Small Aircraft Runway Length Analysis Tool
Quick User Guide

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VIRGINIA TECH

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Federal Aviation Administration

ACRP AIRPORT COOPERATIVE RESEARCH PROGRAM
SARLAR 1 funded through ACRP Program
Contributions to SARLAT version 1
C. Beamon and D. Leech
Delta Airport Consultants

Version 2.0.1
August 25, 2026

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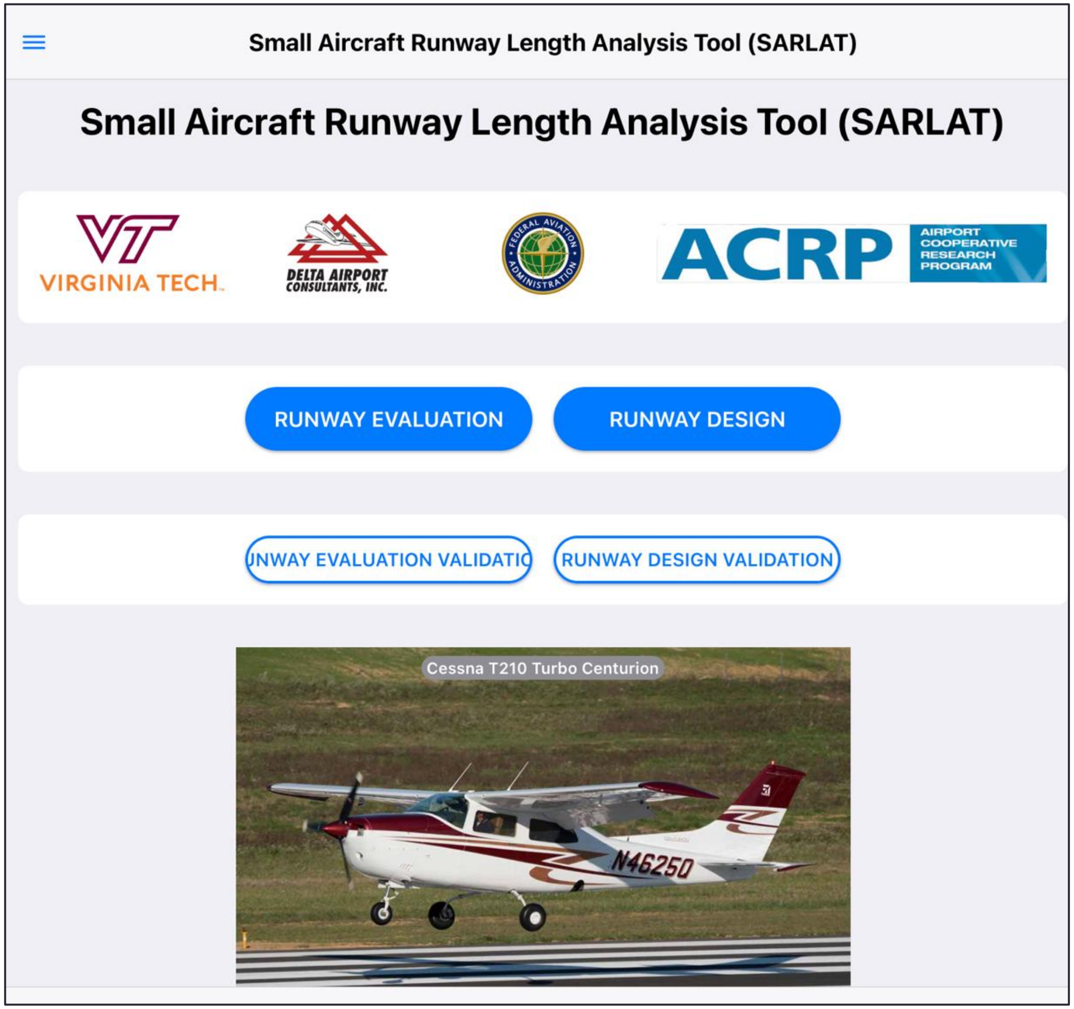
Small Aircraft Runway Length Analysis Tool
Installation Instructions



Installation Instructions for Windows OS

Step 1: Download the Small Aircraft Runway Length Analysis Tool (SARLAT) setup file from:

Windows:

https://atsl-software-downloads.s3.us-east-1.amazonaws.com/sarlat/V2.0.1/SARLAT+2+Setup+2.0.1.exe

Step 2: Locate the downloaded file on your hard drive folder
SARLAT+2+Setup+2.0.1.exe

Step 3: Install the application
Double click on the **SARLAT+2+Setup+2.0.1.exe** file

Note: Non-FAA users do not need Administration privileges to install SARLAT

Installation Instructions for FAA Users

FAA users need to contact FAA IT support and help desk services:

Contact FAA MyIT Help Desk by calling (844) 322-6948 (1-844-FAA-MYIT)

Email: helpdesk@faa.gov

You can also reach general FAA support at (866) 835-5322 (866-TELL-FAA)

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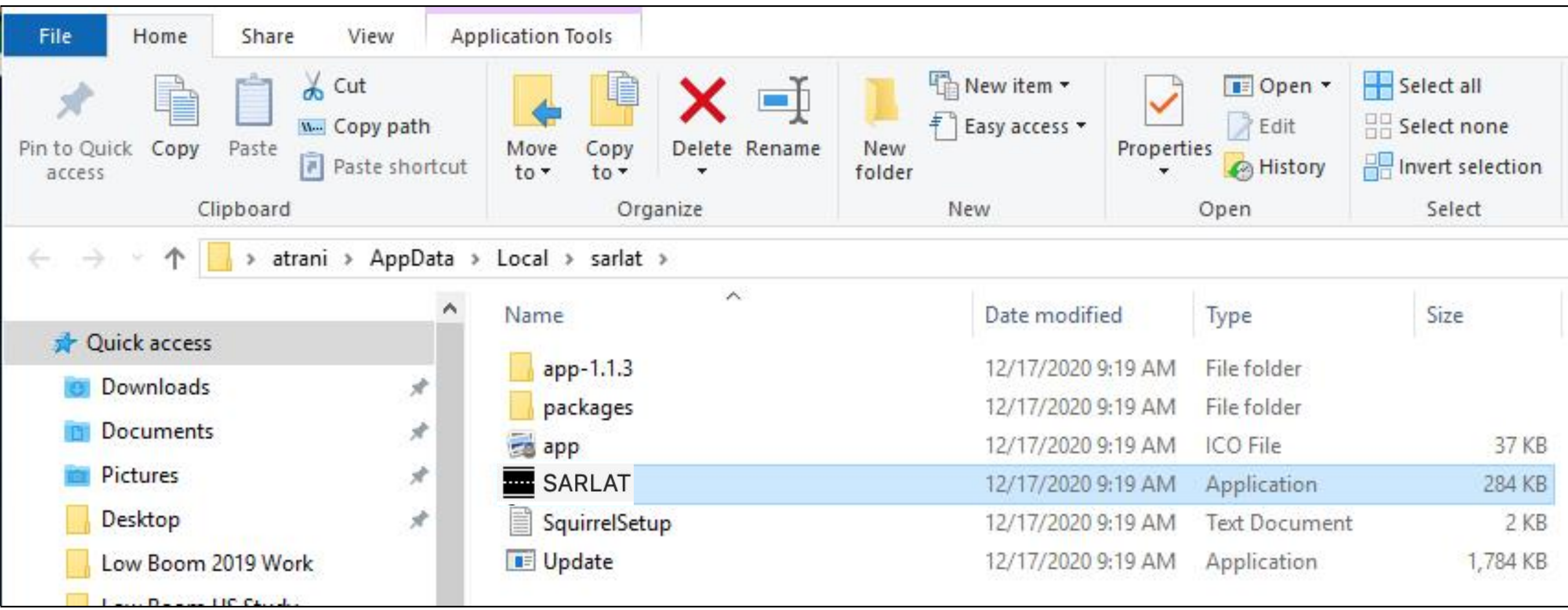
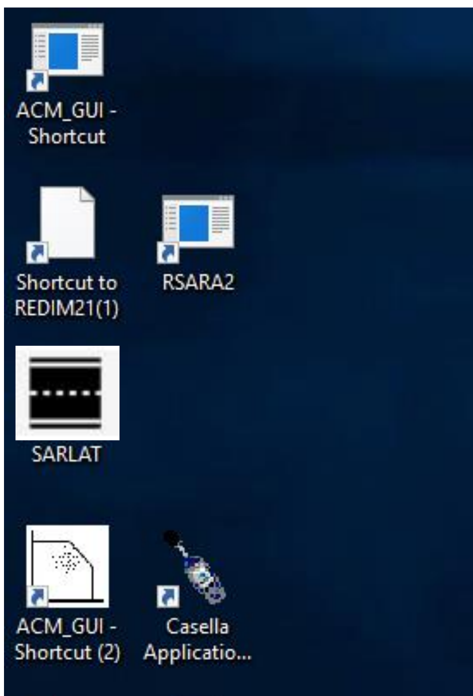
SARLAT Installation Files in Windows OS

- SARLAT is usually installed in your local drive under the name SARLAT
- The example shows SARLAT installed in the **user/AppData/local folder**



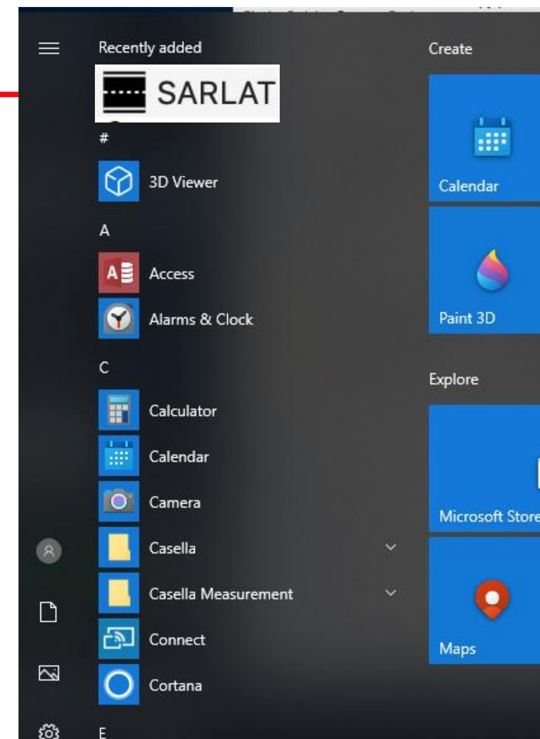
Running the Small Aircraft Runway Length Analysis Tool in **Windows** after Installation

- After installation, SARLAT creates an icon on the desktop automatically
- To run the application again, use the icon on the desktop



Small Aircraft Runway Length Analysis Tool Application icon installed on the Desktop

SARLAT can be executed from the **Applications Panel** in Windows



Installation Instructions for Mac OS

Step 1: Download the Small Aircraft Runway Length Analysis Tool (SARLAT) setup file from:

Mac Intel Processor:
https://atsl-software-downloads.s3.us-east-1.amazonaws.com/sarlat/V2.0.1/SARLAT+2-2.0.1.dmg

Apple Silicon Processors (M1-M5):
https://atsl-software-downloads.s3.us-east-1.amazonaws.com/sarlat/V2.0.1/SARLAT+2-2.0.1-arm64.dmg

Step 2: Locate the downloaded file on your hard drive folder. The file is an Apple Disk Image file called **SARLAT+2-2.0.1-arm64** or **SARLAT+2-2.0.1.dmg** depending upon your Mac processor

Step 3: Install the application

Double click on the **SARLAT+2-2.0.1-arm64 (or SARLAT+2-2.0.1.dmg)** file on the Mac OS

Note: The Mac Intel version of SARLAT will run on Apple Silicon Processors with little speed degradation.

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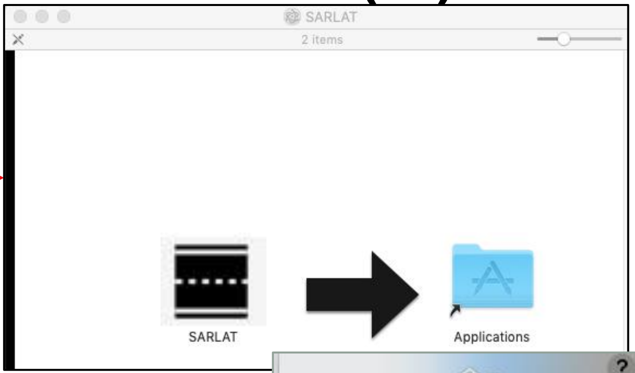
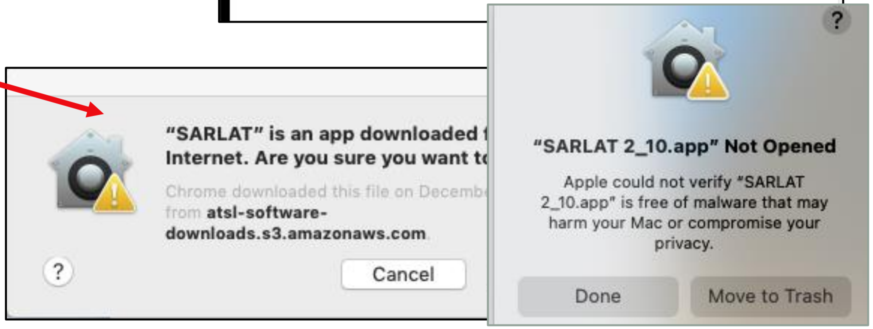
Installation Instructions for Mac OS (2)

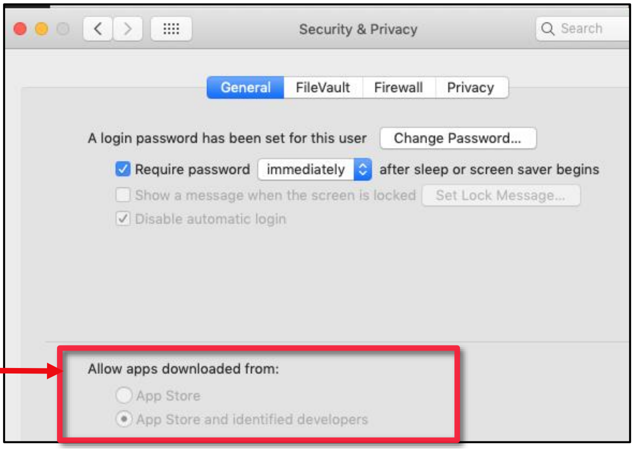
Step 4: Drag the SARLAT application icon to your Applications Folder



Step 5: Click **Open** in the security warning allowing the SARLAT application to run in your computer



Step 6: If necessary, allow the SARLAT application dialog in the **Security & Privacy** inside the **Systems Preferences**



Running SARLAT in **Mac OS** after Installation

- After installation, the SARLAT Application resides in the Applications Folder in your computer

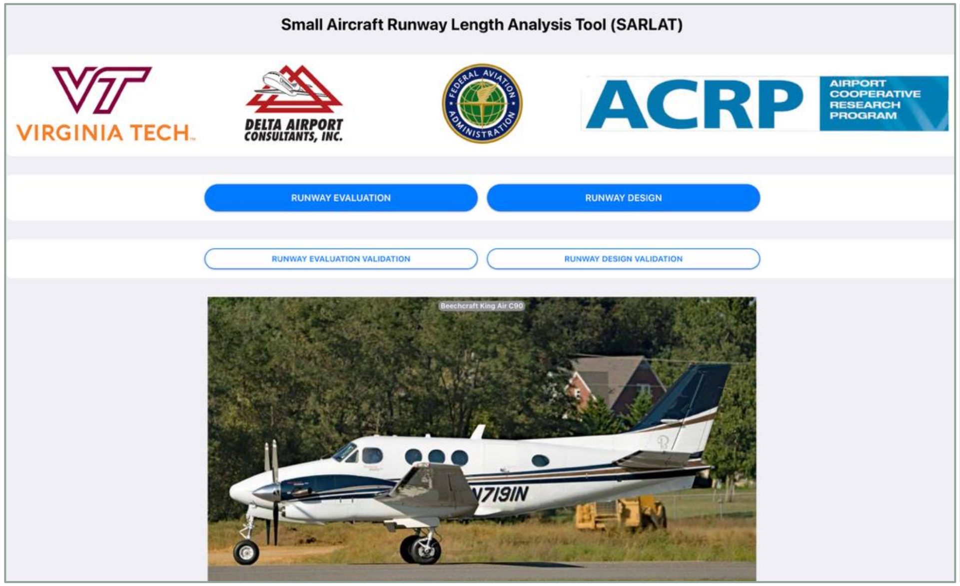
- Double click in there SARLAT icon to run the application
- You can create a shortcut by dragging the SARLAT Application icon to the computer task bar

SARLAT Application Icon

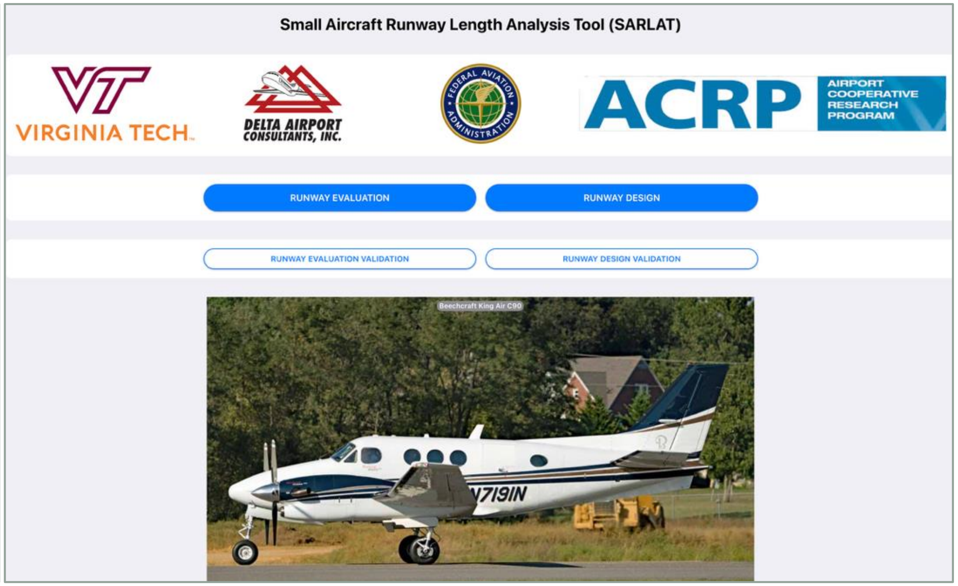
Small Aircraft Runway Length Analysis Tool

- Functionality of the model is the same for both Windows and Mac OS users
- Tool is programmed using Javascript and Hypertext Markup Language (HTML)
- SARLAT does not require a connection to the Internet or a server

Mac OS 15.1 Operating System



Windows 11 Operating System



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Using the Small Aircraft Runway Length Analysis Tool

General Information About SARLAT 2.0.0.18

- SARLAT contains detailed takeoff and landing performance data for individual aircraft
- SARLAT includes 79 aircraft from Light Sport Aircraft (e.g., RV-10/12) to large business jets (Bombardier Global Express 6000)
  - 32 business jets weighing up to 100,000 lbs.
  - 34 representative single-engine and multi-engine piston aircraft
  - 13 representative turboprop aircraft (including two agricultural aircraft)
- SARLAT is a stand-alone computer application developed in Javascript and HTML
- Runs in Windows and Mac OS

SARLAT Reported Takeoff Distances

Aircraft Type	Takeoff Distances Reported in SARLAT
Jet Aircraft (all weights)	Dry runway Takeoff Field Length (TOFL)[1] Wet runway Takeoff Field Length (TOFL)
Piston and Turboprop Aircraft with maximum takeoff weight up to 12,500 lbs.	Dry runway takeoff distance to clear a 35-foot[2] obstacle Wet runway takeoff distance to clear a 35-foot obstacle
Turboprop Aircraft with maximum takeoff weight above 12,500 lbs.	Accelerate-stop-distance or Takeoff Field Length (TOFL) if that value is reported by the manufacturer.

1) *"The runway distance required for an aircraft to safely accelerate from a standing start, transition to flight, and clear a standard obstacle (typically 35 feet above the runway) or safely abort the takeoff" (Aircraft Owner's Pilot Association, 2013).*

2) Some aircraft manufacturers report takeoff distance to clear a 50-foot obstacle

Note: For AIP projects, use **dry takeoff** performance charts.

