JSSI | CONKLIN & DE DECKER

Aircraft Operating Cost and Performance Guide

Bombardier Learjet 60XR

January 01, 2023

Created For Lear 60XR Buyer

AEROTRANS
AIRCRAFT SALES | ACQUISITIONS | CONSULTING

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Data version: V 22.2.1

Bombardier Learjet 60XR

RANGE:
2,044 nm

SPEED:
465 kts

PASSENGERS:
7 people

ACQUISITION COST:	ANNUAL COST:	VARIABLE COST:	FIXED COST:
$3,850,000	**$1,212,987**	**$3,835/hr**	**$637,737**

MAX PAYLOAD:	2,104 lb	ENGINES:	Pratt & Whitney Canada PW305A 2
TOTAL CABIN VOLUME:	447 cu ft	AVIONICS:	Collins Pro-Line 21
WINGSPAN:	43.6 ft	APU:	Standard

PRODUCTION:	2007 - 2013	PRODUCED / IN SERVICE:	109/109
SERIAL NUMBERS:	60-294 to 60-430	MEETS STAGE 3 NOISE LEVELS:	Yes
IFR CERTIFIED:	Yes	REGULATORY CERTIFICATION:	1993
CERTIFICATION BASIS:	FAR 25		

Assumptions

⊛ This report uses custom assumptions that differ from Conklin & de Decker default values.

ANNUAL UTILIZATION (DISTANCE):	63,600 nm	FUEL PRICE (JET A):	$7.5/gal
ANNUAL UTILIZATION (HOURS):	150 hrs	LABOR COST:	$140/hr
AVERAGE SPEED (STANDARD TRIP):	424 kts	AVERAGE LENGTH (STANDARD TRIP):	600 nm

The Learjet 60XR is a Learjet 60 with the Collins Pro Line 21 avionics unit. Cabin layout has also improved. The new cabin design includes a window in the lavatory. In turn, the Learjet 60 was derived from the Learjet 55.

The Learjet 55 was Lear's entry into the medium sized business jet field. In designing the 55, Learjet utilized the earlier Longhorn 28/29 wing with winglets and married it to a larger fuselage. The step-down aisle in the cabin has 5 feet 9 inches of headroom. Power is supplied by two Honeywell TFE 731 engines, which produce 3,700 pounds of thrust each.

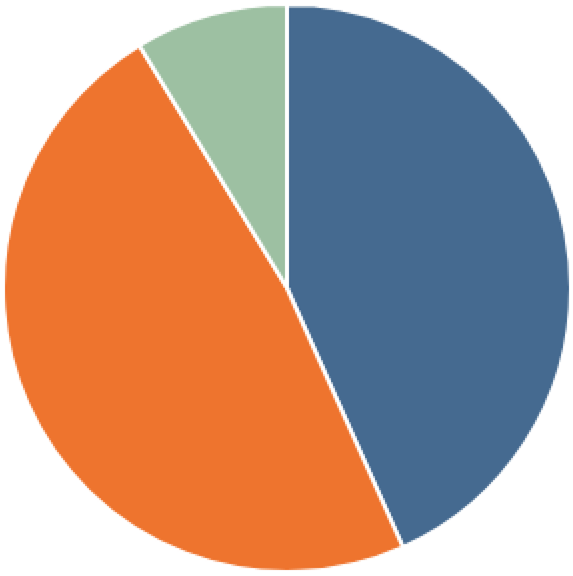
The Learjet 55B introduced a digital flight deck, modified wings, and an improved interior. The 55C was equipped with delta fins that improve performance and handling. Further improvements and a larger cabin resulted in the Learjet 60. The improved Learjet 60 first flew in June 1991, and the fuselage is 3.5 feet longer than the Learjet 55. It is powered by Pratt & Whitney Canada PW305 turbofan engines.

Deliveries of the Learjet 60XR began in 2006.

The Lear 60XR is equipped with the Collins Pro-Line 21 Avionics Suite and an upgraded interior.

1. Cost

Total Annual Cost With Market Depreciation



$1,328,487

- 43% - Variable Cost - $575,250
- 48% - Fixed Cost - $637,737
- 9% - Market Depreciation - $115,500

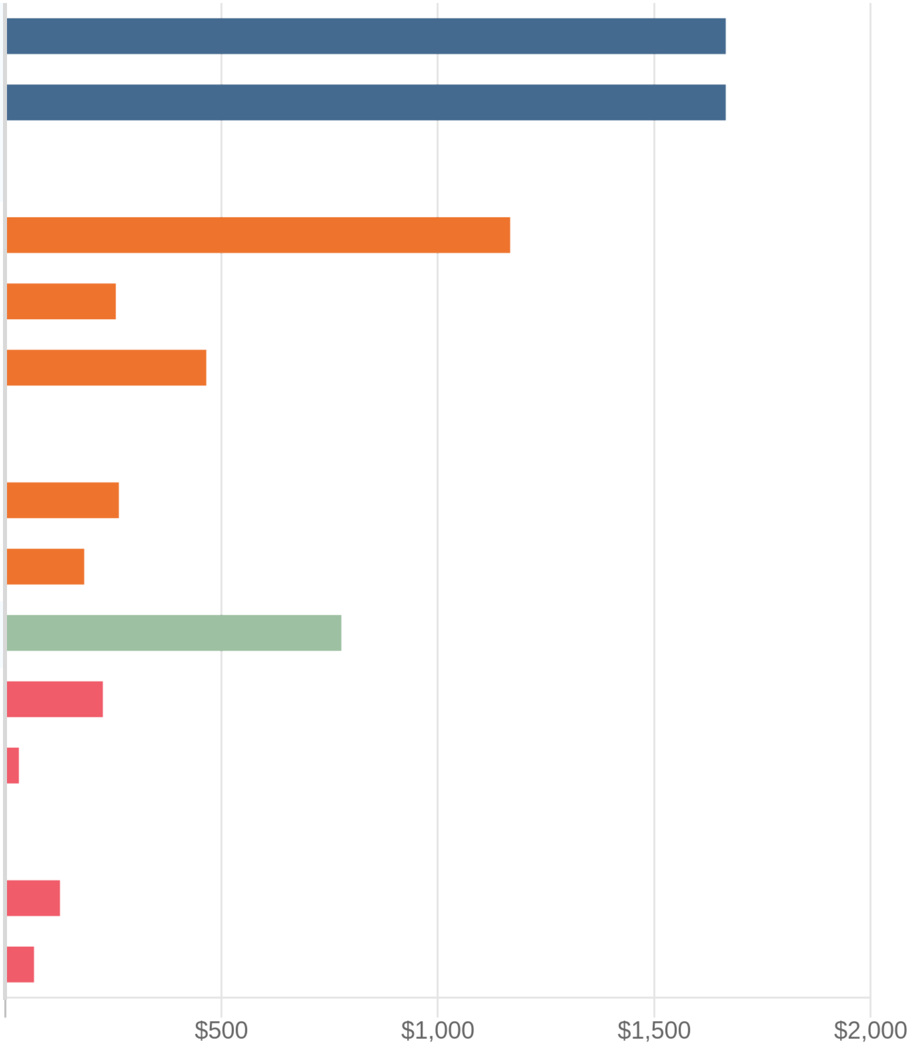
Total Annual Cost:	**$1,212,987**
Variable Cost:	$575,250
Fixed Cost:	$637,737
Per Hour:	$8,087
Per Nautical Mile:	$19.07
Per Seat Per Nautical Mile:	$2.72
Total Annual Cost with Market Depreciation:	**$1,328,487**
Market Depreciation:	$115,500
Per Hour:	$8,857
Per Nautical Mile:	$20.89
Per Seat Per Nautical Mile:	$2.98

