Small Aircraft Runway Length Analysis Tool
Quick User Guide

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Contributions to SARLAT version 1

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Delta Airport Consultants

Version 2.0.0.13

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Small Aircraft Runway Length Analysis Tool
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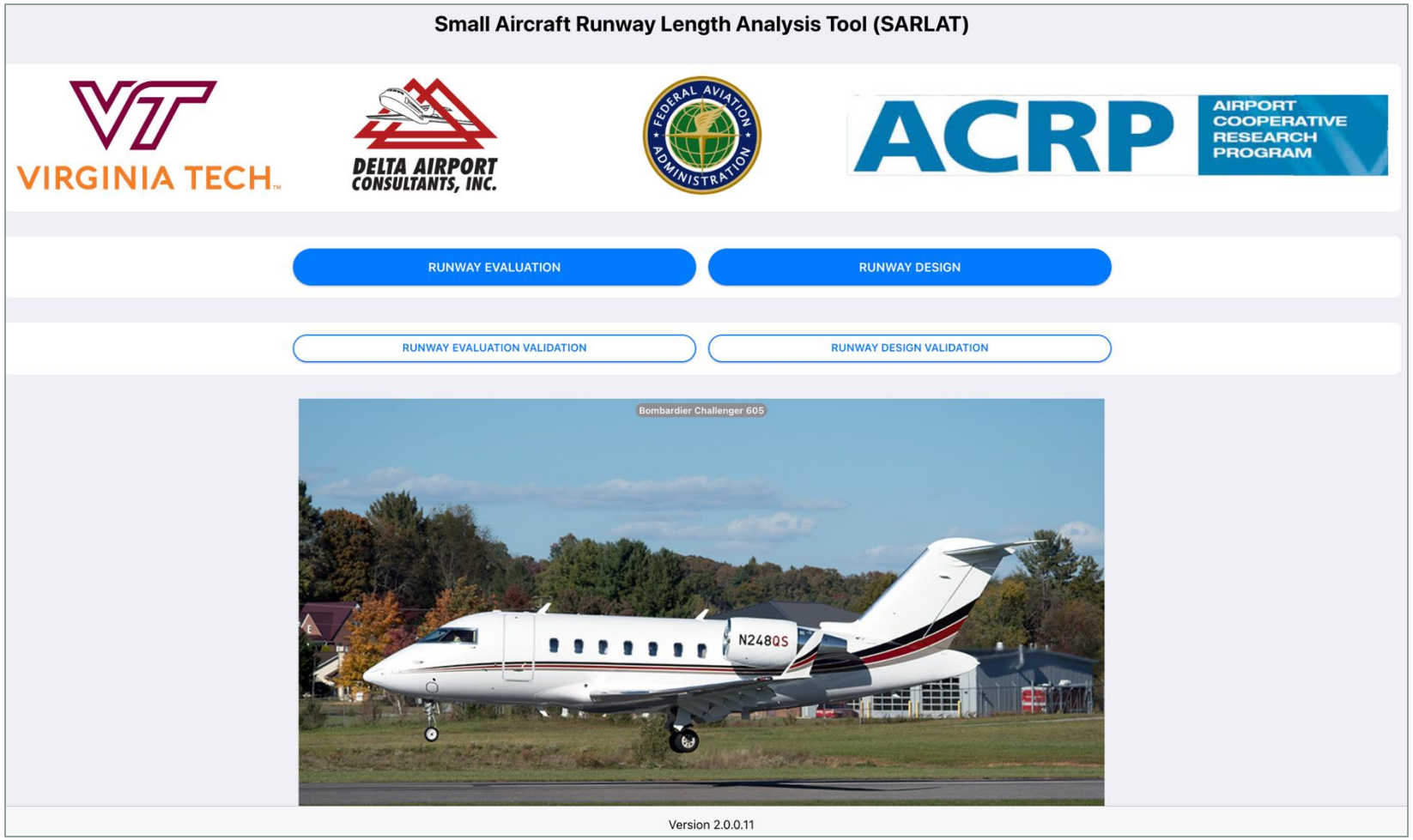


Installation Instructions for Windows OS

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

Windows: https://atsl-software-downloads.s3.amazonaws.com/sarlat/V2.0.0/SARLAT+2-2.0.0+Setup.exe

Step 2: Locate the downloaded file on your hard drive folder

SARLAT+2-2.0.0+Setup.exe

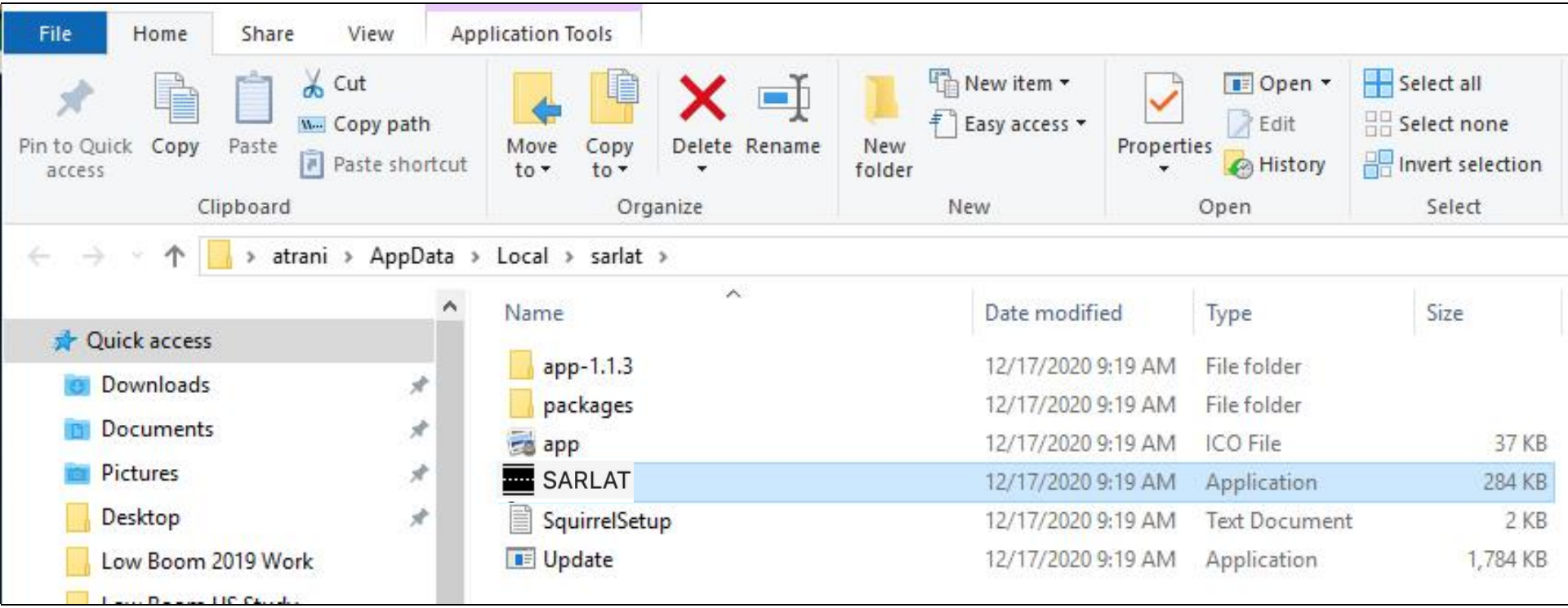
Step 3: Install the application

Double click on the **SARLAT+2-2.0.0+Setup.exe** file

Note: In Windows you do not need to have Administration privileges to install SARLAT

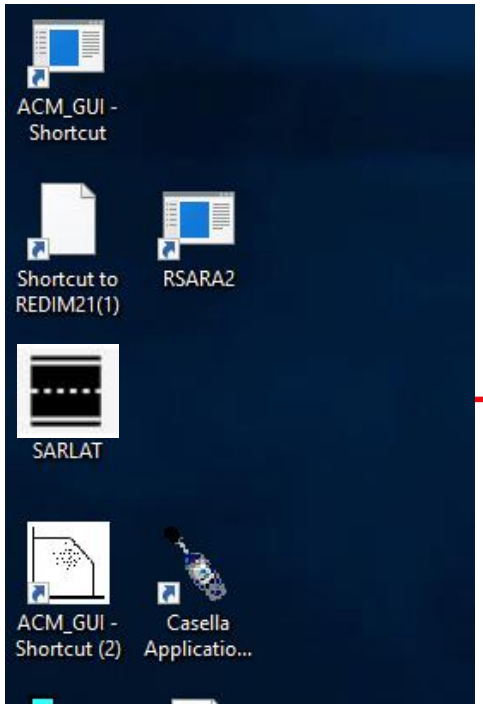
SARLAT Installation Files in Windows OS

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



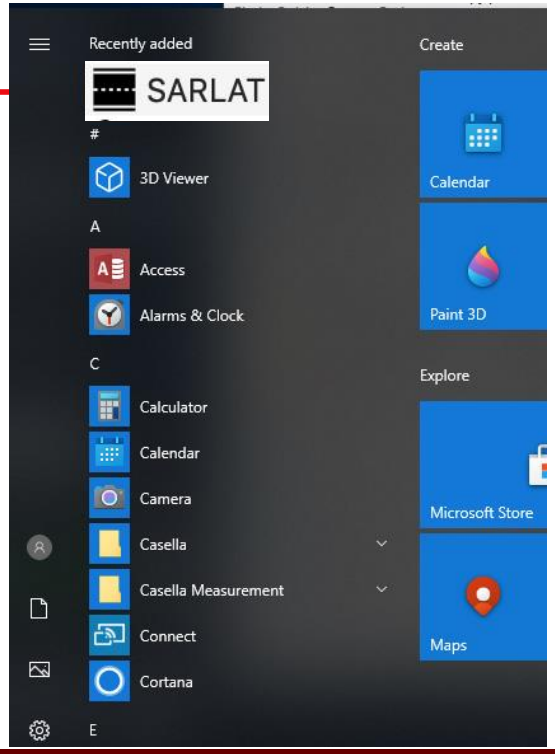
Running the Small Aircraft Runway Length Analysis Tool in **Windows** after Installation

- 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 Processors: https://atsl-software-downloads.s3.amazonaws.com/sarlat/V2.0.0/SARLAT+2-2.0.0-x64.dmg

Mac ARM Processors: https://atsl-software-downloads.s3.amazonaws.com/sarlat/V2.0.0/SARLAT+2-2.0.0-arm64.dmg

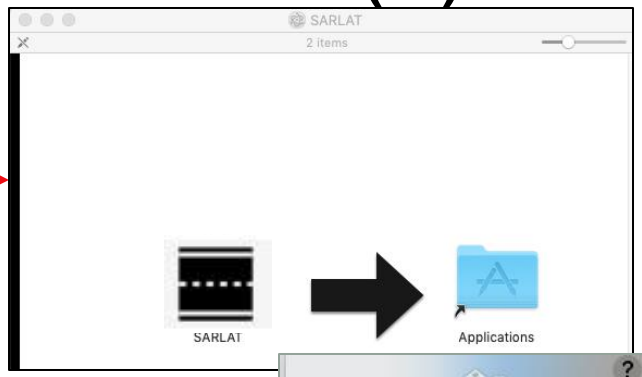
Step 2: Locate the downloaded file on your hard drive folder. The file is an Apple Disk Image file called **SARLAT-2.0.0.dmg**

Step 3: Install the application

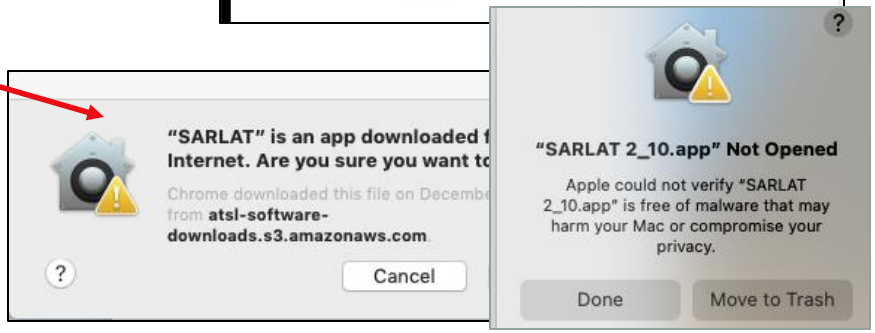
Double click on the **SARLAT-2.0.0.dmg** file on the Mac OS

Installation Instructions for Mac OS (2)

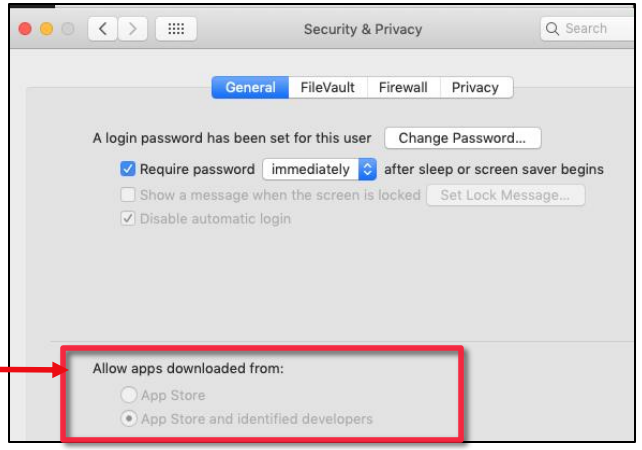
Step 4: Drag the SARLAT application icon to your Applications Folder



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

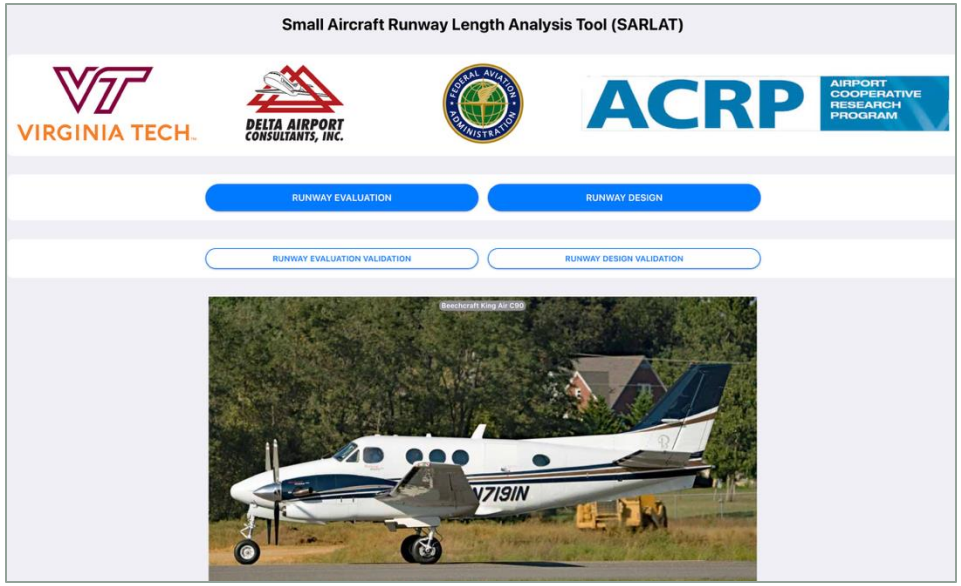
- Double click in there SARLAT icon to run the application
- You can create a shortcut by dragging the SARLAT Application icon to the computer task bar

SARLAT Application Icon

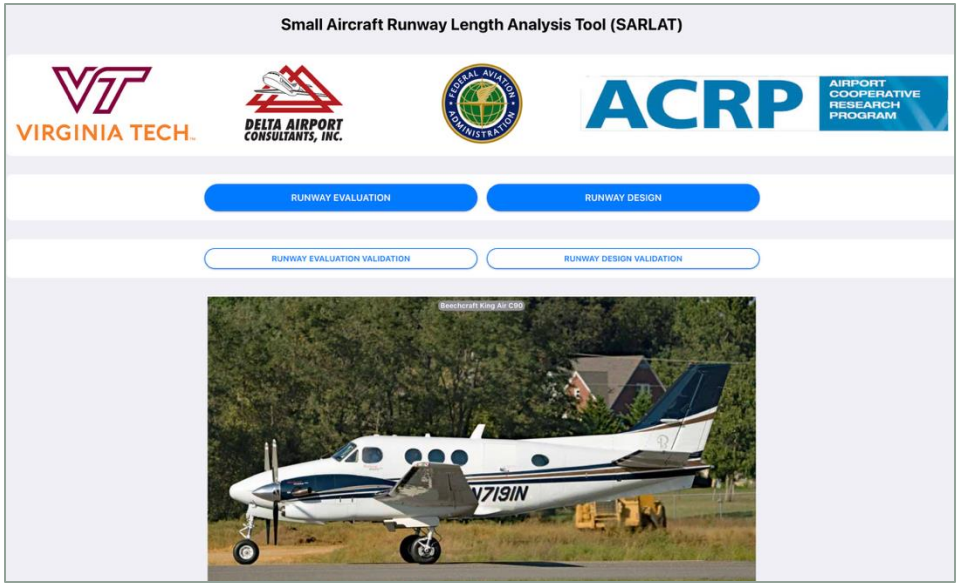
Small Aircraft Runway Length Analysis Tool

- 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



Using the Small Aircraft Runway Length Analysis Tool

General Information About SARLAT 2.0.0.11

SARLAT estimates takeoff and landing distances for 73 aircraft under a range of operational conditions

- 28 turbofan-powered aircraft
- 11 turboprop-powered aircraft (including one agricultural use aircraft)
- 34 piston-powered aircraft

- Data used in the tool has been collected, analyzed, and validated from aircraft flight manuals, pilot operating handbooks, and flight planning guides
- SARLAT 2 includes mission profiles and useful load-range diagrams for large aircraft (i.e., weighing 12,500+ lbs.) and for all jet-powered aircraft.

