STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL

IN RE:	:	
	:	
APPLICATION OF NTE CONNECTICUT, LLC	:	DOCKET NO. 470
FOR A CERTIFICATE OF ENVIRONMENTAL	:	
COMPATIBILITY AND PUBLIC NEED FOR	:	
THE CONSTRUCTION, MAINTENANCE AND	:	
OPERATION OF AN ELECTRIC POWER	:	
GENERATING FACILITY OFF LAKE ROAD,	:	
KILLINGLY, CONNECTICUT	:	OCTOBER 13, 2016

SUPPLEMENTAL RESPONSE OF NTE CONNECTICUT, LLC TO CONNECTICUT SITING COUNCIL PRE-HEARING QUESTION SET ONE

RESPONSE TO QUESTION NO. 68

On September 23, 2016, the Connecticut Siting Council ("Council") issued Pre-Hearing Questions to NTE Connecticut, LLC ("NTE"), relating to the above-captioned docket. Responses to all but one question were filed with the Council on October 7, 2016. Below is NTE's response to Question No. 68.

Question No. 68

Provide an exhaust plume analysis using the MITRE software and include any inputs/assumptions and any outputs/computer printouts and associated conclusions regarding aviation safety in the vicinity of stack plumes similar to Late Filed Exhibit No. 1 in Council Petition No. 1218.

Response

The results discussed in this response are based upon the Exhaust Plume Analyzer software package (the Analyzer) developed and verified by MITRE, a computer simulation model that calculates the potential effects of a vertically discharged plume under actual

meteorological conditions. The Analyzer is copyrighted by MITRE and was produced under contract with the federal government. Version 1.0.1.1 was used to generate the results discussed in this response. For the purposes of this response, NTE, through its consultant, Tetra Tech, has accepted the methodology used in the calculations as correct and adequate.

Background

The KEC stack is located approximately 2.9 miles (2.6 nautical miles) north-northwest of the 2,700-foot long Runway 13/31 of Danielson Airport, the nearest air navigation facility. Although the KEC stack was not required to file with the FAA, due to the proposed height and distance from the nearest air navigation facility, it was important to NTE to obtain a determination from the FAA. A Determination of No Hazard to Air Navigation was issued by the FAA for the KEC stack on July 18, 2016. (*See* NTE Application, Appendix J).

NTE appreciates that concerns can exist proximate to thermal exhaust stacks where small aircraft are likely to be in critical phases of flight (according to FAA, particularly takeoff, landing, and within the pattern[1]). In this instance, the proposed stack is 2.9 miles (2.6 nautical miles) from and not aligned with the nearest runway; aircraft would not be expected to be in critical phases of flight when in the vicinity of the KEC facility. The FAA has defined minimum safe altitudes for general aviation activities. Over congested areas (cities, towns, etc.), aircraft must fly no lower than 1,000 feet above the highest obstacle within a horizontal 2,000-foot radius of the aircraft. Over other areas, aircraft should fly no lower than 500 feet above the ground. Except when taking off or landing, no aircraft may operate below these set minimum altitudes. In addition, in order to maintain a current license, all aircraft pilots are required to complete a

[1] An airfield traffic pattern is a standard path that aircraft follow when preparing to land. Aircraft typically circle the airfield in this traffic pattern, following the set path and altitude, while awaiting authorization to land.

Biennial Flight Review (BFR). This refresher training includes classroom as well as flight time, and is intended to enhance pilot awareness of regulatory and other information included in the Aeronautical Information Manual (AIM). This would include guidelines related to flight operations in the vicinity of power plants and other similar infrastructure. Regulations have been in place for more than 10 years for pilots operating under visual flight rules (VFR) to remain clear of power plants.

Other tall structures exist in the immediate vicinity of the proposed KEC stack, including other exhaust stacks, which is another reason it is unlikely pilots would fly low enough to be influenced by KEC's exhaust plume. For example, the three nearby Lake Road Generating facility stacks are 165 feet tall and would have an exhaust when operating, and the adjacent Eversource electric transmission corridor includes structures with heights ranging from 364 to 469 feet amsl, whereas the KEC stack is 150 feet tall and 465 feet amsl).

Inputs & Assumptions

Since KEC will primarily run on natural gas, Tetra Tech ran the Analyzer assuming 100 percent load on natural gas. The supplemental firing system (duct burners) were also conservatively assumed to be in operation. Since the plume would be larger under colder ambient temperatures, the exhaust temperature and flow rate incorporated into the analysis were those for the -10°F condition (188°F and 61.42 feet per second, respectively).

