, Aurora State Airport Draft Airport Master Plan, Working Paper No. 1, Figure 2-15, November 2023 (Updated)

The current ROFA object deficiencies are:

d. Hubbard State Highway 551 for which the OFA penetrates 3 feet beyond the highway centerline. (368' to 377' clear width available from outer edge of highway gravel shoulder to Runway CL)
e. Perimeter Fence Inside OFA (312' clear width from Runway CL)

Potentially the airport fence could be relocated to the east edge of the 12-foot-wide gravel shoulder, since both the highway and the airport are owned by the State of Oregon. There can be an agreement between ODOT and ODAV to allow this. Relocating the fence in this way would result in a minimum width of the ROFA on the west side of the runway, to a 368-foot clearance - which would be only 32 feet out of conformance.

However, we will evaluate the ROFA for the existing conditions, and thus use the location of the airport perimeter fence as the maximum ROFA available at this time.

When analyzing the risk associated with a reduction in Runway OFA it is important to consider the purpose of the design standard. Paragraph 3.12 of Advisory Circular 150/5300-13B defines the ROFA but does not give detailed design rational behind the standard:

> *"ROFA is a clear area limited to equipment necessary for air and ground navigation, and provides wingtip protection in the event of an aircraft excursion from the runway"*

Appendix I, Paragraph I.8 of Advisory Circular 150/5300-13B provides the only available reference to the design rationale behind the Runway OFA width:

> *"The ROFA serves two principal purposes: 1. Development buffer in proximity to a runway, and 2. Wing clearance for a runway excursion event to the outer limit of the RSA.* `

Appendix I, in Section I.8.2, also clarifies that part of the "development buffer" intent is:

> *"Protection of the ROFA also reserves space for future development of a parallel taxiway that permits proper alignment of aircraft at a holding position on an entrance taxiway."*

However, for the given physical layout of UAO there can be no plan for a parallel taxiway on the west side of the runway, because of the location of Highway 551 and that there never can be hangars or other aviation uses on that side of the runway. Therefore, that leaves the only ROFA purpose for UAO as only "wingtip clearance for a runway excursion" which is precisely what this analysis provides.

Below we will analyze resolving the ROFA utilizing the risk analysis method of ACRP Report #51, for the case:

- No Change to existing ROFA conditions on West Side of Runway (Hwy 551 and Airport Perimeter Fence remain as existing) resulting in a 312-foot clearance to runway CL.

Per the methodology of ACRP Report 51, we analyze the risks for each of the takeoff and landing scenarios. For landing operations, the analysis is further divided into two parts: airborne (approach) phase and ground (landing rollout) phase. However, because the risk of veering off the runway during takeoff is so much less than for during landing, the methodology indicates that usually it is not necessary to evaluate takeoff option except if there are runways that only are used for takeoffs and not for landings. We will do that takeoff evaluation in any case, just to clearly determine what it is in the UAO context.

Since the existing runway to taxiway separation meets the current criteria for a C-II airport, for this study that analysis would seem unnecessary. However, we will include that option in this report because it provides a baseline of safety that the AC 150-5300-13B Airport Design Standards have determined is an acceptable and appropriate level of safety for a C-II airport.

Thus, for this UAO ROFA analysis separate risks are developed for each of:

1. Airborne Phase (Landing) is for instrument approaches which terminate the approach as a missed approach, and the risk is hitting another object such as hitting the airport perimeter fence or a vehicle on Highway 551 (using ACRP Report 51 Fig. 31); “the airborne risk is computed only for missed approaches” (ACRP Report 51, page 21).
2. Ground Phase (Landing Rollout) where risk is veering off the runway into the reduced width ROFA and hitting the fence or a car on Highway 551 (using ACRP Report 51 Fig 42). Figure 42 is based on the assumption that the risk is between the two wingtips of two aircraft, one aircraft on the edge of the runway and the other at the centerline of a taxiway. The ACRP makes clear that the x-axis distance on the Risk Figures are centerline of runway to centerline of taxiway because the risk is assumed aircraft to aircraft. However, the predicted risk is based on the wingtip-to-wingtip distance. When using the Risk Figures for objects (not aircraft) like a fence or road (which has no wings), half of the wingspan should be added to the distance to compensate for the wingtip-to-wingtip assumption. Thus, per Group II standards, the clearance distance used for Figure 42 should add half of 79 feet (equals 39.5 feet) of additional clearance, which would create a total of 351 feet to use in Fig. 42. The risk shown with the 312 feet and the 351 feet are each shown in figures.