Hourly Variable Cost

PER FLIGHT HOUR:

$3,835/hr

Fuel: [1]	**$1,665**
Fuel:	$1,665
Additives:	—
Maintenance:	**$1,167**
Maintenance Labor: [2]	$256
Parts Airframe/Engine/Avionics:	$465
Thrust Reverser Allowance:	—
APU Allowance:	$263
Major Periodic Maintenance:	$183
Engine Reserves:	$777
Miscellaneous Reserves:	**$226**
Landing/Parking:	$32
ATC Navigation:	—
Crew Expenses:	$127
Supplies/Catering:	$67



1. Fuel is calculated using Fuel Price x Fuel Burn + 15% - 222 gal/hr

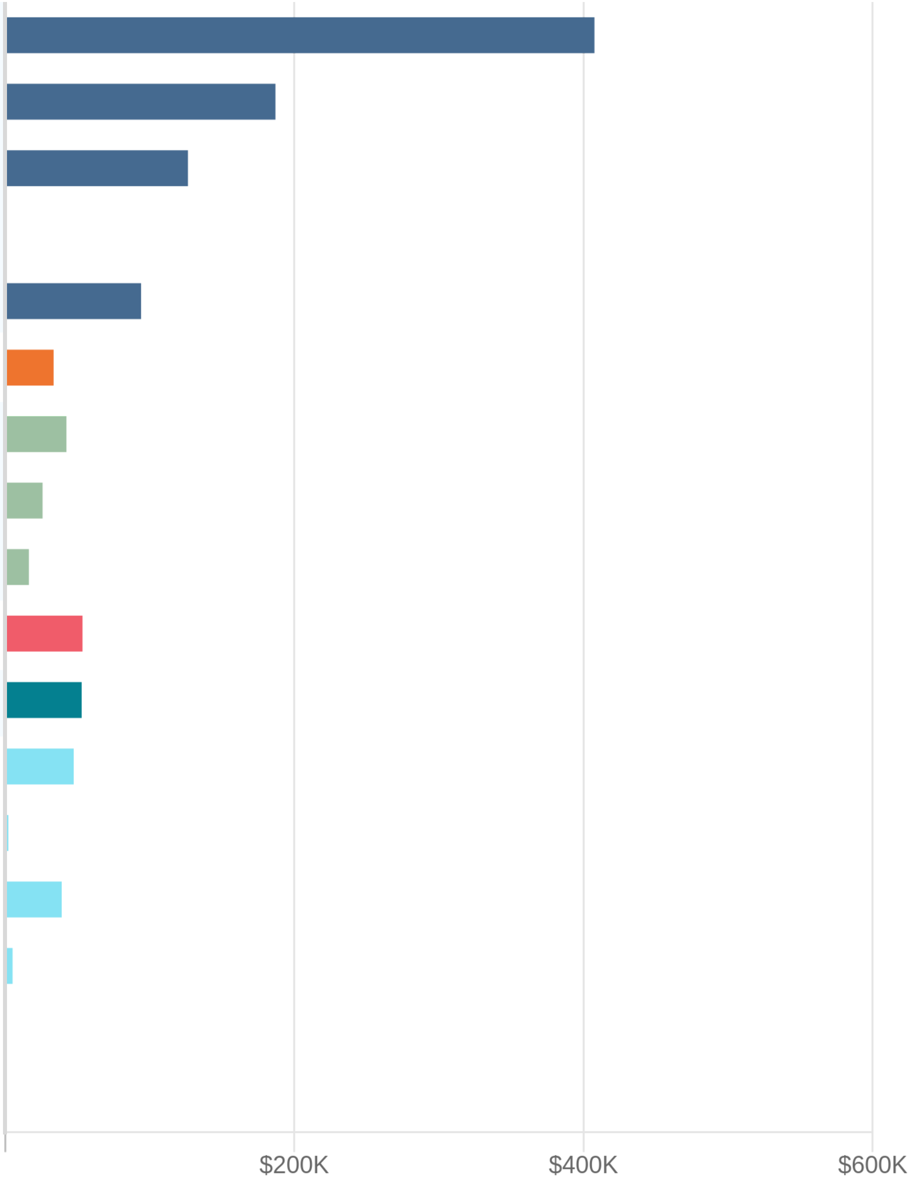
2. Maintenance Labor Cost is calculated using the ratio of Maintenance Labor Hours per Flight Hour and the Labor Rate: 1.83 labor-hr/Fhr @ $140/hr

Annual Fixed Cost

ANNUAL COST:

$637,737

Crew:	**$407,550**
Captain:	$187,000
Copilot:	$126,500
Flight Attendant:	—
Benefits:	$94,050
Hangar:	$33,600
Insurance:	**$42,487**
Hull:	$25,987
Single Limit Liability:	$16,500
Aircraft Modernization:	$53,600
Training:	$53,000
Miscellaneous:	**$47,500**
Navigation Chart Service:	$2,350
Refurbishing:	$39,200
Computer Maintenance Program:	$5,250
Weather Service:	$700
Other:	—