The Analyzer estimates the vertical and radial extent of conditions above the proposed KEC stack with various probabilities of producing either severe turbulence or an aircraft upset as a result of stack emissions of a buoyant plume. Recent applications in Connecticut, such as Late Filed Exhibit No. 1 in Council Petition No. 1218 focus on the probability level of the 1 x 10 (or 1 in 10,000) probability level as a more realistically conservative benchmark.

Results are a function of meteorology; stack height and diameter; stack flow and temperature; and aircraft type. Severe turbulence is defined by MITRE as a vertical acceleration of 1g or greater; an upset is defined as a 45° wing tilt for an aircraft already executing a turn with a 25° wing tilt. Note that upset conditions for "Light Sport" aircraft type are not incorporated in the analysis, as MITRE has determined insufficient data are available for that case.

Analyzer Output

The Analyzer produces results in image form, generating seven plots. Four different types of aircrafts are configured in the Analyzer: Light-Sport (based on Cessna 162, powered parachute aircraft, sport gyroplane aircraft, and light sport glider), Light General Aviation (GA) (based on Piper Warrior/Cessna 172 class aircraft), Business Jet (based on Lockheed Jetstar class aircraft), and Narrow-Body Jet. Probability graphs are generated for each type of aircraft depicting the probability of encountering a plume that would produce a vertical acceleration equivalent to that associated with severe turbulence (1g or greater). A second probability graphic is generated for all aircraft types except for Light-Sport that depicts the probability of encountering a plume condition (while in a turn with a 25° wing tilt) which could produce an upset (45° wing tilt). Note that these results are generated irrespective of whether the plume would be located in an area where wing tilt would be likely; as noted above, aircraft in such critical phases of flight are unlikely to be in proximity to the KEC stack. The probabilities are calculated based on the results of a model simulation run on each of the 25,270 valid hours of meteorological data. Graphic results are provided as an attachment to this response.

- *Light-Sport* – Based on the generated results, a "Light-Sport" aircraft would have a 1 in 10,000 probability of encountering a plume condition that would produce a vertical acceleration equivalent to that associated with severe turbulence when within a vertical

distance of approximately 1,250 feet and a radial distance of approximately 400 feet. For a Cessna 162, a 400-foot plume can be fully traversed in approximately 2 to 3 seconds (125 miles per hour, or 183.3 feet per second).

- *Light GA* – Based on the generated results, a "Light GA" aircraft would have a 1 in 10,000 probability of encountering a plume condition that would produce a vertical acceleration equivalent to that associated with severe turbulence when within a vertical distance of approximately 600 feet and a radial distance of approximately 400 feet. A "Light GA" aircraft would have a 1 in 10,000 probability of encountering a plume condition (while in a turn with a 25° wing tilt) that could produce an upset when within a vertical distance of approximately 250 feet and a radial distance of approximately 170 feet.
- *Business Jet* – Based on the generated results, a "Business Jet" aircraft would have a 1 in 10,000 probability of encountering a plume condition that would produce a vertical acceleration equivalent to that associated with severe turbulence when within a vertical distance of approximately 350 feet and a radial distance of approximately 400 feet. A "Business Jet" aircraft would not have a 1 in 10,000 probability of encountering a plume condition (while in a turn with a 25° wing tilt) that could produce an upset.
- *Narrow-Body Jet* – Based on the generated results, a "Narrow-Body Jet" aircraft would have a 1 in 10,000 probability of encountering a plume condition that would produce a vertical acceleration equivalent to that associated with severe turbulence when within a vertical distance of approximately 200 feet and a radial distance of approximately 320 feet. A "Narrow-Body Jet" aircraft would not have a 1 in 10,000 probability of

encountering a plume condition (while in a turn with a 25° wing tilt) that could produce an upset

Summary

After thorough analysis, the FAA has determined that overall risk associated with thermal exhaust plumes in causing a disruption of flight is low; however, the FAA also determined that thermal exhaust plumes may pose a unique hazard to aircraft in critical phases of flight (takeoff, landing, and within the pattern). The Analyzer was designed under contract with the federal government to identify the probability of risk to aircraft when in these critical phases. Due to the distance between the KEC stack and the Danielson Airport runway, aircraft are not anticipated to be in a critical phase of flight when proximate to the KEC stack. However, in accordance with the Council's request, the Analyzer has been utilized to assess the exhaust from KEC's 150-foot stack.

The Analyzer output for KEC winter conditions indicates that significant distance is maintained between the exhaust plume and the Danielson Airport. For smaller aircraft, of the type expected to use Danielson Airport, the area of turbulence probability extends vertically more than it extends radially. The probability of severe turbulence is indicated within a relatively narrow horizontal extent; for example, the 400-foot radial distance of the turbulence area calculated for the Light Sport aircraft would be traversed within approximately 2 to 3 seconds. This type of short duration turbulence is not unlike that associated with other weather experienced during flight conditions.