SARLAT Reported Takeoff Field Length

Takeoff Field Length (TOFL) considers three criteria to establish takeoff distance:

1) All-engine go distance (AED)
115% of the actual distance required to accelerate and clear a 35-foot obstacle

2) Accelerate-stop distance (ASD)
Distance required to accelerate with all engines, have an engine failure prior to the decision speed, and stop the aircraft on the runway using wheel and air brakes (no thrust reverser)

3) Engine-out accelerate and go distance (EOD)
Distance required to accelerate with all engines, have an engine failure prior to the decision speed, and continue the takeoff to clear a 35-foot obstacle

Aircraft Flight Manuals report the Takeoff Field Length as a single value (i.e., the most limiting of the three conditions described above). SARLAT reports TOFL as a single value.

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SARLAT Reported Landing Distances

Aircraft Type	Landing Distances Reported in SARLAT
Jet Aircraft Turboprop aircraft	1) Uncorrected[1] dry runway landing distance 2) Wet runway landing distance published by the aircraft manufacturer or the dry landing distance with an additional 15% margin 3) Corrected dry pavement landing distance (1.67 times the uncorrected dry landing distance) for aircraft operating under 14 CFR Part 135 rules or Part 91K 4) Corrected wet pavement landing distance (1.92 times the uncorrected dry landing distance) for aircraft operating under 14 CFR Part 135 EOD rules with an approved safety program
Piston Aircraft	1) Uncorrected[1] dry runway landing distance 2) Wet runway landing distance published by the aircraft manufacturer or the dry landing distance with an additional 15% margin.

1) *"The uncorrected landing distance (or actual landing distance) is the baseline stopping distance published in an aircraft's flight manual" (Flight Safety Foundation ALAR Briefing Note, Landing Distances).*

Note: For AIP projects, use **wet landing** performance charts.

How to Identify the Operating Regulations Applicable to the Runway Length Evaluation?

Regulation>>>	Part 91	Part 135	Part 91K	Part 135.4 "Eligible on Demand"
Who	Non-commercial operators, as well as ferry flights Filed as N number	Up to 30 seats Scheduled or Charter Filed with callsign	Fractional Filed with callsign	• Scheduled <5 round trips weekly scheduled, no jets, 9 seats max • Nonscheduled with <=30 seats, 7500 pounds max payload, or all-cargo Filed with callsign
Weather Reporting at Destination	None	Required for IFR	Can conduct approach to minimums at destination, if alternate has weather reporting	Can conduct approach to minimums at destination, if alternate has weather reporting
Landing Buffer for Jets	None	Land within 60% of available dry runway length; +15% if wet (Turboprops 70% with no wet adjustment)	Same as Part 135	Land within 80% of available dry runway length, if operator has approved safety program; +15% if wet

- A commercial, for-profit aircraft operator is approved to operate under specific regulations.
- A given operator may be operating under Part 91K for some flights with passengers, Part 135.4 Eligible or Demand (EOD) for other flights with passengers, and Part 91 for a ferry flight with no passengers
- Part 91 is the default. Identify the most common operating regulation used by an aircraft operator at the airport and assume that all flights are conducted under that regulation.

Landing Weight Information in SARLAT

- SARLAT includes landing performance data for all landing weight conditions published by the aircraft manufacturer
- **For AIP projects, SARLAT has default landing weights for each aircraft**
- The default landing weight is estimated as the Basic Operating Weight (BOW), the weight of the average number of passengers carried, and the fuel reserve according to National Business Aircraft Association guidelines
- Detailed information about the landing weights used in SARLAT is included at the end of this User Guide.

Note: For AIP projects, use **the default landing weight** factors programmed in SARLAT.

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SARLAT Runway Length Analysis Limits

Parameter	Lower Limit	Upper Limit	Remarks
Temperature (deg. Fahrenheit)	As per aircraft manufacturer data	As per aircraft manufacturer data	Jet powered aircraft reported to 40-50 degrees. Celsius.
Pressure Altitude (feet)	0	None	Performance data is reported to 8,000 feet altitude. For many jets, the data covers up to 12,000 feet.
Wind (knots)	-10	5	Headwind is negative
Runway Gradient (%)	0	2	Assumes both runway ends of the runway are used (uphill is positive)
Runway Surface Conditions	Dry, Wet, Grass*, and Gravel*		

- Grass and gravel information applies to few aircraft in SARLAT
- SARLAT data sources are Pilot Operating Handbooks, Aircraft Flight Manuals, and Flight Planning Guides

Takeoff Obstacles

- SARLAT assumes that any obstacles affecting takeoff can be visually avoided by the pilot, including One Engine Inoperative (OEI) as applicable to typical operations of GA jet aircraft and large turboprops
- However, trips conducted at higher density altitudes and very long trip distances (e.g., oceanic flights) can be payload-impacted due to OEI
- When significant OEI obstacles are present beyond the airport perimeter, a detailed aircraft performance engineering analysis is recommended: consult with Part 135 aircraft operators using the airport to assess if this is needed, or not.

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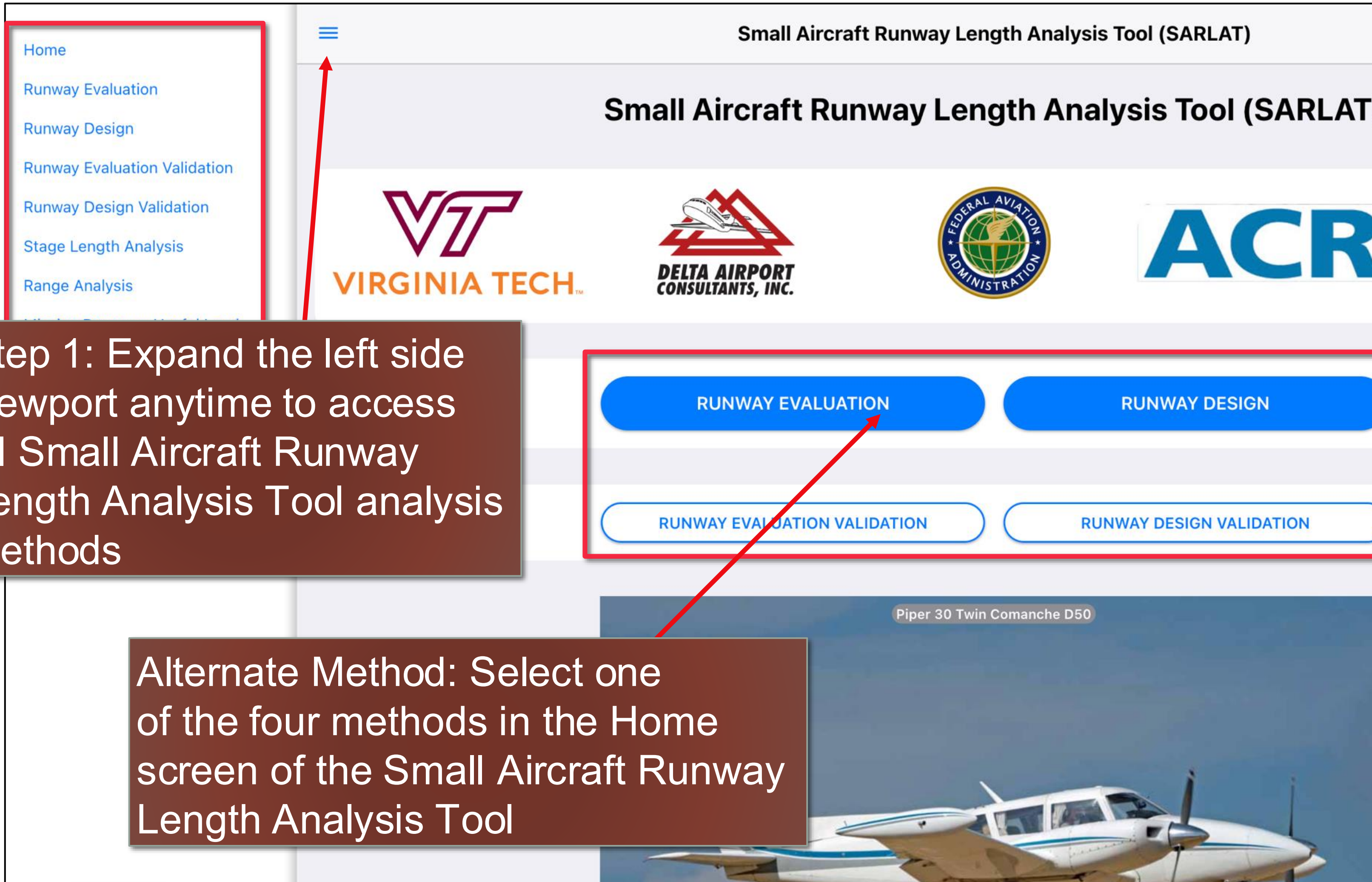
Small Aircraft Runway Length Analysis Tool **Menu Structure and Interface**



Step 1: Expand the left side viewport anytime to access all Small Aircraft Runway Length Analysis Tool analysis methods

Alternate Method: Select one of the four methods in the Home screen of the Small Aircraft Runway Length Analysis Tool

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SARLAT 2 Model Analysis Options

The Small Aircraft Runway Length Analysis Tool has **three areas described below:**

- **Analysis modes:**
  - a) Evaluation of an existing runway
  - b) Design for needed runway length
- **Validation modes:**
  - a) Evaluation of an existing runway plots
  - b) Design for needed runway length
- **Mission Analysis:**
  - a) Stage length analysis
  - b) Useful load-range analysis

Home

Runway Evaluation

Runway Design

Runway Evaluation Validation

Runway Design Validation

Stage Length Analysis

Range Analysis

- Use the **Analysis Modes** to calculate runway length
- Use the **Validation Modes** to validate and visualize the runway performance of individual aircraft for a set of airport conditions
- Mission analysis modes can be used to obtain payload-range information

SARLAT Analysis Modes

- Conduct runway length planning using the applicable analysis mode:

- **Runway Evaluation** is to determine if the existing runway length can reliably accommodate the fleet mix at the airport
- Also, for assessing operations and impacts if a shorter runway length is needed during construction

- **Runway Design** is to assess the needed runway length for the critical aircraft per parameters in AC 150/5325-4, such as to assess the need for a runway extension, rehabilitation, or reconstruction

Runway Evaluation Mode

Objective: To determine if a group of aircraft can reliably operate from an existing runway

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Runway Evaluation Mode

- **Objective:**
  - To determine if a group of aircraft can reliably operate from an existing runway
- **Output Produced**
  - Suitability of each aircraft to operate at the airport
    - Takeoff distances (dry and wet)
    - Landing distances (Part 91 dry and wet; and Part 135 dry and wet)
  - Aircraft useful load for the available runway length and airport conditions
  - Range profiles that can be flown from the available runway

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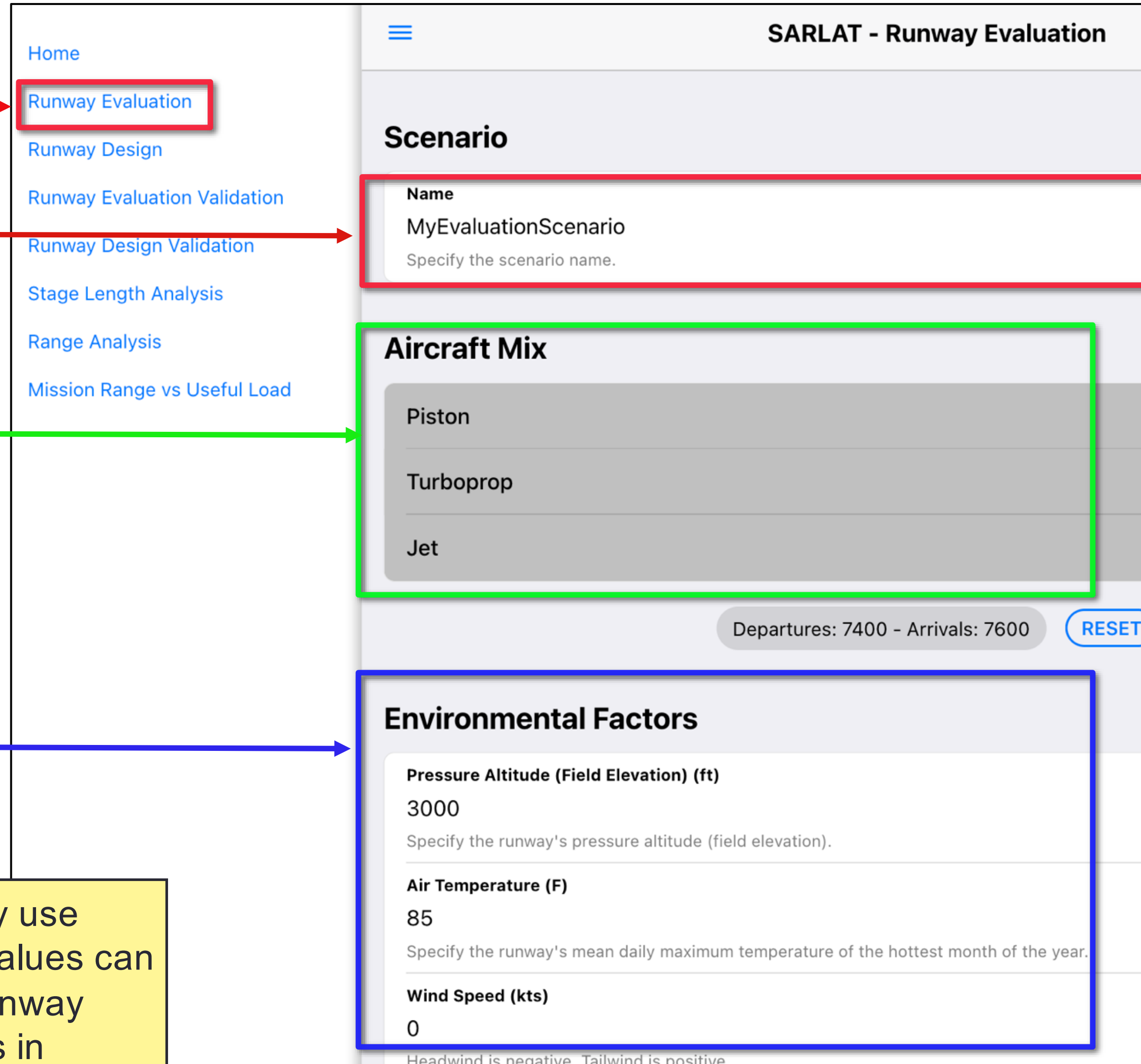
Runway Evaluation Mode Interface

Step 1: Select Runway Evaluation mode

Step 2: Select a scenario name

Step 3: Select the aircraft using the airport and enter the fleet mix (expandable list)

Step 4: Enter the airport environmental conditions



Runway length calculations normally use calm wind conditions. Wind speed values can be used to study the sensitivity of runway length to a variety of wind conditions in SARLAT. Tailwind values are positive.

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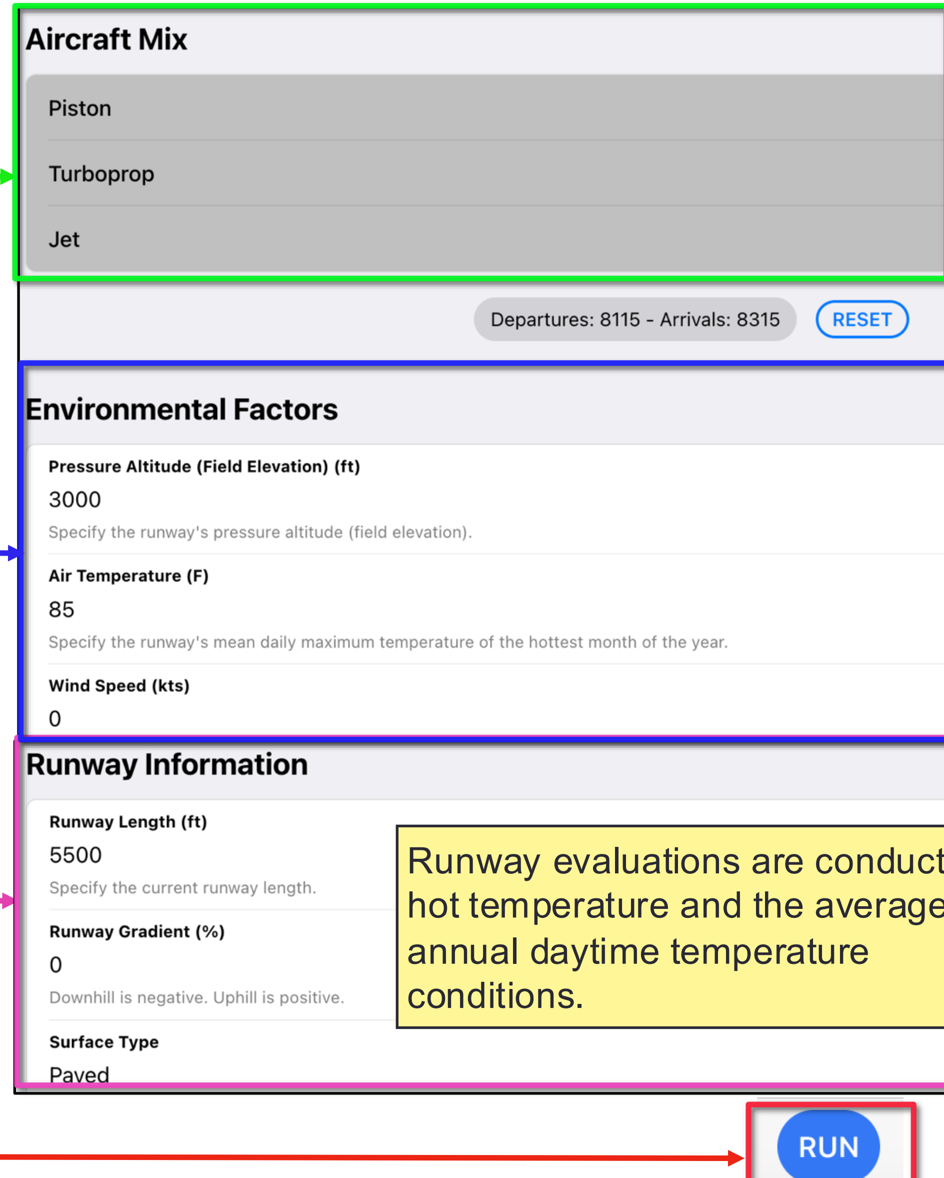
Runway Evaluation Mode Interface (2)

Step 3: Select the aircraft using the airport and enter the fleet mix (expandable list)

Step 4: Enter the airport environmental conditions

Step 5: Enter the runway information

Step 6: Run the case



Runway evaluations are conducted at hot temperature and the average annual daytime temperature conditions.