SARLAT 2 Takeoff Runway Length Reports

- For turbofan and turboprop aircraft weighing 12,500 lbs. or more, SARLAT 2 reports **Takeoff Balanced Field Length**
- For turboprop aircraft weighing less than 12,500 lbs. and piston-powered twin-engine aircraft we report **Takeoff Distance to Clear a 50-foot Obstacle**
- For single-engine piston-powered aircraft, we report **Takeoff Distance to Clear a 50-foot Obstacle**

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

SARLAT 2 Landing Runway Length Reports

- For all types of aircraft, we report **uncorrected dry pavement landing distance**
- For all types of aircraft, we report **wet pavement landing distance (dry landing distance corrected)**
- For **turbofan-powered aircraft** operating under 14 CFR Part 135 rules, we report corrected dry pavement landing distance (1.67 times the uncorrected dry landing distance)
- For **turbofan-powered aircraft** operating under 14 CFR Part 135 rules, we report corrected wet pavement landing distance (1.92 times the uncorrected dry landing distance)
- For **turboprop-powered** aircraft operating under 14 CFR Part 135 rules, we report corrected dry pavement landing distance (1.43 times the uncorrected dry landing distance)

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	Up to 30 seats Scheduled or Charter	Fractional	• Scheduled <5 round trips weekly scheduled, no jets, 9 seats max • Nonscheduled with <=30 seats, 7500 pounds max payload, or all-cargo
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)		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 Distance Data in SARLAT

- SARLAT includes landing performance data under maximum allowable weight landing conditions
- For this reason, if you use the Part 135 toggles in SARLAT, some aircraft will display long landing distances consistent with higher approach speeds
- A future version of SARLAT will include landing distances for different weights

For AIP projects, the FAA will decide on applicable landing weights to be used.

SARLAT 2 Runway Length Analysis Limits

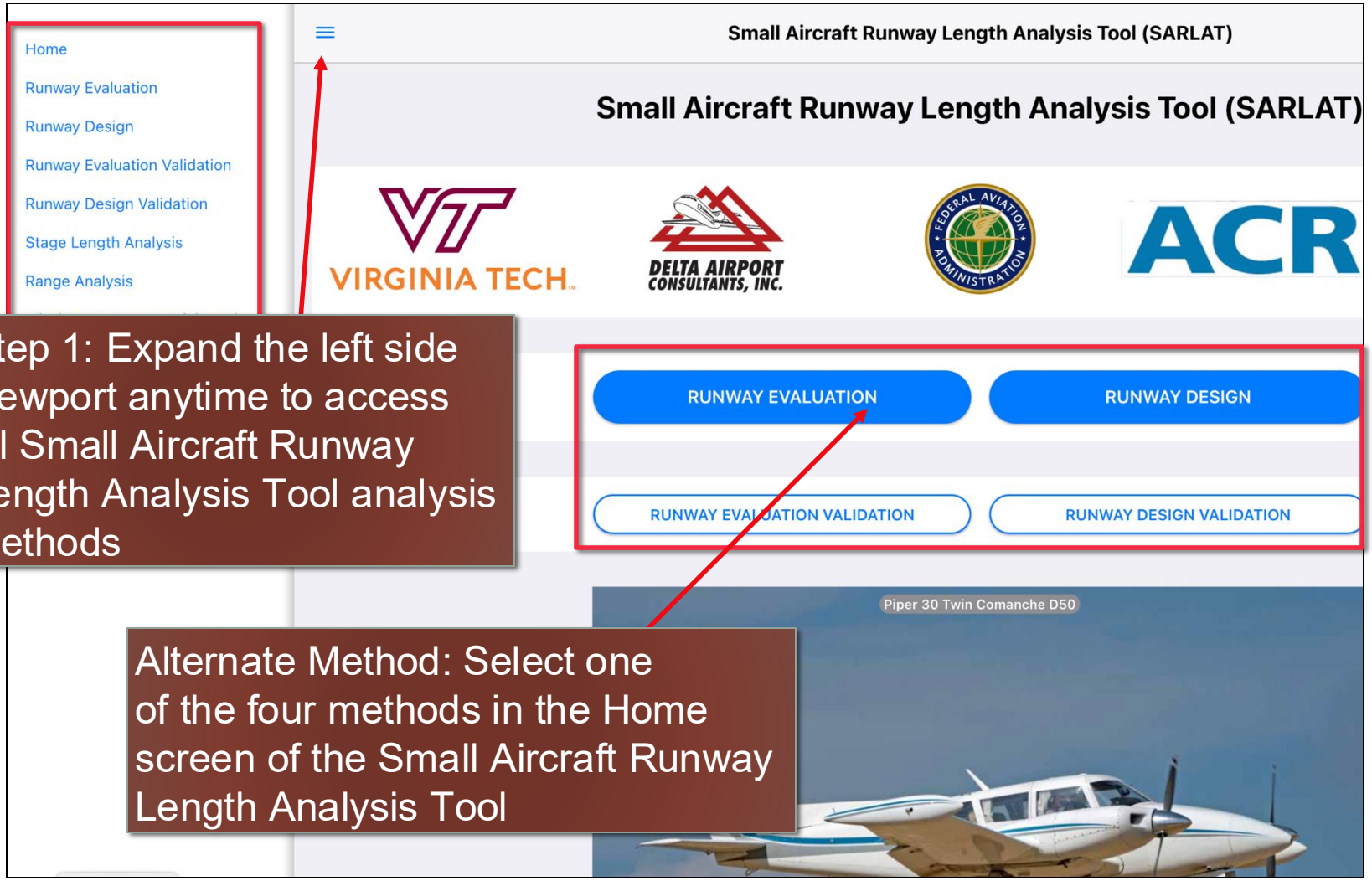
Parameter	Lower Limit	Upper Limit	Remarks
Temperature (deg. Fahrenheit)	Limited by aircraft manufacturer data	Limited by aircraft manufacturer data	Jet powered aircraft reported to 40-50 degrees. C.
Pressure Altitude (feet)	0	None	Performance data is reported to 8,000 feet altitude. For many jets, the 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*		

SARLAT data sources are Pilot Operating Handbooks, Aircraft Flight Manuals, and Flight Planning Guides

Takeoff Obstacles

- SARLAT2 assumes that any obstacles affecting takeoff can be visually avoided by the pilot, including One Engine Inoperative (OEI) as applicable to jet aircraft and large turboprops
- However, trips conducted at higher density altitudes and longer trip distances can be payload-impacted due to OEI.
- When obstacles are present beyond the airport perimeter, a detailed aircraft performance engineering analysis is necessary.

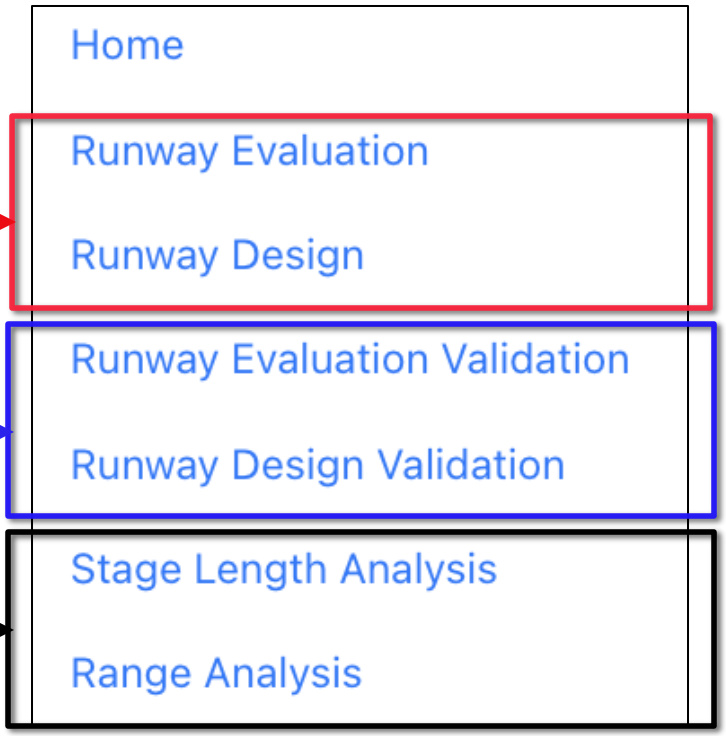
Small Aircraft Runway Length Analysis Tool **Menu Structure and Interface**



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



- 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

Analysis Modes

- Conduct runway length planning using the applicable analysis mode:
- 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 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 Evaluation Mode

Runway Evaluation Mode

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

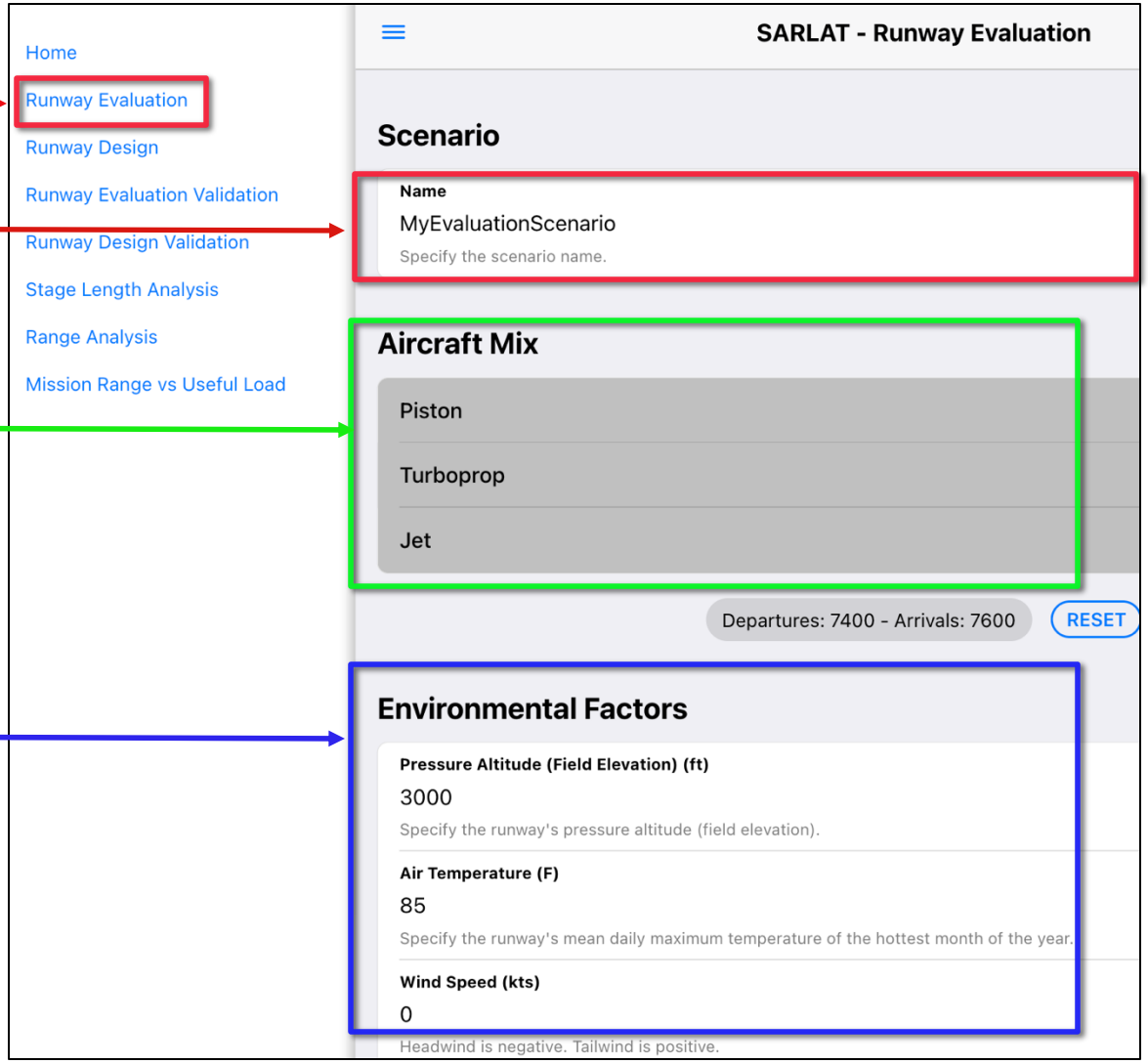
Runway Evaluation Mode Interface

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



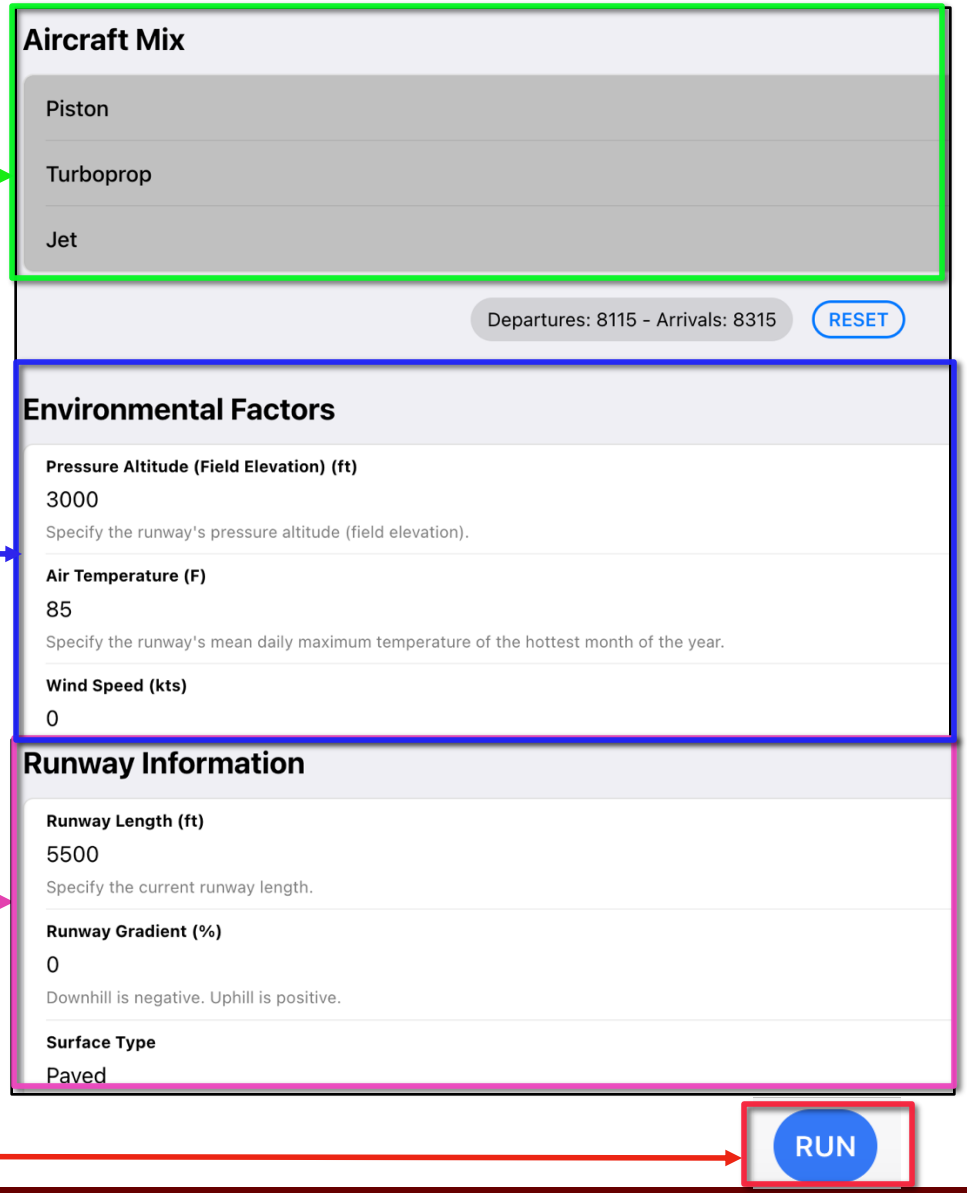
Runway Evaluation Mode Interface (2)

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 Evaluation Mode: Definition of the Aircraft Fleet Mix

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

Runway Takeoff and Landing Restrictions

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

Aircraft Name	Aircraft Mix	NBAA IFR Maximum Range SAMPLE DATA		Useful Load (Takeoff Weight)		Landing at Maximum Landing Weight					
						No Correction		Part 135 Eligible		Part 135	
		Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Piston											
Beechcraft 55 Baron	12%			100 % 5100 lbs	100 % 5100 lbs	✓	✓				
Cessna 172 Skyhawk	37%			100 % 2300 lbs	100 % 2300 lbs	✓	✓				
Piper 30 Twin Comanche D50	1%			100 % 3600 lbs	100 % 3600 lbs	✓	✓				
Turboprop											
Beechcraft 300 Super King Air	1%			79 % 12833 lbs	37 % 10524 lbs	✓	✓			✗	✗
Beechcraft King Air 350ER	1%	100% FLIGHTS IN NAS 1350 nm / 5 pax	53% FLIGHTS IN NAS 220 nm / 5 pax	74 % 14918 lbs	38 % 12708 lbs	✓	✓			✓	✓