In addition, the presence of other taller structures in proximity to the KEC stack would be expected to cause pilots to provide additional distance between the ground and air travel. The Lake Road Generating stacks are located approximately 3.5 miles from Danielson Airport; no

incidents have been recorded by the National Transportation Safety Board (NTSB) in association with that stack exhaust, over the 14 years those stacks have been in place.

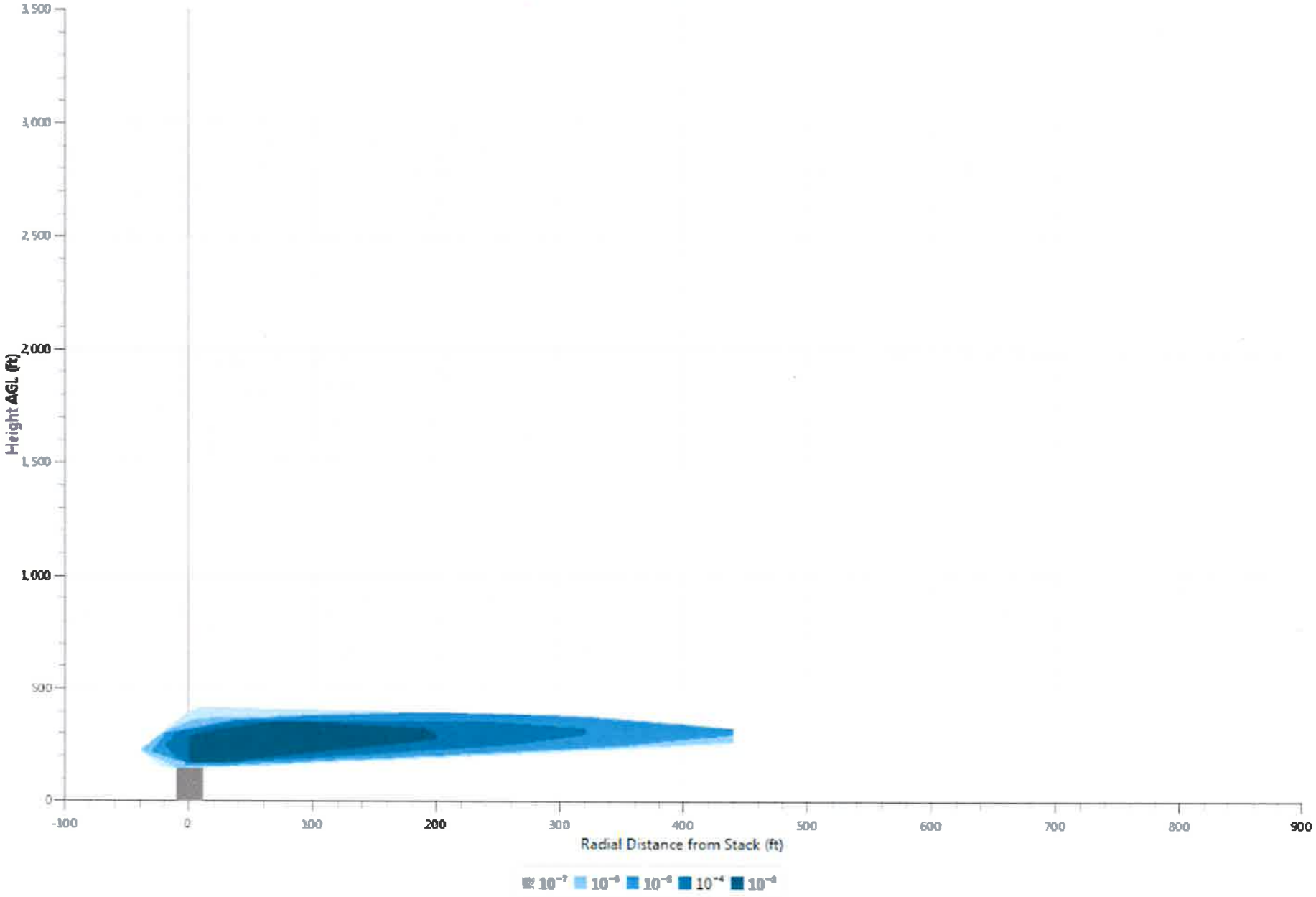
CERTIFICATION OF SERVICE

I hereby certify that on this 13th day of October, 2016, a copy of the foregoing was sent via electronic mail and first class mail, postage prepaid, to the following:

John Bashaw, Esq.
Mary Mintel Miller, Esq.
Reid and Riege, P.C.
One Financial Plaza, 21st Floor
Hartford, CT 06103
jbashawfilrrlawpc.com
mmiller@rrlawpc.com

Sean Hendricks, Town Manager
Town of Killingly
172 Main Street
Killingly, CT 06239
shendricks@killinglyct.org