Runway Evaluation Mode: Definition of the Aircraft Fleet Mix

Select the aircraft fleet mix and expand each one of three aircraft engine groups

Jet aircraft group expanded

Number of annual operations by each aircraft

Aircraft Mix

Piston

Turboprop

Jet

Aircraft Name	Annual Operations
CL35 - Bombardier Challenger 350	300
CL60 - Bombardier Challenger 605	400
LJ35 - Bombardier LearJet 35	100
LJ45 - Bombardier Learjet 45	80
LJ60 - Bombardier Learjet 60	150
C56X - Cessna 560 XL	600
C68A - Cessna Citation Latitude	120

SARLAT Aircraft Characteristics Data

To facilitate the identification of each aircraft, SARLAT includes pictures and aircraft characteristics in both **Runway Evaluation** or **Runway Design** modes

Aircraft Mix

Piston

Turboprop

Jet

Aircraft Name

CL35 - Bombardier Challenger 350

CL60 - Bombardier Challenger 605

LJ35 - Bombardier LearJ

LJ45 - Bombardier Learj

LJ60 - Bombardier Learj

C56X - Cessna 560 XL

C68A - Cessna Citation Latitude

Selecting an aircraft from the list shows the aircraft picture and the aircraft characteristics

Bombardier Challenger 350

FAA Type Designator	CL35
Engine Type	Jet
Aircraft Design Group (ADG)	II

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Runway Evaluation Output Interface

Evaluation Conditions

Pressure altitude = 3,000 feet
Runway length = 5,500 feet
Design temperature = 85 deg. F.
Runway gradient = 0.0%
Surface = paved

Runway Evaluation Conditions

Landing Suitability Table Includes 14 CFR Part 135 Landing Checks

Takeoff Weights and Useful Load Constraints

Runway Takeoff and Landing Restrictions

Pressure Altitude: 3000 ft | Air Temperature: 85 F | Wind Speed: 0 kts | Runway Length: 5500 ft | Gradient: 0.0 % | Surface Type: Paved

Aircraft Name	Aircraft Mix	NBAA IFR Maximum Range		Useful Load (Takeoff Weight)		Landing at NBAA Minimum IFR Reserves					
						Part 91		Part 135 EOD		Part 135/91K	
		Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Piston											
BE55 - Beechcraft 55 Baron	10%			100 % 5100 lbs	100 % 5100 lbs	✓	✓				
C172 - Cessna 172 Skyhawk	27%			100 % 2300 lbs	100 % 2300 lbs	✓	✓				
PA24 - Piper 24 Comanche	7%			100 % 2550 lbs	100 % 2550 lbs	✓	✓				
Turboprop											
B350 - Beechcraft King Air 350ER	8%	100 % FLIGHTS IN NAS 1135 nm / 5 pax	27 % FLIGHTS IN NAS 155 nm / 5 pax	74 % 14918 lbs	38 % 12708 lbs	✓	✓			✓	✓

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Runway Evaluation Output Interface

Evaluation Conditions	
	Pressure altitude = 3,000 feet Runway length = 5,500 feet Design temperature = 85 deg. F. Runway gradient = 0.0% Surface = paved

Provides the operational weight limitations for each aircraft type

Aircraft useful load and mission range are reported as output

Runway Takeoff and Landing Restrictions

Pressure Altitude: 3000 ft | Air Temperature: 85 F | Wind Speed: 0 kts | Runway Length: 5500 ft

Gradient: 0.0 % | Surface Type: Paved

Runway Evaluation Conditions

Aircraft Name	Aircraft Mix	NBAA IFR Maximum Range		Useful Load (Takeoff Weight)	
		Dry	Wet	Dry	Wet
Piston					
BE55 - Beechcraft 55 Baron	10%			100 % 5100 lbs	100 % 5100 lbs
C172 - Cessna 172 Skyhawk	27%			100 % 2300 lbs	100 % 2300 lbs
PA24 - Piper 24 Comanche	7%			100 % 2550 lbs	100 % 2550 lbs
Turboprop					
B350 - Beechcraft King Air 350ER	8%	100 % FLIGHTS IN NAS 1135 nm / 5 pax	27 % FLIGHTS IN NAS 155 nm / 5 pax	74 % 14918 lbs	38 % 12708 lbs

The BE55 (Beechcraft Baron) can operate from the 5500-foot runway at 100% useful load (dry and wet runway)

The B350 (King Air 350ER) can operate from the 5500-foot runway at 74% useful load in dry runway conditions

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Runway Evaluation Output Interface

Evaluation Conditions	Pressure altitude = 3,000 feet Runway length = 5,500 feet Design temperature = 85 deg. F. Runway gradient = 0.0% Surface = paved

SARLAT reports aircraft useful load and mission range in the runway evaluation mode

Runway Takeoff and Landing Restrictions

Pressure Altitude: 3000 ft | Air Temperature: 85 F | Wind Speed: 0 kts | Runway Length: 5500 ft | Gradient: 0.0 % | Surface Type: Paved

Runway Evaluation Conditions

Aircraft Name	Aircraft Mix	NBAA IFR Maximum Range		Useful Load (Takeoff Weight)	
		Dry	Wet	Dry	Wet
Jet					
CL35 - Bombardier Challenger 350	10%	100 % FLIGHTS IN NAS 1947 nm / 5 pax	93 % FLIGHTS IN NAS 1275 nm / 5 pax	70 % 35914 lbs	53 % 33109 lbs
CL60 - Bombardier Challenger 605	10%	98 % FLIGHTS IN NAS 1827 nm / 5 pax	90 % FLIGHTS IN NAS 1278 nm / 5 pax	58 % 39367 lbs	45 % 36535 lbs
LJ35 - Bombardier LearJet 35	14%	92 % FLIGHTS IN NAS 1079 nm / 4 pax	72 % FLIGHTS IN NAS 756 nm / 4 pax	68 % 15810 lbs	56 % 14915 lbs
LJ45 - Bombardier Learjet 45	14%	100 % FLIGHTS IN NAS 1336 nm / 4 pax	95 % FLIGHTS IN NAS 1025 nm / 4 pax	93 % 20909 lbs	78 % 19554 lbs

The CL35 (Bombardier Challenger 350) can operate from the 5,500 dry runway at 70% useful load.
The CL35 can fly 1947 nm with five passengers plus two pilots from the existing 5500-foot runway (dry)

The LJ45 (Bombardier Learjet 45) can operate at 78% useful load from a wet runway.

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Evaluation Mode: Mission Range vs. Useful Load Diagram

CL35 - Bombardier Challenger 350	10%	100 % FLIGHTS IN NAS 1947 nm / 5 pax	93 % FLIGHTS IN NAS 1275 nm / 5 pax	70 % 35914 lbs	53 % 33109 lbs
CL60 - Bombardier Challenger 605	10%	98 % FLIGHTS IN NAS 1827 nm / 5 pax	90 % FLIGHTS IN NAS 1278 nm / 5 pax	58 % 39367 lbs	45 % 36535 lbs

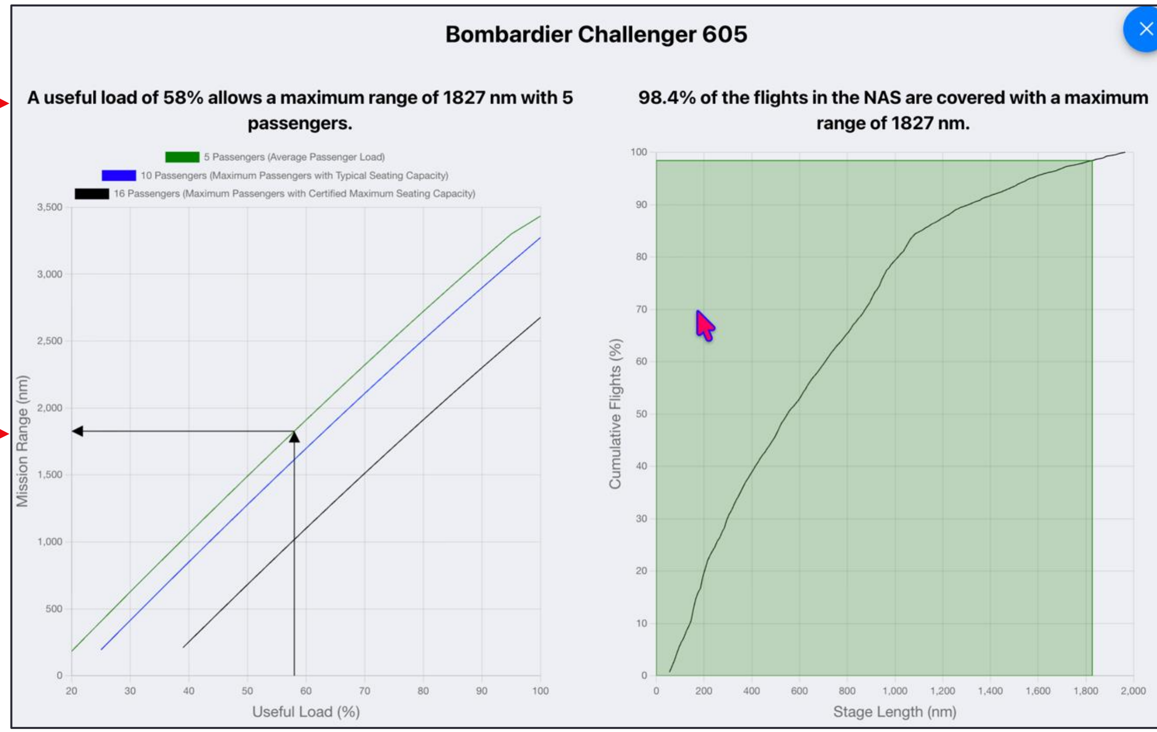
The CL60 can takeoff at 58% useful load from a dry 5500-foot runway at 3000-foot elevation.

The CL60 can fly five passengers and two pilots 1827 nm (with NBAA fuel reserves) from a dry 5,500-foot runway.

Click on the green area to see the cumulative plot of distances flown.

The CL60 can fly five passengers and two pilots 1827 nm (with NBAA fuel reserves) from a dry 5,500-foot runway.

98.4% of the flights in the NAS can be performed with five passengers and two pilots flying 1827 nm.



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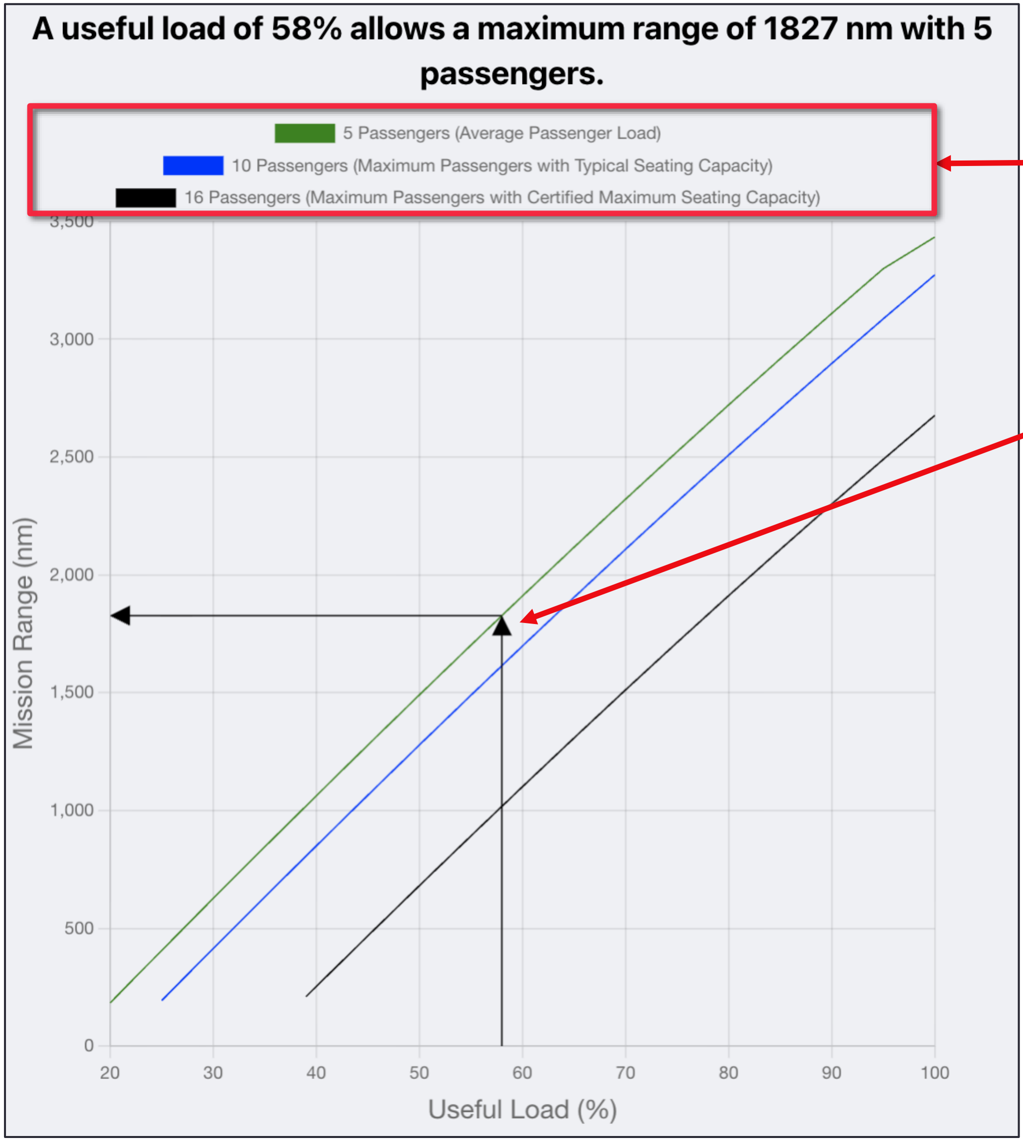
Evaluation Model: Mission Range vs. Useful Load Diagram



Three passenger loading conditions are displayed in SARLAT

The CL60 can fly five passengers and two pilots 1827 nm (with NBAA fuel reserves) from a dry 5,500-foot runway.

SARLAT displays the mission range using the average passenger load (five passengers for the Challenger 605).

Useful Load Mission Range Diagram for the Bombardier Challenger 605 (CL60)

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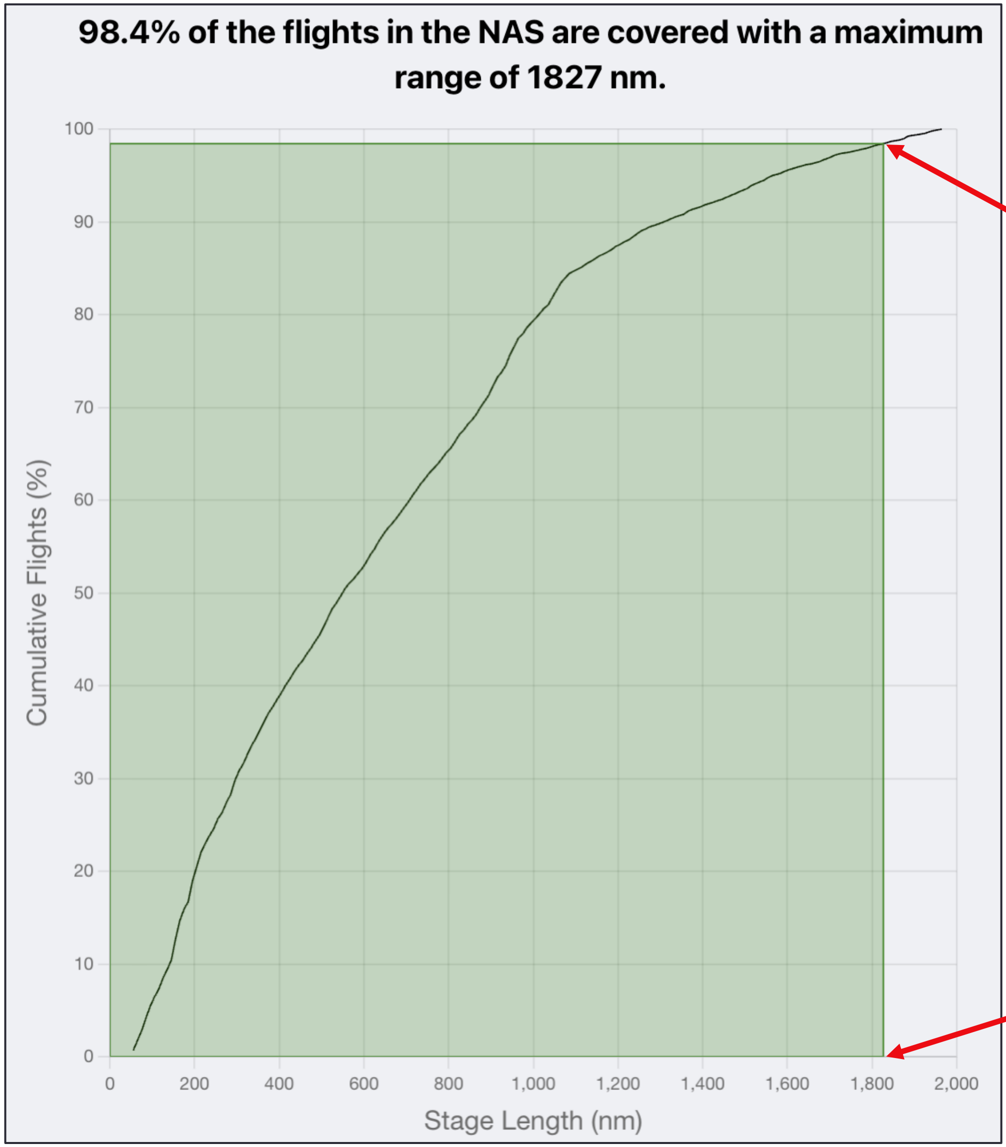
Evaluation Model: Cumulative Flights



For the aircraft selected, SARLAT displays the cumulative flights in the National Airspace System considering the mission stage length for the flight.

The CL60 can fly five passengers and two pilots 1827 nm from a dry 5,500-foot runway. 1827 nm covers 98.4% of the historical flights flown in the year 2025 by the same aircraft.

Cumulative mission length diagram for Bombardier Challenger 605

The CL60 can fly five passengers and two pilots 1827 nm (with NBAA fuel reserves) from a dry 5,500-foot runway.

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Runway Evaluation Mode: Part 135 Operations

Evaluation Conditions

Pressure altitude = 3,000 feet
Runway length = 5,500 feet
Design temperature = 85 deg. F.
Runway gradient = 0.0%
Surface = paved

Landing table shows if the aircraft can operate under Part 135 or EOD at maximum allowable landing weight

Aircraft Name	Aircraft Mix	NBAA IFR Maximum Range		Useful Load (Takeoff Weight)		Landing at NBAA Minimum IFR Reserves					
						Part 91		Part 135 EOD		Part 135/91K	
		Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Jet											
CL35 - Bombardier Challenger 350	10%	100 % FLIGHTS IN NAS 1947 nm / 5 pax	93 % FLIGHTS IN NAS 1275 nm / 5 pax	70 % 35914 lbs	53 % 33109 lbs	✓	✓	✓	✓	✓	✓
CL60 - Bombardier Challenger 605	10%	98 % FLIGHTS IN NAS 1827 nm / 5 pax	90 % FLIGHTS IN NAS 1278 nm / 5 pax	58 % 39367 lbs	45 % 36535 lbs	✓	✓	✓	✓	✓	✓
LJ35 - Bombardier LearJet 35	14%	92 % FLIGHTS IN NAS 1079 nm / 4 pax	72 % FLIGHTS IN NAS 756 nm / 4 pax	68 % 15810 lbs	56 % 14915 lbs	✓	✓	✓	✓	✓	✗
LJ45 - Bombardier Learjet 45	14%	100 % FLIGHTS IN NAS 1336 nm / 4 pax	95 % FLIGHTS IN NAS 1025 nm / 4 pax	93 % 20909 lbs	78 % 19554 lbs	✓	✓	✓	✓	✓	✓

The CL60 can land in dry and wet runway conditions considering Part 135 landing correction factors.
The LJ35 cannot operate on a wet runway while operating under Part 135.

Runway Evaluation: Aircraft Data Table

Aircraft table with general information about each aircraft modeled in SARLAT.

Information includes engine type, aircraft design group, aircraft approach category, operating empty weight, useful load, maximum takeoff weight, maximum allowable landing weight, takeoff flap setting used in SARLAT, landing flap setting used in SARLAT, and the takeoff distance criteria (i.e., takeoff distance, takeoff field length, or accelerate-stop distance).