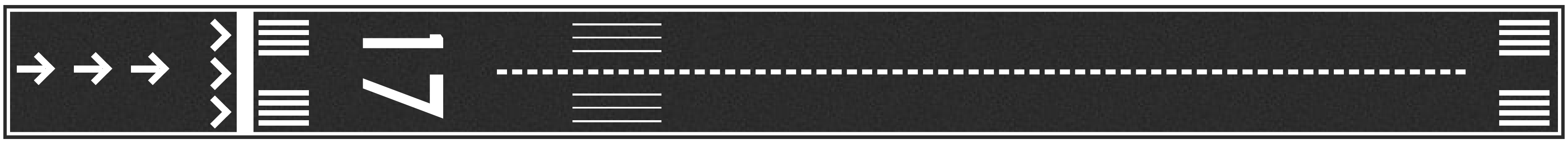
2. Performance

NORMAL CRUISE:	LONG-RANGE CRUISE:	MAXIMUM CRUISE:
436 kts	**423 kts**	**465 kts**

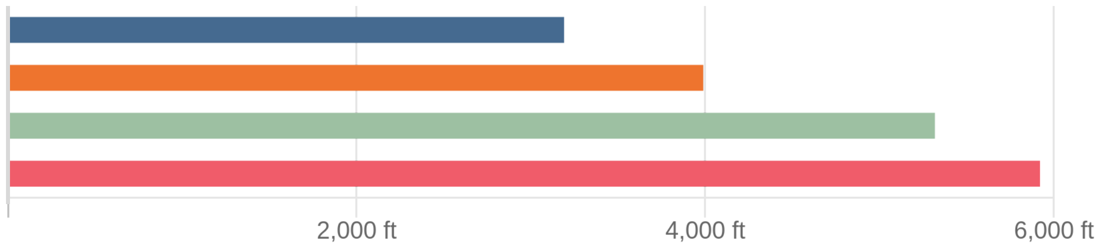
RATE OF CLIMB:	MAX CERT. ALTITUDE:	INITIAL CRUISE ALTITUDE:	TIME TO CRUISE ALTITUDE:
4,500 ft/min	**51,000 ft**	**41,000 ft**	**18 min**

SERVICE CEILING:	ENGINE OUT RATE OF CLIMB:	ENGINE OUT CEILING:
42,400 ft	**718 ft/min**	**24,300 ft**

Field Length



FAR-91	3,190 ft
FAR-135	3,988 ft
FAR-121	5,317 ft
Balanced Field Length	5,920 ft



Speeds

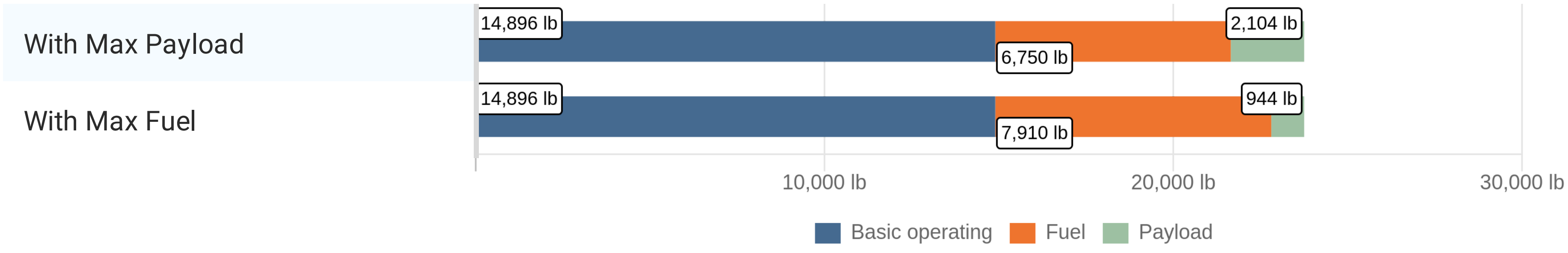
VMC (GROUND):	–
VMC (AIR):	–
V2 (MAX. TAKEOFF GROSS WT.):	147 KIAS
VREF (BOW + PAX + NBAA RES.):	132 KIAS