Kenneth C. Baldwin



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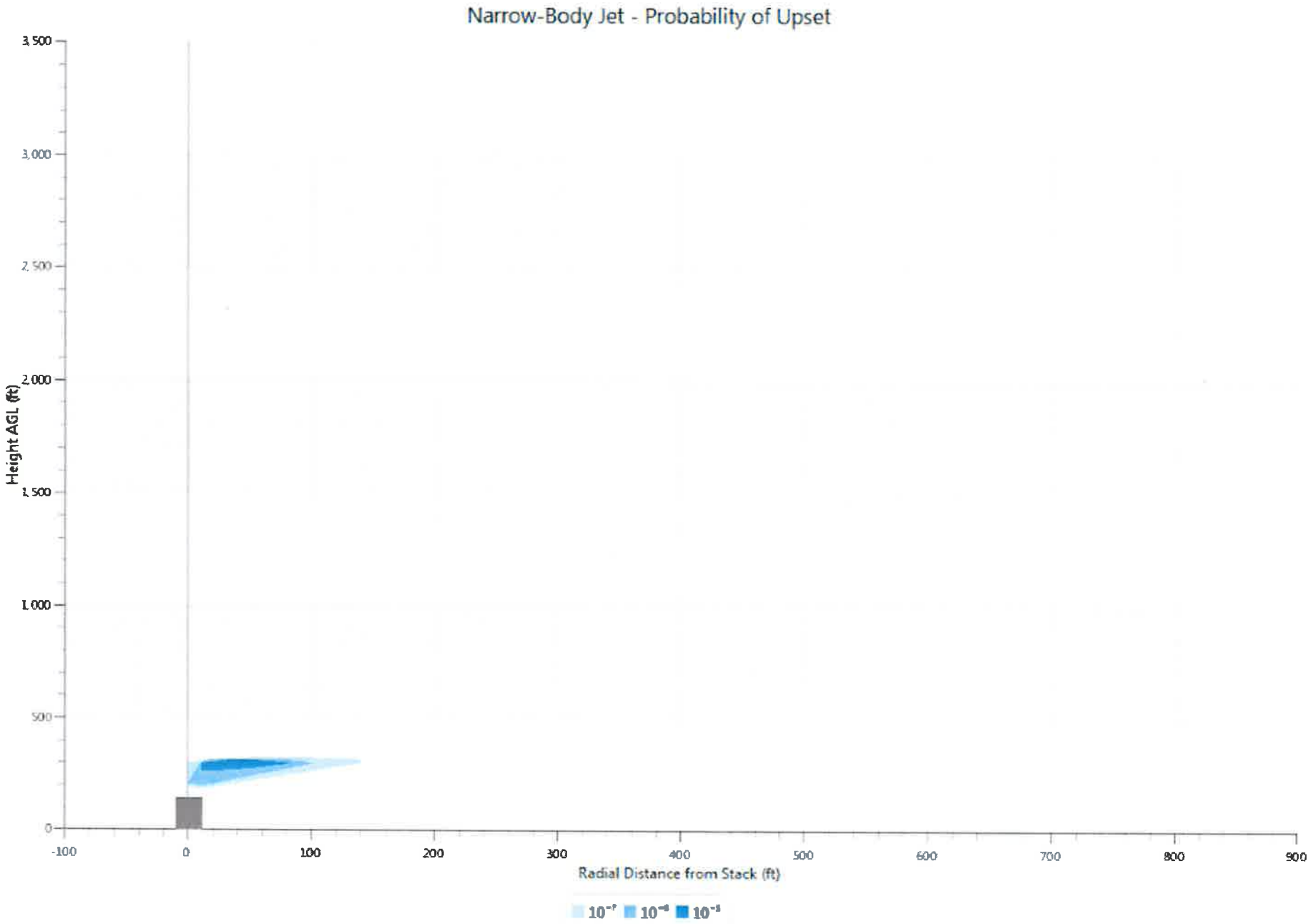