Aircraft Characteristics

Aircraft Name	FAA Type Designator	Engine Type	Aircraft Design Group (ADG)	Aircraft Approach Category (AAC)	Taxiway Design Group (TDG)	Weight Category	Operating Empty Weight (OEW)	Useful Load	Maximum Takeoff Weight (MTOW)	Maximum Allowable Landing Weight (MALW)	Takeoff Flap Settings	Landing Flap Settings	Takeoff Distance
Piston													
Beech Bonanza 36	BE36	Piston	I	A	1A	Small	2200 lbs	1400 lbs	3600 lbs	3600 lbs	Up	Down	Takeoff over 50ft obstacle
Beechcraft 55 Baron	BE55	Piston	I	B	1A	Small	3236 lbs	1864 lbs	5100 lbs	5100 lbs	Up	Down	Takeoff distance
Turboprop													
Beechcraft King Air 350ER	B350	Turboprop	II	B	2A	Large	10385 lbs	6115 lbs	16500 lbs	15675 lbs	Approach	Down	Takeoff field length
Jet													
Bombardier Challenger 350	CL35	Jet	II	C	1B	Large	24800 lbs	15800 lbs	40600 lbs	40600 lbs	10°	30°	Takeoff field length

Infeasible Operating Conditions in the Runway Evaluation Mode

Example:

- Demanding airport conditions
- Some aircraft cannot operate from a 5,500 ft. runway **at 6,200 for elevation** and 86 degrees Fahrenheit temperature with a practical useful load

Design Conditions	
	Pressure altitude = 6,200 feet Runway length = 5,500 feet Design temperature = 86 deg. F. Runway gradient = 0% Surface = dry

Runway Takeoff and Landing Restrictions

Pressure Altitude: 6200 ft | Air Temperature: 86 F | Wind Speed: 0 kts | Runway Length: 5500 ft | Gradient: 0.0 % | Surface Type: Paved

Aircraft Name	Aircraft Mix	NBAA IFR Maximum Range		Useful Load (Takeoff Weight)		Landing at NBAA Minimum			
						Part 91		Part 135 EOD	
		Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Piston									
BE55 - Beechcraft 55 Baron	10%			100 % 5100 lbs	100 % 5100 lbs	✓	✓		
C172 - Cessna 172 Skyhawk	27%			100 % 2300 lbs	100 % 2300 lbs	✓	✓		
PA24 - Piper 24 Comanche	7%				✗	✓	✓		
Turboprop									
B350 - Beechcraft King Air 350ER	8%	✗		15 % 11293 lbs		✓	✓		

Aircraft with a red cross mark cannot operate at the airport conditions selected with a practical useful load.

Runway Design Mode

Objective: To estimate the unconstrained runway length required by a known aircraft fleet mix

Runway Design Mode

- **Objective:**
  - To estimate the runway length needed by the critical aircraft
- **Output Produced**
  - Takeoff runway distance requirements (dry and wet)
  - Landing runway distance requirements (Part 91 dry and wet, Part 135 EOD dry and wet, Part 135 dry and wet)

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Runway Design Mode Interface

Step 1: Select Runway Design mode

Step 2: Name your scenario

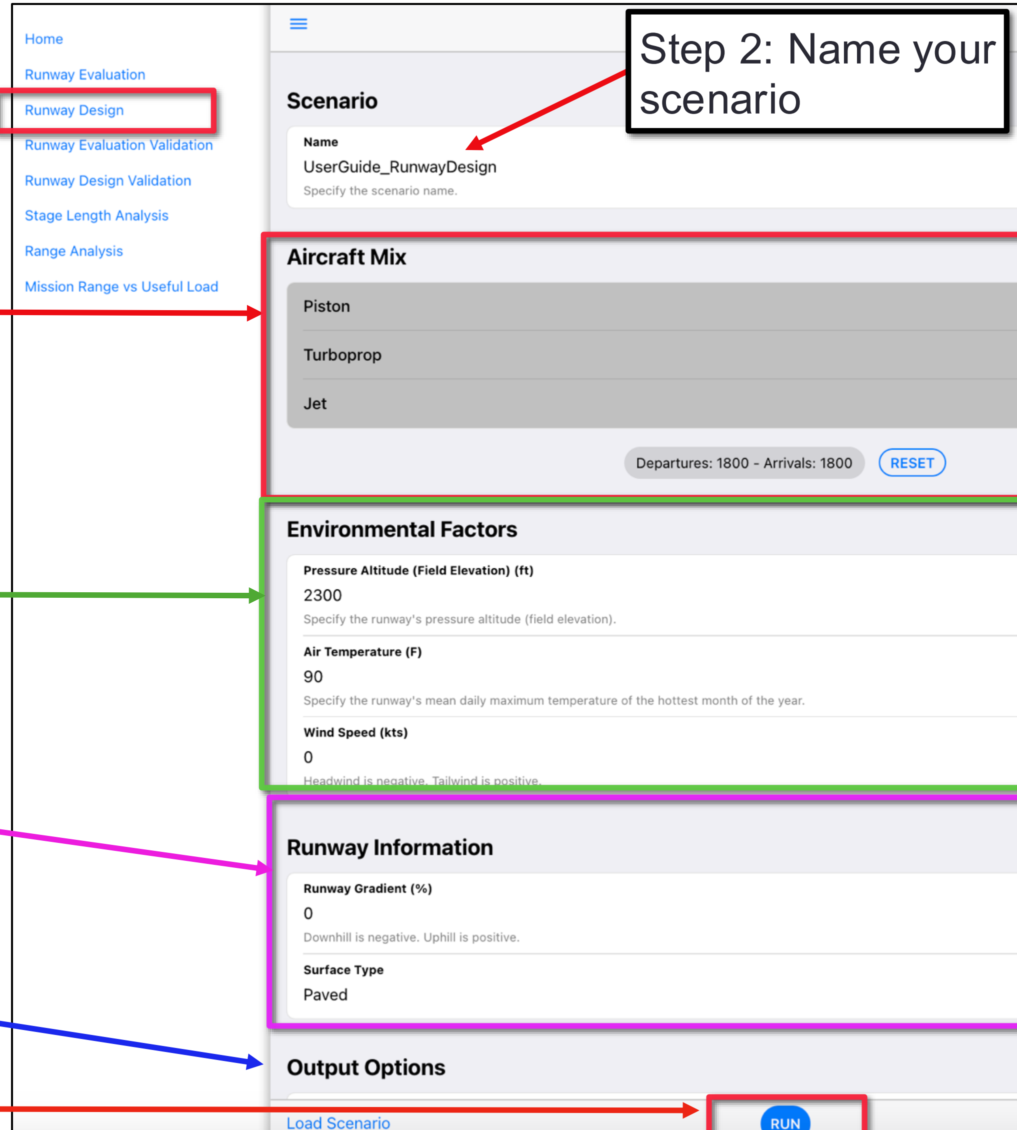
Step 3: Select the aircraft types(s) to be considered in the runway design

Step 4: Enter the airport environmental conditions

Step 5: Enter the runway grade and surface

Step 6: Select the output options

Step 7: Run the case



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Runway Design Mode: Fleet Mix Parameters (Piston Aircraft)

Aircraft Mix

Piston

Aircraft Name	Annual Operations	Takeoff Useful Load (%)
BE36 - Beech Bonanza 36	0	100
BE55 - Beechcraft 55 Baron	0	100
BE58 - Beechcraft 58 Baron	600	100
C150 - Cessna 150	0	100
C152 - Cessna 152	0	100
C172 - Cessna 172 Skyhawk	3200	100

Step 1: Define the annual operations for each aircraft. Annual operations is the sum of arrivals and departure operations.

Step 2: Define the desired useful load carried for departure operations. For piston aircraft, the default is 100%.

Note: For piston aircraft, SARLAT reports landing runway performance at the maximum landing weight.

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Runway Design Mode: Fleet Mix Parameters for Large Turboprop Aircraft (Maximum Takeoff Gross Weight 12,500 lbs. or Higher)

Step 1: Define the annual operations for each aircraft.

Step 3: Define if aircraft type is operating under Part 135

Aircraft Mix

Piston

Turboprop

Aircraft Name	Annual Operations	Trip Distance with Average Passenger Load (nm)	Takeoff Useful Load (%)	Part 135	Landing Weight (% of MALW)
AT5T - AirTractor 502	0		100	No	
AT8T - AirTractor 802	0		70	No	
BE30 - Beechcraft 300 Super King Air	0	914	70	No	77
B350 - Beechcraft King Air 350ER	400	1026	70	Yes	74
BE20 - Beechcraft King Air B200GT	500	438	70	N	
BE9L - Beechcraft King Air C90	0		100	N	

SARLAT 2 has default landing weight factors applicable to AIP projects

Step 2: Define the trip distance with regular use for each critical aircraft, using TFMSC city pair data.

SARLAT automatically calculates the useful load required to fly the trip distance selected in the third column.

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Runway Design Mode: Fleet Mix Parameters for Jet-Aircraft

Step 1: Define the annual operations for each aircraft.

Step 3: Define if the aircraft type is operating under Part 135.

Aircraft Mix

Piston

Turboprop

Jet

Aircraft Name	Annual Operations	Trip Distance with Average Passenger Load (nm)	Takeoff Useful Load (%)	Part 135	Landing Weight (% of MALW)
CL35 - Bombardier Challenger 350	210	1553	60	Yes	82
CL60 - Bombardier Challenger 605	230	1910	60	Yes	80
GLEX - Bombardier Global 6000	0	3603	60	No	73
LJ35 - Bombardier LearJet 35	0	1133	70	N	
LJ45 - Bombardier Learjet 45	200	822	70	N	

SARLAT 2 has default landing weight factors applicable to AIP projects

Step 2: Define the trip distance with regular use for each critical aircraft, using TFMSC city pair data.

SARLAT automatically calculates the useful load required to fly the trip distance selected in the third column.

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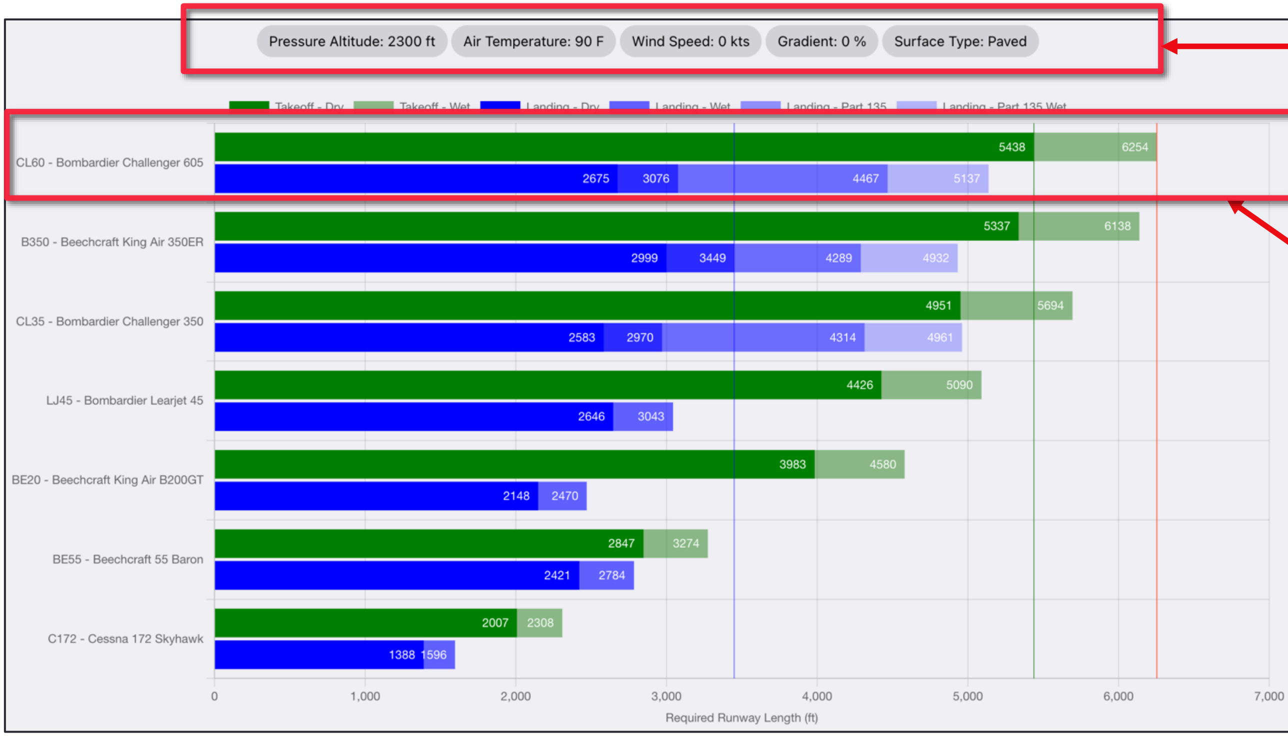
VIRGINIA TECH

Runway Design: Takeoff and Landing Distances Output

Design Conditions	Pressure altitude = 2,300 feet Design temperature = 90 deg. F. Useful loads determined by the critical length flown by each aircraft Wind speed = 0 knots Runway gradient = 0%

- Provides a graphical output of runway length requirements for each aircraft
- Runway length requirements are sorted from high to low



Runway Design Conditions

The Bombardier Challenger 605 (CL60) requires 5,438 feet of runway for takeoff (dry pavement).

The CL60 requires 6,254 feet of runway departing from a wet runway.

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Runway Design: Takeoff and Landing Distances Output Table

Design Conditions

Pressure altitude = 2,300 feet
Design temperature = 90 deg. F.
Wind speed = 0 knots
Runway gradient = 0%

- Provides a table output of runway length requirements for each aircraft
- Compares dry and wet conditions for takeoff
- Multiple landing conditions provided

Aircraft Name	Takeoff Useful Load (%)	Landing Useful Load (%)	Takeoff (ft)		Landing (ft)					
					Part 91		Part 135 EOD		Part 135/91K	
			Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Piston										
BE55 - Beechcraft 55 Baron	100	100	2847	3274	2421	2784				
C172 - Cessna 172 Skyhawk	100	100	2007	2308	1388	1596				
Turboprop										
B350 - Beechcraft King Air 350ER	70	74	5337	6138	2999	3449			4289	4932
BE20 - Beechcraft King Air B200GT	90	77	3983	4580	2148	2470				
Jet										
CL35 - Bombardier Challenger 350	60	82			2583	2970			4314	4961
CL60 - Bombardier Challenger 605		80	5438	6254	2675	3076			4467	5137
LJ45 - Bombardier Learjet 45		85	4426	5090	2646	3043				

Takeoff and landing assumptions

Takeoff Distance output

Landing distance output

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Critical Aircraft Considering Runway Length Requirements

Design Conditions	Pressure altitude = 2,300 feet Design temperature = 90 deg. F. Wind speed = 0 knots Runway gradient = 0%

- Provides a summary output table with takeoff and landing distance requirements for each aircraft
- The table includes the cumulative annual operations for all aircraft, sorted from the highest to the smallest runway length required
- The yellow row shows the critical aircraft

Critical Aircraft for Runway Length

TAKEOFF DRY | TAKEOFF WET | LANDING DRY | LANDING WET | PART 135

B350 - Beechcraft King Air 350ER is the critical aircraft and requires **5337 ft** of runway to be fully accommodated in the full range of specified operating conditions.

Aircraft Name	Engine Type	Aircraft Design Group (ADG)	Aircraft Approach Category (AAC)	Taxiway Design Group (TDG)	Takeoff Useful Load (%)	Landing Useful Load (%)	Annual Operations	Cumulative Annual Operations	Takeoff Dry (ft)	Takeoff Wet (ft)	Landing Dry (ft)	Landing Wet (ft)
CL60 - Bombardier Challenger 605	Jet	II	C	1B	60	80	230	230	5438	6254	2675	3076
B350 - Beechcraft King Air 350ER	Turboprop	II	B	2A	70	74	400	630	5337	6138	2999	3449
CL35 - Bombardier Challenger 350	Jet	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	210	840	4951	5694	2583	2970
LJ45 - Bombardier Learjet 45	Jet	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	200	1040	4426	5090	2646	3043
BE20 - Beechcraft King Air B200GT	Turboprop	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	500	1540	3983	4580	2148	2470
BE55 - Beechcraft 55 Baron	Piston	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	600	2140	2847	3274	2421	2784
C172 - Cessna 172	Piston	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	3200	5340	2007	2308	1388	1596

The critical aircraft for runway length requirement is the first aircraft with 500 or more cumulative annual operations (highlighted in yellow).

The BE350 is the critical aircraft and requires 5,337 feet of runway for takeoff (dry pavement). Round to 5,400 feet.

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Critical Aircraft Considering Runway Design Toggles

- Toggles report the critical aircraft for combinations of takeoff and landing conditions using dry and wet runway conditions
- The scenario presented below, assumes no aircraft operates under Part 135 operations

In this example the critical aircraft is reported using dry takeoff and wet landing conditions (both conditions selected in blue)

Critical Aircraft for Runway Length

TAKEOFF DRY | TAKEOFF WET | LANDING DRY | LANDING WET

B350 - Beechcraft King Air 350ER is the critical aircraft and requires **5337 ft** of runway to be fully accommodated in the full range of specified operating conditions.

Aircraft Name	Engine Type	Aircraft Design Group (ADG)	Aircraft Approach Category (AAC)	Taxiway Design Group (TDG)	Takeoff Useful Load (%)	Landing Useful Load (%)	Annual Operations	Cumulative Annual Operations	Takeoff Dry (ft)	Takeoff Wet (ft)	Landing Dry (ft)	Landing Wet (ft)
CL60 - Bombardier Challenger 605	Jet	II	C	1B	60	80	230	230	5438	6254	2675	3076
B350 - Beechcraft King Air 350ER	Turboprop	II	B	2A	70	74	400	630	5337	6138	2999	3449
CL35 - Bombardier Challenger 350	Jet	II	C	1B	60	82	210	840	4951	5694	2583	2970
LJ45 - Bombardier Learjet 45	Jet	I	C	1B	70	85	200	1040	4426	5090	2646	3043
BE20 - Beechcraft King Air B200GT	Turboprop	II	B	2A	70	77	500	1540	3867	4447	2148	2470
BE58 - Beechcraft 58 Baron	Piston	I	B	1A	100	100	600	2140	2685	3088	2802	3222
C172 - Cessna 172 Skyhawk	Piston	I	A	1A	100	100	3200	5340	2007	2308	1388	1596

Note: For AIP projects, use **wet landing** and **dry takeoff** performance.

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Critical Aircraft Considering Part 135 Operations

- The scenario presented below, assumes the CL35, CL60, and the B350 are operated under 14 CFR Part 135 rules
- The landing distances reported in the table are adjusted using the operation factors described on pages 15-16 of the guide

When Part 135 operations apply, the landing distances are adjusted, and the Part 135 toggle is displayed

Critical Aircraft for Runway Length

TAKEOFF DRY | TAKEOFF WET | LANDING DRY | LANDING WET | PART 135

B350 - Beechcraft King Air 350ER is the critical aircraft and requires **5337 ft** of runway to be fully accommodated in the full range of specified operating conditions.

Aircraft Name	Engine Type	Aircraft Design Group (ADG)	Aircraft Approach Category (AAC)	Taxiway Design Group (TDG)	Takeoff Useful Load (%)	Landing Useful Load (%)	Annual Operations	Cumulative Annual Operations	Takeoff Dry (ft)	Takeoff Wet (ft)	Landing Dry (ft)	Landing Wet (ft)
CL60 - Bombardier Challenger 605	Jet	II	C	1B	60	80	230	230	5438	6254	**4467**	**5137**
B350 - Beechcraft King Air 350ER	Turboprop	II	B	2A	70	74	400	630	5337	6138	**4289**	**4932**
CL35 - Bombardier Challenger 350	Jet	II	C	1B			210	840	4951	5694	**4314**	**4961**
LJ45 - Bombardier Learjet 45	Jet	I	C	1B			200	1040	4426	5090	2646	3043
BE20 - Beechcraft King Air B200GT	Turboprop	II	B	2A			500	1540	3983	4580	2148	2470

In this example, B350, CL35, and CL60 operate under Part 135 rules. The Landing values in the table are adjusted accordingly.

Note: For AIP projects, use **wet landing** and **dry takeoff** performance.