3. Ground Phase (Takeoff) where risk is veering off the runway into the reduced width ROFA and hitting the fence or a car on Highway 551 (using ACRP Report 51 Fig 49).

Finally, to have more relevant data, we will also perform the risk analysis of the standard required 300-foot separation between runway centerline and taxiway centerline for a landing, which is the level of safety the AC 150/5300-13B sets for in a C-II airport:

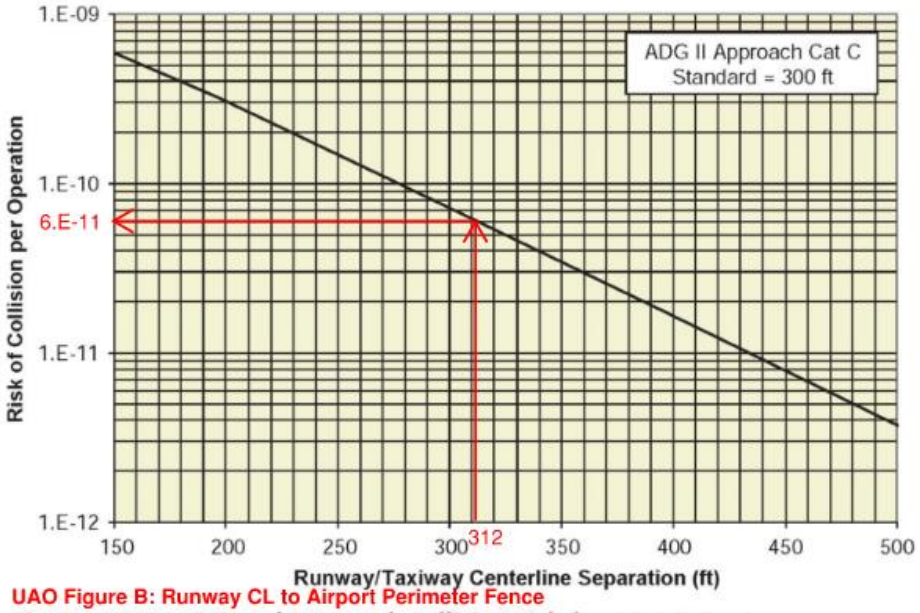
4. Ground Phase (Landing Rollout) where risk is veering off the runway into the taxiway (using ACRP Report 51 Fig 42).

This data will give us an example of an acceptable level of safety utilized in AC 150/5300-13B for a C-II airport.

5. Specific Analysis: Proposed MOS Option - No Change to Existing ROFA Conditions (312' Separation from Runway Centerline to Airport Fence)

The Perimeter Fence at the west side is located 312 feet from the runway centerline. The risks associated with leaving it there as a modification of standards, for each of the phases of flight are analyzed below:

1. Airborne Landing Phase Risk from Reduced ROFA – For a very conservative analysis we will assume that this includes all approach to landings, not just missed approaches. Using the separation of 312' and Figure AA-33 in Appendix A of ACRP Report #51, the following provides a risk level 6.0E-11 of occurrence per landing (which as an inverse, is one chance in a 16.7 trillion landings) that an aircraft gets 312' from the runway centerline. This can be seen in the figure below:

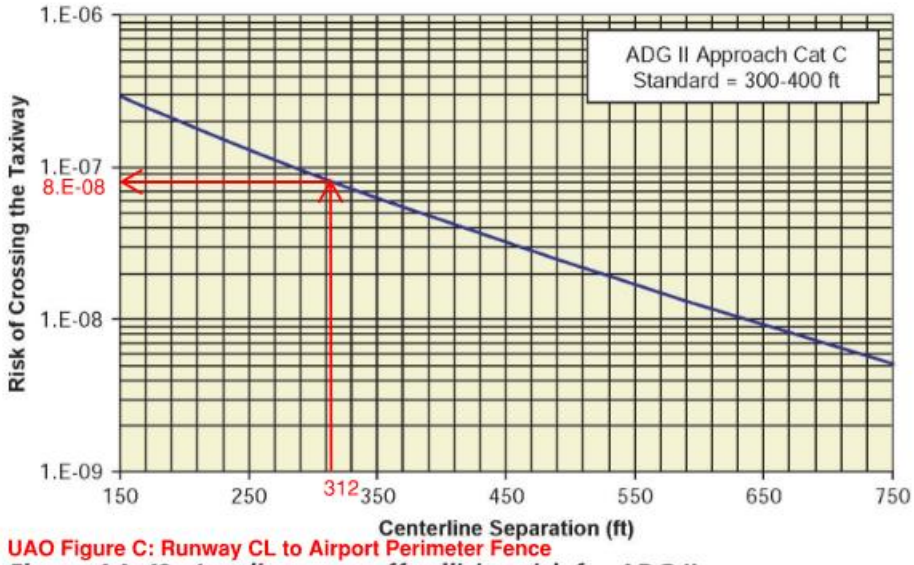


UAO Figure B: Runway CL to Airport Perimeter Fence

Figure AA-31. Missed approach collision risk for ADG II Cat I.

The current annual number of landing operations at UAO is approximately 45,115 or half of the 90,230 annual operations. As the risk is one incident in every 16.7 trillion landings, the time between occurrences is calculated as 16 trillion landings divided by 45,115 landing operations per year which equates to one incident every 369,000 years. Thus, this risk is of no significance.

2. Landing Roll Phase Risk for Reduced ROFA - Using the separation of 312' and Figure AA-43 in Appendix A of ACRP Report #51, provides a risk level 8.0E-08 or in the inverse: one chance in 12.5 million landings. This can be seen in the figure below:



UAO Figure C: Runway CL to Airport Perimeter Fence

Figure AA-42. Landing veer-off collision risk for ADG II.

As the risk is one incident in every 12.5 million landings, the rate of occurrence is calculated as 12.5 million landings divided by 45,115 landings per year which equates to one incident every 277 years.

Using the ACRP described adjustment when the object is not another aircraft and half the C-II wingspan can be added to the clearance distance, results in a separation of 351' and Figure AA-43 in Appendix A of ACRP Report #51, provides a risk level 6.0E-08 or one chance in 16.7 million landings. This can be seen in the figure below:

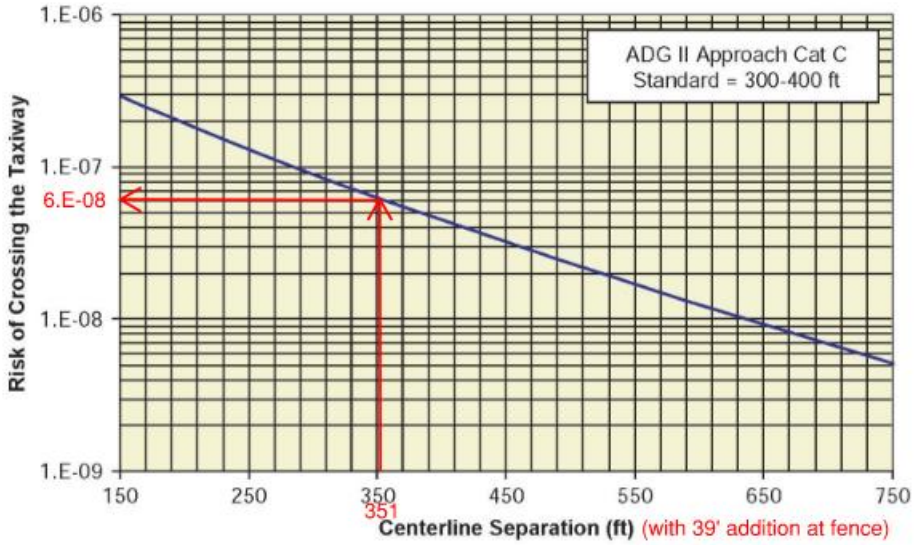
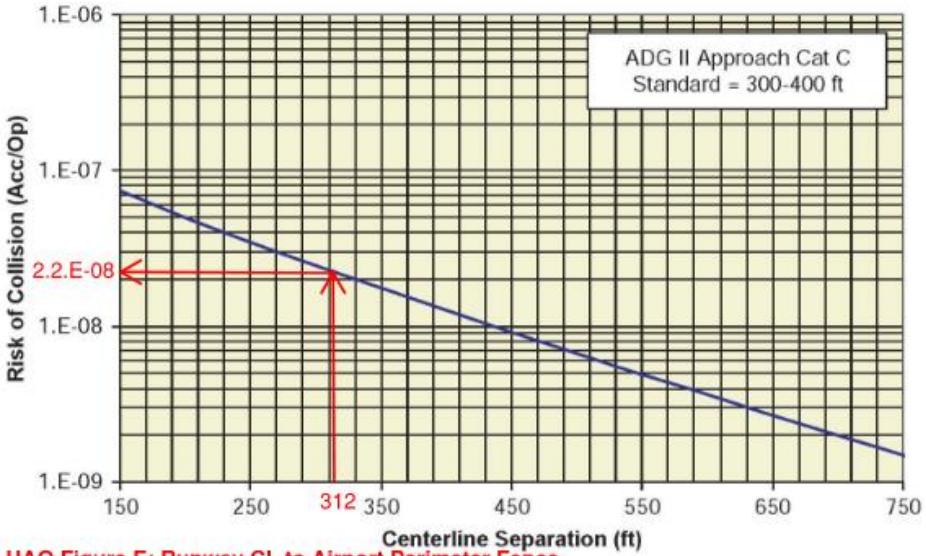


Figure AA-42. Landing veer-off collision risk for ADG II.
UAO Figure D: Runway CL to Airport Perimeter Fence Including Wingspan adjustment

As the risk is one incident in every 16.7 million landings, the rate of occurrence is calculated as 16.7 million landings divided by 45,115 landings per year which equates to one incident every 369 years.

3. Takeoff Roll Phase Risk for Reduced ROFA - Using the separation of 312' and Figure AA-49 in Appendix A of ACRP Report #51, provides a risk level 2.2E-08) or one chance in 45.5 million takeoffs. This can be seen in the figure below:

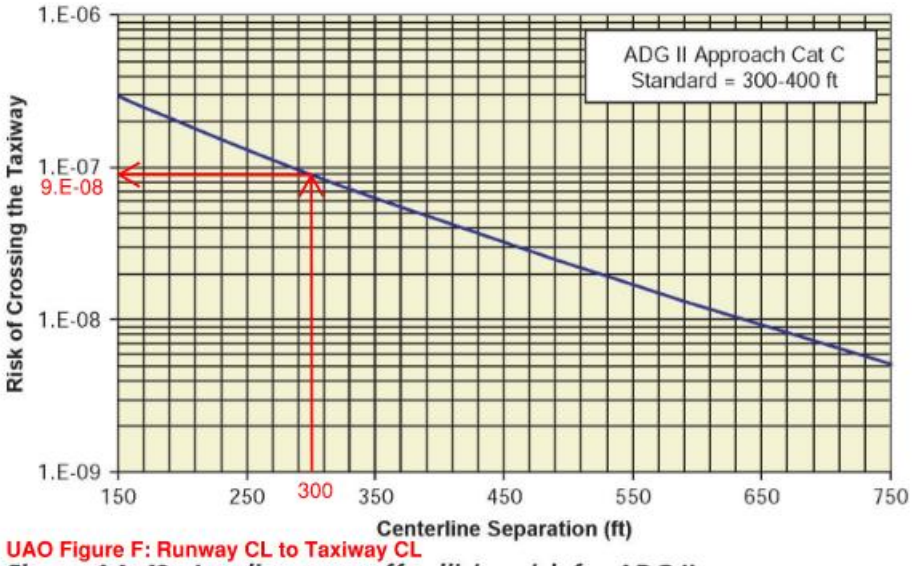


UAO Figure E: Runway CL to Airport Perimeter Fence
Figure AA-49. Takeoff veer-off collision risk for ADG II.