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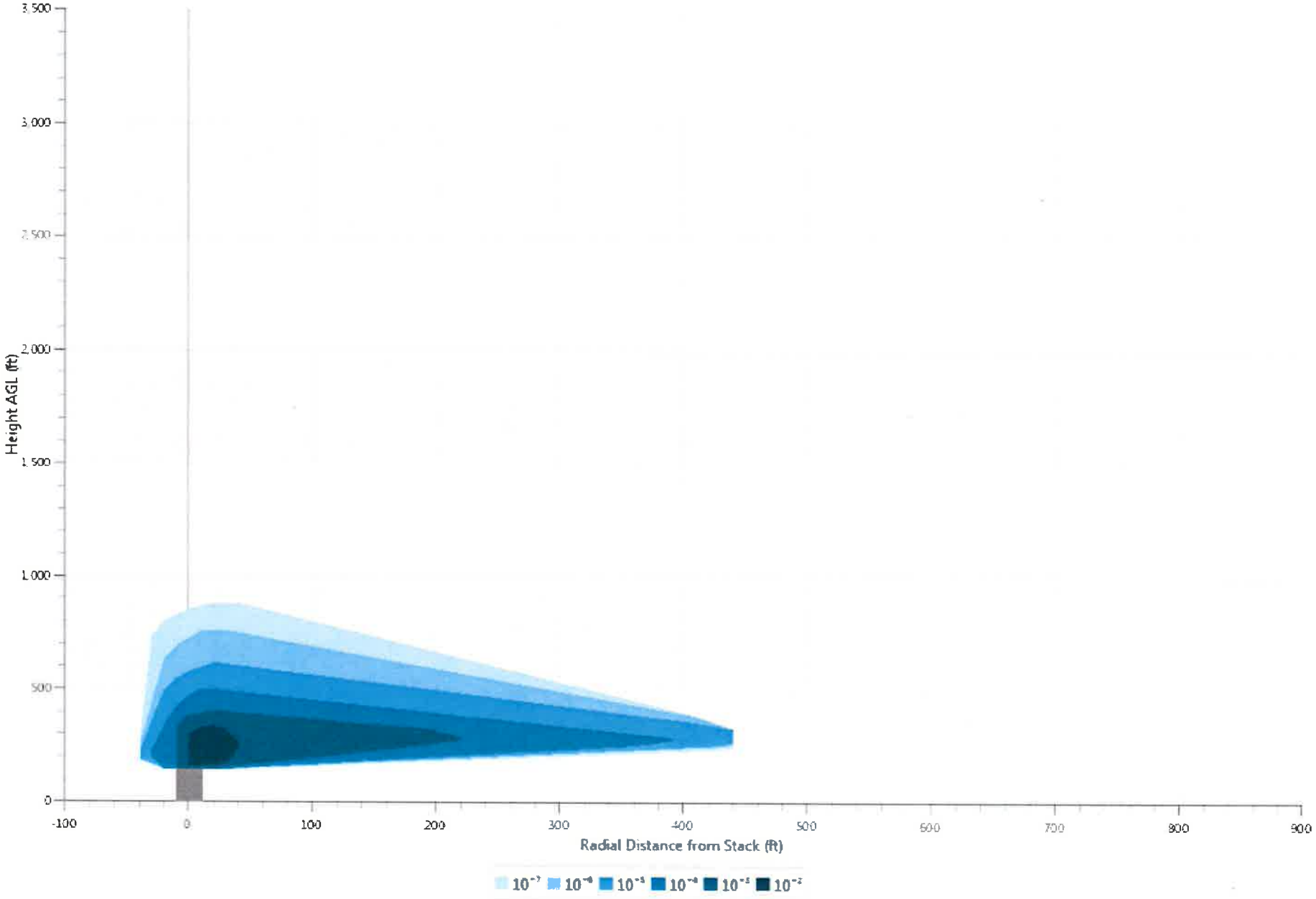
Business Jet - Probability of Severe Turbulence