FAR 36 Noise Levels

TAKEOFF:	70.8 EPNdB
SIDELINE:	83.2 EPNdB
APPROACH:	87.7 EPNdB

3. Weight/Payload

Weight Breakdown



With Max Payload

MAXIMUM PAYLOAD:	RANGE AT MAX PAYLOAD:
2,104 lb	**1,789 nm**

With Max Fuel

AVAILABLE PAYLOAD:	PASSENGER CAPACITY:
944 lb	**5 people**

RAMP WEIGHT:	23,750 lb
MAX LANDING:	19,500 lb
BASIC OPERATING:	14,896 lb
USABLE FUEL:	7,910 lb

MAX GROSS TAKEOFF WEIGHT:	23,500 lb
ZERO FUEL:	17,000 lb
USEFUL LOAD:	8,854 lb

4. Range

Long-Range Cruise

RANGE:
2,182 nm

AVERAGE SPEED:
426 kts

ENDURANCE:
5 hrs

PASSENGERS:
4 people

Maximum Cruise

RANGE:
2,053 nm

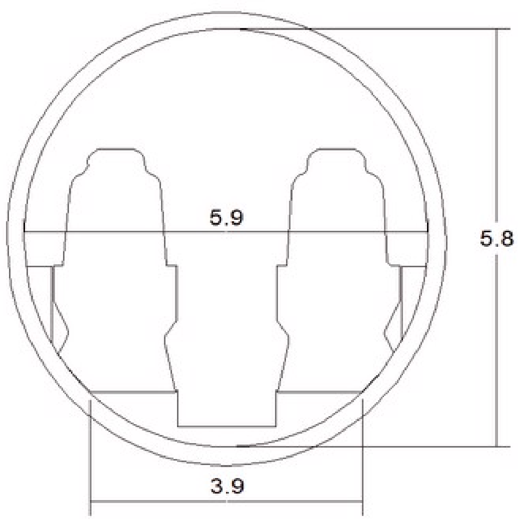
AVERAGE SPEED:
466 kts

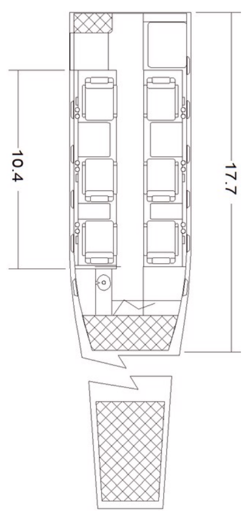
ENDURANCE:
4 hrs

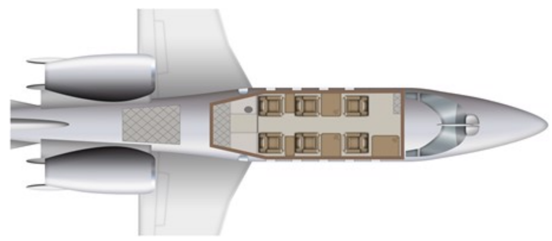
PASSENGERS:
4 people

SEATS FULL RANGE:	2,044 nm
FERRY RANGE:	2,398 nm

5. Interior





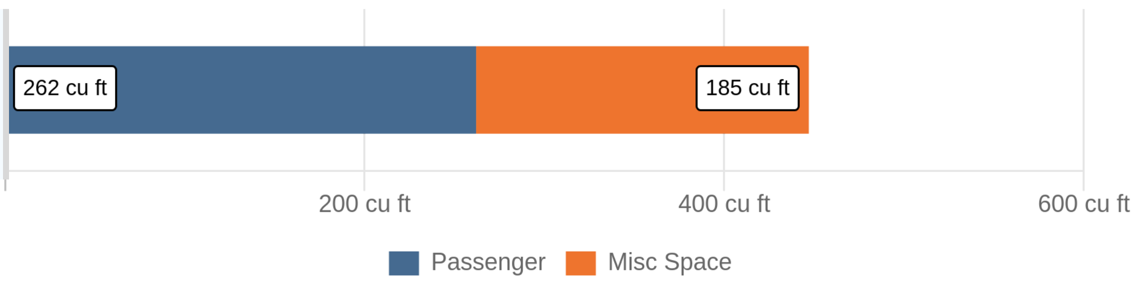


PASSENGERS:
7 people

CREW:
2 people

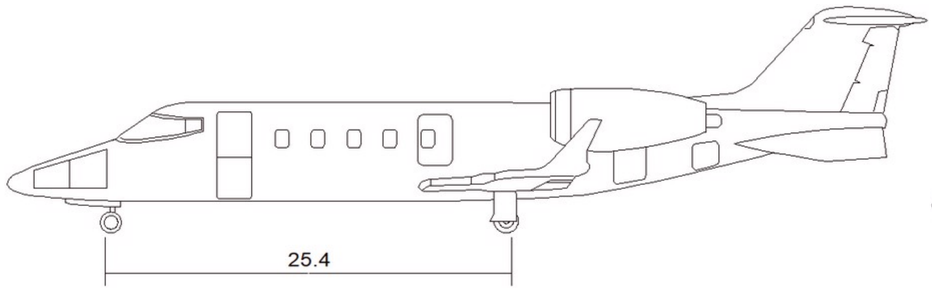
TYPICAL VOLUME PER PASSENGER:
37 cu ft/person

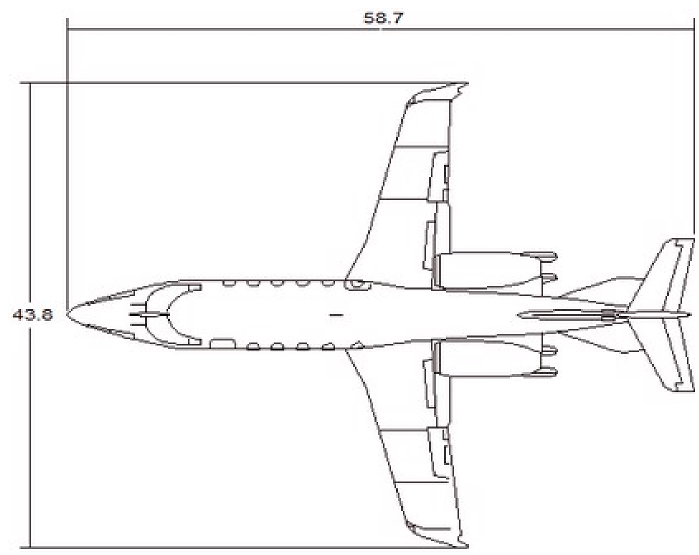
CABIN VOLUME BREAKDOWN:
447 cu ft

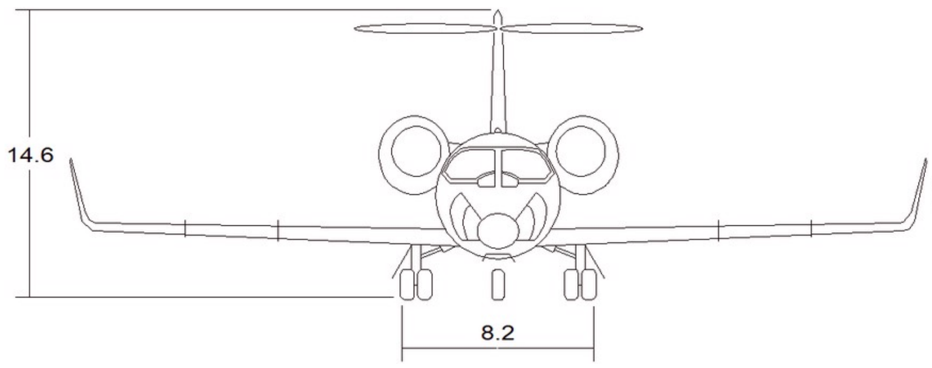


TOTAL CABIN VOLUME:	PASSENGER AREA:	MISC SPACE (GALLEY, LAV, ETC.):
447 cu ft	**262 cu ft**	**185 cu ft**
CABIN WIDTH:	CABIN LENGTH:	CABIN HEIGHT:
5.92 ft	**17.67 ft**	**5.75 ft**
TOTAL BAGGAGE VOLUME:	INTERNAL:	EXTERNAL:
48 cu ft	**24 cu ft**	**24 cu ft**
DOOR:	WIDTH (DOOR):	LENGTH (DOOR):
10.5 sq ft	**2 ft**	**5.25 ft**
PRESSURE DIFFERENTIAL:	SEA LEVEL CABIN TO:	CABIN ALT AT MAX CERT ALT:
9.4 psi	**25,700 ft**	**8,000 ft**

6. Exterior







WINGSPAN:

43.6 ft

FUSELAGE:

58.5 ft

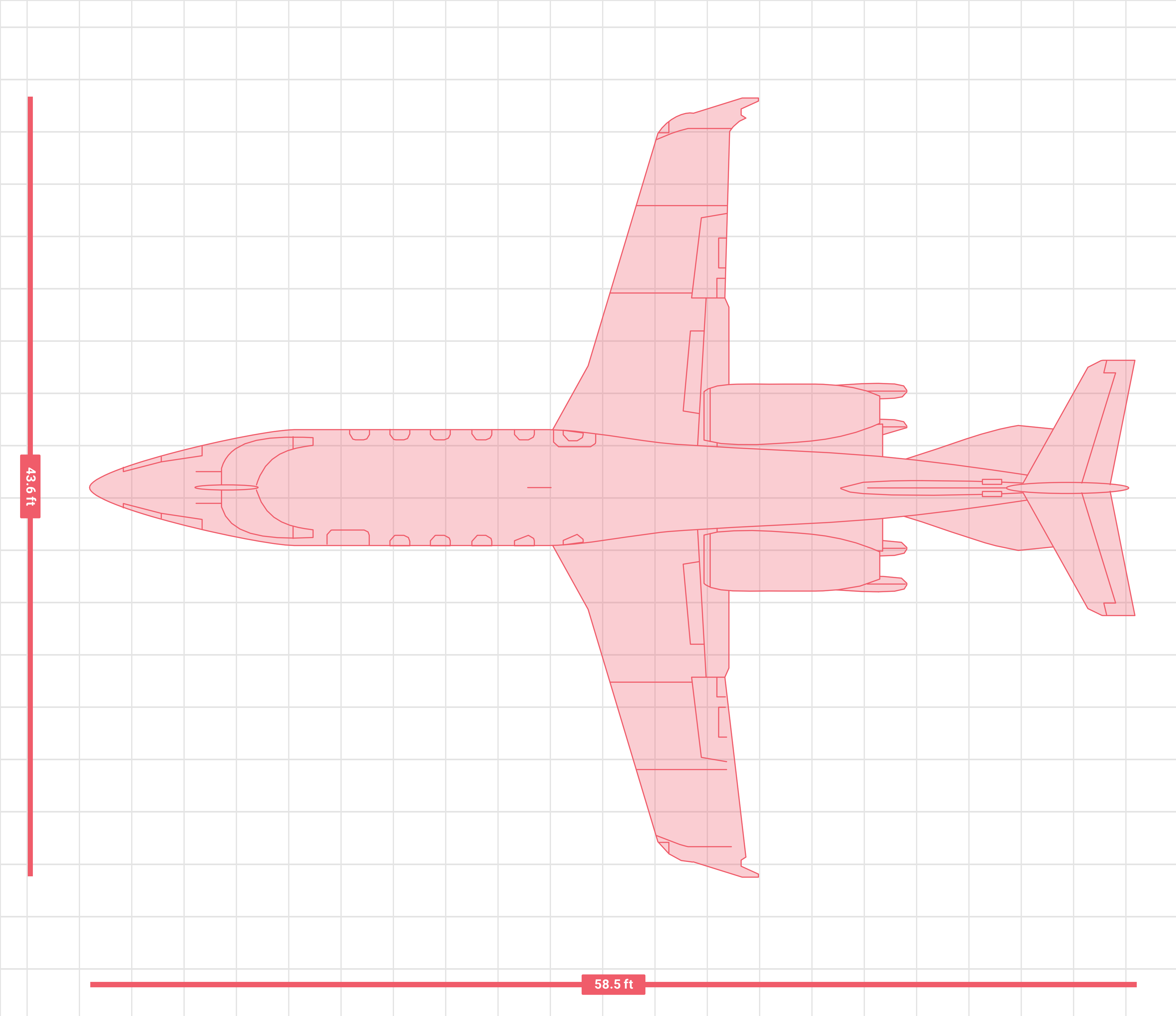
POWERPLANT:

Pratt & Whitney Canada PW305A 2

7. Overlay

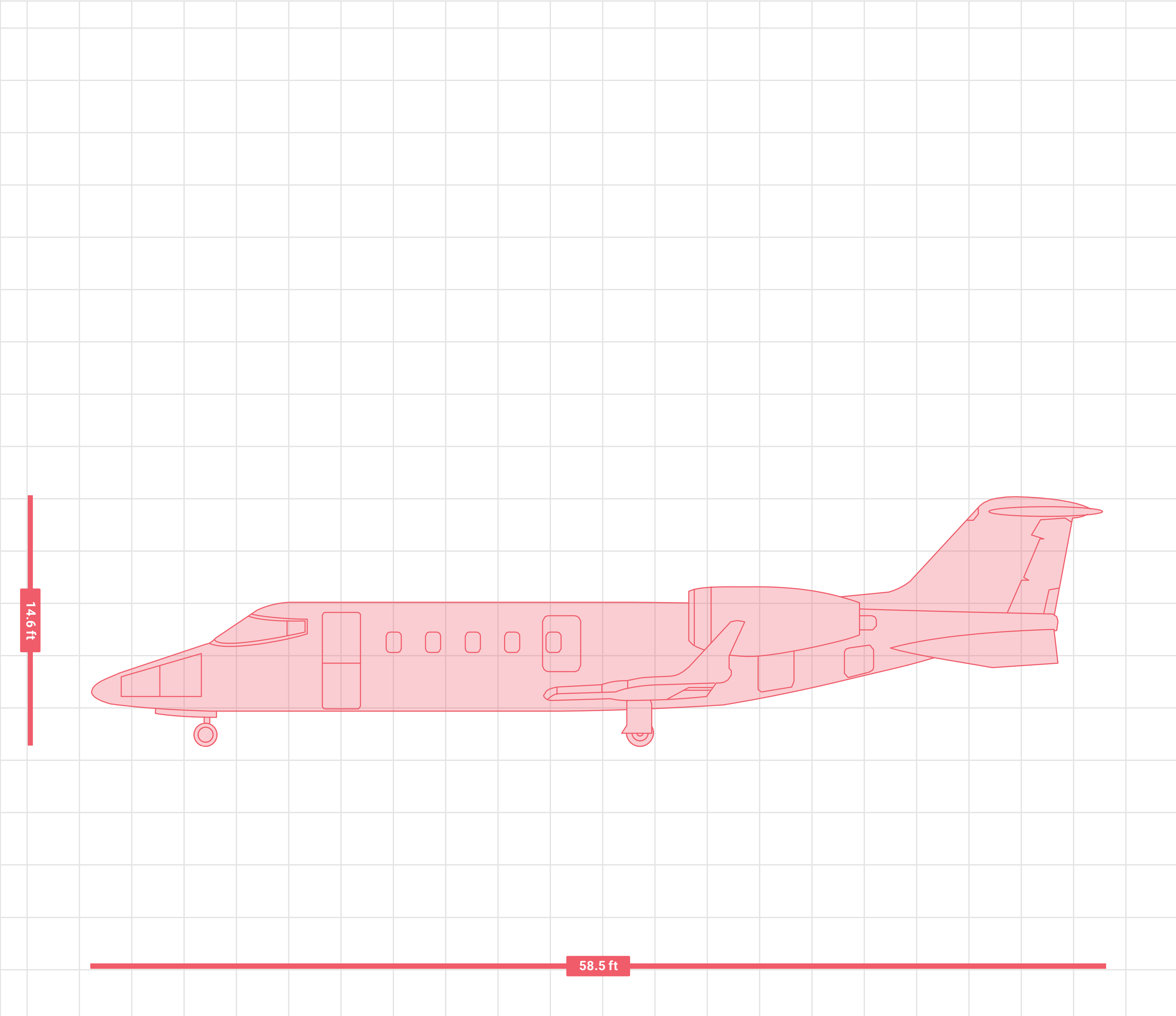
Top View

Bombardier Learjet 60XR	Wingspan	43.6 ft	Fuselage	58.5 ft



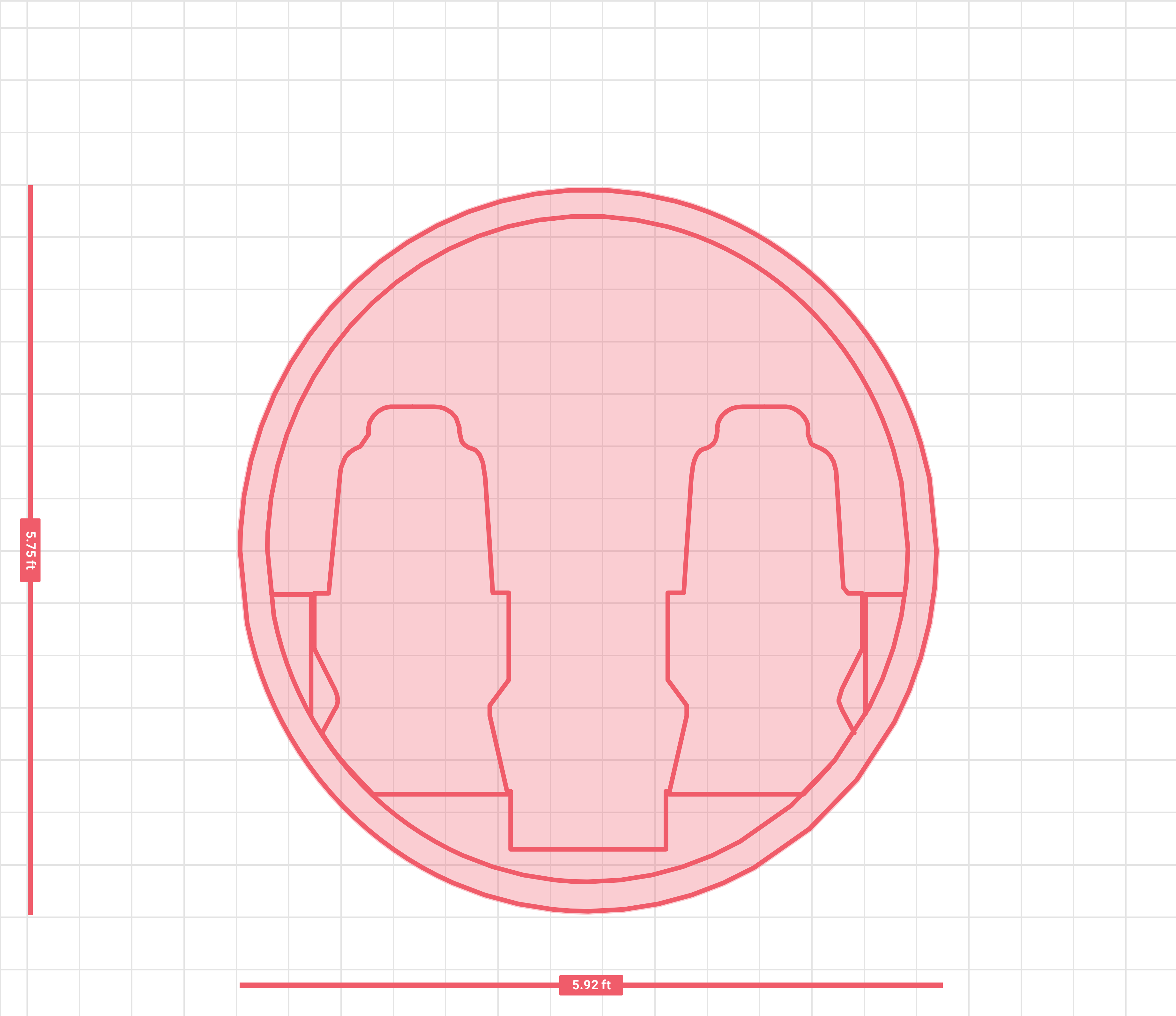
Side View

Bombardier Learjet 60XR	Height	14.6 ft	Fuselage	58.5 ft



Cabin View

Bombardier Learjet 60XR | Cabin Height 5.75 ft | Cabin Width 5.92 ft



8. Equipment

AVIONICS

Collins Pro-Line 21

COCKPIT VOICE RECORDER:	Standard
FLIGHT DATA RECORDER:	Optional
EICAS:	Standard
GROUND WARNING SYSTEM:	EGPWS
TRAFFIC WARNING SYSTEM:	TCAS II
MAINT DIAG SYS:	Standard
VHF 8KHZ SPACING:	Standard

AUXILIARY POWER UNIT

Standard

MEETS STAGE 3 NOISE LEVELS:	Yes
REGULATORY CERTIFICATION:	1993
IFR CERTIFIED:	Yes
PRODUCTION:	2007 - 2013
SINGLE POINT REFUEL:	Standard
EXTERNAL LAV. SERVICE:	Standard

Aircraft Operating Costs & Performance Guide
Explanation of Terms & Assumptions

Introduction

The following pages describe the content of each cost element as well as the aircraft performance data and specifications used in *The Conklin & de Decker Report*.