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Critical Aircraft According to RDC and TDG Parameters

Design Conditions	Pressure altitude = 2,300 feet Design temperature = 90 deg. F. Wind speed = 0 knots Runway gradient = 0%

- SARLAT displays an output table listing the critical aircraft according to: ADG, AAC, TDG and RDC among the fleet mix defined
- SARLAT selects the most critical aircraft for each of the four parameters individually based on cumulative **regular use** with **similar characteristics**

- For the example shown:
- The critical ADG group is II with 1,340 annual operations in the group
- The critical AAC group is C with 640 annual operations in the group
- Runway Design Code (RDC) is C-II
- The critical aircraft for Taxiway Design Group (TDG) is 2A with 900 annual operations

Group	Critical Group
Aircraft Approach Category (AAC)	C
Aircraft Design Group (ADG)	II
Runway Design Code (RDC)	C-II
Taxiway Design Group (TDG)	2A

Infeasible Operating Conditions in the Runway Design Mode

Example:

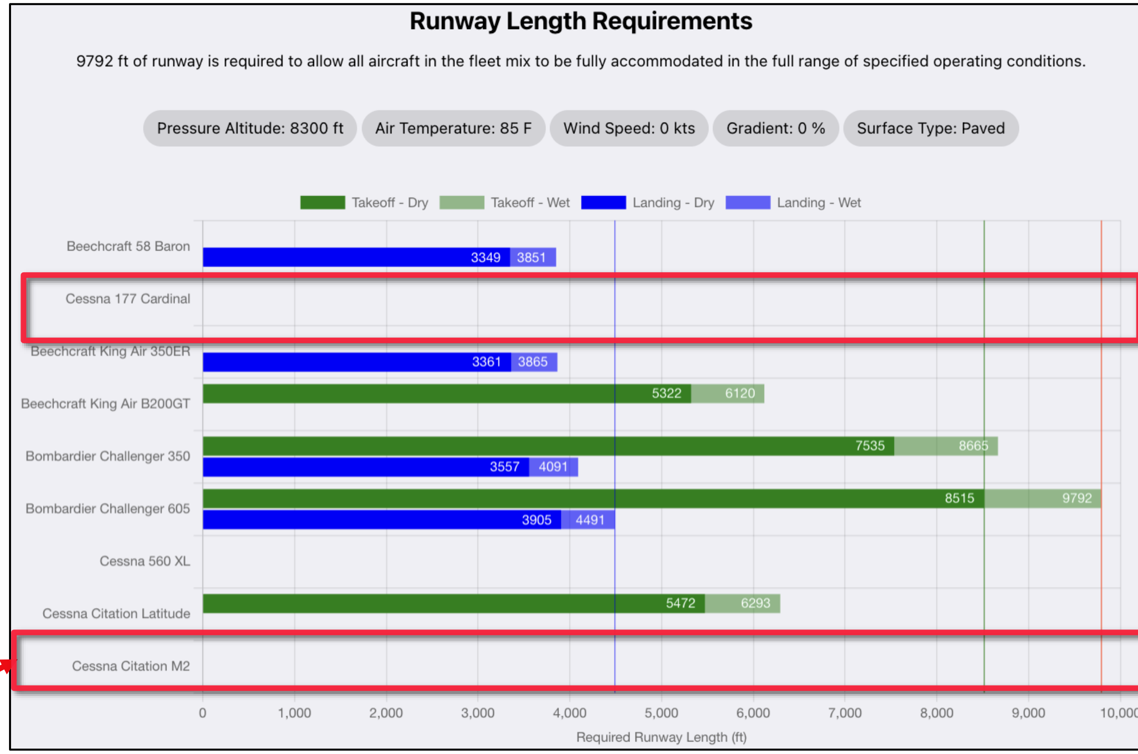
- Demanding airport design conditions
- 7300 feet pressure altitude
- 75 deg. F. design temperature

The B350 cannot operate at the airport design conditions with a takeoff useful load of 70%. If the takeoff useful load is reduced to 65%, the operation is feasible.

Infeasible Operating Conditions in the Runway Design Mode

Example:

- Demanding airport design conditions
- 8300 feet pressure altitude
- 85 deg. F. design temperature



Aircraft not reported in the bar plot cannot operate at the airport design conditions with the useful load desired.

Aircraft Name	Error
Beechcraft 58 Baron	Temperature is above maximum takeoff temperature.
Cessna 177 Cardinal	Altitude is above maximum takeoff altitude.
Cessna 177 Cardinal	Altitude is above maximum takeoff altitude.
Beechcraft King Air 350ER	Temperature is above maximum takeoff temperature.
Beechcraft King Air B200GT	Temperature is above maximum takeoff temperature.
Cessna 560 XL	Temperature is above maximum takeoff temperature.

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Runway Evaluation Validation Mode

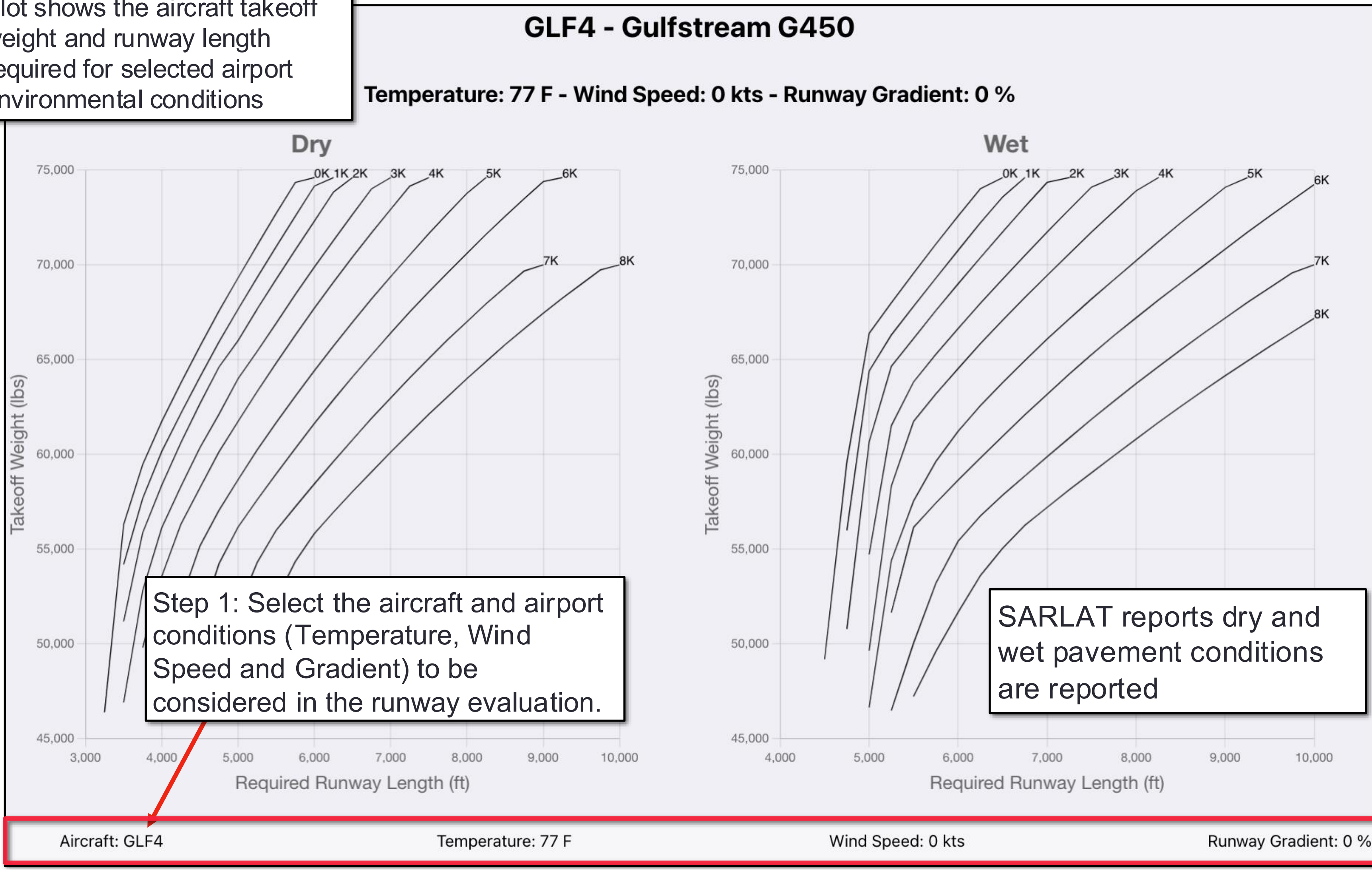
Objective: Provides graphical information of aircraft takeoff weight foe a given runway length with airport temperature, runway grade, and wind speed as independent parameters

Runway Evaluation Validation Mode

- **Objectives:**
  - Provides a graphical depiction of **aircraft takeoff weight** limited by runway length for various airport design parameters (temperature, runway grade, and wind speed) as used in the Runway Evaluation module
  - Validate the maximum takeoff weight of the aircraft limited by runway length for a set of airport conditions
- **Output Produced**
  - Plot of runway length versus takeoff weight

Runway Evaluation Validation Mode

Plot shows the aircraft takeoff weight and runway length required for selected airport environmental conditions



Step 1: Select the aircraft and airport conditions (Temperature, Wind Speed and Gradient) to be considered in the runway evaluation.

SARLAT reports dry and wet pavement conditions are reported

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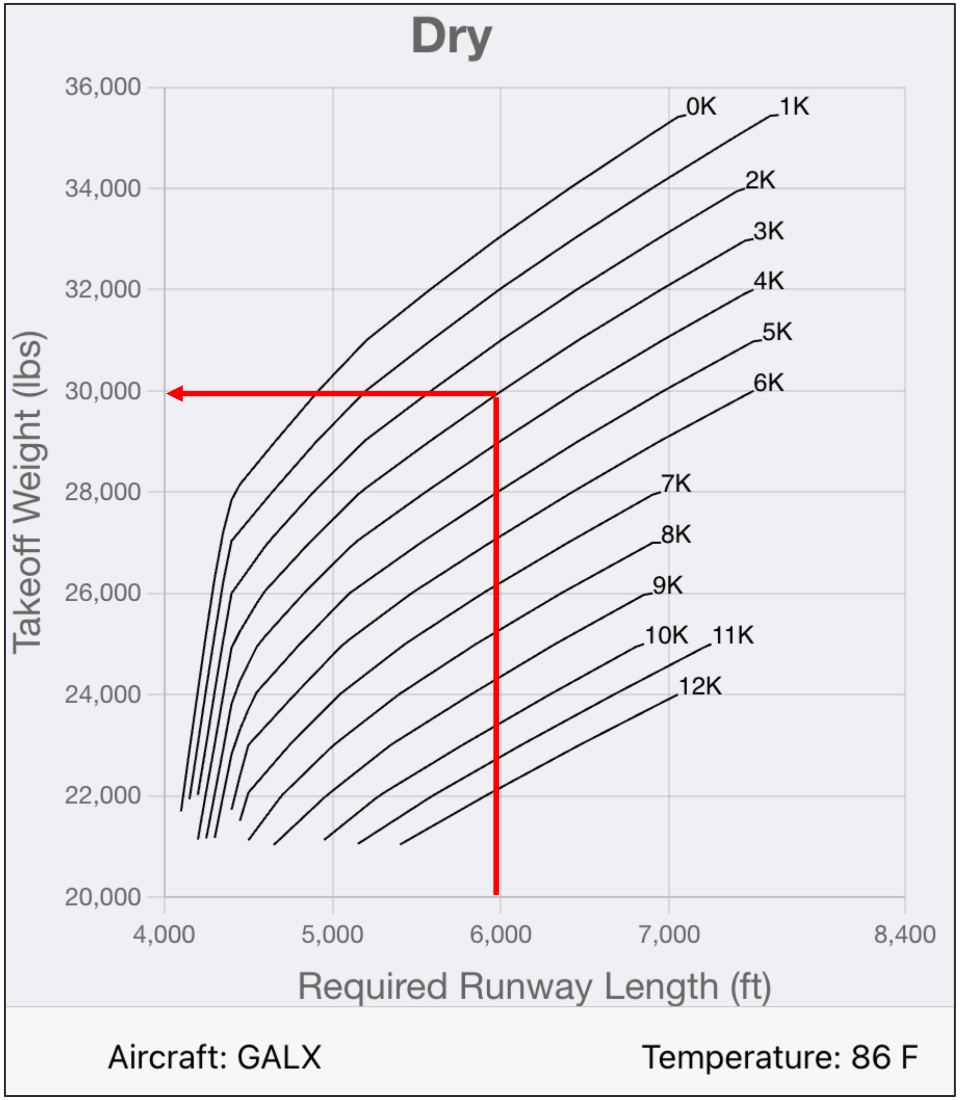
Interpretation of the Runway Evaluation Validation Plots

- The SARLAT runway evaluation validation plots are used to estimate the maximum takeoff weight conditions for a given temperature, airport elevation, and runway length
- For the example shown, a Gulfstream 200 (GALX) has a maximum takeoff weight of 30,000 lbs. departing from a 6,000-foot dry runway located 3,000 feet above mean sea level conditions with 86 degrees Fahrenheit temperature
- The 30,000 lbs. takeoff weight is converted in SARLAT to an equivalent useful load in the runway evaluation mode.



VIRGINIA TECH

Runway Design Validation Mode

Objective: Provides graphical information of the required runway length for various design parameters including airport temperature, runway grade, and aircraft useful load

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Runway Design Validation Mode

- **Objective:**
  - Provides graphical information of the **takeoff and landing runway length required** for various design parameters (temperature, runway grade, and useful load) as used in the Runway Design module
  - Validate the runway length requirements of individual aircraft for a set of airport conditions
- **Output Produced**
  - Plot of runway length versus takeoff weight at different airport elevations and airport environmental conditions

Home

Runway Evaluation

Runway Design

Runway Evaluation Validation

Runway Design Validation

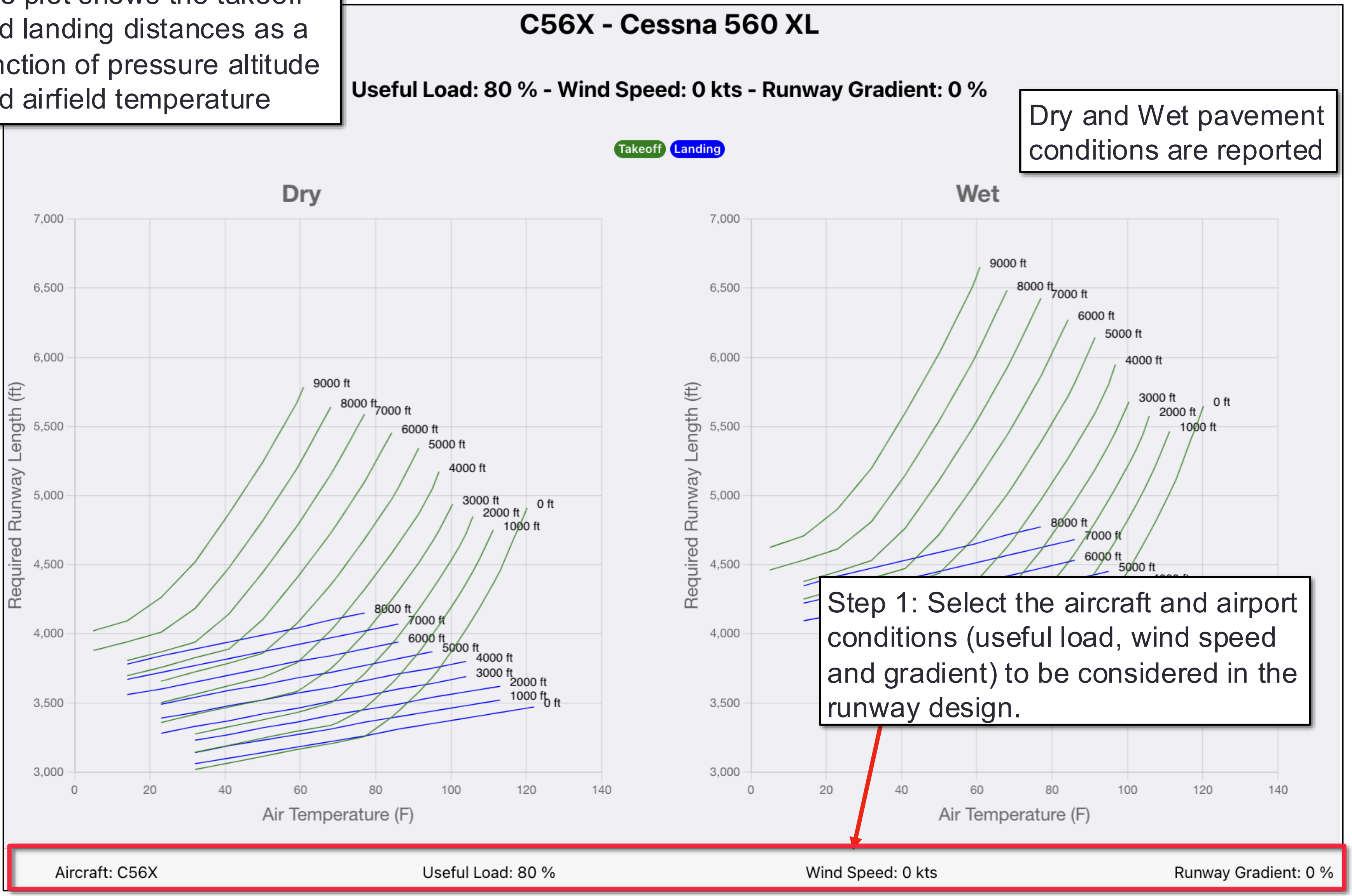
Stage Length Analysis

Range Analysis

Runway Design Validation Mode

The plot shows the takeoff and landing distances as a function of pressure altitude and airfield temperature

Dry and Wet pavement conditions are reported

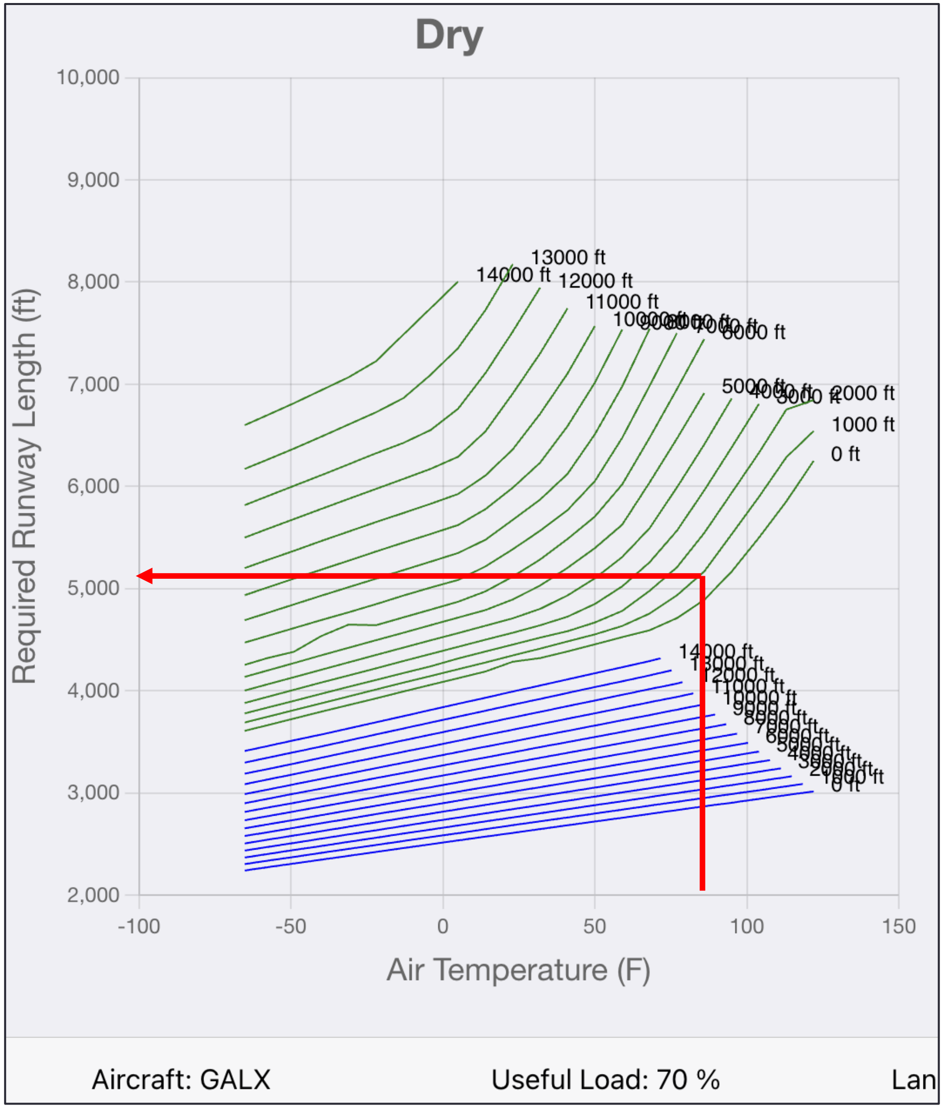


Step 1: Select the aircraft and airport conditions (useful load, wind speed and gradient) to be considered in the runway design.