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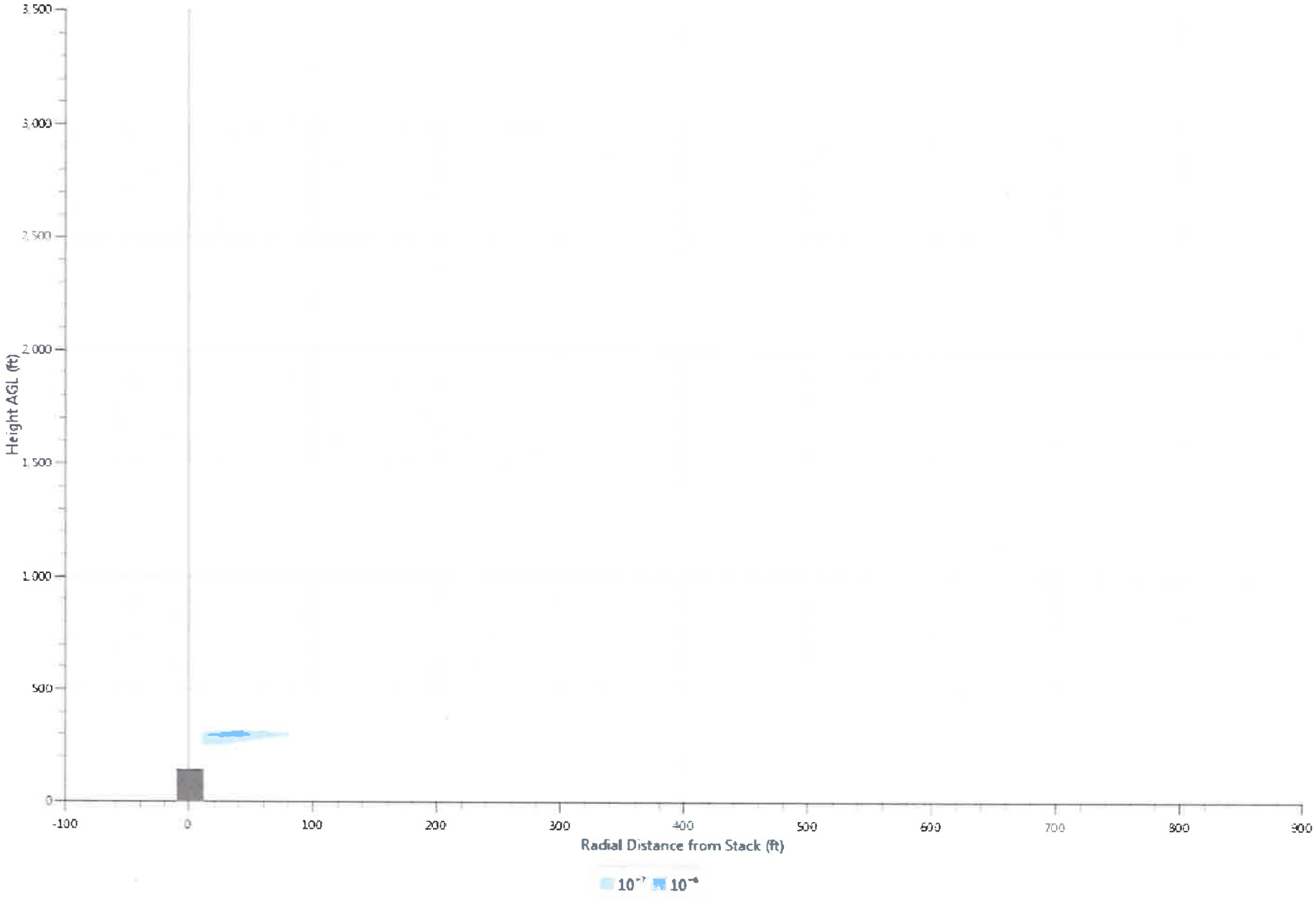
Save current chart as image

Business Jet - Probability of Upset



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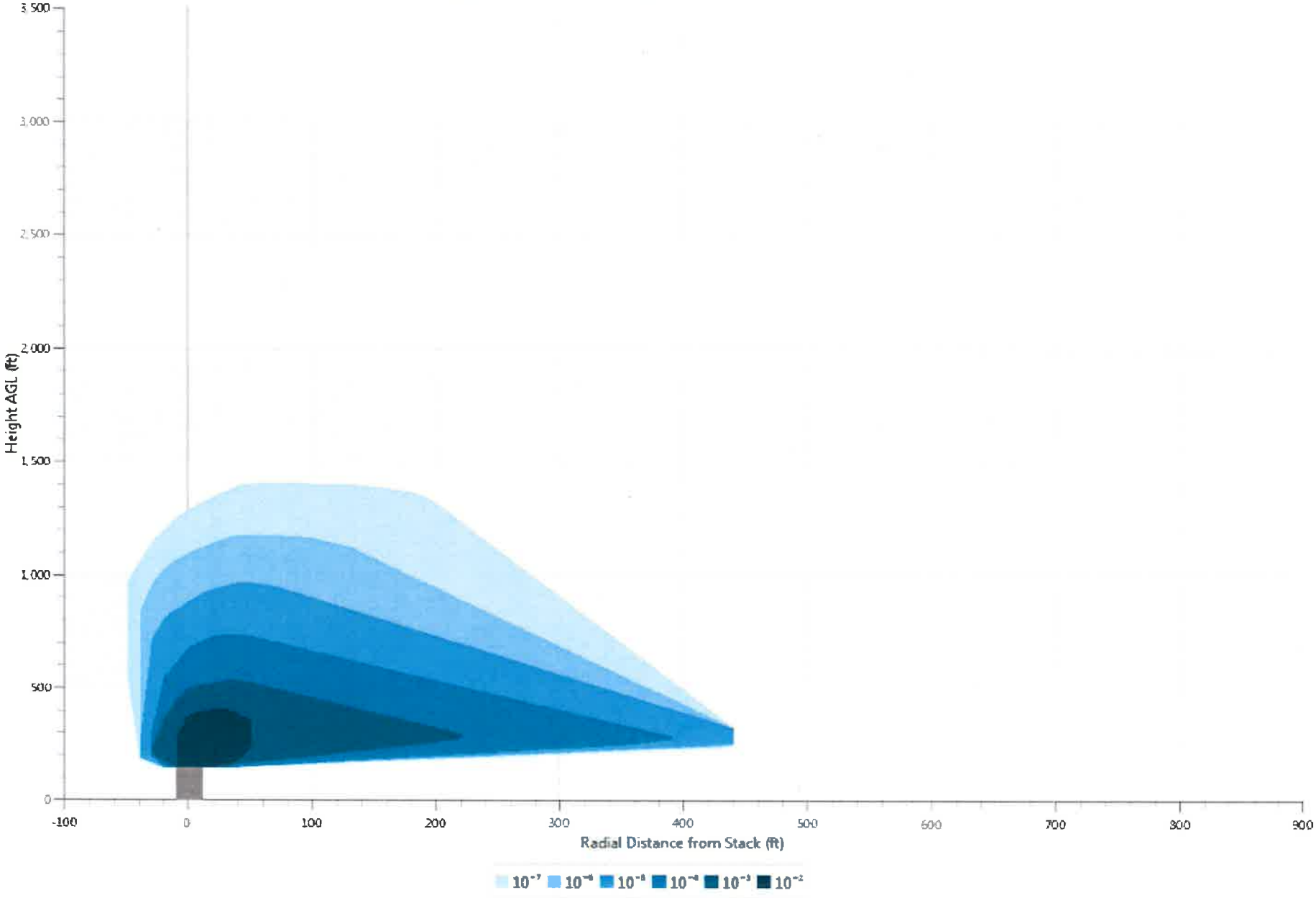
Save current chart as image