The data for aircraft not yet certificated will be marked "Preliminary Data" to indicate that the data shown for this aircraft has not yet been independently verified. Occasionally, data for aircraft recently certificated will also be marked as "Preliminary Data" for the same reason.

Methodology and Disclaimer

It is the opinion of Conklin & de Decker that the data presented in this publication is based on reasonable methodologies, assumptions and reliable sources. Manufacturers' data may be based on different assumptions, sales price adjustments, individually negotiated fleet contracts, differing warranties, or specialty maintenance programs peculiar to a manufacturer or year of production, and is therefore, in the opinion of Conklin & de Decker, not suitable for comparison with other aircraft. Conklin & de Decker has made adjustments based on research, which in its opinion are reasonable and necessary in order to provide a database that is suitable for comparative purposes. Actual experience will vary, and the data does not reflect specialized maintenance contracts, separately negotiated fleet deals, or other items unique to particular sales transactions.

The Aircraft Operating Costs & Performance Guide is not intended as a budgeting tool. It makes generalized assumptions that may not apply to your aircraft and operating conditions. Due to fluctuations in market costs, operating conditions and other factors, we make no warranties or representations regarding the future costs of maintenance or operation of any aircraft.

Measures and Currency

The measures for weights, volumes, distances and speed may be shown in the English system (Lbs, Gallons, Feet, Miles, Knots, etc.) or the Metric system (Kilos, Liters, Meters, Kilometers Kilometers/Hour, etc.), depending on the selection made by the user when the program is opened. The English system is the default selection.

The default currency selection for showing the cost data is the US Dollar ($). Other currencies may be selected by the user when the program is opened.

Regional Cost Data

The Aircraft Operating Costs & Performance Guide default database is focused on US/North American cost factors. Regional databases are available for a number of regions with substantial business aviation activity, such as Europe and China. These databases use cost factors that are obtained from operators and Maintenance and Repair Organizations (MROs) in that region and focus on regional costs, such as fuel, salaries, Air Traffic Control (ATC) charges, etc., many of which are significantly different than these costs in the US. The Regional databases may be selected when the program is opened.

General Assumptions - Fixed-Wing Aircraft and Helicopters

The cost data shown in the *Conklin & de Decker Report* is based on extensive research using a variety of sources of information such as industry surveys, manufacturer supplied technical data and maintenance schedules and average actual cost data supplied by Jet Support Services, Inc (JSSI), major Maintenance and Repair Organizations (MROs), manufacturers, etc. We also use our knowledge of similar aircraft models utilizing similar maintenance philosophies in conjunction with operator cost data to calculate the estimated costs for aircraft that have recently entered production or have gone out of production.

All jet, turboprop, helicopter and piston aircraft maintenance costs are estimated using our FulLife™ cost approach. Under the FulLife™ approach we estimate the funds that should be set aside in order to pay for all scheduled and unscheduled, near-term and eventual maintenance of the aircraft over one operational life cycle of each inspection, component overhaul, engine overhaul and replacement of life limited items.

For example, if the aircraft (fixed wing or helicopter) has a major inspection due at 5,000 hours, the maintenance cost accrued per hour is equal to the cost of the inspection divided by its interval of 5,000 hours. Similarly, if an aircraft has a gear overhaul that is due at 6,000 landings, the cost of the overhaul equals the cost of the overhaul divided by the overhaul interval of 6,000 cycles. For more detailed information, please refer to the maintenance cost categories below.

During the warranty period new jets and turboprops, which can extend to 5 years, the operator may see labor costs 15% less and parts costs 30% less than aircraft not under warranty. For helicopters and piston aircraft, which generally have much shorter warranty periods, the impact of warranty of the cost of maintenance is minor.

The costs shown are list prices for the goods and services offered and do not take into account discounts that operators may be able to obtain through negotiation. Cost shown for each country or region are average costs for that country or region and do not reflect the sometimes much higher costs that may be encountered in particular cities.

Sales, Use and VAT Taxes

No sales or value added taxes (VAT) are included in these costs.

Annual Utilization

Almost all aircraft are used to fly trips from A to B – in other words their true annual utilization should be expressed as a function of distance. Aircraft variable costs on the other hand are usually expressed as hourly costs. Therefore, we have established an annual utilization in nautical miles (NM) based on NBAA survey data for each group of aircraft (jets, turboprops, piston aircraft and helicopters). The assumed annual utilization expressed in terms of distance is:

- Jets: 175,000 NM (325,000 KM)
- Turboprops: 115,000 NM (210,000 KM)
- Corporate (professionally flown) Pistons: 45,000 NM (83,000 KM)
- Business Pistons: 22,500 NM (41,500 KM)
- Helicopters: 45,000 NM (83,000 KM)

Hourly annual utilization used in the Aircraft Operating Costs & Performance Guide for each aircraft is then calculated by dividing the annual utilization in NM or KM by the average speed (Block Speed) of that aircraft. Block speed is derived from the aircraft performance man ual

Average Speed

The average speed is the recommended cruise speed if this is defined by the manufacturer in the performance manual for the aircraft. If the manufacturer does not provide a recommended cruise speed, we use the average speed between the long range cruise speed and the high speed/maximum cruise speed.

Maintenance Assumption

Our cost numbers assume that aircraft maintenance is performed at a qualified service facility for routine maintenance and a factory authorized MRO facility for major/heavy maintenance and overhauls unless indicated otherwise in the aircraft categories' explanations.

Aircraft Categories

Corporate - Jets, Turboprops and Pistons

Corporate costs assume the aircraft is owned and operated by a company solely for company use. These aircraft are flown by one or two professional pilots, depending on the class of aircraft. Super mid-size and larger jet aircraft also carry a professional flight attendant. These aircraft are required to maintain a very high reliability rate and are kept in excellent condition. Equipment levels for all models are assumed to be appropriate for the transportation of executives in instrument meteorological conditions (IMC). In addition, the long-range jets are equipped for extended over-water, trans-continental flights. When appropriate corporate aircraft are also suitably equipped for internet and mobile phone connectivity for both the crew and the passengers.

Commercial (Helicopter Only)

Commercial costs assume the aircraft is part of a fleet owned and operated for commercial purposes. Relative cost per hour is lower than a corporate aircraft. The aircraft is flown by a professional pilot whose primary job is pilot. Aircraft utilization is much higher than corporate. Pilot salaries are generally lower than corporate pilots and insurance is generally 50-100% higher than corporate. Aircraft maintenance and component overhauls are usually done in-house as opposed to sending the aircraft to a certified maintenance facility. These aircraft generally have fewer optional equipment items.