VIRGINIA TECH

Interpretation of the Runway Design Validation Plots

- The SARLAT runway design validation plots are used to estimate the runway length for a takeoff (or landing) useful load conditions, temperature, airport elevation, and runway grade
- For the example shown, a Gulfstream 200 (GALX) requires a 5,200-foot dry runway operating from an airfield located 1,000 feet above mean sea level conditions at 90 degrees Fahrenheit temperature
- The takeoff and landing runway lengths calculated are reported in SARLAT as the output of the runway design mode.



Stage Length Analysis Mode

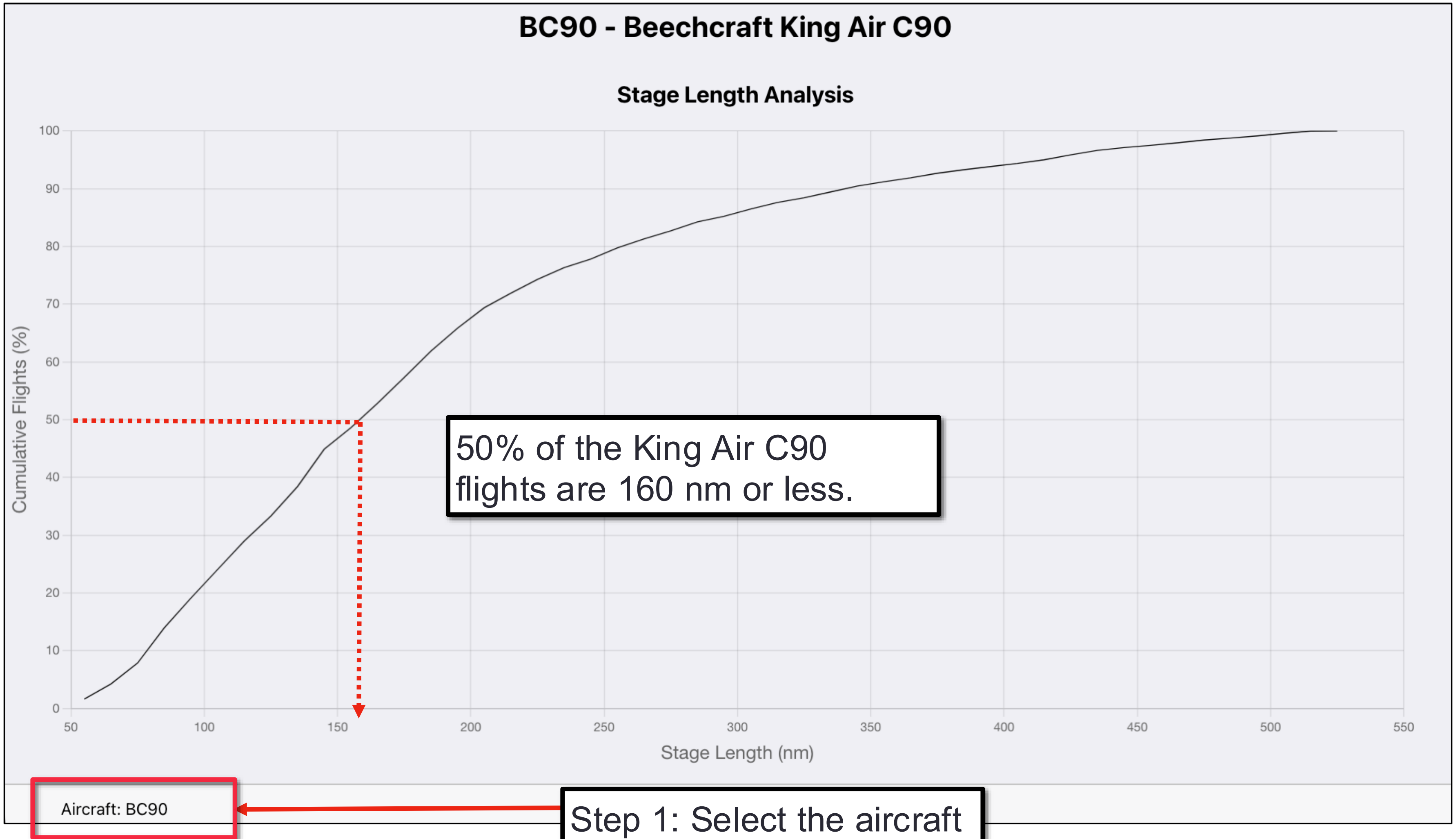
Objective: Provides graphical information of the cumulative number of flights in the National Airspace System versus distance flow

Stage Length Analysis

- **Objective:**
  - Provides graphical information of the cumulative number flights versus distance flown in the National Airspace System
- **Output Produced**
  - Plot of cumulative number of flights versus distance flown (stage length).
  - The plot is individual by aircraft.
  - All aircraft in SARLAT have a cumulative plot.

Home
Runway Evaluation
Runway Design
Runway Evaluation Validation
Runway Design Validation
Stage Length Analysis
Range Analysis

Stage Length Analysis



Step 1: Select the aircraft to be plotted

Aircraft Range Analysis

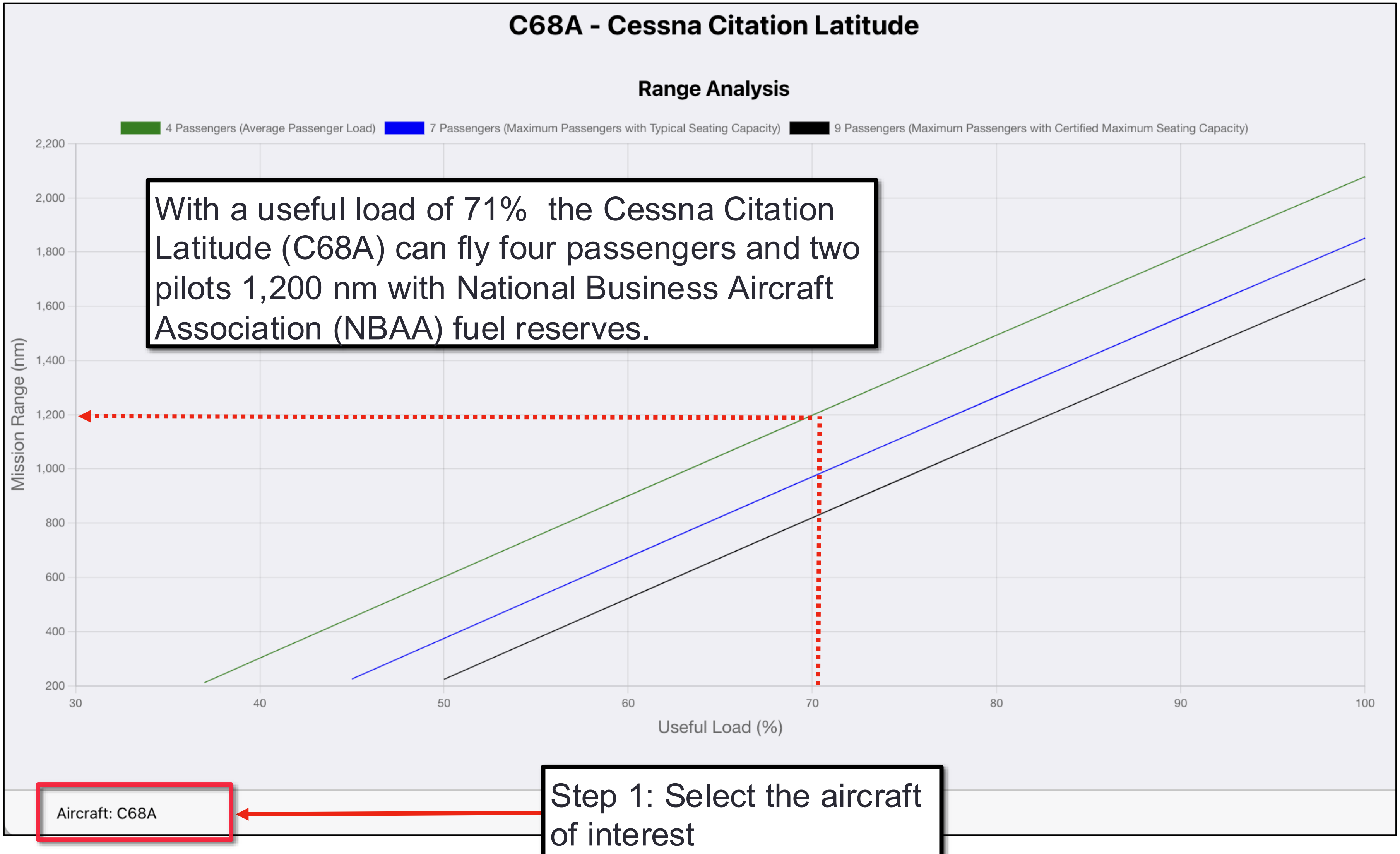
Objective: Provides graphical information of useful load and mission distance flown for jet-powered and turboprop aircraft whose maximum takeoff gross weight is 12,500 lbs. or more

Aircraft Range Analysis

- **Objective:**
  - Provides graphical information of trip distance to useful load for jet-powered aircraft and large turboprops
- **Output Produced**
  - Payload-range diagram with useful load and mission range.
  - The plot is individual by aircraft.

VIRGINIA TECH

Aircraft Range Analysis



Saving and Exporting Data in SARLAT

Exporting and Saving Scenario Runs

- SARLAT can export data for use in spreadsheets or the clipboard
- SARLAT can load saved scenarios
- SARLAT can save the graphical output produced in Portable Graphics Format (PNG)
- SARLAT exports table results in two formats:
  - Clipboard
  - Excel

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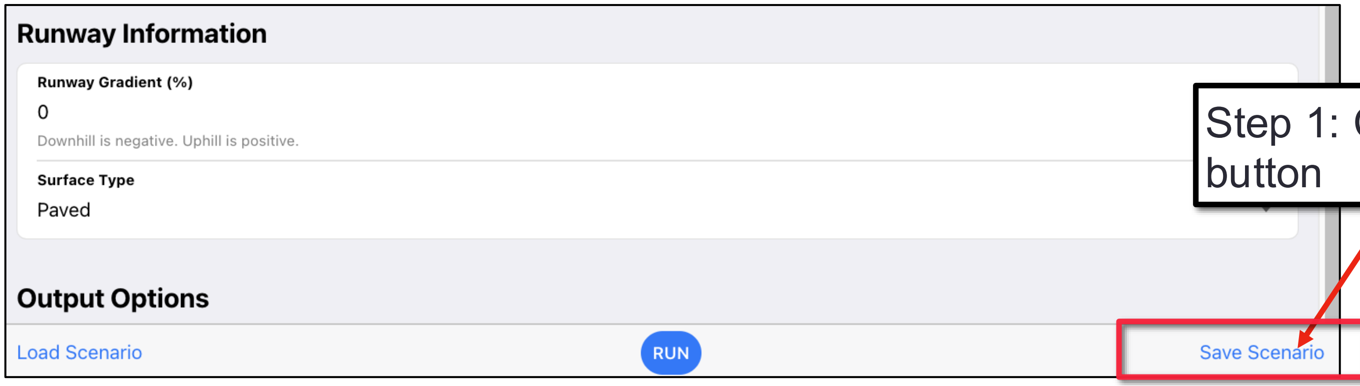
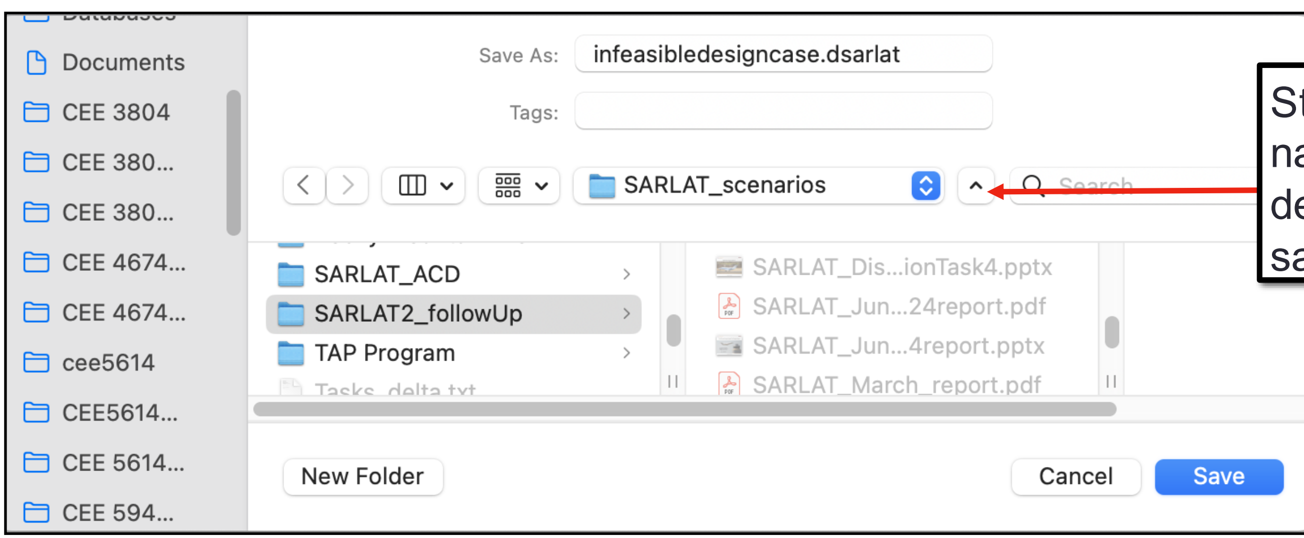
Saving SARLAT Scenario Runs

- SARLAT saves your run using the .dsarlat type file



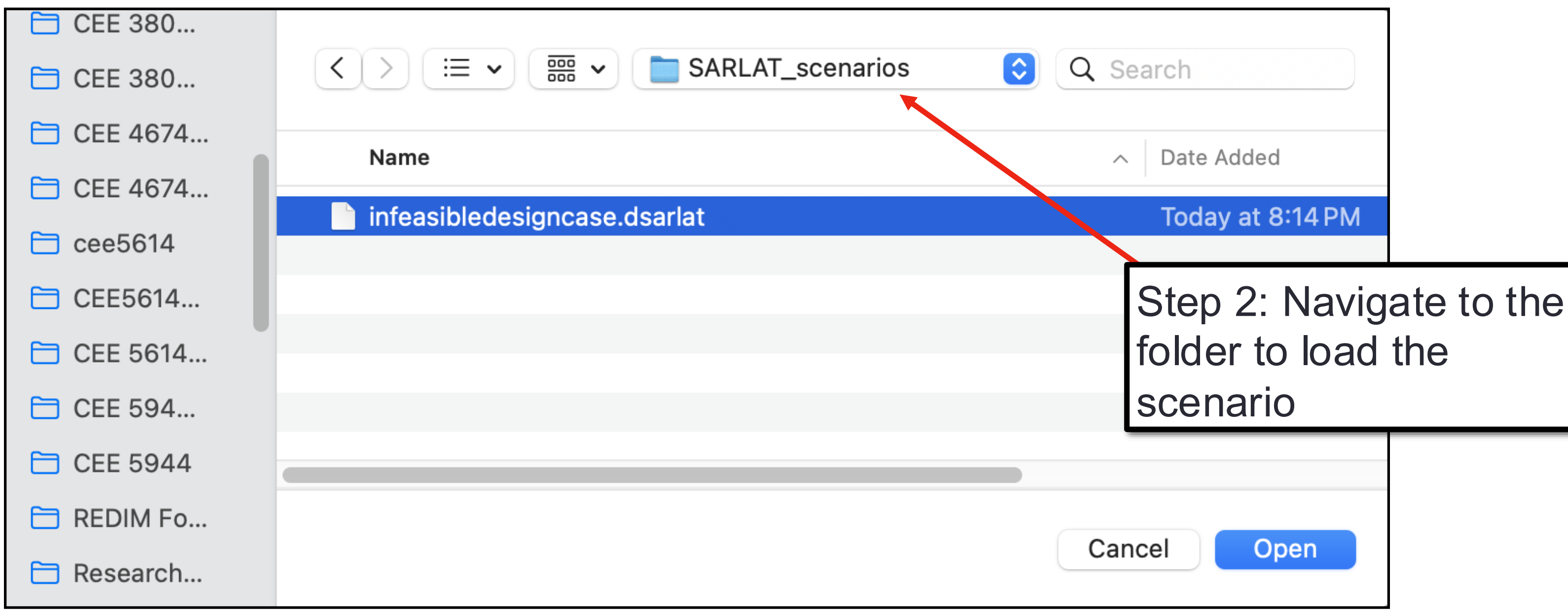
Step 1: Click the save button



Step 2: Name and navigate to the destination folder to save the scenario

Loading SARLAT Scenario Runs

- SARLAT loads saved .dsarlat files with saved scenario runs



Exporting SARLAT Graphical Output

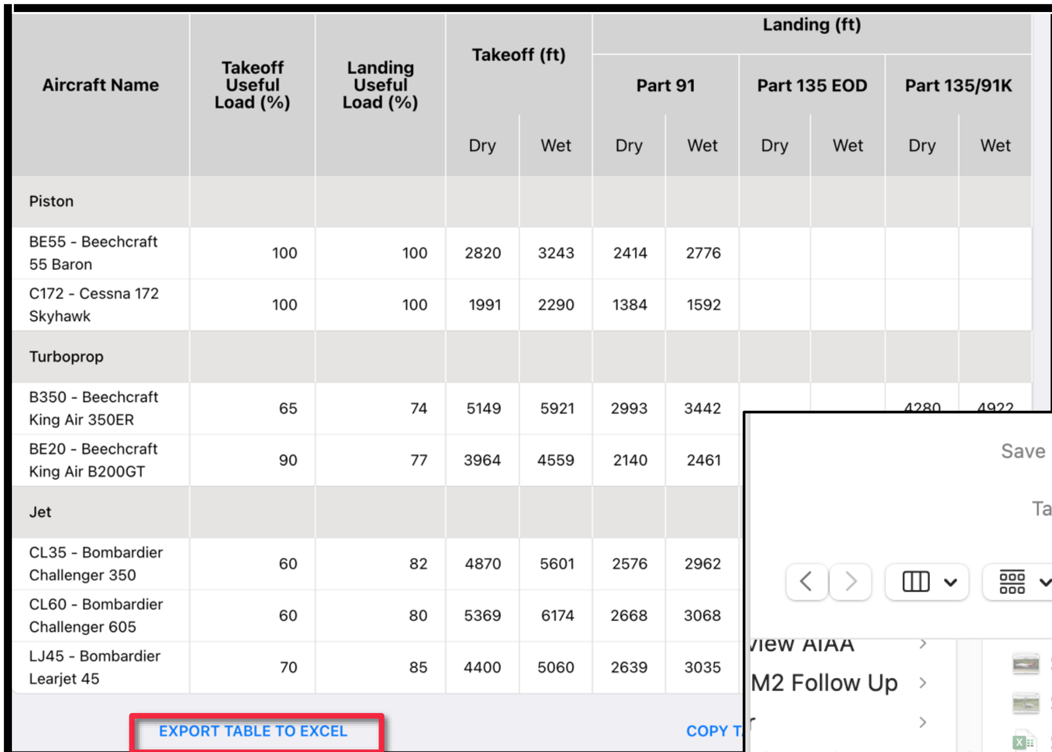
- SARLAT saves graphic output as Portable Network Graphic (PNG) files

Step 1: Click "Export Chart to PNG"

Step 2: Navigate to the destination folder and indicate a file name.