Light GA - Probability of Severe Turbulence



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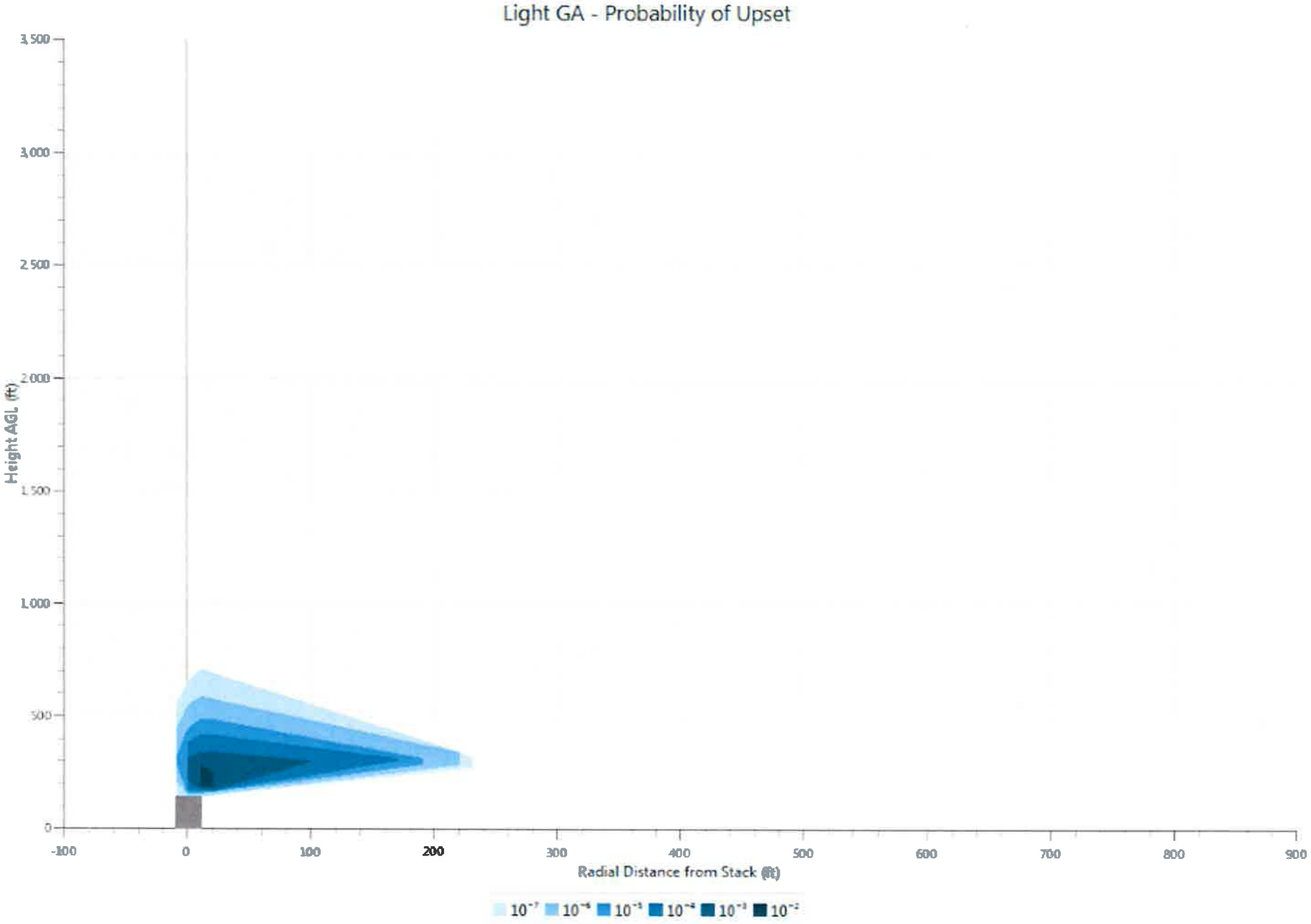