Takeoff Weights and Useful Load Constraints

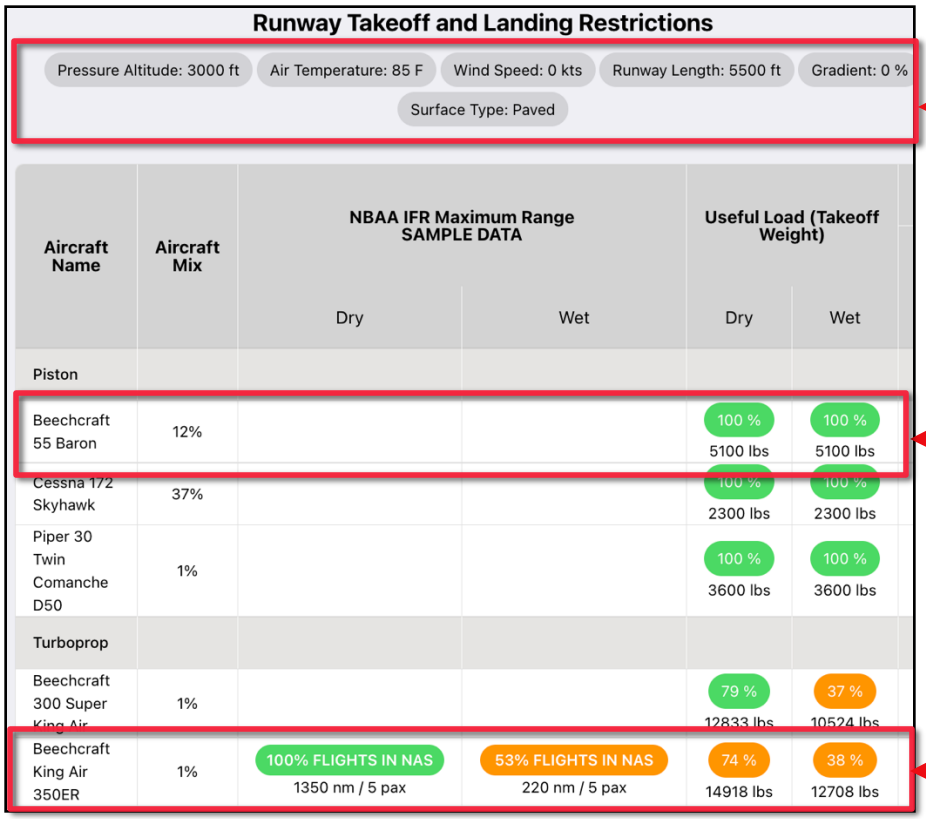
Runway Evaluation Output Interface

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 % | Surface Type: Paved

Aircraft Name	Aircraft Mix	NBAA IFR Maximum Range SAMPLE DATA		Useful Load (Takeoff Weight)	
		Dry	Wet	Dry	Wet
Piston					
Beechcraft 55 Baron	12%			100 % 5100 lbs	100 % 5100 lbs
Cessna 172 Skyhawk	37%			100 % 2300 lbs	100 % 2300 lbs
Piper 30 Twin Comanche D50	1%			100 % 3600 lbs	100 % 3600 lbs
Turboprop					
Beechcraft 300 Super King Air	1%			79 % 12833 lbs	37 % 10524 lbs
Beechcraft King Air 350ER	1%	100% FLIGHTS IN NAS 1350 nm / 5 pax	53% FLIGHTS IN NAS 220 nm / 5 pax	74 % 14918 lbs	38 % 12708 lbs

Runway Evaluation Conditions

The Beechcraft Baron 58 can operate from the 5500-foot runway at 100% useful load

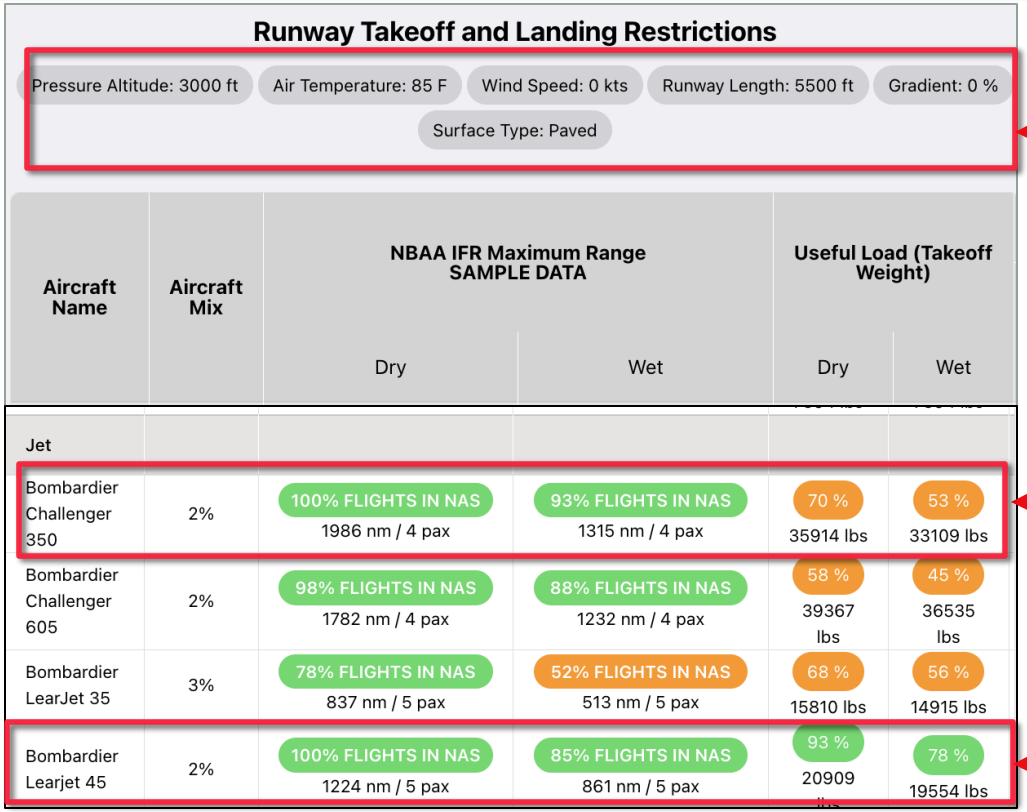
The Beechcraft King Air 350ER can operate from the 5500-foot runway at 74% useful load in dry runway conditions

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

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 % | Surface Type: Paved

Aircraft Name	Aircraft Mix	NBAA IFR Maximum Range SAMPLE DATA		Useful Load (Takeoff Weight)	
		Dry	Wet	Dry	Wet
Jet					
Bombardier Challenger 350	2%	100% FLIGHTS IN NAS 1986 nm / 4 pax	93% FLIGHTS IN NAS 1315 nm / 4 pax	70 % 35914 lbs	53 % 33109 lbs
Bombardier Challenger 605	2%	98% FLIGHTS IN NAS 1782 nm / 4 pax	88% FLIGHTS IN NAS 1232 nm / 4 pax	58 % 39367 lbs	45 % 36535 lbs
Bombardier LearJet 35	3%	78% FLIGHTS IN NAS 837 nm / 5 pax	52% FLIGHTS IN NAS 513 nm / 5 pax	68 % 15810 lbs	56 % 14915 lbs
Bombardier Learjet 45	2%	100% FLIGHTS IN NAS 1224 nm / 5 pax	85% FLIGHTS IN NAS 861 nm / 5 pax	93 % 20909	78 % 19554 lbs

Runway Evaluation Conditions

The Bombardier Challenger 350 can operate from the runway at 70% useful load (dry runway conditions)

The Bombardier Learjet 45 can operate at 78% useful load in wet runway conditions. The Learjet 45 can fly 861 nm with five passengers plus two pilots from the 5500-foot runway (wet pavement conditions).

Evaluation Mode: Mission Range vs. Useful Load Diagram

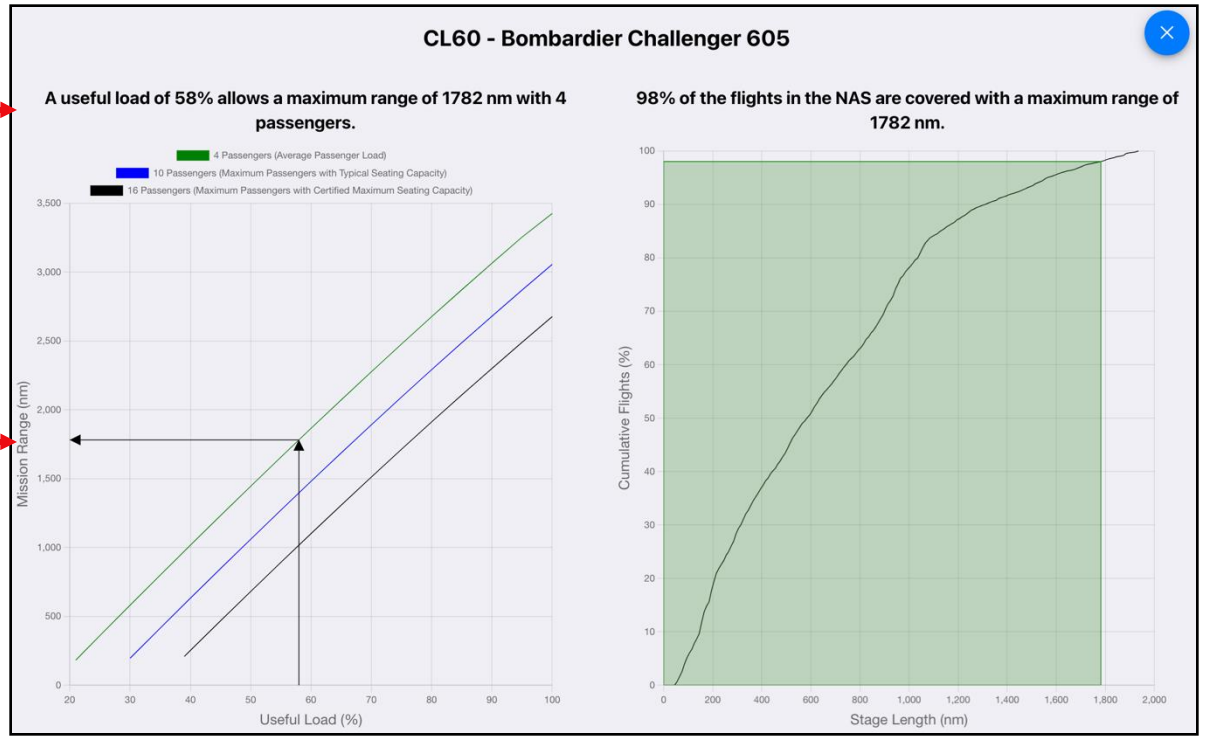
Aircraft Name	Aircraft Mix	NBAA IFR Maximum Range SAMPLE DATA		Useful Load (Takeoff Weight)	
		Dry	Wet	Dry	Wet
Jet					
Bombardier Challenger 350	2%	100% FLIGHTS IN NAS 1986 nm / 4 pax	93% FLIGHTS IN NAS 1315 nm / 4 pax	70 % 35914 lbs	53 % 33109 lbs
Bombardier Challenger 605	2%	98% FLIGHTS IN NAS 1782 nm / 4 pax	88% FLIGHTS IN NAS 1232 nm / 4 pax	58 % 39367 lbs	45 % 36535 lbs

The Bombardier CL605 can takeoff at 58% useful load from a dry 5500-foot runway.

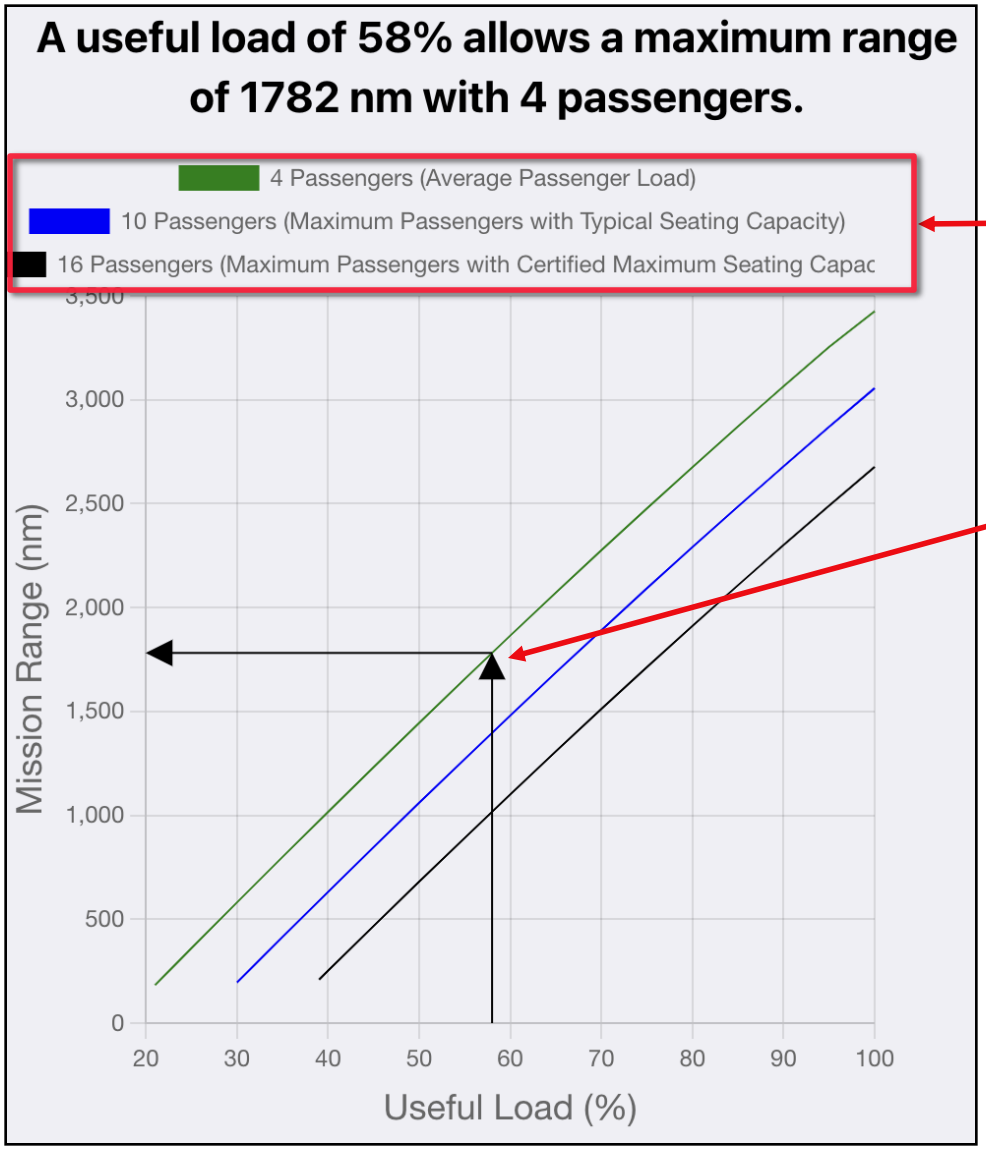
The CL605 can fly four passengers and two pilots 1782 nm (with NBAA fuel reserves) from the 5,500-foot runway in dry conditions.

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

The Bombardier CL605 can fly four passengers and two pilots 1782 nm (with NBAA fuel reserves) from the 5,500-foot runway in dry conditions



Evaluation Model: Mission Range vs. Useful Load Diagram

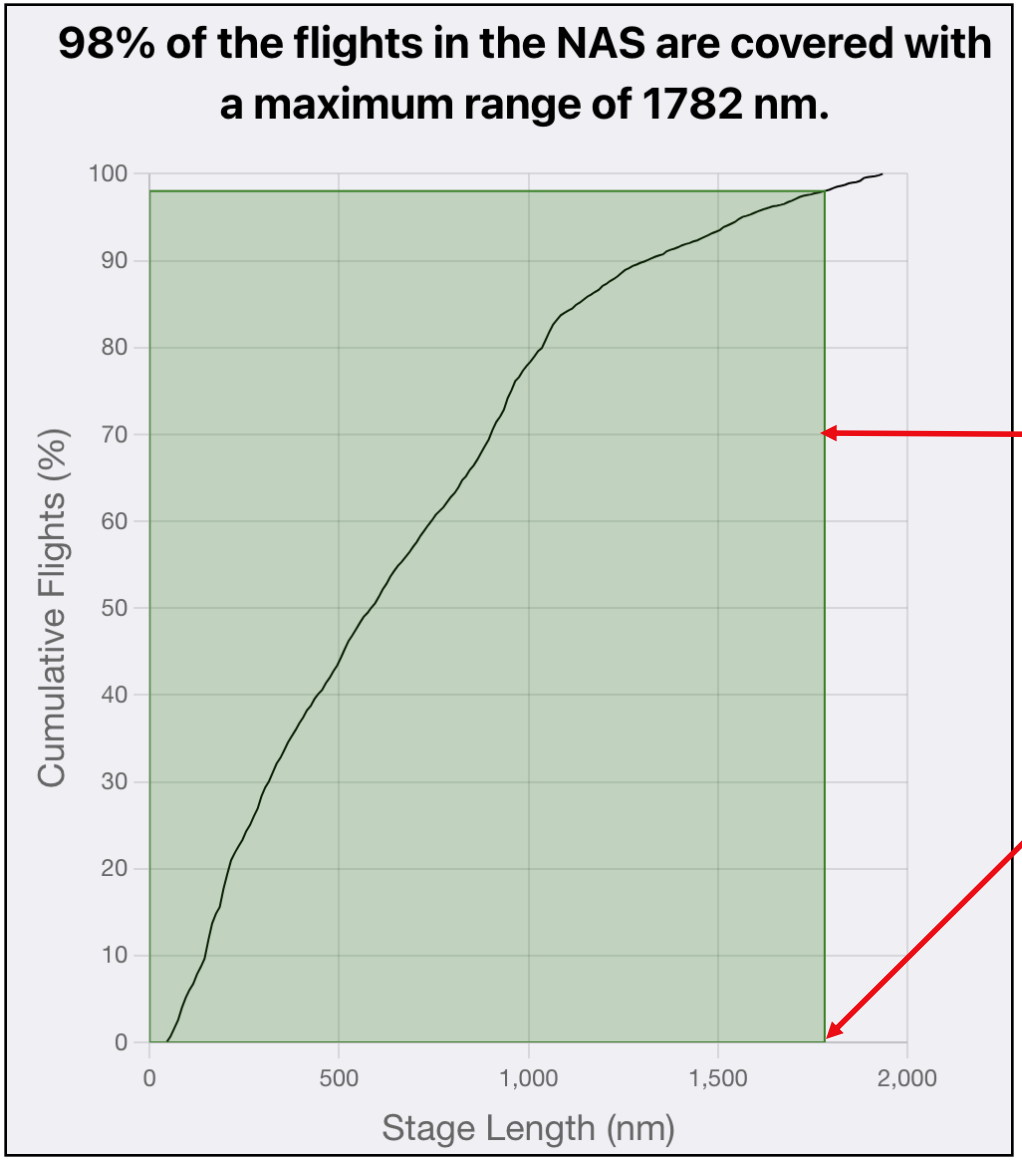


Three passenger loading conditions are displayed in SARLAT 2

The Bombardier CL605 can fly four passengers and two pilots 1782 nm (with NBAA fuel reserves) from the 5,500-foot runway in dry conditions.

SARLAT 2 displays the mission range using the average passenger load (four passengers).

Evaluation Model: Cumulative Flights Coverage



SARLAT 2 displays the cumulative flights in the National Airspace System considering the mission stage length for the flight.

The Bombardier CL605 with a mission range of 1782 nm covers 98% of the historical flights performed in the National Airspace System.

The Bombardier CL605 can fly four passengers and two pilots 1782 nm (with NBAA fuel reserves) from the 5,500-foot runway in dry conditions.