As the risk is one incident in every 45.5 million takeoffs, the rate of occurrence is calculated as 45.5 million takeoffs divided by 45,115 takeoffs per year which equates to one incident every 1,008) years.

Finally, as a test of the level of safety that AC 150/5300-13B considers acceptable we check what the predicted risk level is of the existing runway-taxiway separation considered appropriate[10] by FAA.

4. Landing Roll Phase Risk to Taxiway Consistent with Safety Standards of AC 150/5300-13B - Using the separation of 300' and Figure AA-43 in Appendix A of ACRP Report #51, provides a risk level 9.0E-08 or one chance in 11.1 million landings. This can be seen in the figure below:



UAO Figure F: Runway CL to Taxiway CL

Figure AA-42. Landing veer-off collision risk for ADG II.

As the risk is one incident in every 11.1 million landings, the rate of occurrence is calculated as 11.1 million landings divided by 45,115 landings per year which equates to one incident every 246 years.

[10] Note that Section 3-24 of Order 5100.38D Change 1 states that the FAA will not fund airport safety greater than that in the Airport Design standards, so the standard set by the runway-taxiway separation is a significant number. Order 5100.38D Change 1 can be downloaded for free at: https://www.faa.gov/documentLibrary/media/Order/AIP-Handbook-Order-5100-38D-Chg1.pdf

6. Conclusions

Considering the risk of each phase of flight, the risk of collision during the landing roll is the controlling factor. The Hazard Severity Classification for this type of operation would be major and the acceptable probability of occurrence is remote (1E-05) or less than once every 1-10 years. The following table summarizes the risk associated with each phase of flight:

Phase of Flight	Rate of Occurrence	Acceptable Level
Airborne Phase	Once every 369,000 years	Yes
Landing Roll Phase	Once every 277 years (or 369 years with calculation adjustment for fence object in lieu of wing object)	Yes
Takeoff Roll Phase	Once every 1,000 years	Yes

A runway to object separation of 312’ provides an acceptable level of safety as the controlling occurrence is once every 277 years (or 369 years with the adjustment for wingspan at the fence as allowed in the ACRP method). This is much less risk than the once per 100 years FAA standard shown in Table A-3 and results in a Category E “Extremely Improbable” occurrence. Further, per ACRP’s method, a wingtip to fence occurrence is considered by ACRP’s method to be a Table A-4 Minimal Severity occurrence. This combination via Figure A-1 concludes that the outcome as Low Risk.

Figure UAO F shows that the existing risk of occurrence between the existing runway and existing taxiway, which fully meets FAA standards, is one in every 246 years. This means that the risk to an occurrence at the taxiway, is much less (i.e. longer duration between events) than the FAA’s 100-year standard. The risk of collision with the perimeter fence is then even much less than that of a taxiway collision.

Finally, there is an incremental improvement option of ODAV and ODOT coming to an agreement to move the perimeter fence further west, to the east edge of the 12’ wide gravel shoulder, which would result in a 368-foot separation. If the 39.5-foot wing span correction is added at the new fence location, this results in an equivalent distance of 407 feet for use on Figure AA-42. That in turn would result in an ACRP predicted probability occurrence being once every 515 years, almost half the risk of a taxiway collision.

Given that the commercial use of aviation is itself only around 100 years old, these numbers of one predicted occurrence at the existing airport fence every 277 or 369 years, demonstrates the high level of safety that will be maintained at Aurora Airport with this MOS.

Given the regional and national importance of Aurora Airport for emergency medical, firefighting, and emergency power line moving, along with the use by local national corporations, using the MOS ensures the airport can continue to upgrade with safety improvements, and can continue to support the approximately 1,500 employees that rely on the airport for their livelihood.

This study shows definitively that the 2012 signing off on the Aurora Airport master plan and ALP with a modification of standards for the ROFA, by FAA and ODAV, was a reasonable and appropriate action to take. The same action should be taken for the current 2024 master plan work.

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