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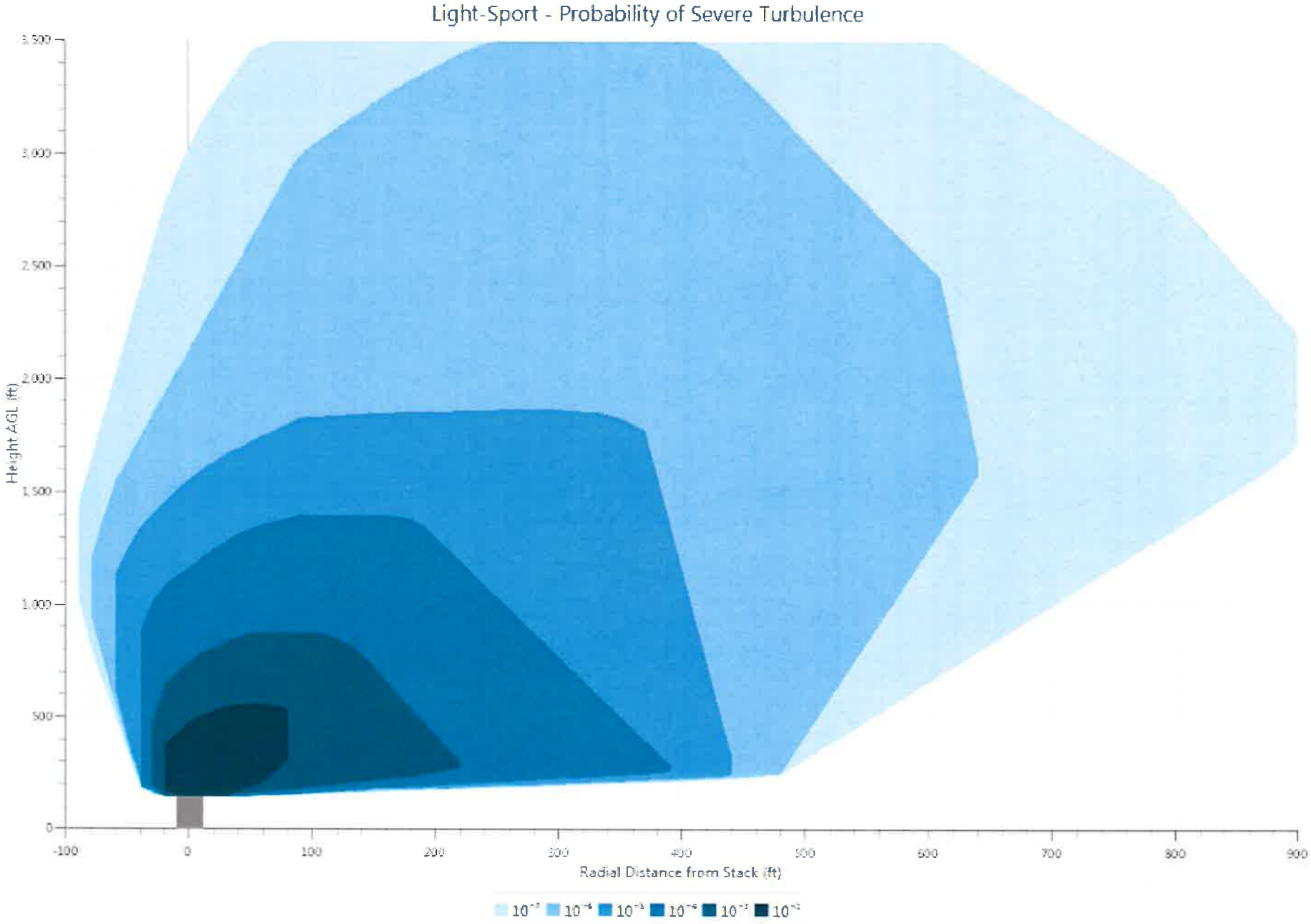

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