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

Runway Takeoff and Landing Restrictions

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

Runway Evaluation Conditions

Aircraft Name	Aircraft Mix	NBAA IFR Maximum Range SAMPLE DATA		Useful Load (Takeoff Weight)		Landing at Maximum Landing Weight					
						No Correction		Part 135 Eligible		Part 135	
		Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Jet											
Bombardier Challenger 350	2%	100% FLIGHTS IN NAS 1986 nm / 4 pax	93% FLIGHTS IN NAS 1315 nm / 4 pax	70 % 35914 lbs	53 % 33109 lbs	✓	✓	✓	✓	✓	✗
Bombardier Challenger 605	2%	98% FLIGHTS IN NAS 1782 nm / 4 pax	88% FLIGHTS IN NAS 1232 nm / 4 pax	58 % 39367 lbs	45 % 36535 lbs	✓	✓	✓	✓	✓	✗
Bombardier LearJet 35	3%	78% FLIGHTS IN NAS 837 nm / 5 pax	52% FLIGHTS IN NAS 513 nm / 5 pax	68 % 15810 lbs	56 % 14915 lbs	✓	✓	✓	✓	✗	✗
Bombardier Learjet 45	2%	100% FLIGHTS IN NAS 1224 nm / 5 pax	85% FLIGHTS IN NAS 861 nm / 5 pax	93 % 20909 lbs	78 % 19554 lbs	✓	✓	✓	✓	✗	✗
Bombardier Learjet 60	1%	95% FLIGHTS IN NAS 1086 nm / 5 pax	66% FLIGHTS IN NAS 634 nm / 5 pax	67 % 20005 lbs	51 % 18593 lbs	✓	✓	✓	✗	✗	✗

The Bombardier Challenger 605 can land in dry and wet runway conditions without landing correction factors applied.
The aircraft can land on a 5,500-foot runway dry runway operating under Part 135 (landing distance is 60% of the runway length available).
The Challenger 605 cannot land in wet runway conditions while operating under Part 135.

Runway Evaluation: Aircraft Data Table

Aircraft table with general information about each aircraft modeled in SARLAT 2.

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 2, landing flap setting used in SARLAT 2, and the criteria for the takeoff distance estimate (e.g., accelerate-stop distance, takeoff distance, etc.)

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 deg. 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 % | Surface Type: Paved

Aircraft Name	Aircraft Mix	NBAA IFR Maximum Range SAMPLE DATA		Useful Load (Takeoff Weight)		Landing	
						No Correction	
		Dry	Wet	Dry	Wet	Dry	Wet
Piston							
Beechcraft 55 Baron	12%			100 % 5100 lbs	84 % 4800 lbs	✓	✓
Cessna 172 Skyhawk	37%			100 % 2300 lbs	100 % 2300 lbs	✓	✓
Piper 30 Twin Comanche D50	1%			100 % 3600 lbs	100 % 3600 lbs	✓	✓
Turboprop							
Beechcraft 300 Super King Air	1%			✗	✗	✓	✗
Beechcraft King Air 350ER	1%	✗		15 % 11293 lbs	✗	✓	✓

Aircraft with a red cross mark cannot operate at the airport conditions selected

Runway Design Mode

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 (dry, wet, EOD dry and west, Part 135 dry and wet)

Runway Design Mode Interface

Step 1: Select Runway Design mode

Step 2: Name your scenario

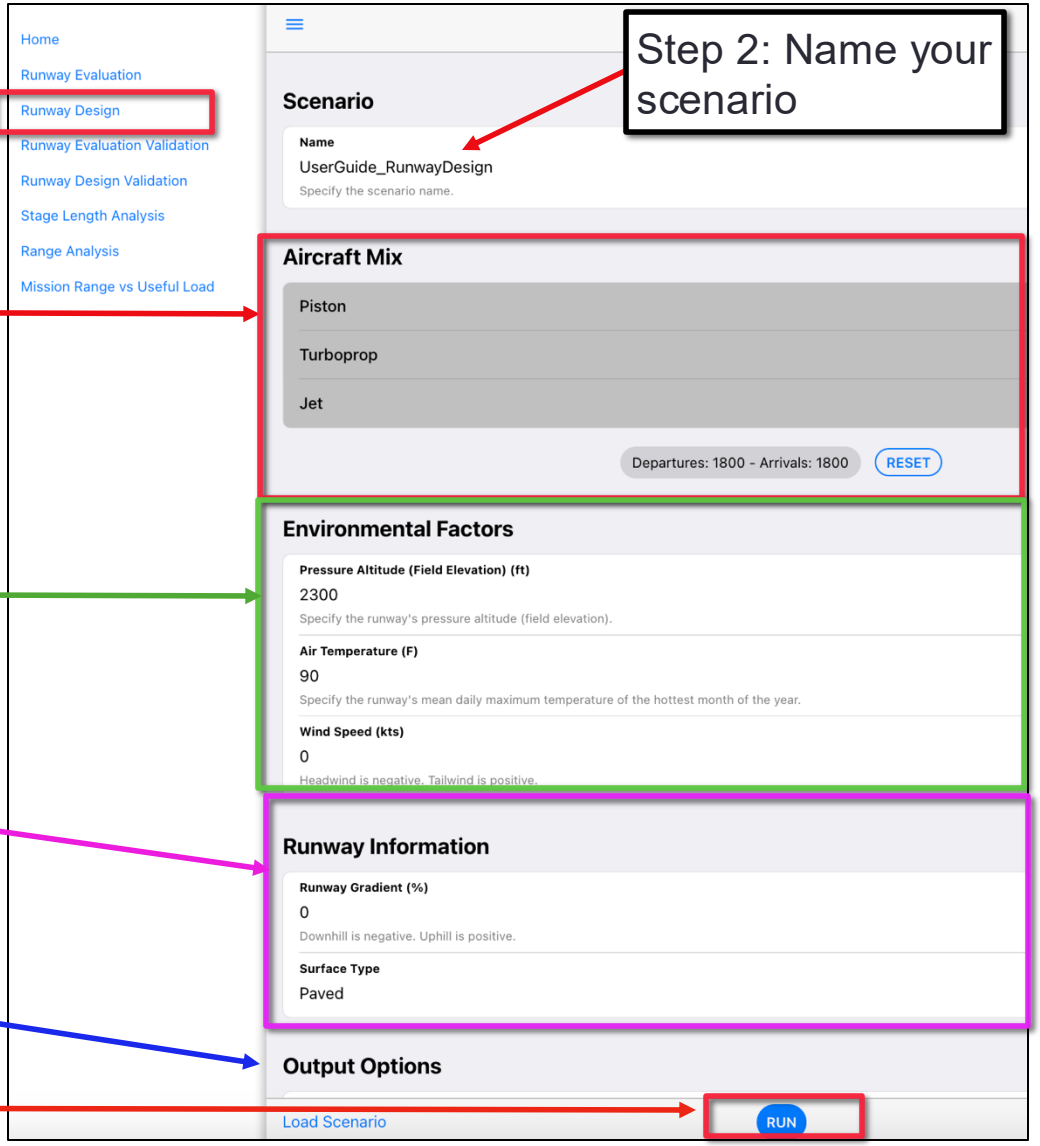
Step 3: Select the aircraft types(s) to be considered in the runway design

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



Runway Design Mode: Fleet Mix Parameters (Piston Aircraft)

Aircraft Mix

Piston

Aircraft Name	Annual Operations	Useful Load (%)
BE36 - Beech Bonanza 36	0	100
BE55 - Beechcraft 55 Baron	0	100
BE58 - Beechcraft 58 Baron	600	100
C150 - Cessna 150	500	100
C152 - Cessna 152	1200	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

SARLAT 2 reports landing runway performance at the maximum landing weight. The useful load definition above only affects departure operations.

Runway Design Mode: Fleet Mix Parameters for Large Turboprop Aircraft (Those with Maximum Takeoff 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**	Critical Range with Average Passenger Load (nm)	Useful Load (%)	Part 135
AT8T - AirTractor 802	0		100	No
BE30 - Beechcraft 300 Super King Air	0	840	70	No
B350 - Beechcraft King Air 350ER	400	1050	65	No
BE20 - Beechcraft King Air B200GT	500	412	70	No
BE9L - Beechcraft King Air C90	0		100	No

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

SARLAT 2 automatically calculates the useful load equivalent to fly the trip distance selected in the third column.

Runway Design Mode: Fleet Mix Parameters for Jet-Powered 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**	Critical Range with Average Passenger Load (nm)	Useful Load (%)	Part 135
CL35 - Bombardier Challenger 350	210	1560	60	Yes
CL60 - Bombardier Challenger 605	230	1865	60	Yes
LJ35 - Bombardier LearJet 35	0	890	70	No
LJ45 - Bombardier Learjet 45	200	760	70	No

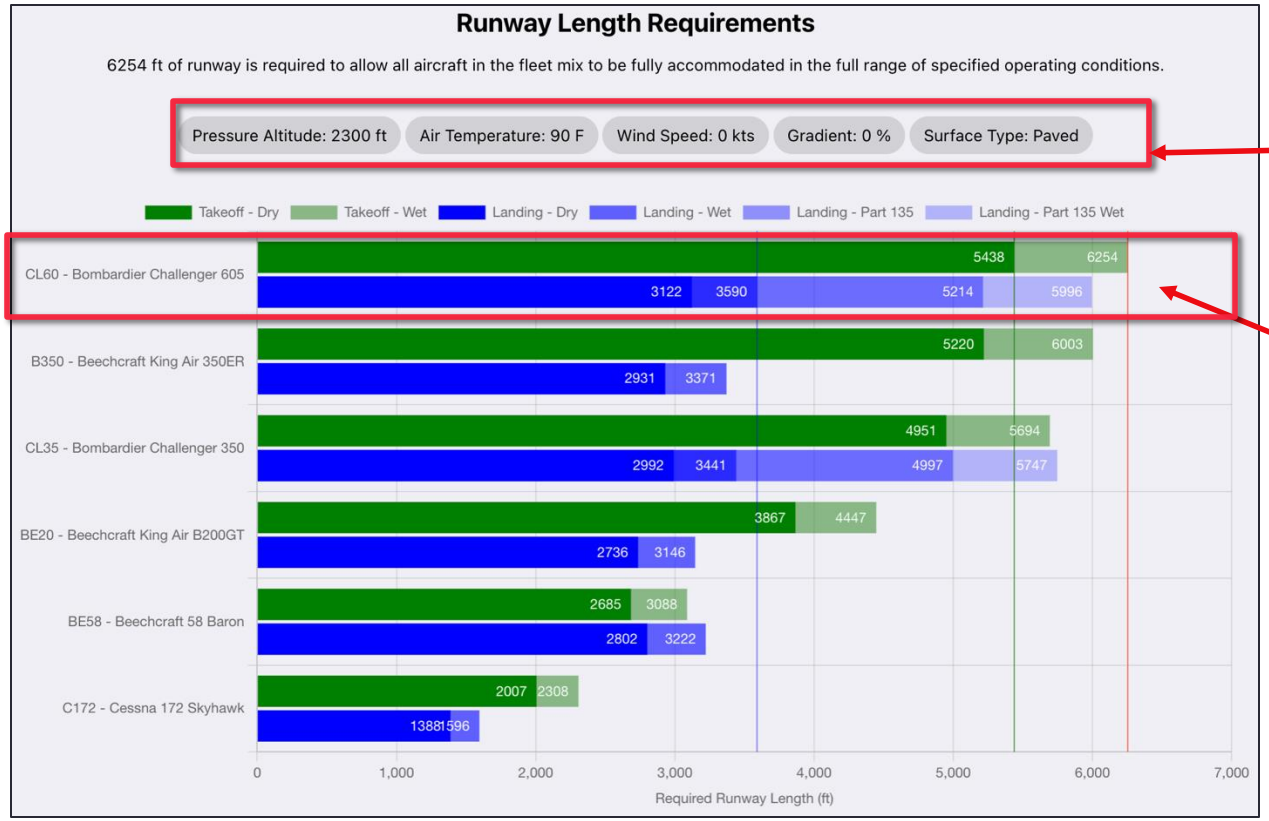
Step 2: Define the trip distance with regular use for each critical aircraft, using TFMSC city pair data.

SARLAT 2 automatically calculates the useful load equivalent to fly the trip distance selected in the third column.

Runway Design Graphical 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
- The Bombardier Challenger 605 is the critical aircraft in this example.



Runway Design Conditions

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

6,254 feet of runway is needed if the pavement is wet.

Runway Design Table Output

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	Useful Load (%)	Takeoff (ft)		Landing (ft)					
				No Correction		Part 135 Eligible		Part 135	
		Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Piston									
BE58 - Beechcraft 58 Baron	100	2685	3088	2802	3222				
C172 - Cessna 172 Skyhawk	100	2007	2308	1388	1596				
Turboprop									
B350 - Beechcraft King Air 350ER	65	5220	6003	2931	3371				
BE20 - Beechcraft King Air B200GT	70	3867	4447	2736	3146				
Jet									
CL35 - Bombardier Challenger 350	60	4951	5694	2992	3441			4997	5747
CL60 - Bombardier Challenger 605	60	5438	6254	3122	3590			5214	5996

Takeoff distance output

Landing distance output

Critical Aircraft Considering Runway Design Parameters

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
- Shows the cumulative annual operations for all aircraft sorted from the highest to the smallest runway length

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 **5220 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)	Useful Load (%)	Annual Operations	Cumulative Annual Operations	Takeoff Dry (ft)	Takeoff Wet (ft)
CL60 - Bombardier Challenger 605	Jet	II	C	1B	60	230	230	5438	6254
B350 - Beechcraft King Air 350ER	Turboprop	II	B	2A	65	400	630	5220	6003
CL35 - Bombardier Challenger 350	Jet	II	C	1B	60	210	840	4951	5694
BE20 - Beechcraft King Air B200GT	Turboprop	II	B	2A	70	500	1340	3867	4447
BE58 - Beechcraft 58 Baron	Piston	I	B	1A	100	600	1940	2685	3088

The Beechcraft King Air B350ER is the critical aircraft and requires 5,220 feet of runway for takeoff (dry pavement)

Round to 5,200 feet.

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

Critical Aircraft Considering Runway Design Toggles

- Toggles report the critical aircraft for combinations of takeoff/landing conditions and dry and wet pavement conditions
- A Part 135 operations toggle considers adjusted landing distances

The critical aircraft considering runway length is reported considering dry takeoff and wet landing conditions (both conditions selected in blue)

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 **5220 ft** of runway to be fully accommodated in the full range of specified operating con

Aircraft Name	Engine Type	Aircraft Design Group (ADG)	Aircraft Approach Category (AAC)	Taxiway Design Group (TDG)	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	230	230	5438	6254	3122	3590
B350 - Beechcraft King Air 350ER	Turboprop	II	B	2A	65	400	630	5220	6003	2931	3371
CL35 - Bombardier Challenger 350	Jet	II	C	1B	60	210	840	4951	5694	2992	3441
BE20 - Beechcraft King Air B200GT	Turboprop	II	B	2A	70	500	1340	3867	4447	2736	3146
BE58 - Beechcraft 58 Baron	Piston	I	B	1A	100	600	1940	2685	3088	2802	3222

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%

- Provides a table output of the critical aircraft according to: ADG, AAC, TDG and RDC
- SARLAT 2 selects the most critical aircraft for each of the four parameters individually.

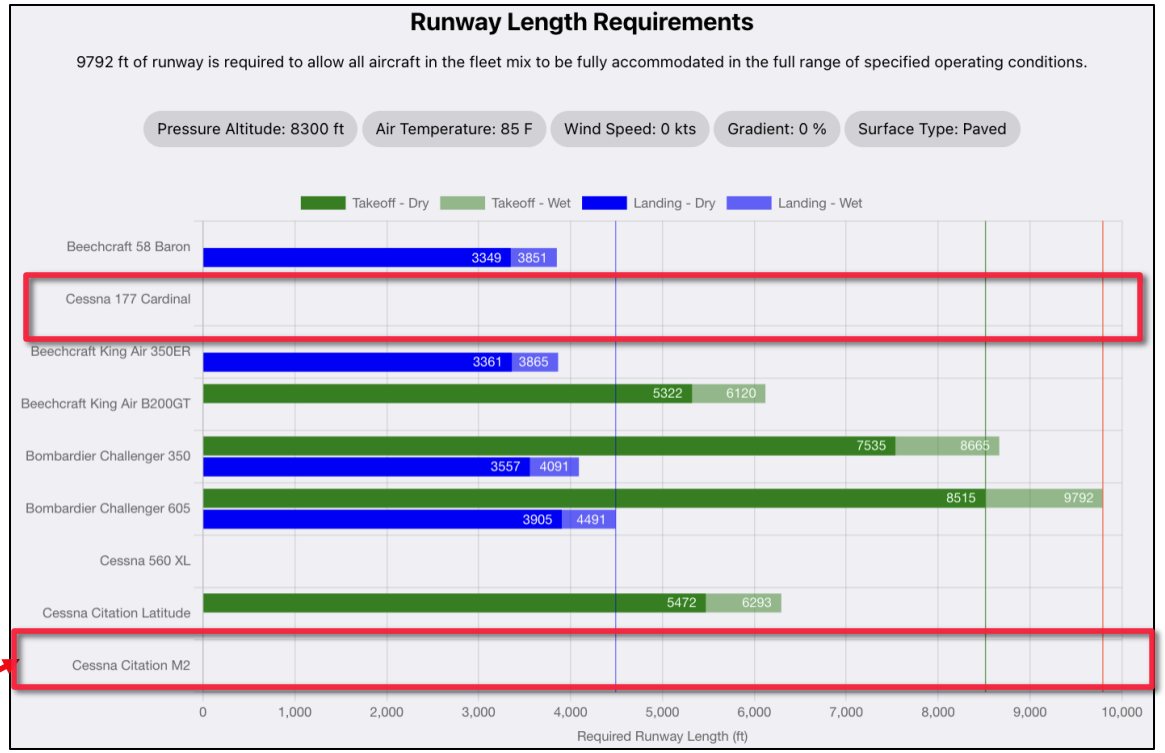
- For the example shown:
- The critical aircraft according to ADG group is II (Challenger 605)
- The critical aircraft according to AAC group is C (Challenger 605)
- Runway Design Code (RDC) is C-II
- The critical aircraft for Taxiway Design Group (TDG) is 2A (King Air B350ER)

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

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 bar plot cannot operate at the airport design conditions

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.