Exporting SARLAT Numerical Output Data

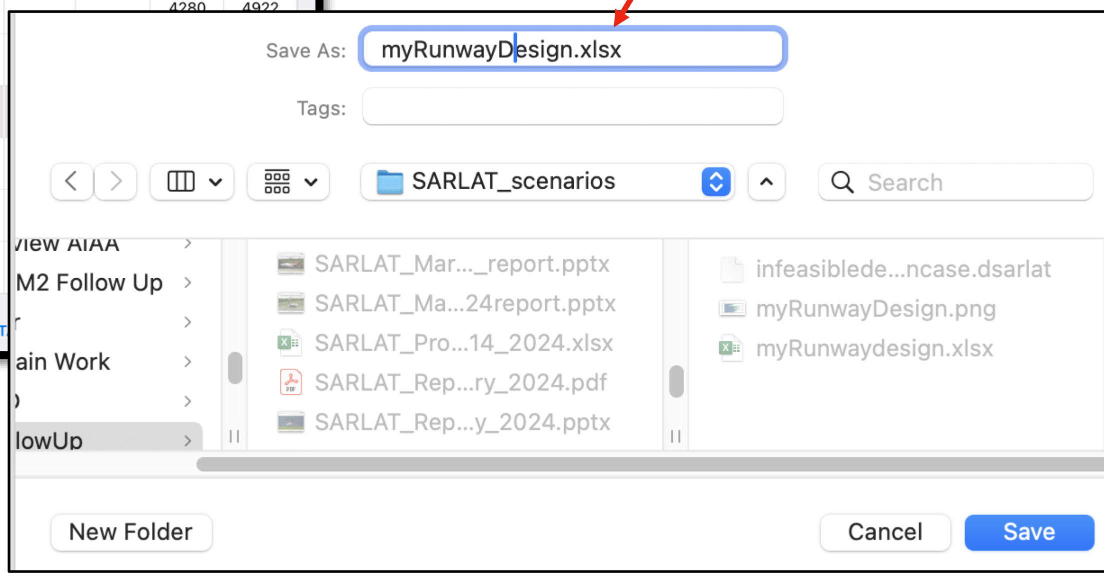
- SARLAT 2 saves numerical output data in Excel format or to the Clipboard



Aircraft Name	Takeoff Useful Load (%)	Landing Useful Load (%)	Takeoff (ft)		Landing (ft)					
					Part 91		Part 135 EOD		Part 135/91K	
			Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Piston										
BE55 - Beechcraft 55 Baron	100	100	2820	3243	2414	2776				
C172 - Cessna 172 Skyhawk	100	100	1991	2290	1384	1592				
Turboprop										
B350 - Beechcraft King Air 350ER	65	74	5149	5921	2993	3442			4280	4922
BE20 - Beechcraft King Air B200GT	90	77	3964	4559	2140	2461				
Jet										
CL35 - Bombardier Challenger 350	60	82	4870	5601	2576	2962				
CL60 - Bombardier Challenger 605	60	80	5369	6174	2668	3068				
LJ45 - Bombardier Learjet 45	70	85	4400	5060	2639	3035				

EXPORT TABLE TO EXCEL

Step 2: Navigate to the destination folder and define a file name.



Step 1: Click "Export Table to Excel"

VIRGINIA TECH

Exporting SARLAT Excel Output File

- SARLAT Excel output format

Useful load values (%)

Takeoff data (feet)

Part 91 landing data (feet)

Part 135 landing data (feet) if applicable

Aircraft Name	Useful Load (%)	Takeoff (ft)	Landing (ft)				
No Correction	Part 135 Eligible	Part 135					
Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Piston							
Beechcraft 58 Baron	100	2649	3046	2777	3194		
Cessna 177 Cardinal	100	1915	2202	1345	1547		
Turboprop							
Beechcraft King Air 350ER	50	4776	5492	2916	3353		
Beechcraft King Air B200GT	78	3866	4446	2711	3118		
Jet							
Bombardier Challenger 350	56	4635	5330	2970	3415		
Bombardier Challenger 605	52	4835	5560	3100	3565		
Cessna 560 XL	64	3608	4149	3518	4046		
Cessna Citation Latitude	71	3979	4576	2727	3136		
Cessna Citation M2	67	3294	3788	2923	3361		

Critical Aircraft Based on Runway Length

Objective: Determine the critical aircraft based on runway length performance

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Critical Aircraft Based on Runway Length

- The critical aircraft for runway length requirement is derived from the ranked order list by runway length, with 500 or more cumulative annual operations
- For large aircraft, this includes trip distance with regular use by that aircraft type (as a function of useful payload).

Critical Aircraft for Runway Length

TAKEOFF DRY | TAKEOFF WET | LANDING DRY | LANDING WET

B350 - Beechcraft King Air 350ER is the critical aircraft and requires **5337 ft** of runway to be fully accommodated in the full range of specified operating conditions.

Aircraft Name	Engine Type	Aircraft Design Group (ADG)	Aircraft Approach Category (AAC)	Taxiway Design Group (TDG)	Takeoff Useful Load (%)	Landing Useful Load (%)	Annual Operations	Cumulative Annual Operations	Takeoff Dry (ft)	Takeoff Wet (ft)	Landing Dry (ft)	Landing Wet (ft)
CL60 - Bombardier Challenger 605	Jet	II	C	1B	60	80	230	230	5438	6254	2675	3076
B350 - Beechcraft King Air 350ER	Turboprop	II	B	2A	70	74	400	630	5337	6138	2999	3449
CL35 - Bombardier Challenger 350	Jet	II	C	1B	60	82	210	840	4951	5694	2583	2970
LJ45 - Bombardier Learjet 45	Jet	I	C	1B	70	85	200	1040	4426	5090	2646	3043
BE20 - Beechcraft King Air B200GT	Turboprop	II	B	2A	70	77	500	1540	3867	4447	2148	2470
BE58 - Beechcraft 58 Baron	Piston	I	B	1A	100	100	600	2140	2685	3088	2802	3222
C172 - Cessna 172 Sky	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1596

The Beechcraft King Air B350ER (B350) is the critical aircraft and requires 5,337 feet of runway for takeoff (dry pavement). The runway length is rounded to 5,400 feet.

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Critical Aircraft with Part 135 Toggle

- The table below shows a design scenario with three aircraft in the fleet mix
- Since aircraft are operated under Part 135 rules, the Part 135 toggle appears in the output table below
- The aircraft takeoff and landing distances are sorted in descending order using the most demanding conditions (i.e., dry takeoff conditions)
- Part 135 landing distances adjustments are included when reporting the landing distances with the Part 135 toggle on
- The B350 (King Air B350ER) is the critical aircraft because it is the first aircraft to reach more than 500 cumulative annual operations

Critical Aircraft for Runway Length

TAKEOFF DRY | TAKEOFF WET | LANDING DRY | LANDING WET | PART 135

B350 - Beechcraft King Air 350ER is the critical aircraft and requires **5337 ft** of runway to be fully accommodated in the full range of specified operating conditions.

Aircraft Name	Engine Type	Aircraft Design Group (ADG)	Aircraft Approach Category (AAC)	Taxiway Design Group (TDG)	Takeoff Useful Load (%)	Landing Useful Load (%)	Annual Operations	Cumulative Annual Operations	Takeoff Dry (ft)	Takeoff Wet (ft)	Landing Dry (ft)	Landing Wet (ft)
CL60 - Bombardier Challenger 605	Jet	II	C	1B	60	80	230	230	5438	6254	**4467**	**5137**
B350 - Beechcraft King Air 350ER	Turboprop	II	B	2A	70	74	400	630	5337	6138	**4289**	**4932**
CL35 - Bombardier Challenger 350	Jet	II	C	1B	60	82	210	840	4951	5694	**4314**	**4961**

No Critical Aircraft Based on Runway Length Example

- In the scenario presented the following aircraft operate at the airport:

Aircraft	Annual Operations
BE58	200
C172	150
BE90	100

Design Conditions

Pressure altitude = 2,029 feet
Design temperature = 88 deg. F.
Wind speed = 0 knots
Runway gradient = 0%

Aircraft Name	Takeoff Useful Load (%)	Landing Useful Load (%)	Takeoff (ft)		Landing (ft)					
					Part 91		Part 135 EOD		Part 135/91K	
			Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Piston										
BE58 - Beechcraft 58 Baron	100	100	2616	3008	2768	3183				
C172 - Cessna 172 Skyhawk	100	100	1937	2228	1375	1581				
Turboprop										
BE9L - Beechcraft King Air C90	100	100	3143	3614	2800	3220				

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No critical aircraft found message

Critical Aircraft for Runway Length

No critical aircraft could be identified because the annual cumulative operations are below the 500 operations regular use threshold. Defaulting to the most demanding single-engine piston or turboprop aircraft in production. Consult APP-410 for further guidance on use with AIP projects.

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No Critical Aircraft Based on Runway Length Example

- Following with the example in the previous slide, if the cumulative number of annual operations at the airport is below 500:
  - SARLAT reports the critical aircraft as the most demanding single-engine piston or turboprop aircraft in production for the selected design conditions
  - For the example below, the Pilatus PC-12 (PC12) is found to be the most demanding aircraft requiring 3,665 feet or runway

Critical Aircraft for Runway Length

No critical aircraft could be identified because the annual cumulative operations are below the 500 operations regular use threshold. Defaulting to the most demanding single-engine piston or turboprop aircraft in production. Consult APP-410 for further guidance on use with AIP projects.

PC12 - Pilatus PC 12 NG is the critical aircraft and requires **3665 ft** of runway to be fully accommodated in the full range of specified operating conditions.

Group	Critical Group
Aircraft Approach Category (AAC)	A
Aircraft Design Group (ADG)	I
Runway Design Code (RDC)	A-I
Taxiway Design Group (TDG)	1

When no critical aircraft is found, SARLAT reports RDC A-I by default

Single-Engine Piston and Turboprop in Production in SARLAT Database

Piston Aircraft	Turboprop Aircraft
BE36 - Beech Bonanza 36	C208 - Cessna 208 Caravan
C172 - Cessna 172 Skyhawk	PC12 - Pilatus PC 12 NG
C182 - Cessna 182 Skylane	TBM8 - Socata TBM 850
T206 - Cessna T206 Turbo Stationair	
SR20 - Cirrus SR 20	
SR22 - Cirrus SR 22	
S22T - Cirrus SR 22 Turbo	
DA40 - Diamond 40 Star	
DA42 - Diamond 42 Twin Star	
FDCT - Flight Design CTLS	
P28A - Piper 28 161 Cherokee	
PA44 - Piper 44 180 Seminole	
P06T - Tecnam P2006T	
RV12 - Vans RV 12	

Default Takeoff Weights in SARLAT

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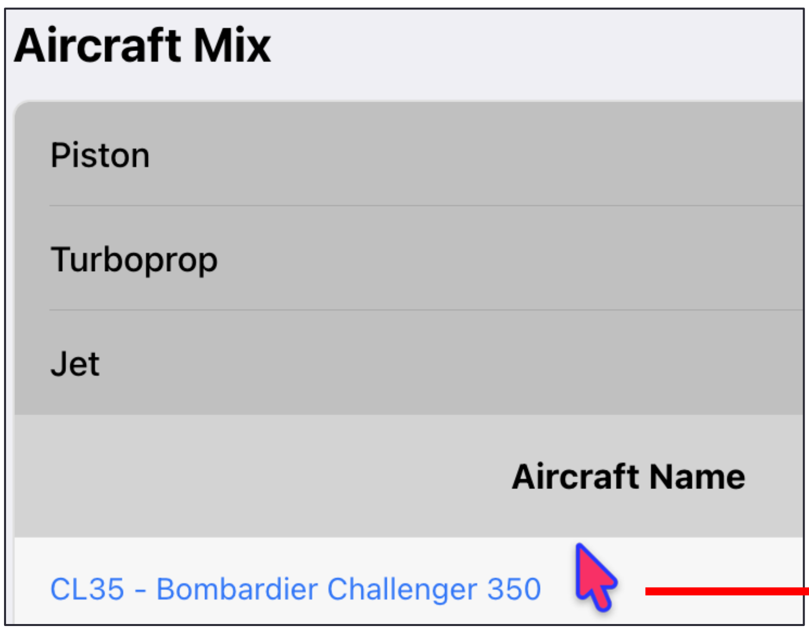
Default Takeoff Weights in SARLAT

- An external analysis was performed to determine realistic default takeoff weights considering aircraft mission range and the distribution of distances flown in the NAS
- The aircraft takeoff weight is estimated as the sum of the Basic Operating Empty Weight (BOW) and Useful Load (UL)
- Useful load is the sum of the Payload (PYL) and Fuel Weight (*FW*)
- SARLAT contains a database with values of $BOW, UL,$ Maximum Takeoff Weight (*MTOW*) and Maximum Landing Weights (*MALW*) for each aircraft
- The aircraft data can be viewed in the Runway Evaluation or Runway Design modes by selecting a specific aircraft in the fleet mix



FAA Type Designator	CL35
Engine Type	Jet
Aircraft Design Group (ADG)	II
Aircraft Approach Category (AAC)	C
Weight Category	Large
Operating Empty Weight (OEW)	24800 lbs
Useful Load	15800 lbs
Maximum Takeoff Weight (MTOW)	40600 lbs
Maximum Allowable Landing Weight (MALW)	34150 lbs

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Default Useful Load Values in Runway Design Mode

- SARLAT includes default takeoff weights for all jet aircraft and for turboprop aircraft weighing more than 12,500 lbs.
- The aircraft takeoff weight in SARLAT is controlled by the Takeoff Useful Load (expressed as a percent of the Maximum Useful Load)
- For the example below, the Bombardier Challenger 350 has a default takeoff useful load of 60%
- With a useful load of 60%, the Bombardier Challenger 350 can fly four passengers plus two pilots 1,553 nautical miles with NBAA fuel reserves (enough for 95% of the missions flown in the NAS)

Aircraft Mix

Piston

Turboprop

Jet

Aircraft Name	Annual Operations	Trip Distance with Average Passenger Load (nm)	Takeoff Useful Load (%)
CL35 - Bombardier Challenger 350	400	1553	60
CL60 - Bombardier Challenger 605	500	1910	60

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Default Useful Load Values in SARLAT

- An external analysis was performed to determine realistic takeoff default weights considering aircraft mission range and the distribution of distances flown in the NAS
- The table illustrates the rules used in the derivation of default useful loads in SARLAT

Aircraft Group	Maximum Takeoff Weight (lbs.)	Default Useful Load (%)
Piston and Turboprop Aircraft	< 12,500	100
Turboprop Aircraft	>=12,500	70
Light Jets	<18,000	80
Mid-size Jets	>= 18,000 and < 30,000	70
Super mid-size and Large Jets	>=30,000	60

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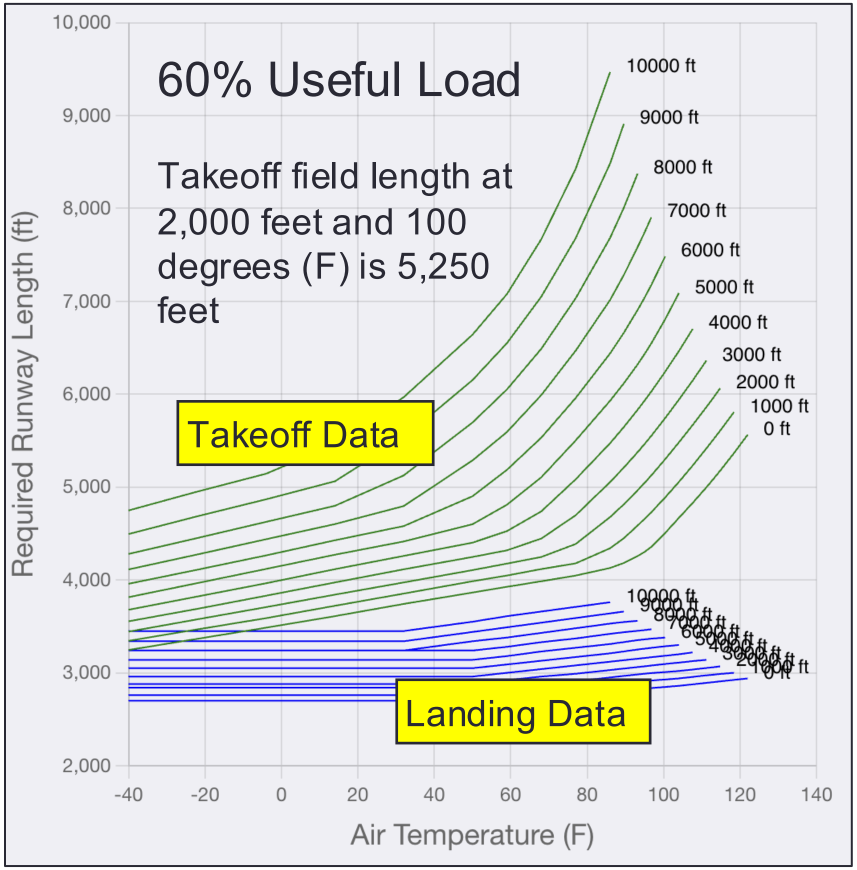
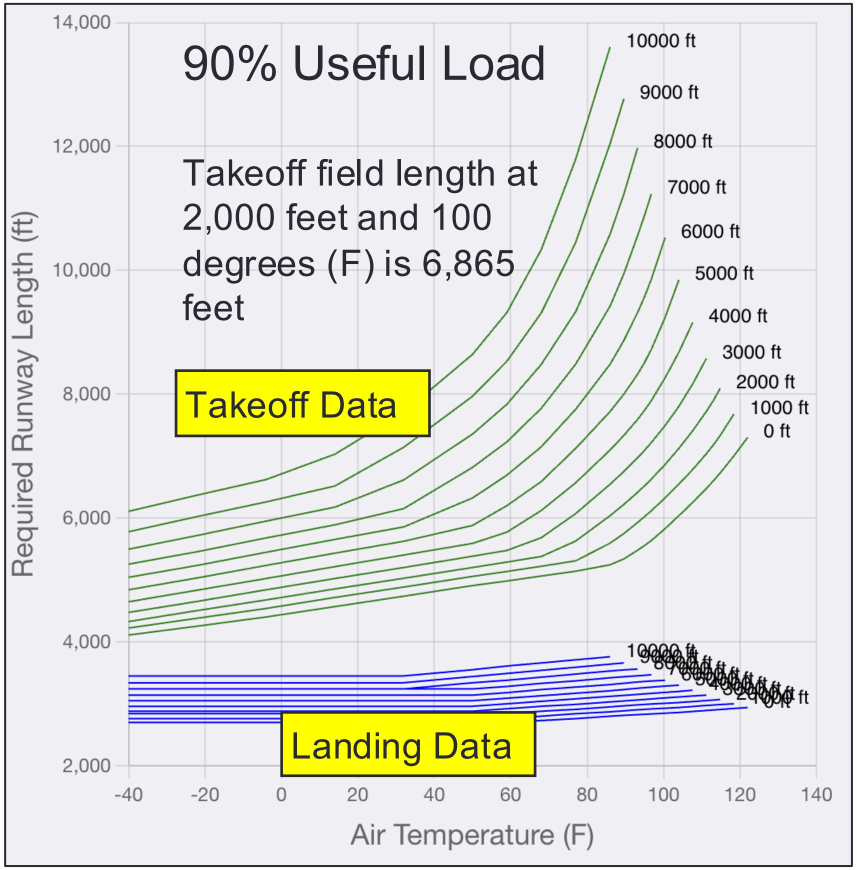
Useful Load has a Significant Effect on Takeoff Field Length

- Below we show the SARLAT Runway Design Validation curves for a mid-size jet (CL35) operated at two useful load values (60% and 90%)
- At an airfield elevation of 2,000 feet and 100 degrees Fahrenheit design temperature, the takeoff field length for the Challenger 350 increases 31% when the useful load increases from 60% to 90%





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FEDERAL AVIATION ADMINISTRATION

Default Landing Weights in SARLAT

Assumptions and Methods Used to Estimate Default Landing Weights in SARLAT

Assumptions:

- Aircraft land with the **average passenger load** at the airport
- The aircraft lands with National Business Aviation Association (NBAA**) fuel reserves**
- NBAA fuel reserve is determined by computer simulation or by regression analysis using aircraft manufacturer data or the Eurocontrol BADA 3.16 model parameters
- The airport alternate is 100 nm for very light jets and turboprops, 200 nm for light, mid-size, and 300 nm for large jets

NBAA Fuel Reserve Considerations

1) At the destination airport, add fuel to climb to 5,000 feet after a missed approach
2) Hold segment of five minutes (decision phase to divert to the alternate airport)
3) Climb to optimum cruise altitude and fly to the alternate at economy cruise
4) Perform a normal descent
5) Perform an instrument approach
6) Land with 30 minutes of fuel based on low cruise power at 5,000 feet.