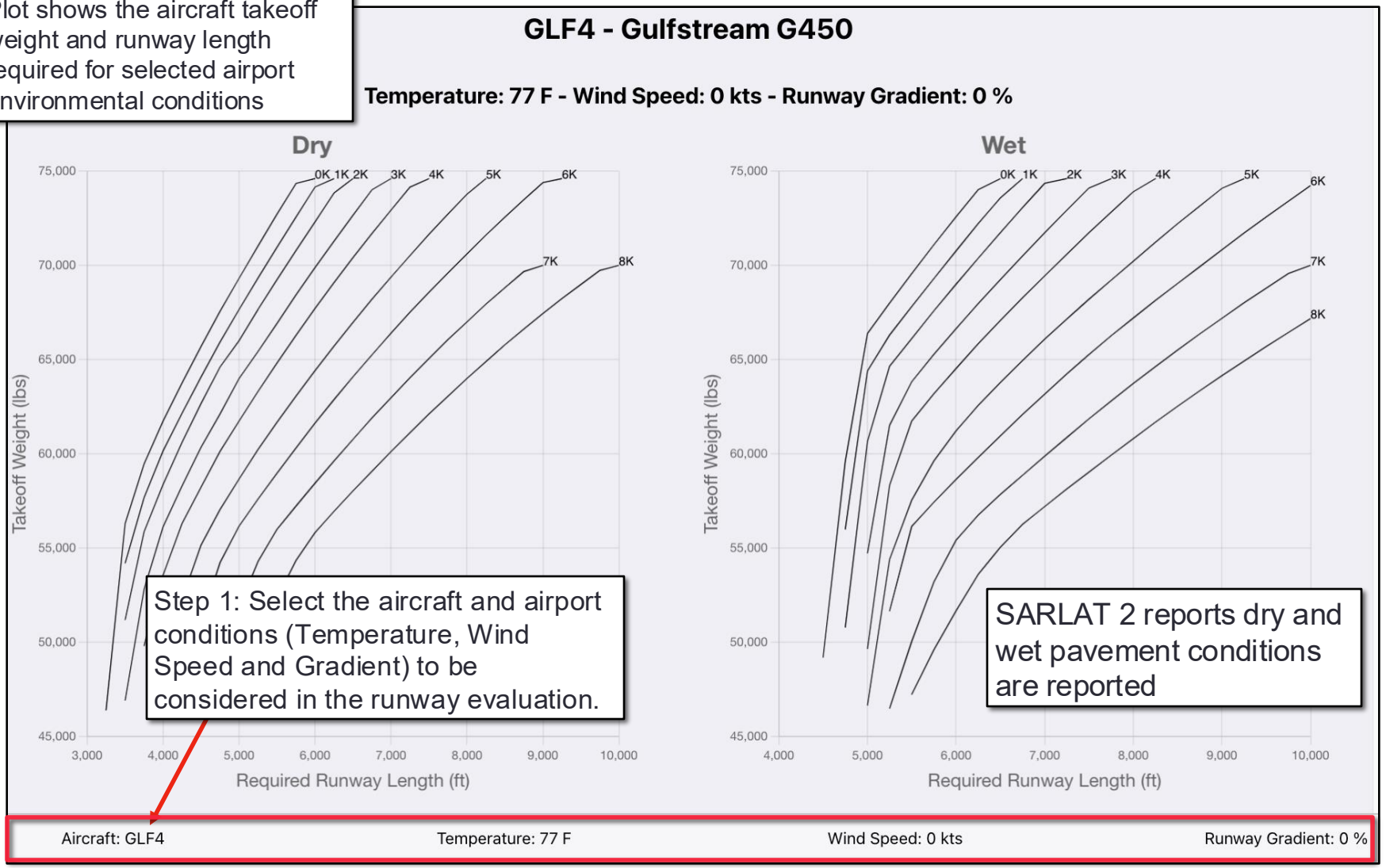
Runway Evaluation Validation Mode

Runway Evaluation Validation Mode

- **Objective:**
  - Provides a graphical depiction of aircraft takeoff weight and runway length required for various design parameters (temperature, runway grade, and wind speed) as used in the Runway Evaluation module
  - **Validate and visualize the runway performance of individual aircraft 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



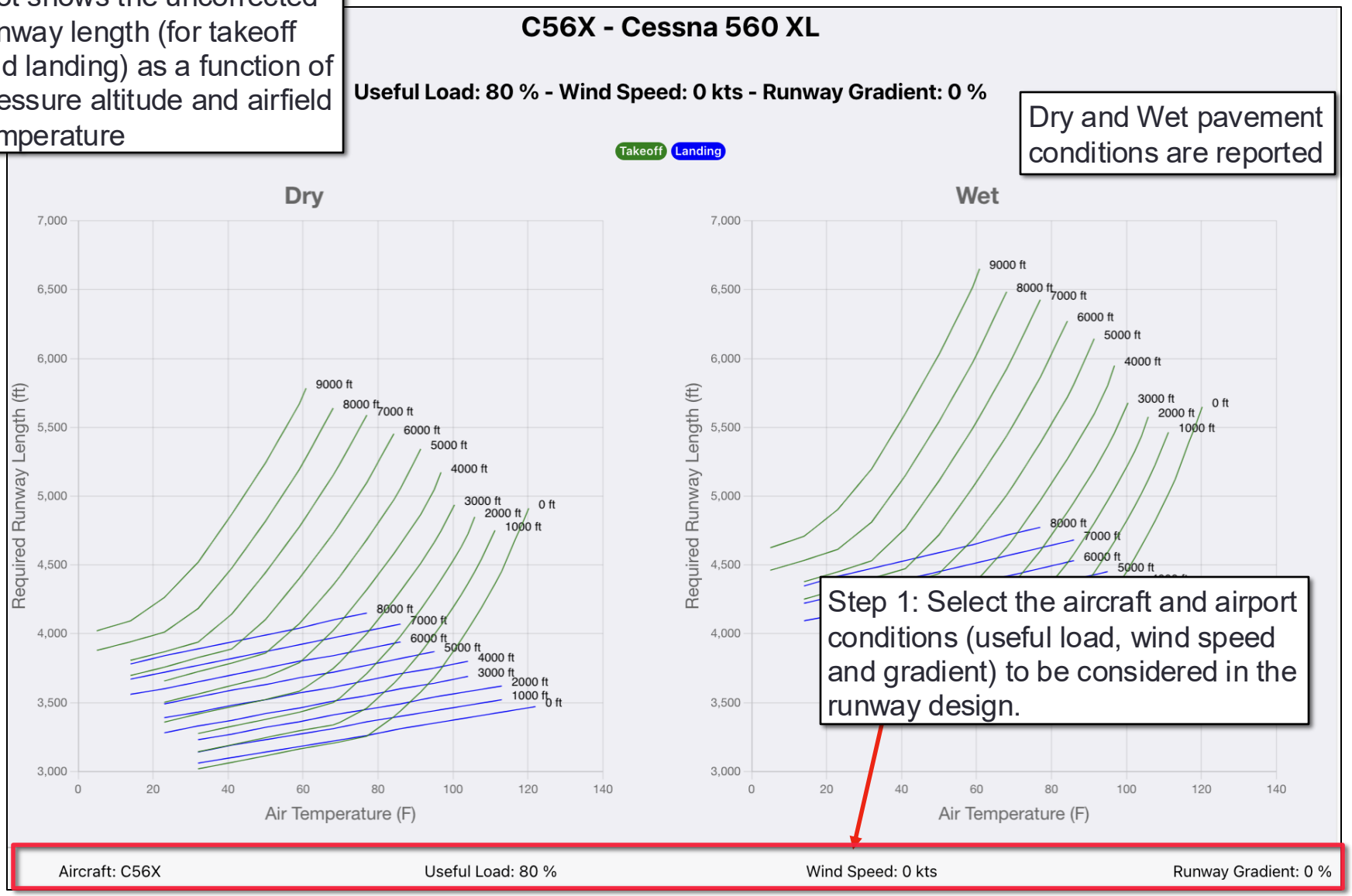
Runway Design Validation Mode

Runway Design Validation Mode

- **Objective:**
  - Provides a graphical depiction of aircraft takeoff weight and runway length required for various design parameters (temperature, runway grade, and useful load) as used in the Runway Design module
  - **Validate and visualize the runway performance 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

Runway Design Validation Mode

Plot shows the uncorrected runway length (for takeoff and landing) as a function of pressure altitude and airfield temperature



Dry and Wet pavement conditions are reported

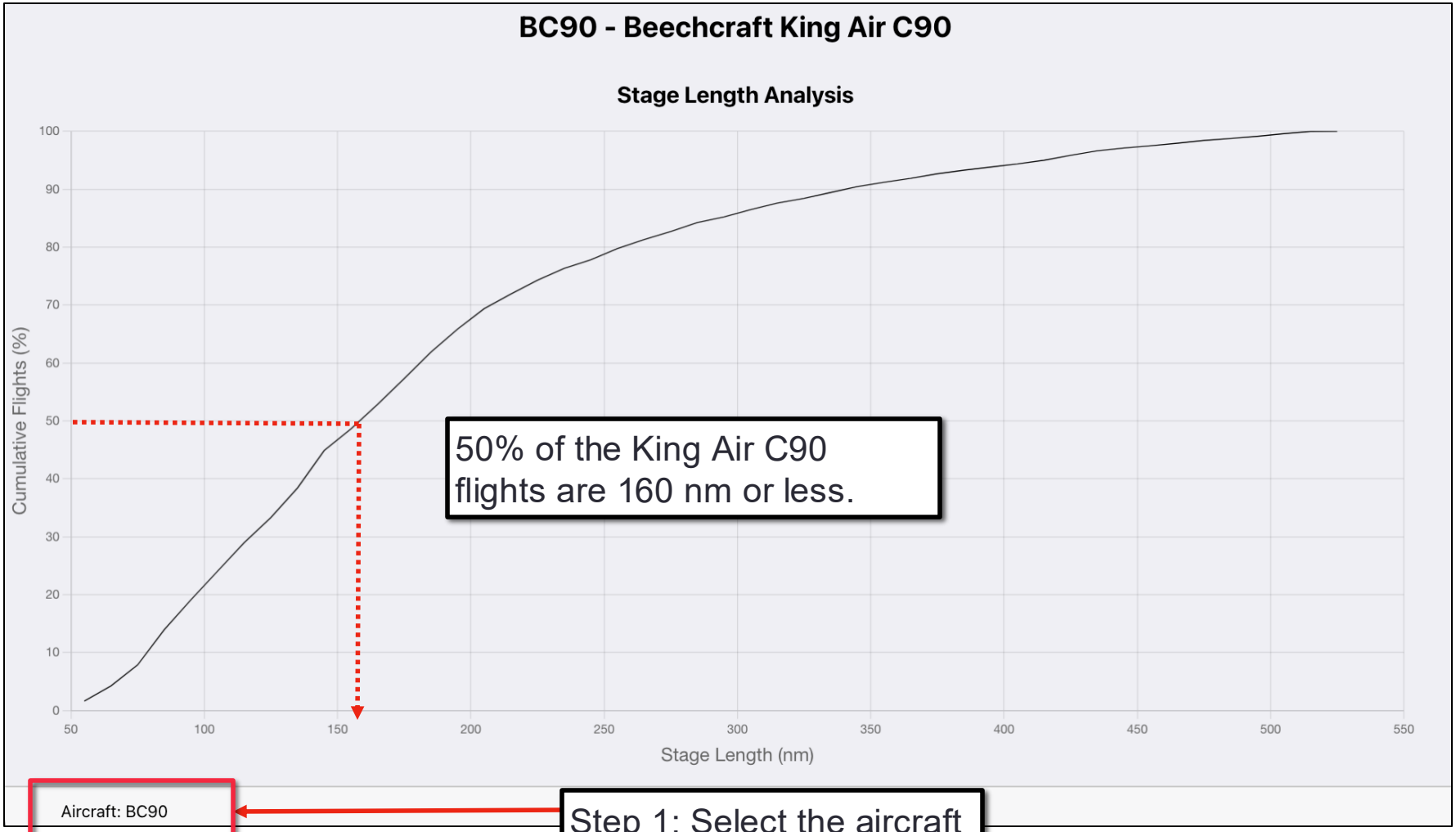
Step 1: Select the aircraft and airport conditions (useful load, wind speed and gradient) to be considered in the runway design.

Aircraft Stage Length Analysis

Stage Length Analysis

- **Objective:**
  - Provides a 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 2 have a cumulative plot.

Stage Length Analysis

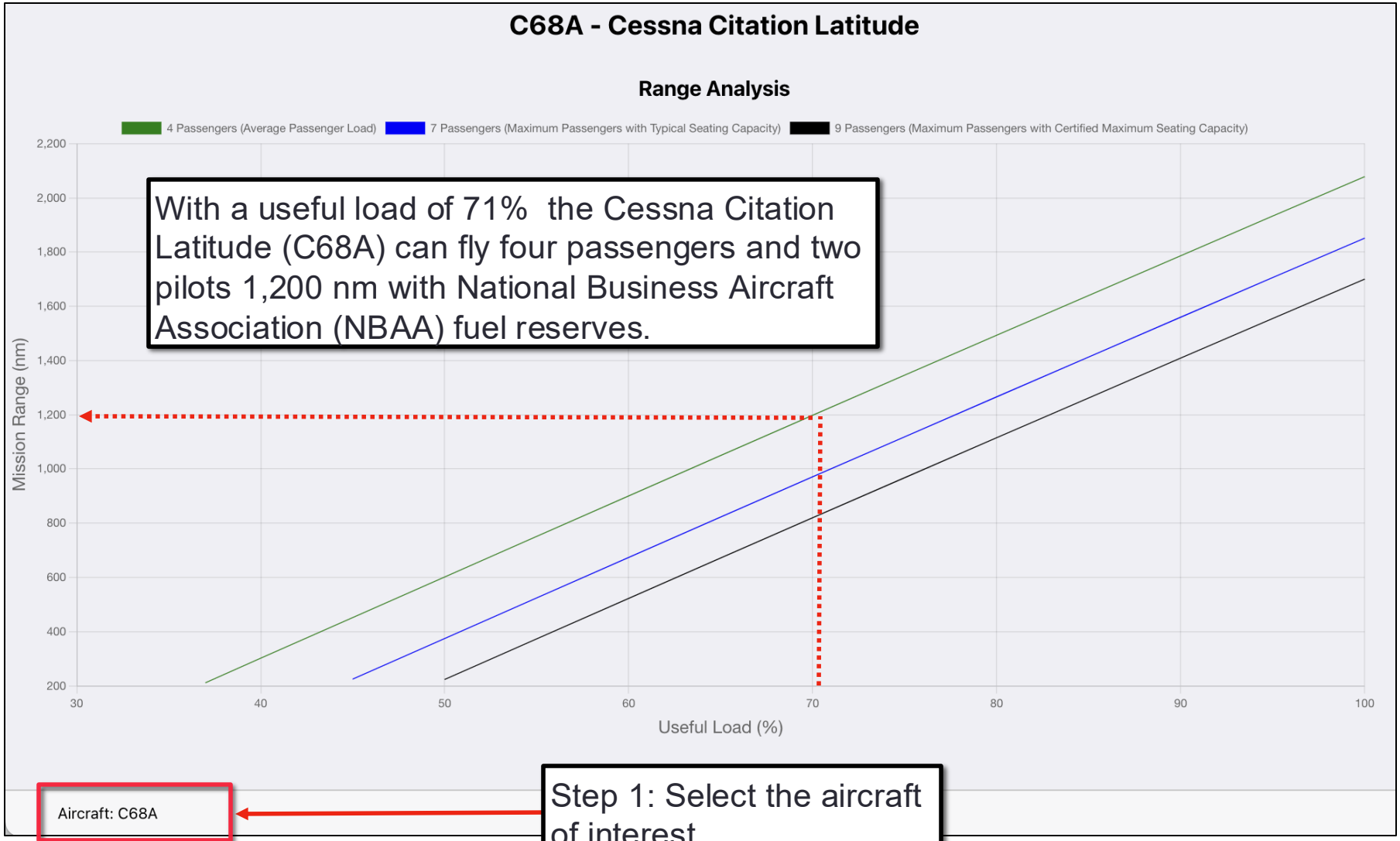


Aircraft Range Analysis

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.

Aircraft Range Analysis



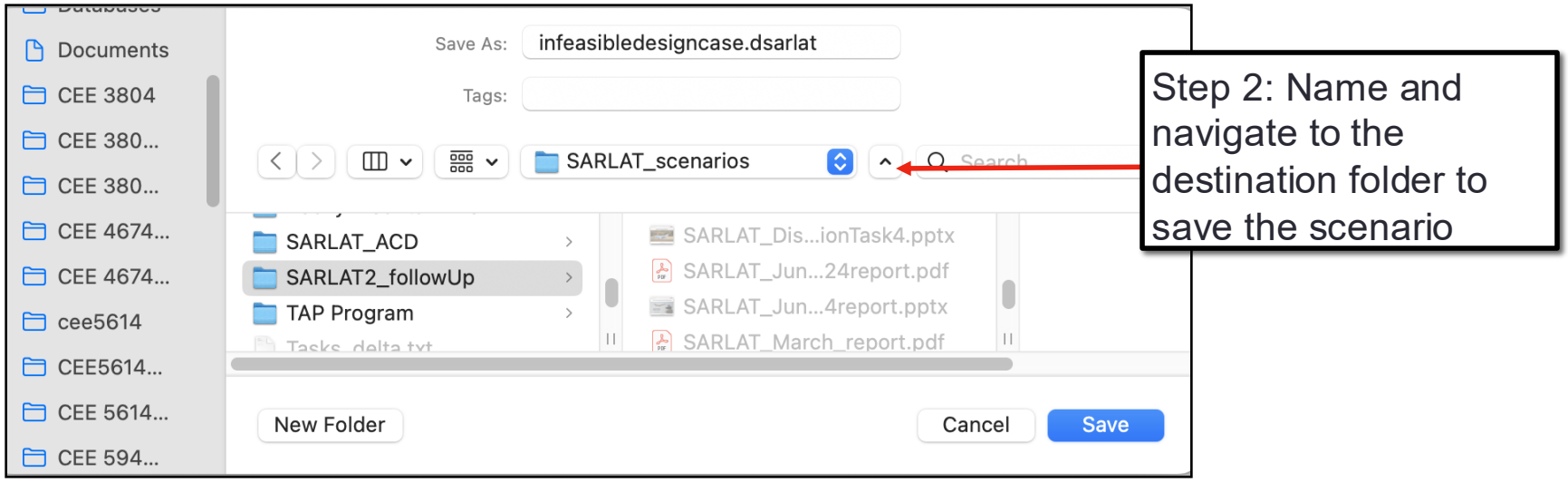
Saving and Exporting Data in SARLAT 2

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

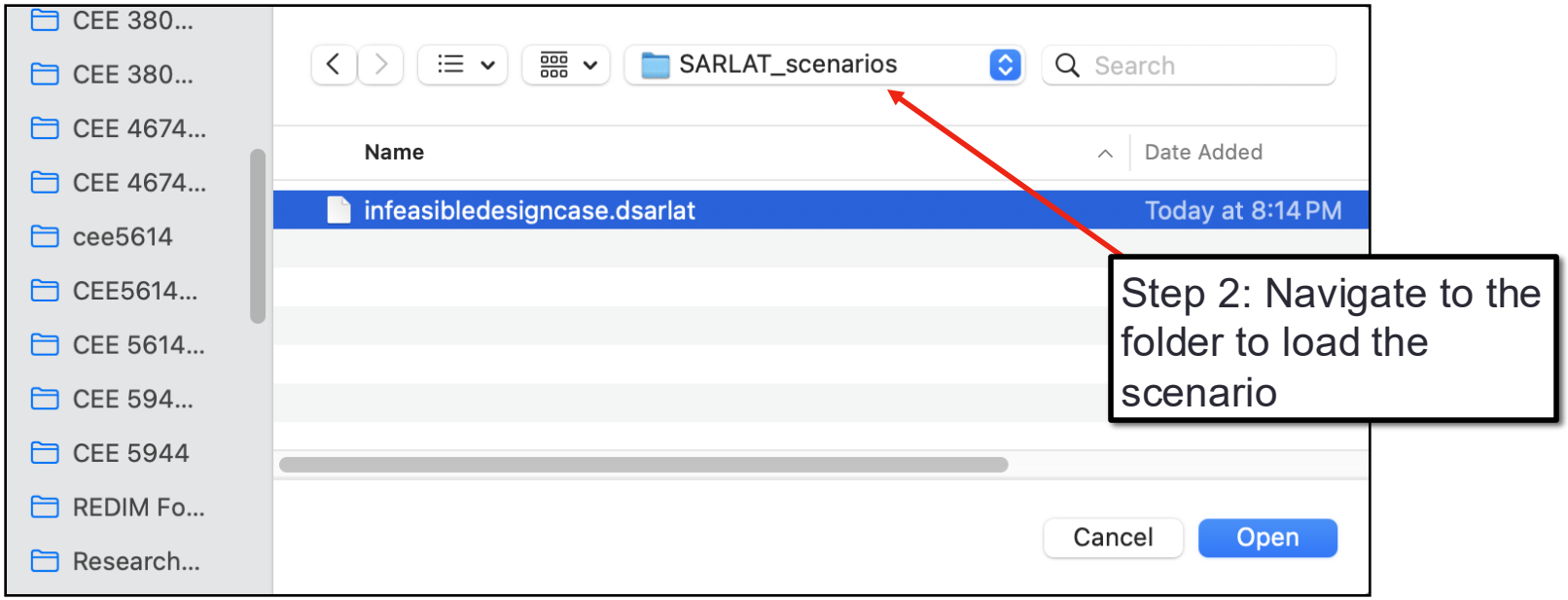
Saving SARLAT Scenario Runs

- SARLAT saves your run using the .dsarlat type file



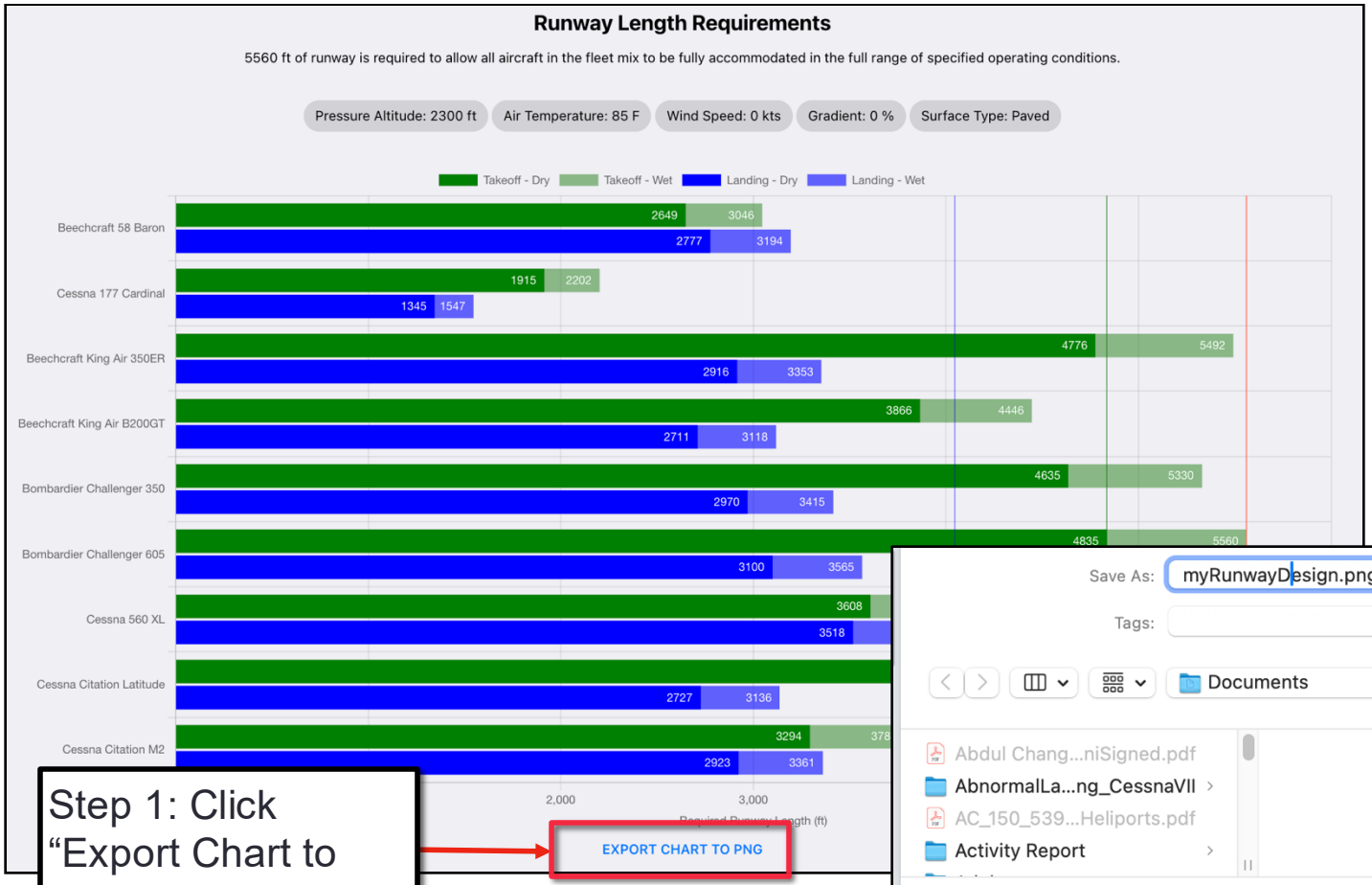
Loading SARLAT Scenario Runs

- SARLAT 2 loads saved .dsarlat files with saved scenario runs

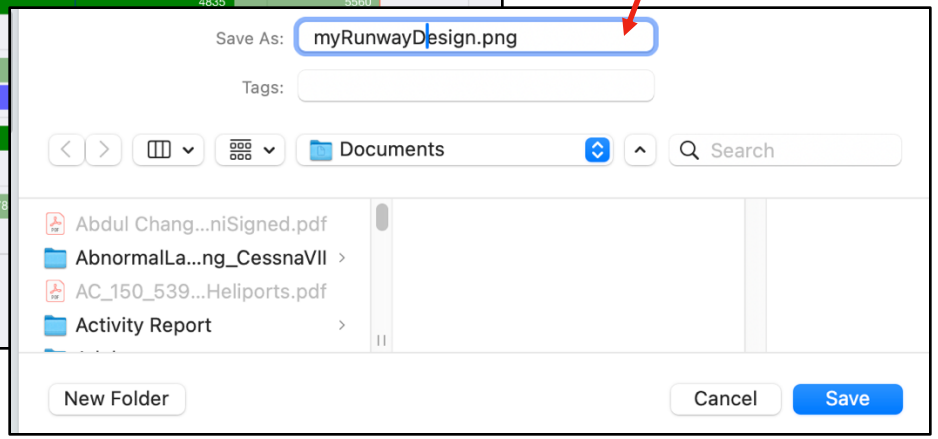


Exporting SARLAT 2 Graphical Output

- SARLAT 2 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 2 Numerical Output Data

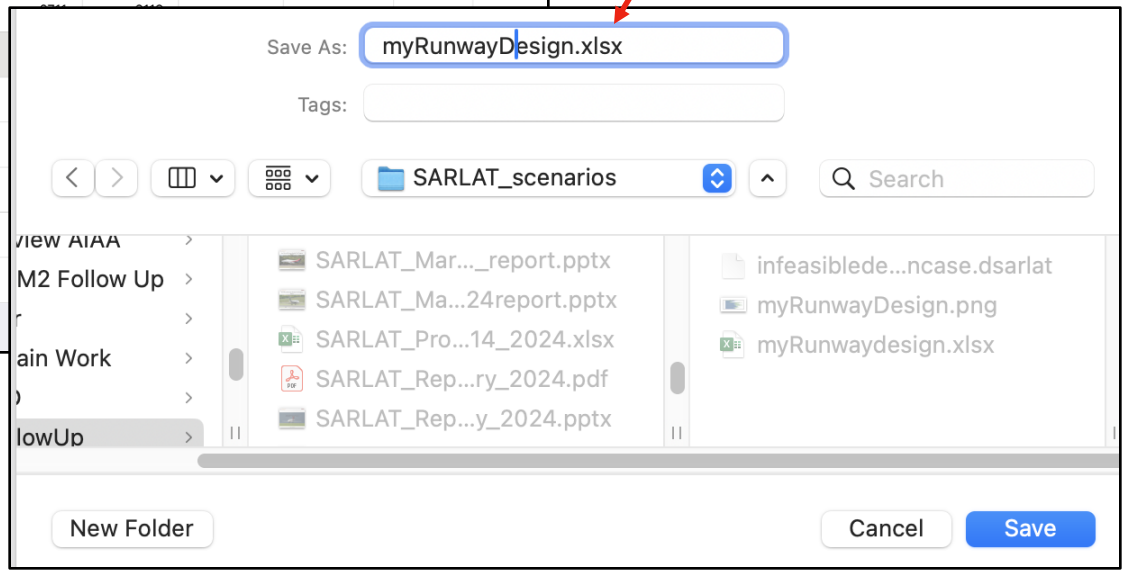
- SARLAT 2 saves numerical output data in Excel format or to the Clipboard

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						
Jet									
Bombardier Challenger 350	56	4635	5330						
Bombardier Challenger 605	52	4835	5560						
Cessna 560 XL	64	3608	4149						
Cessna Citation Latitude	71	3979	4576						
Cessna Citation M2	67	3294	3788						

EXPORT TABLE TO EXCEL

Step 1: Click “Export Table to Excel”

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



Exporting SARLAT 2 Excel Output File

- SARLAT 2 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.

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.

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 **5220 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)	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	230	230	5438	6254	3122	3590
B350 - Beechcraft King Air 350ER	Turboprop	II	B	2A	65	400	630	5220	6003	2931	3371

The Beechcraft King Air B350ER is the critical aircraft and requires 5,220 feet of runway for takeoff (dry pavement). The runway length is rounded to 5,200 feet.

Critical Aircraft Based on Runway Length (2)

- The table below shows a sorted list of aircraft types ranked in descending runway length requirements
- The sorted list is arranged in descending order using the dry takeoff distance as the reference condition.

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 **5220 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)	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	230	230	5438	6254	3122	3590
B350 - Beechcraft King Air 350ER	Turboprop	II	B	2A	65	400	630	5220	6003	2931	3371

The Beechcraft King Air B350ER is the critical aircraft and requires 5,220 feet of runway for takeoff (dry pavement). The runway length is rounded to 5,200 feet.

Critical Aircraft with Part 135 Toggle (3)

- The table below shows a design scenario with four aircraft in the fleet mix
- The sorted list is arranged in descending order using the wet landing distance as the reference condition (i.e., the most demanding runway length)
- Part 135 landing distances adjustments are considered when reporting wet landing distances with the Part 135 toggle on
- Part 135 landing conditions are the most demanding conditions for the Challenger 350
- The Challenger 350 is the critical aircraft because it has more than 500 annual operations and has the longest wet landing distance under Part 135

Critical Aircraft for Runway Length

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

CL35 - Bombardier Challenger 350 is the critical aircraft and requires **5747 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)	Useful Load (%)	Annual Operations	Cumulative Annual Operations	Takeoff Dry (ft)	Takeoff Wet (ft)	Landing Dry (ft)	Landing Wet (ft)
CL35 - Bombardier Challenger 350	Jet	II	C	1B	60	600	600	4951	5694	**4997**	5747
B350 - Beechcraft King Air 350ER	Turboprop	II	B	2A	65	500	1100	5220	6003	**4191**	**4820**
C56X - Cessna 560 XL	Jet	II	B	1B	70	400	1500	3930	4520	3544	4076
BE36 - Beech Bonanza 36	Piston	I	A	1A	100	1000	2500	3070	3530	2084	2397

The Bombardier Challenger 350 is the critical aircraft and requires 5,747 feet of runway for landing under Part 135 rules. The runway length is rounded to 5,800 feet.

No Critical Aircraft Based on Runway Length Example

- If the cumulative number of annual operations at the airport do not reach 500, no critical aircraft is reported using the sorted method explained in the previous slides
- SARLAT 2 reports the critical aircraft as the most demanding aircraft in categories ADG I and AAC A for the design conditions
- For the example below, the Mooney M20J is found to be the most demanding ADG I and AAC A

Critical Aircraft for Runway Length

TAKEOFF DRY | TAKEOFF WET | LANDING DRY | LANDING WET

No critical aircraft could be identified, because the annual cumulative operations are below 500. Defaulting to the most demanding AAC A - ADG I aircraft.

M20P - Mooney M20J is the critical aircraft and requires **3711 ft** of runway to be fully accommodated in the full range of specified operating conditions.

The most critical aircraft in ADG I and AAC A for the design conditions

Aircraft Name	Engine Type	Aircraft Design Group (ADG)	Aircraft Approach Category (AAC)	Taxiway Design Group (TDG)	Useful Load (%)	Annual Operations	Cumulative Annual Operations	Takeoff Dry (ft)	Takeoff Wet (ft)	Landing Dry (ft)	Landing Wet (ft)
B350 - Beechcraft King Air 350ER	Turboprop	II	B	2A	70	160	160	5337	6138	2931	3371
C56X - Cessna 560 XL	Jet	II	B	1B	70	80	240	3930	4520	3544	4076
BE36 - Beech Bonanza 36	Piston	I	A	1A	100	120	360	3070	3530	2084	2397

Note: the annual cumulative number of operations is less than 500

Case Study # 1: Runway Design

New Airport Description

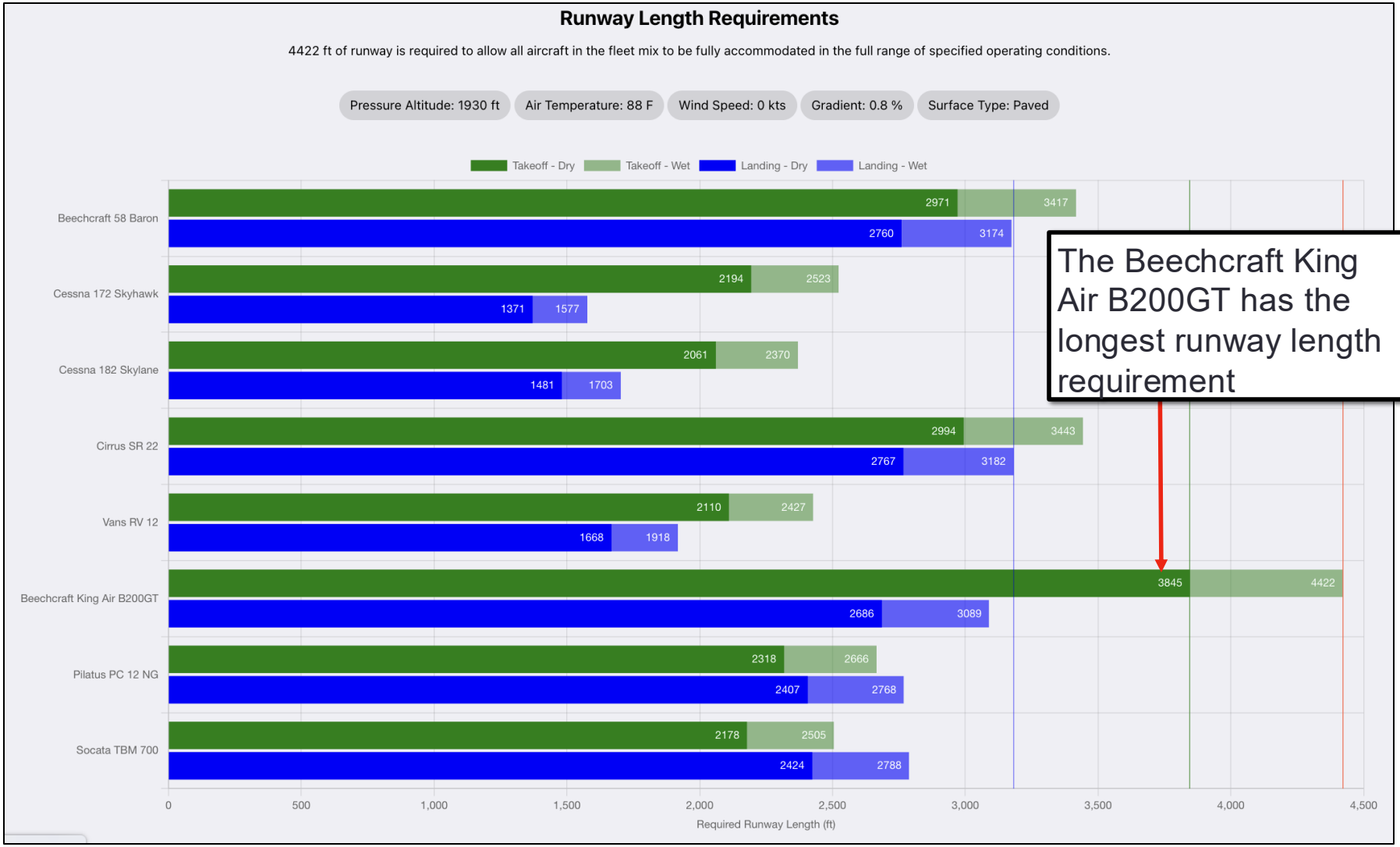
- A small rural, community plans to build a new airport
- The new airport will be equipped with a single, paved primary runway
- The anticipated aircraft fleet mix was developed for the new airport
- The near-term critical aircraft for RDC was identified as the Beechcraft King Air B200GT per the approved forecast. Expected trip distance with regular use based on input from users of the airport is 550 NM.
- The critical aircraft is defined by the Federal Aviation Administration (FAA) in *Advisory Circular 150/5000-17, Critical Aircraft and Regular Use Determination (2017)* as the most demanding aircraft to make regular use of the airport (at least 500 annual operations, including itinerant and local operations).
- No aircraft operating under Part 135 regulations are anticipated at this airport, nor is an AWOS planned (so, Part 135 operations are not selected in the analysis)
- The proposed airport will be built at an elevation of 1,930 feet Mean Sea Level (MSL)
- The design temperature, the mean daily maximum temperature of the hottest month of the year, is projected to be 88 degrees Fahrenheit (in July)
- Wind conditions were assumed to be calm for the analysis
- Preliminary engineering analysis for the proposed runway has determined an anticipated runway gradient of 0.8%.