Default Landing Weights in SARLAT are Reported as the Percent of Maximum Landing Weight (*PMALW*)

$$W_{landing} = BOW + NBAA_{fuel} + PAY$$

$W_{landing}$	SARLAT landing weight (lbs.)
BOW	Basic operating empty weight (lbs.)
$NBAA_{fuel}$	NBAA reserve fuel weight (lbs.)
PAY	Payload weight (lbs.)

$$PMALW = \frac{W_{landing}}{W_{MALW}}$$

$PMALW$	Percent of maximum allowable landing weight (dim)

- Payload is estimated using the average passenger load
- 200 lbs. per passenger and pilot

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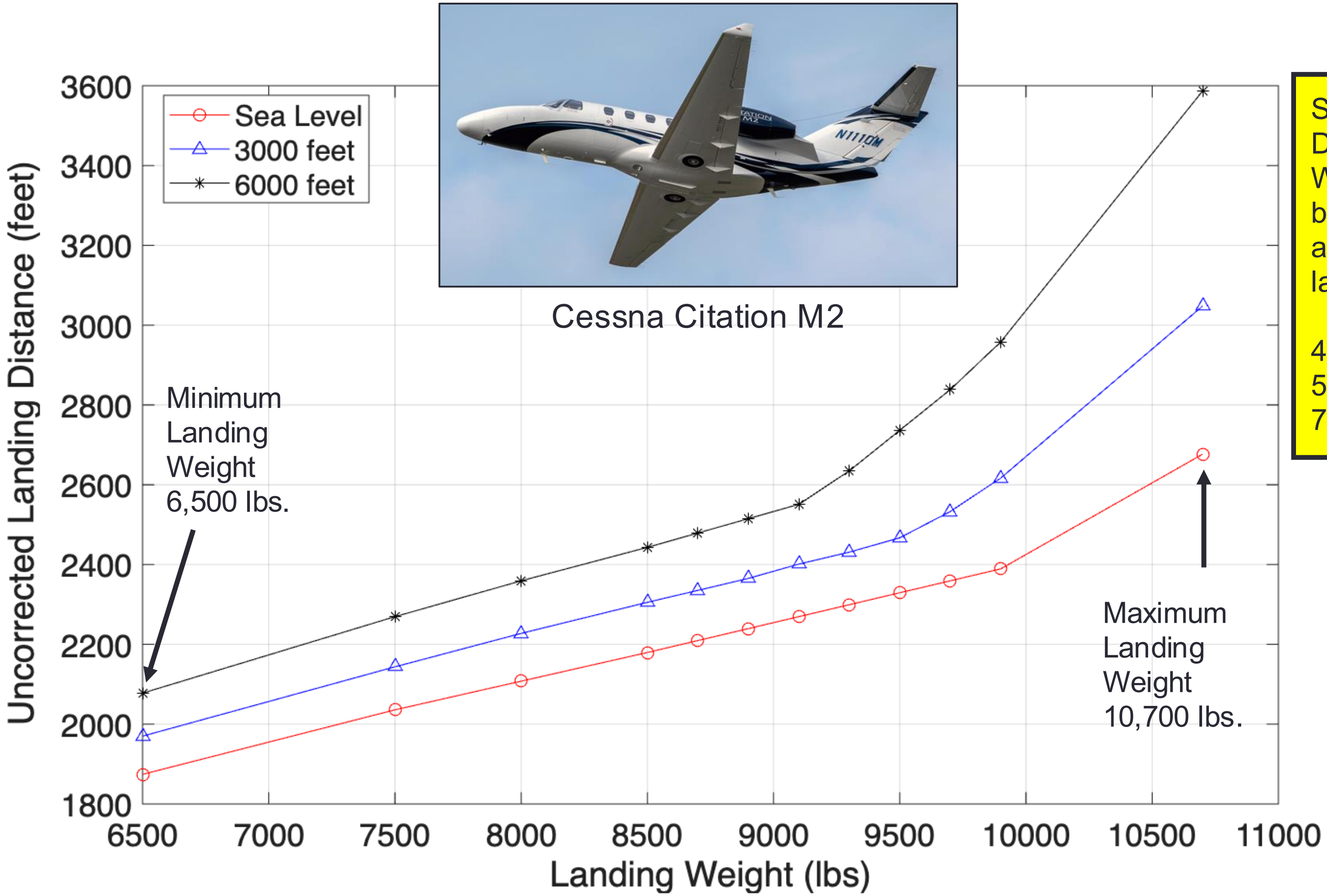
Landing Weight Affects Landing Distance

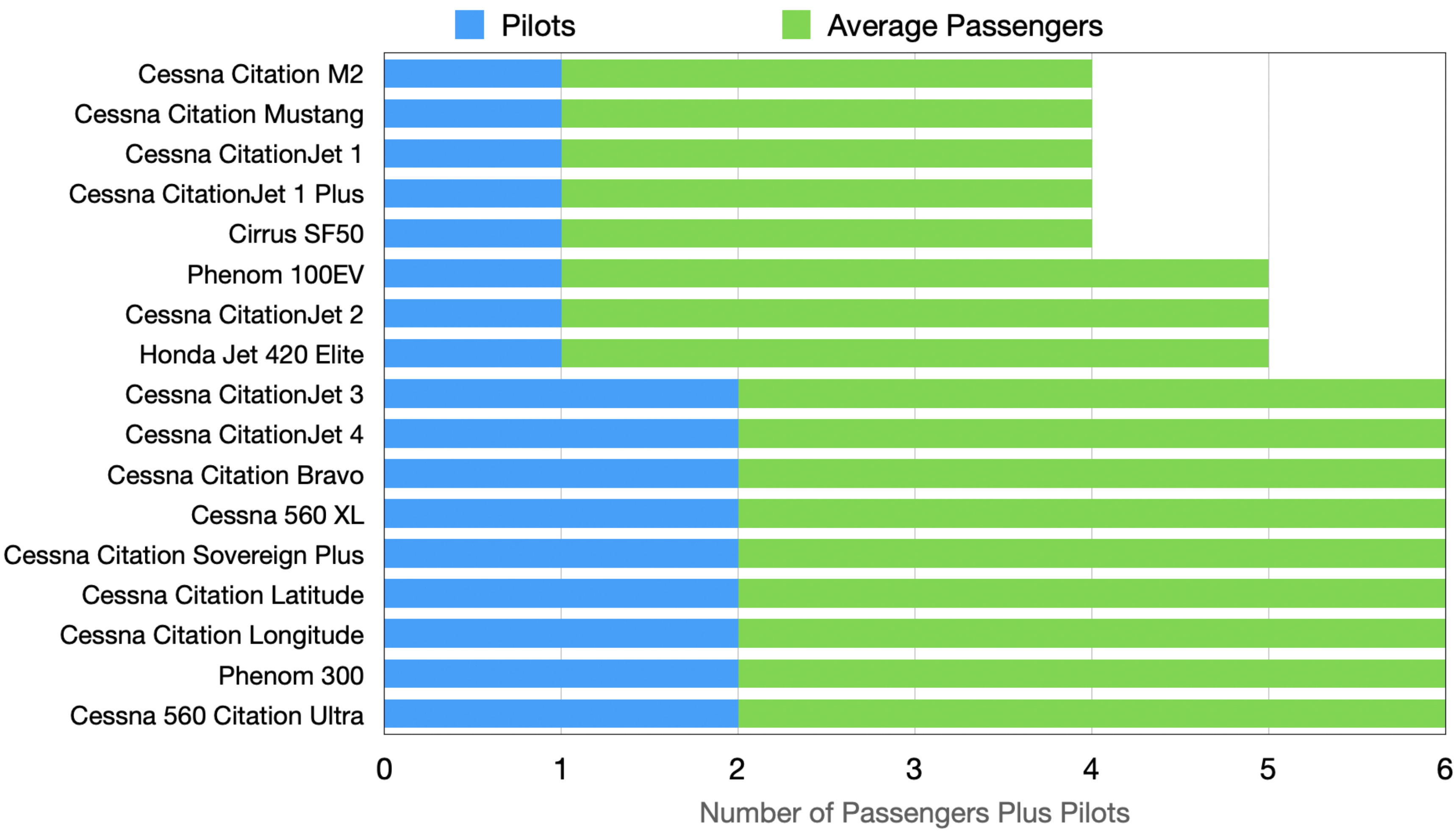


Spread of Landing Distance with Weight (difference between maximum and minimum landing weight)

43% at sea level
55% at 3,000 feet
73% at 6,000 feet

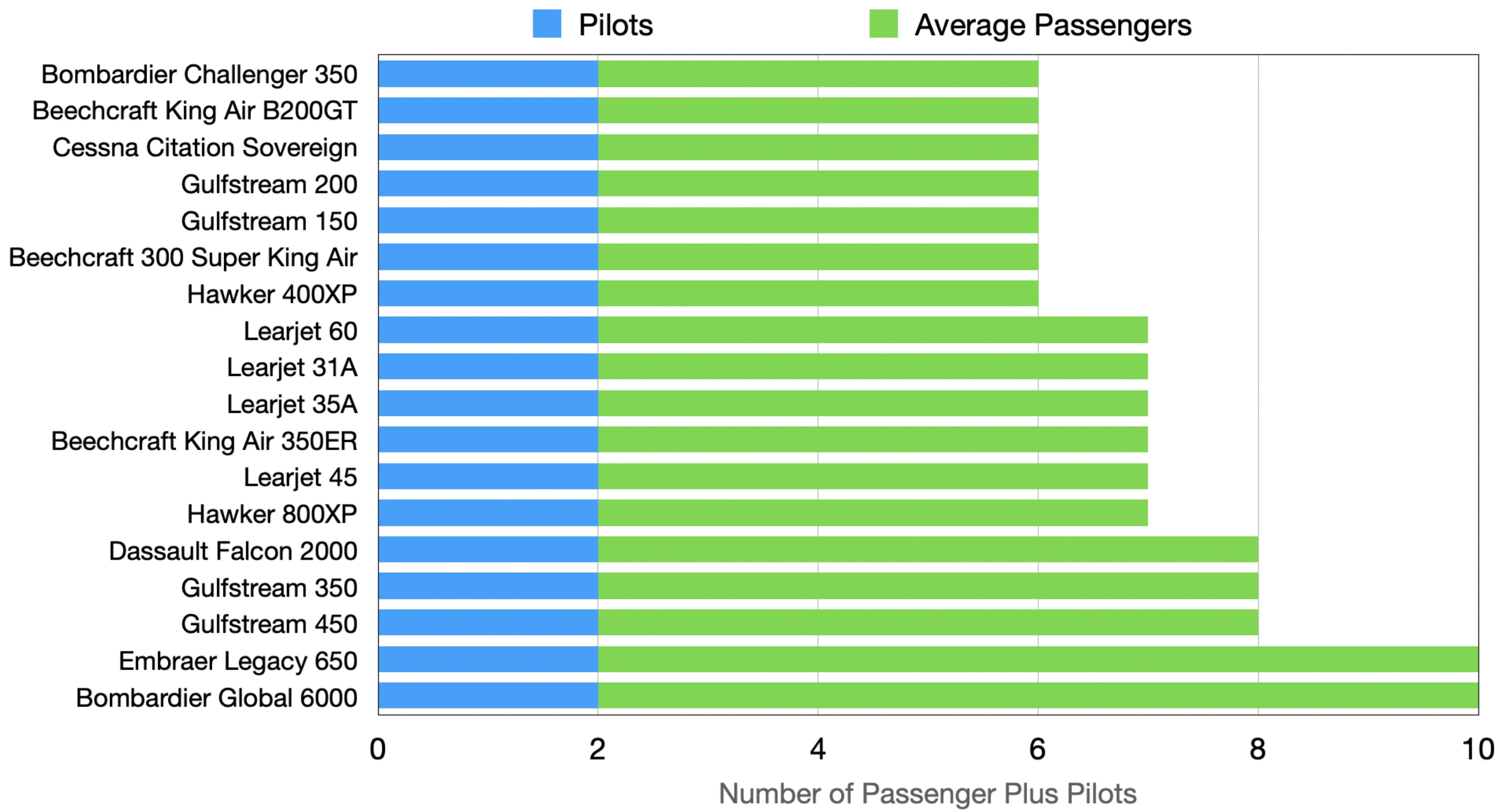
Source: Cessna Aircraft Co.

Number of Passengers and Pilots Assumed in Landing Weight Calculations

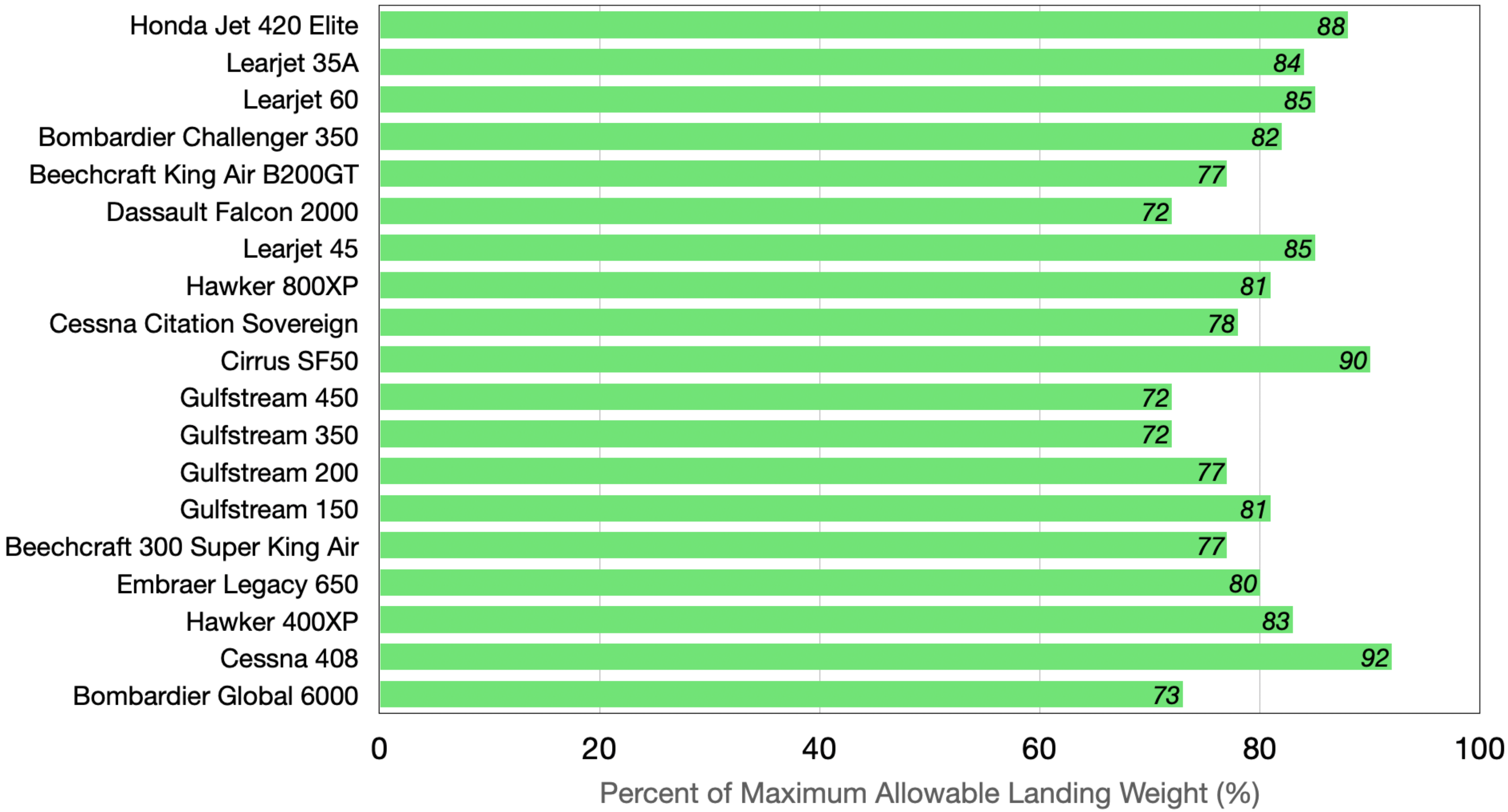


Note: The Cessna Citation CJ3 and CJ4 can be operated with a single pilot. However, they are normally operated with two pilots.

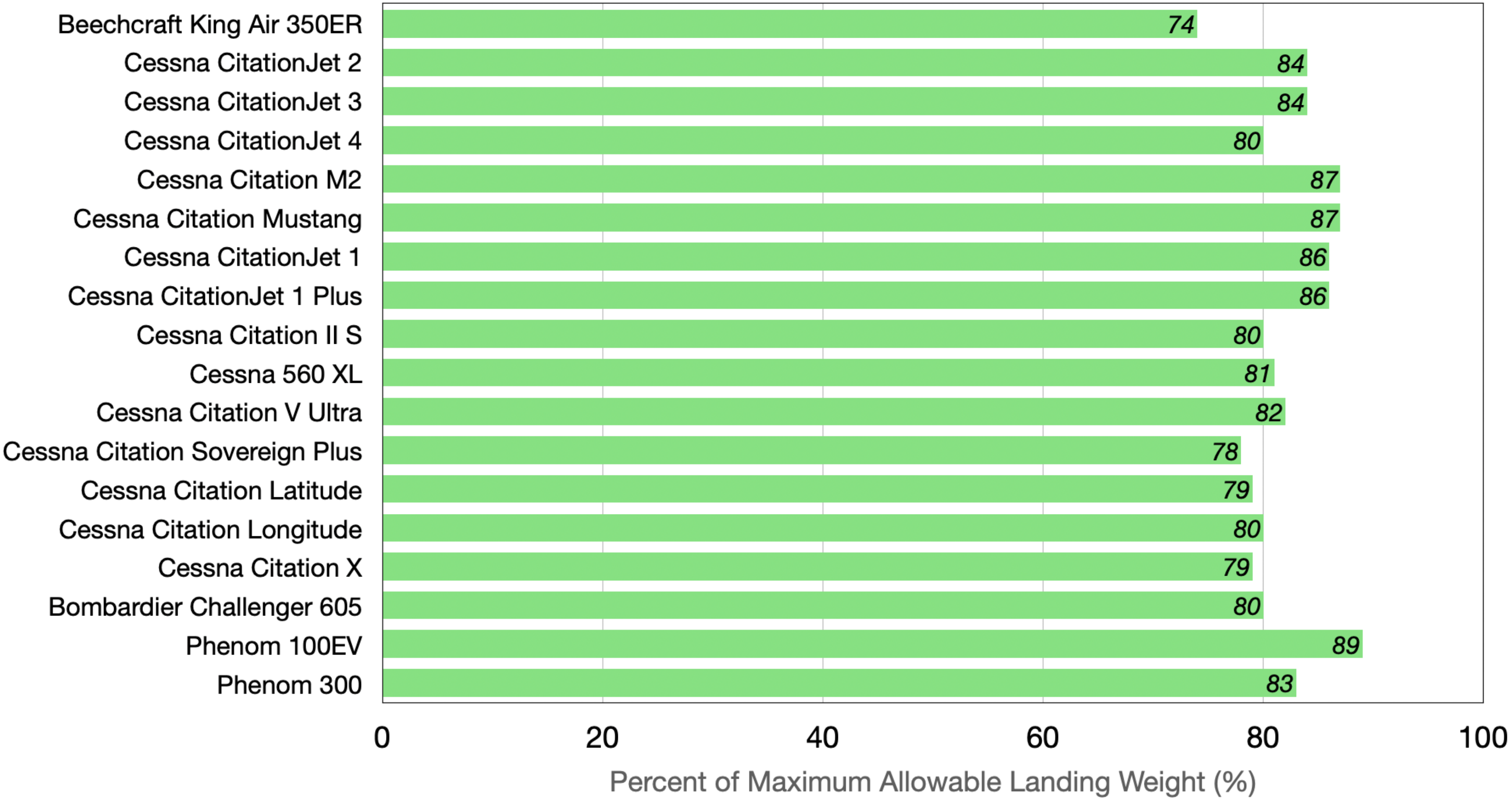
Number of Passengers and Pilots Assumed in Landing Weight Calculations



Default Landing Weights (*PMAWL*) for Jet and Large Turboprop Aircraft in SARLAT



Default Landing Weights (*PMAWL*) for Jet and Large Turboprop Aircraft in SARLAT



Reduction in Landing Distance for Mid-size Jets in SARLAT Using the Default Landing Weight Assumptions

15-19% reduction in landing distance using SARLAT landing weights compared to MALW