New Airport Projected Fleet Mix and Design Conditions

Aircraft Name	Useful Load (%)	Annual Departures	Annual Arrivals
Piston			
Beechcraft 58 Baron	100	215	215
Cessna 172 Skyhawk	100	745	745
Cessna 182 Skylane	100	370	370
Cirrus SR 22	100	260	260
Mooney M20J	100	200	200
Vans RV 12	100	120	120
Turboprop			
Beechcraft B200 King Air	90	260	260
Pilatus PC 12 NG	90	90	90
Socata TBM 700	90	70	70

Parameter	Value
Pressure Altitude (Field Elevation) (ft)	1930
Air Temperature (F)	88
Wind Speed (knots)	0
Runway Gradient (%)	0.8
Surface Type	Paved

New Airport Runway Length Requirements: Graphical Output



New Airport Runway Length Requirements Table Output

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	2971	3417	2760	3174				
Cessna 172 Skyhawk	100	2194	2523	1371	1577				
Cessna 182 Skylane	100	2061	2370	1481	1703				
Cirrus SR 22	100	2994	3443	2767	3182				
Vans RV 12	100	2110	2427	1668	1918				
Turboprop									
Beechcraft King Air B200GT	78	3845	4422	2686	3089				
Pilatus PC 12 NG	60	2318	2666	2407	2768				
Socata TBM 700	60	2178	2505	2424	2788				

The Beechcraft King Air B200GT has the longest runway length requirement

New Airport Analysis Summary

- The analysis shows that a **3,900-foot long runway** satisfies the dry pavement requirement for the Beechcraft King Air B200GT (which is critical aircraft for both RDC and runway length)
- Wet landing conditions for the critical aircraft require a 3,100 foot runway (rounded from 3,089 feet)

New Airport Sensitivity Analysis: Climate Change

- The design explores future climate changes predicted by 2050 per FAA report TC 21/43
- National Climate Assessment predicts a four-degree F increase in the mean maximum temperature of the hottest month of the year by 2050 in a high emissions scenario

SARLAT 2 output with design temperature of 98 degrees. F.

- Beechcraft King Air B200GT requires 3,932 feet of runway (dry takeoff) with the new design conditions

- **The runway required is rounded to 4,000 feet per AC policy.**

Case Study # 2: Runway Evaluation

Existing Runway Airport Evaluation

- Existing reliever airport with a 5,200-foot paved runway
- The airport manager is interested in understanding how the existing runway length supports aircraft using the airport
- The anticipated aircraft fleet mix was developed using FAA Traffic Management Systems counts
- Operators of certain aircraft use Part 135/91K regulations, so Part 135/91K operations are selected for those aircraft types in the analysis
- The airport is located at an elevation of 2,960 feet Mean Sea Level (MSL)
- Evaluate both the annual average daily daytime temperature (64 F) and a hot temperature, the mean daily maximum temperature of the hottest month of the year, is 85 degrees Fahrenheit (in August) to understand how performance varies seasonally since not all operations occur during hot conditions
- Wind conditions were assumed to be calm for the analysis
- The existing runway has a gradient of 0.6%.

Existing Airport Fleet Mix and Design Conditions

Aircraft Name	Annual Departures	Annual Arrivals
Piston		
Beechcraft 58 Baron	185	185
Cessna 152	1200	1200
Cessna 172 Skyhawk	935	935
Mooney M20V Acclaim	265	265
Turboprop		
Beechcraft King Air 350ER	270	270
Pilatus PC 12 NG	345	345
Socata TBM 700	260	260
Jet		
Bombardier Challenger 350	255	255
Cessna Citation 560XL	145	145
Cessna Citation Latitude	165	165
Cessna Citation X	95	95
Cessna Citation CJ4	130	130
Cirrus Vision SF50	60	60
Embraer Phenom 300	270	270

Existing Airport Design Conditions

Parameter	Value
Existing Runway length (ft)	5,200
Pressure Altitude (Field Elevation) (ft)	2,960
Air Temperature (F)	85
Wind Speed (knots)	0
Runway Gradient (%)	0.6
Surface Type	Paved

Runway Evaluation Results for Piston and Turboprop Aircraft

Aircraft Name	Aircraft Mix	NBAA IFR Maximum Range SAMPLE DATA		Useful Load (Takeoff Weight)		Landing at Maximum Landing Weight					
						No Correction		Part 135 Eligible		Part 135	
		Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Piston											
Beechcraft 58 Baron	4%			100 % 5400 lbs	100 % 5400 lbs	✓	✓				
Cessna 152	26%			100 % 1670 lbs	100 % 1670 lbs	✓	✓				
Cessna 172 Skyhawk	20%			100 % 2300 lbs	100 % 2300 lbs	✓	✓				
Mooney M20V Acclaim Ultra	6%			100 % 3368 lbs	100 % 3368 lbs	✓	✓				
Turboprop											
Beechcraft King Air 350ER	6%	100% FLIGHTS IN NAS 945 nm / 5 pax	✗	61 % 14087 lbs	25 % 11897 lbs	✓	✓			✓	✓
Pilatus PC 12 NG	7%			100 % 10450 lbs	100 % 10450 lbs	✓	✓			✓	✓
Socata TBM 850	6%			100 % 7394 lbs	100 % 7394 lbs	✓	✓			✓	✓

Observations:

1) All piston aircraft can operate at 100% useful load from the 5,200-foot runway
2) The King Air B350ER can operate at 61% useful load from a 5,200-foot dry runway
3) The King Air B350ER can operate at 25% useful load from a 5,200-foot wet runway (impractical)
4) The “x” mark under range for the King Air B350ER reports a limited aircraft range that is impractical.

Runway Evaluation Results for Jet Aircraft

Aircraft Name	Aircraft Mix	NBAA IFR Maximum Range SAMPLE DATA		Useful Load (Takeoff Weight)		Landing at Maximum Landing Weight					
						No Correction		Part 135 Eligible		Part 135	
		Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Bombardier Challenger 350	6%	99% FLIGHTS IN NAS 1751 nm / 4 pax	67% FLIGHTS IN NAS 750 nm / 4 pax	64 % 34957 lbs	39 % 31031 lbs	✓	✓	✓	✓	✓	✗
Cessna 560 XL	3%	100% FLIGHTS IN NAS 1623 nm / 4 pax	100% FLIGHTS IN NAS 1364 nm / 4 pax	100 % 20200 lbs	88 % 19348 lbs	✓	✓	✓	✓	✗	✗
Cessna Citation Latitude	4%	100% FLIGHTS IN NAS 2078 nm / 4 pax	100% FLIGHTS IN NAS 1640 nm / 4 pax	100 % 30800 lbs	85 % 28949 lbs	✓	✓	✓	✓	✓	✗
Cessna Citation Sovereign	2%	100% FLIGHTS IN NAS 2246 nm / 4 pax	100% FLIGHTS IN NAS 2246 nm / 4 pax	100 % 30300 lbs	100 % 30300 lbs	✓	✓	✓	✓	✓	✗
Cessna Citation X	2%	86% FLIGHTS IN NAS 1333 nm / 4 pax	68% FLIGHTS IN NAS 922 nm / 4 pax	68 % 31661 lbs	54 % 29667 lbs	✓	✓	✓	✗	✗	✗
Cessna CitationJet 4	3%	100% FLIGHTS IN NAS 1446 nm / 4 pax	100% FLIGHTS IN NAS 1446 nm / 4 pax	100 % 16950 lbs	100 % 16950 lbs	✓	✓	✓	✓	✗	✗
Cirrus Vision SF50	1%	85% FLIGHTS IN NAS 552 nm / 3 pax	38% FLIGHTS IN NAS 236 nm / 3 pax	90 % 5755 lbs	68 % 5229 lbs	✓	✓	✓	✓	✗	✗
Phenom 300	6%	100% FLIGHTS IN NAS 1536 nm / 4 pax	100% FLIGHTS IN NAS 1466 nm / 4 pax	100 % 17968 lbs	97 % 17778 lbs	✓	✓	✓	✓	✓	✗

Observations:

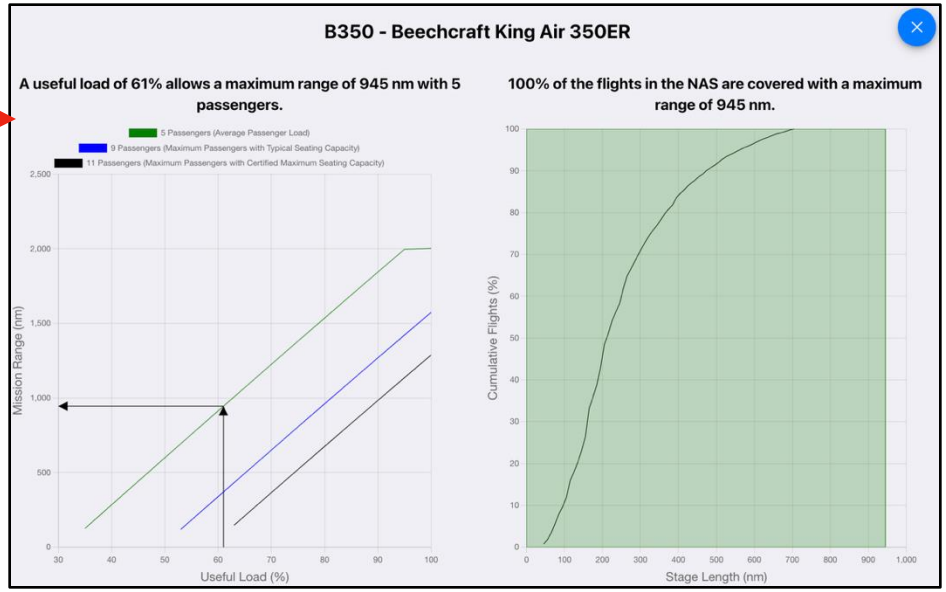
1) Three jets operate with useful load limitations from the 5,200-foot runway
2) The Bombardier Challenger 350 can operate at 39% useful load under wet pavement conditions
3) The “x” mark under the Part 135 columns indicate that landings are not feasible when accounting for the added landing runway length requirements of air taxi operations.

Interpretation of Useful Load Results for King Air B350ER

Probe deeper into the SARLAT 2 results by selecting individual aircraft that operate with significant useful load restrictions.

Aircraft Name	Aircraft Mix	NBAA IFR Maximum Range SAMPLE DATA		Useful Load (Takeoff Weight)		Landing at Maximum Landing Weight					
						No Correction		Part 135 Eligible		Part 135	
		Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Turboprop											
Beechcraft King Air 350ER	6%	100% FLIGHTS IN NAS 945 nm / 5 pax	✗	61 % 14087 lbs	25 % 11897 lbs	✓	✓			✓	✓

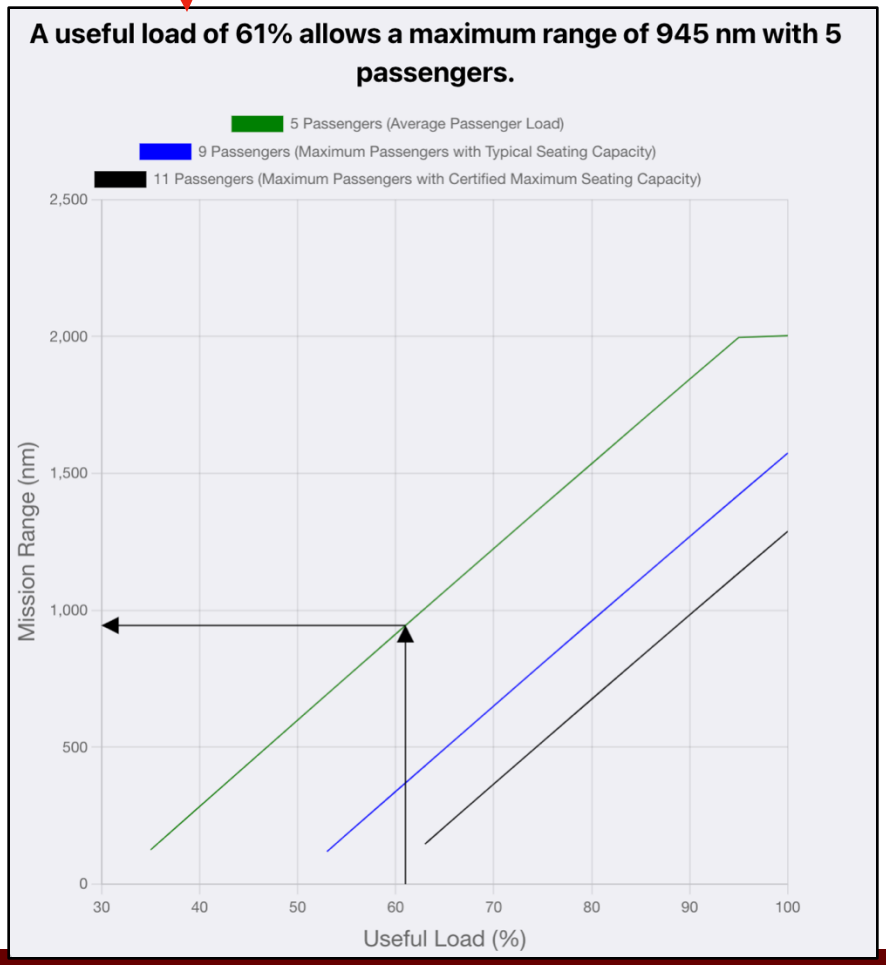
Click on the green area to explore the cumulative diagram of flights possible with five passengers plus two pilots and fly 945 nautical miles (with NBAA reserves)



- A King Air B350ER can operate at 61% of its maximum useful load
- The aircraft can takeoff at 14,087 lbs. and carry five passengers and travel 945 nautical miles
- 945 nm covers 100% of the flights conducted with the B350ER in the NAS.

Useful Load and Mission Range for the King Air B350ER

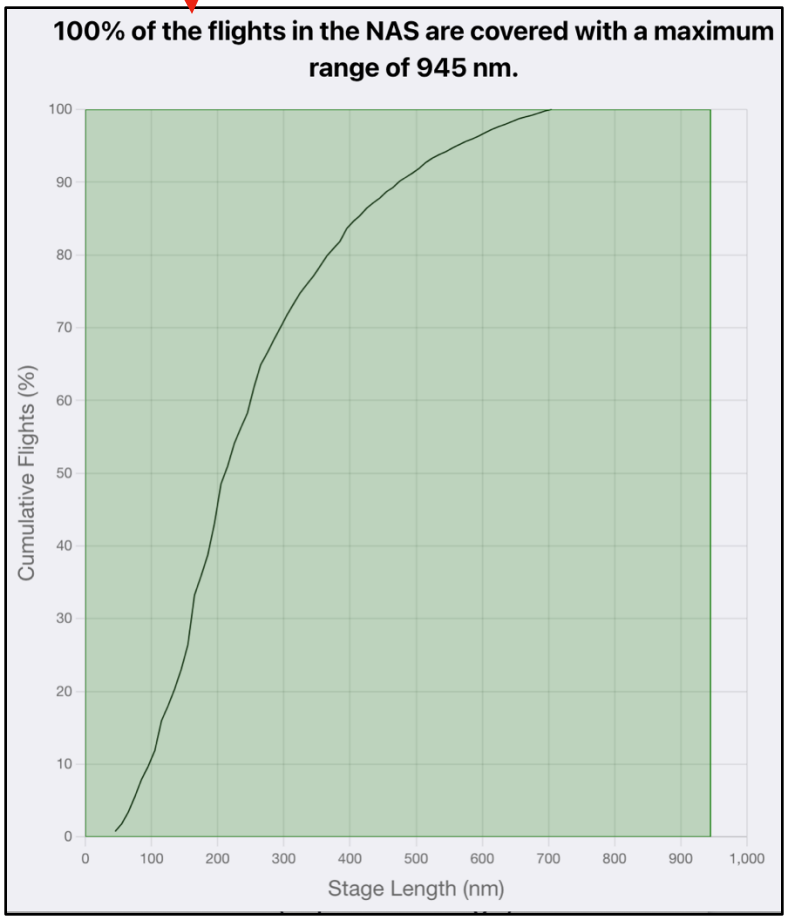
Aircraft Name	Aircraft Mix	NBAA IFR Maximum Range SAMPLE DATA		Useful Load (Takeoff Weight)		Landing at Maximum Landing Weight					
						No Correction		Part 135 Eligible		Part 135	
		Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Turboprop											
Beechcraft King Air 350ER	6%	100% FLIGHTS IN NAS 945 nm / 5 pax	✗	61 % 14087 lbs	25 % 11897 lbs	✓	✓			✓	✓



- A King Air B350ER can operate at 61% of its maximum useful load from the 5,200-foot runway (dry pavement)
- The King Air B350ER takeoff field length is defined by the accelerate-stop-distance (certification basis is FAR Part 23 Commuter Category)
- The aircraft can takeoff at a weight of 14,087 lbs. and carry five passengers and two pilots and travel 945 nautical miles
- If the aircraft carries 9 passengers and two pilots, the mission range is reduced to 380 nm

Mission Range and Trip Distances Flown for the King Air B350ER

Aircraft Name	Aircraft Mix	NBAA IFR Maximum Range SAMPLE DATA		Useful Load (Takeoff Weight)		Landing at Maximum Landing Weight					
						No Correction		Part 135 Eligible		Part 135	
		Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Turboprop											
Beechcraft King Air 350ER	6%	100% FLIGHTS IN NAS 945 nm / 5 pax	✗	61 % 14087 lbs	25 % 11897 lbs	✓	✓			✓	✓



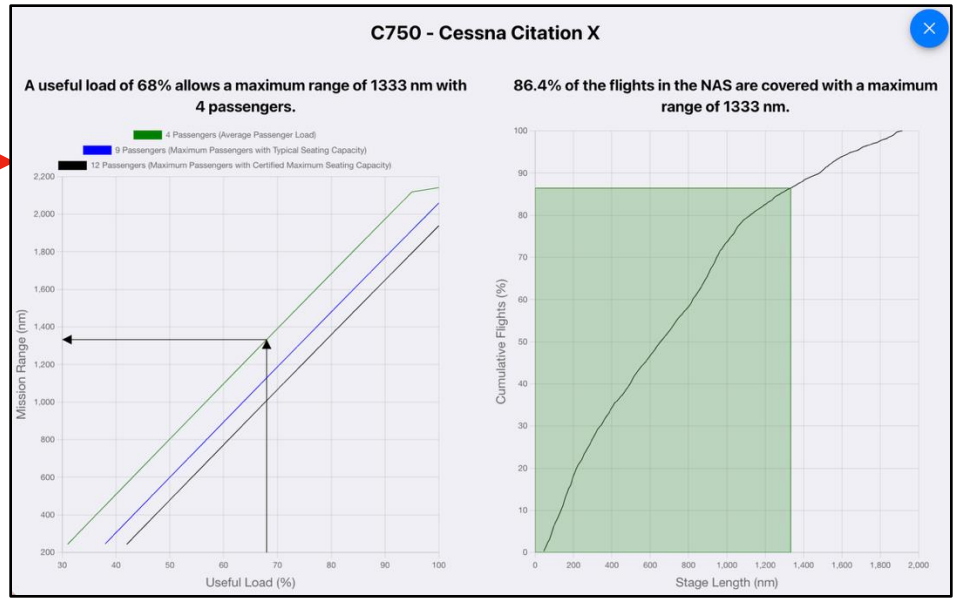
- A King Air B350ER can operate at a weight of 14,087 lbs. and carry five passengers plus two pilots and travel 945 nautical miles
- The cumulative plot of flights for the King Air B350ER shows that a mission of 945 nm covers 100% of the flights conducted in the NAS
- The King Air B350ER has a generous payload-range envelope making possible its operation from the 5,200-foot runway carrying typical passenger loads nearly 1,000 nautical mile.

Interpretation of Useful Load Results for Cessna Citation X

Probe deeper into the SARLAT 2 results by selecting individual aircraft that operate with significant useful load restrictions.

Aircraft Name	Aircraft Mix	NBAA IFR Maximum Range SAMPLE DATA		Useful Load (Takeoff Weight)		Landing at Maximum Landing Weight					
						No Correction		Part 135 Eligible		Part 135	
		Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Cessna Citation X	2%	86% FLIGHTS IN NAS 1333 nm / 4 pax	68% FLIGHTS IN NAS 922 nm / 4 pax	68 % 31661 lbs	54 % 29667 lbs	✓	✓	✓	✗	✗	✗

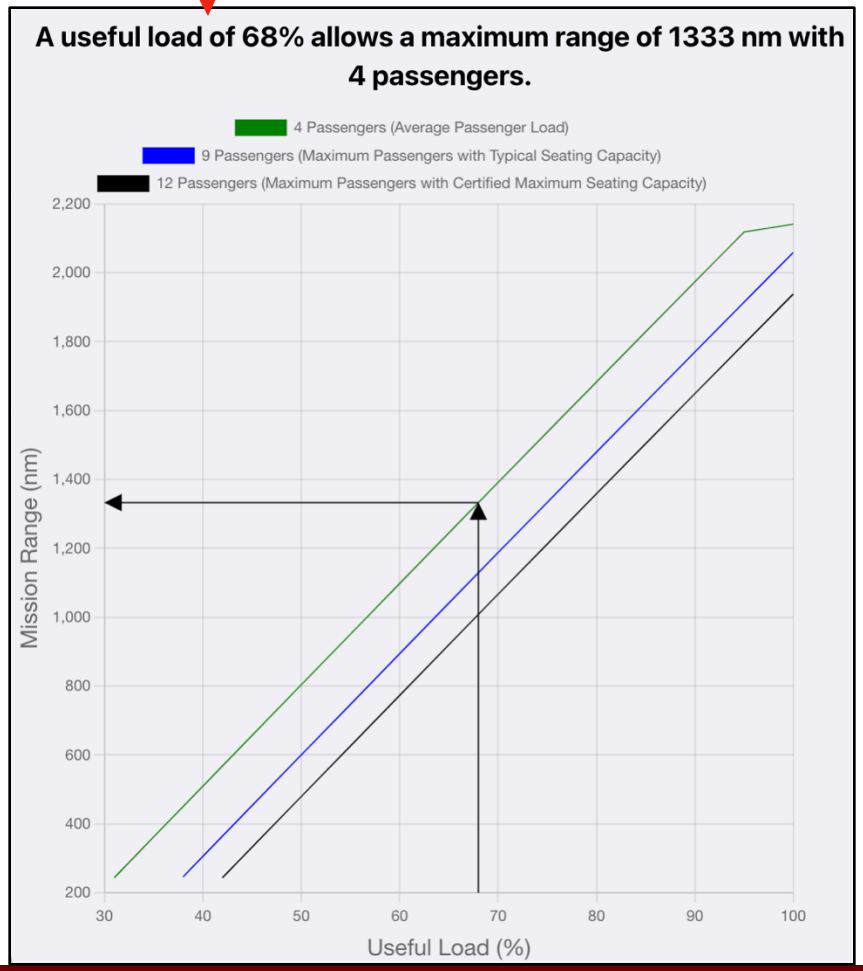
Click on the green area to explore the cumulative diagram of flights possible with four passengers plus two pilots and fly 1,333 nautical miles (with NBAA reserves)



- The Cessna Citation X can operate at 68% of its maximum useful load from the 5,200-foot runway (dry pavement)
- The aircraft can takeoff at 31,661 lbs. and carry four passengers and travel 1,333 nautical miles
- 1,333 nm covers 86% of the flights in the NAS conducted with the Citation X

Useful Load and Mission Range for the Cessna Citation X

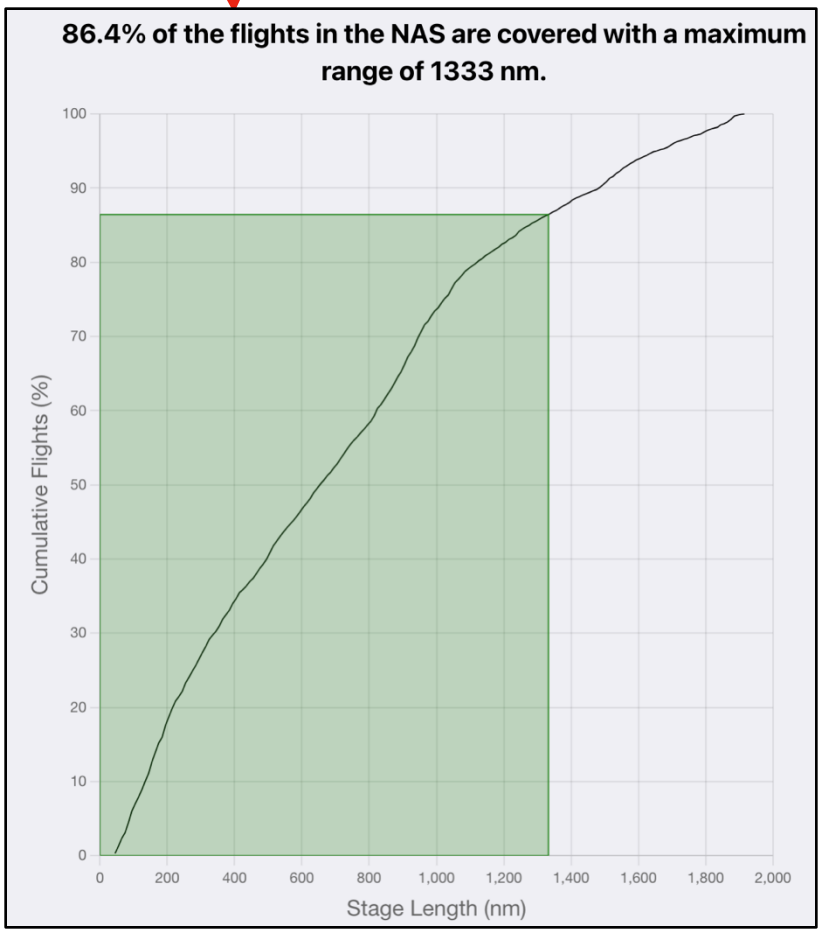
Aircraft Name	Aircraft Mix	NBAA IFR Maximum Range SAMPLE DATA		Useful Load (Takeoff Weight)		Landing at Maximum Landing Weight					
						No Correction		Part 135 Eligible		Part 135	
		Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Cessna Citation X	2%	86% FLIGHTS IN NAS 1333 nm / 4 pax	68% FLIGHTS IN NAS 922 nm / 4 pax	68 % 31661 lbs	54 % 29667 lbs	✓	✓	✓	✗	✗	✗



- The Cessna Citation X can operate at 68% of its maximum useful load from the 5,200-foot runway (dry pavement)
- The Cessna Citation X takeoff field length is either the accelerate-stop-distance or the single engine-out continued takeoff (certification basis is FAR Part 25)
- The aircraft can takeoff at a weight of 31,661 lbs. and carry four passengers and two pilots and travel 1,333 nautical miles
- If the aircraft carries 9 passengers and two pilots instead, the mission range is reduced to 1,120 nm

Mission Range and Trip Distances Flown for the Cessna Citation X

Aircraft Name	Aircraft Mix	NBAA IFR Maximum Range SAMPLE DATA		Useful Load (Takeoff Weight)		Landing at Maximum Landing Weight					
						No Correction		Part 135 Eligible		Part 135	
		Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Turboprop											
Beechcraft King Air 350ER	6%	100% FLIGHTS IN NAS 945 nm / 5 pax	✗	61 % 14087 lbs	25 % 11897 lbs	✓	✓			✓	✓



- The Cessna Citation X departs at a weight of 31,661 lbs., carries four passengers two pilots, and travels 1,333 nautical miles
- The cumulative plot of flights for the Cessna Citation X shows that a mission of 1,333 nm covers 86.4% of the flights conducted in the NAS
- The cumulative flights versus stage length plot is obtained from thousands of flights via FAA TFMSC data.

Interpretation of 14 CFR Part 135 Landing Results for the Cessna Citation X

Aircraft Name	Aircraft Mix	NBAA IFR Maximum Range SAMPLE DATA		Useful Load (Takeoff Weight)		Landing at Maximum Landing Weight					
						No Correction		Part 135 Eligible		Part 135	
		Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Cessna Citation X	2%	86% FLIGHTS IN NAS 1333 nm / 4 pax	68% FLIGHTS IN NAS 922 nm / 4 pax	68 % 31661 lbs	54 % 29667 lbs	✓	✓	✓	✗	✗	✗

Aircraft Name	Useful Load (%)	Takeoff (ft)		Landing (ft)					
				No Correction		Part 135 Eligible		Part 135	
		Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Jet									
Cessna Citation X	68	5674	6525	4025	4629			6722	7730

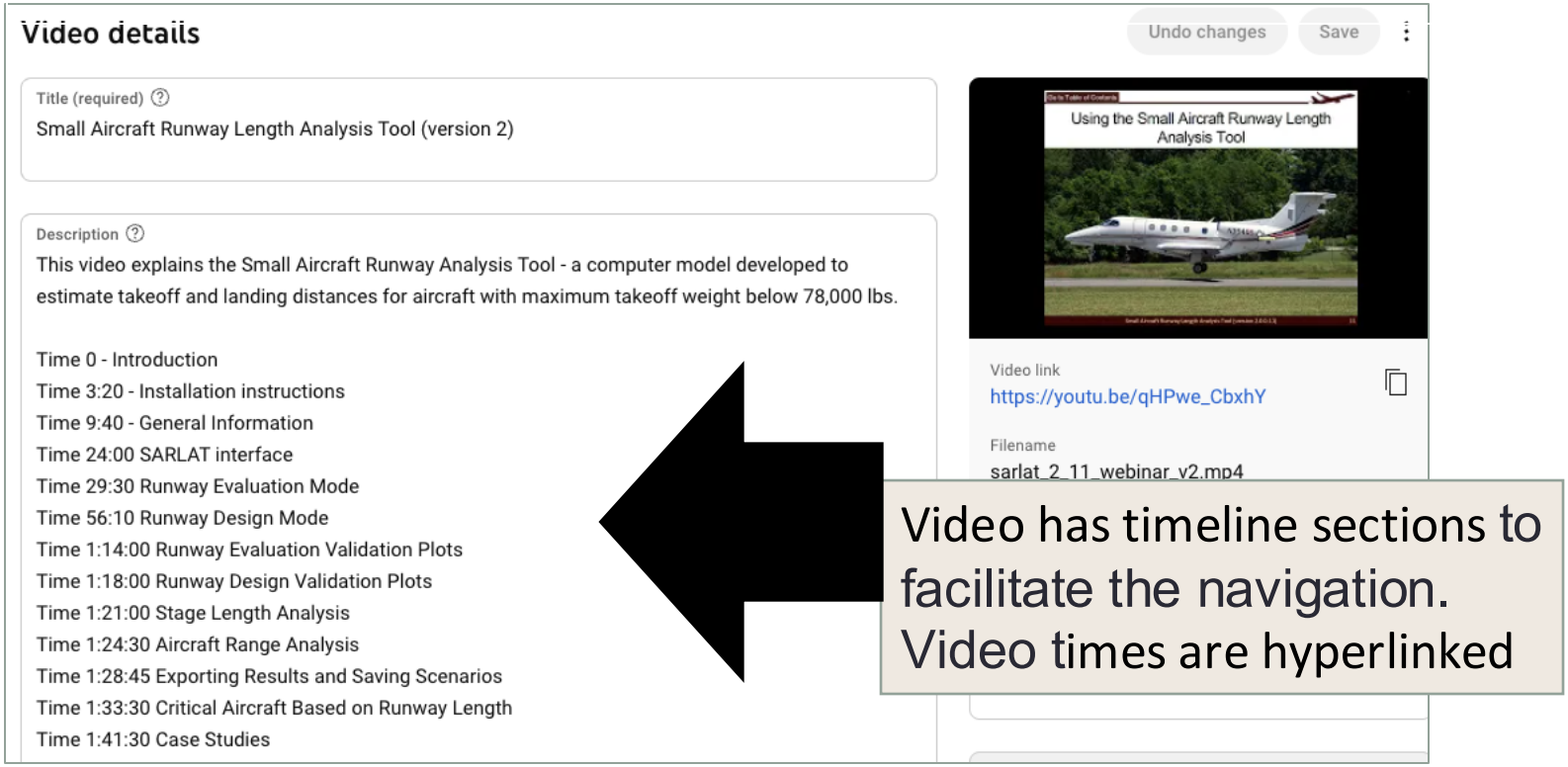
- The Cessna Citation X can take off and land on the 5,200-foot runway using actual (uncorrected) distances reported by the aircraft manufacturer
- The uncorrected landing distances are 4,025 (dry) feet and 4,629 feet (wet)
- The aircraft **cannot land under 14 CFR Part 135 rules** because adjustments to the landing distances by 1.67 and 1.92 are applied to the uncorrected dry and wet distances, respectively
- For 14 CFR Part 135 rules under dry runway conditions, the runway requirement is 6,277 feet long.

Runway Evaluation Case Analysis Summary

- The 5,200-foot runway seems acceptable for most of the aircraft in the fleet mix
  - Any assessments for a runway extension are evaluated in Runway Design, not Runway Evaluation
- Large turboprops like the King Air B350ER have a wide payload-range envelope, allowing them to operate with five passengers and two pilots and still fly 100% of the missions flown in the NAS with a useful load of 61% from a dry 5,200-foot runway
- Surprisingly, some small jets like the Cirrus Vision SF50 can operate with substantial useful load limitations if the 5,200-foot runway is wet (i.e., 68% useful load but only able to fly 235 nm with three passengers and a single pilot); if the runway is wet, the pilot may opt to delay the flight until conditions improve

Feedback and YouTube Tutorial to Learn More About the SARLAT 2 Tool

- We welcome your feedback
- Please contact: Dr. Antonio Trani (vuela@vt.edu)



https://youtu.be/Psygw4MnPFk

Additional Notes and SARLAT 2 Errata Table

Landing Distance Data in SARLAT

- SARLAT includes landing performance data under maximum allowable weight landing conditions
- For this reason, if you use the Part 135 toggles in SARLAT, some aircraft will display long landing distances consistent with higher approach speeds
- A future version of SARLAT will include landing distances for different weights

For AIP projects, the FAA will decide on applicable landing weights to be used.