EMS (Helicopter Only)

EMS costs assume the aircraft is owned and operated by a company solely for emergency transport of patients from an accident scene to a medical facility or sick patients from one hospital location to another. The aircraft is flown by a professional pilot whose primary job is pilot. These aircraft are required to maintain a very high reliability rate and are kept in excellent condition. Equipment levels are assumed to be appropriate for the transportation of people experiencing a life-threatening medical emergency in instrument meteorological conditions (IMC).

Offshore (Helicopter Only)

Offshore costs assume the aircraft is part of a fleet owned and operated for transporting personnel to offshore rigs. Relative cost per hour is generally lower than for corporate aircraft. The aircraft is flown by a professional pilot whose primary job is pilot. Aircraft utilization is much higher than corporate. Pilot salaries are generally 20-30% lower than corporate pilots and insurance is generally 50-100% higher than corporate. Aircraft maintenance and component overhauls are usually done in-house as opposed to sending the aircraft to a certified maintenance facility. These aircraft generally have fewer optional equipment items.

Utility (Helicopter Only)

Utility costs assume the aircraft is part of a fleet owned and operated for utility purposes like stringing high voltage power lines, lifting equipment and logging. The aircraft is flown by one or two professional pilots, depending on the maximum take-off gross weight of the helicopter. Aircraft utilization is much higher than corporate. Pilot salaries are generally 20-30% lower than corporate pilots and insurance is generally 25 - 50% higher than corporate. Aircraft maintenance and component overhauls are usually done in-house as opposed to sending the aircraft to a certified maintenance facility. These aircraft generally have fewer optional equipment items.

Data Sources for Maintenance Costs

Newly-Fielded and Newly-Developed Aircraft

Manufacturer supplied cost data and our knowledge of similar aircraft models utilizing similar maintenance philosophies are used to estimate costs for aircraft not yet certificated. These aircraft will be noted as having “Preliminary Data” to indicate that the data shown for this aircraft has not yet been independently verified. Occasionally, data for aircraft recently certificated will also be marked as “Preliminary Data” for the same reason.

Mature Aircraft

We use actual cost data supplied by Jet Support Services, Inc, major MROs and manufacturers for aircraft that have been in production for at least 5 years. We also use our knowledge of similar aircraft models utilizing similar maintenance philosophies in conjunction with operator cost data to calculate the estimated costs for aircraft for which only limited data is available.

Variable Costs

Fuel Cost

Conklin & de Decker's fuel cost is obtained from a third-party survey of numerous Fixed Base Operators (FBOs) for the US database and from knowledgeable operators and FBO’s in regions. The fuel cost shown is the list price for private, non-commercial operators. The prices shown do not contain any discounts, but do include applicable taxes as well as airport and FBO uplift fees. The cost of fuel is updated regularly (currently twice annually). No additives are included in the fuel cost. The cost of fuel may be shown as cost-per-gallon or cost-per-liter, depending on whether the user of the program has selected the English or the Metric system of measures. In addition, the cost of fuel will be shown in the currency selected by the user when the program was opened.

Fuel Burn - Fixed-Wing

The average fuel burn is shown in gallons per hour or liters per hour for each make/model aircraft using data that is generally derived from flight manuals, is calculated at the recommended cruise speeds and includes start, taxi and take-off fuel. Cruise altitude assumed for unpressurized aircraft is 8,000 feet (2,500 meters). For pressurized aircraft a flight altitude for optimum cruise fuel consumption is used. However, the cruise altitude cannot exceed the maximum certificated altitude. In addition, the cabin altitude cannot exceed 8,000 Ft (2,500 M). If it does, the cruise altitude is decreased to achieve an 8,000 Ft (2,500 M) cabin altitude.

The fuel burn calculation includes engine start, taxi, take-off and climb, cruise, descent, and landing for a standard trip length for each class of aircraft so that fuel burns for the aircraft in each class of aircraft are directly comparable:

Standard Trip Length:

- Jets: 600 NM (1,100 KM)
- Turboprops: 300 NM (550 KM)
- Pistons: 200 NM (370 KM)

The flight crew and passenger complement is assumed to be as follows, unless otherwise noted:

	Pilots	*Passengers*
Jets (all except VLJ)	2	4
Jets (VLJ)	1	3
Turboprops (twin engine)	2	4
Turboprops (single engine)	1	4
Pistons	1	2

The flight profile used for the fixed-wing fuel burn calculation is as follows:

- Start, taxi and take-off (include fuel for 10 minutes ground time)
- International Standard Atmosphere (ISA), Standard Day (sea – level, 59F/15C)
- Normal climb at ISA Standard conditions, no wind
- Climb direct to altitude (no step climb), at minimum rate of climb of 500 feet/minute (150 meters/minute):
  - Altitude for jets to be an optimum flight level between FL 290 – FL 450
  - Altitude for turboprops and pistons is the optimum altitude consistent with the need to keep cabin altitude at or below 8,000 Ft (2,500 Meters)
- Cruise at altitude for at least 50% of the total flight time
- Cruise speed to be at a recommended constant cruise speed or Mach number
- Normal descent at ISA Standard conditions (no winds, 59F/15C at sea – level). A high speed/maximum descent schedule will not be used if a slower descent schedule is available
- Trip time is measured from take – off to touchdown

The average fuel burn rate is then calculated as trip fuel/trip time.

To that amount we add 15% to account for real world conditions to include:

- Pilot flying techniques
- Using high speed/maximum power settings
- Air Traffic Control Restrictions - restricting the aircraft to less than optimum altitudes. Lower altitudes usually increase fuel burn
- Ground delays - Running engines while spending extra time on the ground
- Auxiliary Power Unit (APU) operation (many jets and some turboprops)
- Tankering Fuel - Carrying more fuel than is required for a single flight (common on many larger aircraft to take advantage of discounted fuel at home base)

Fuel Burn - Helicopters

The average fuel burn is shown in gallons per hour or liters per hour for each make/model helicopter using data that is generally derived from flight manuals and is calculated at recommended cruise speeds. Cruise altitude and temperature for helicopters are assumed to be 2,000 Ft (600 Meters) and ISA temperatures.

The fuel burn calculation includes engine start, taxi, take-off and climb, cruise, decent and landing for a standard trip length so that fuel burn rates among different helicopters are directly comparable:

- Helicopters: 50 NM (90 KM)

The flight crew and passenger complement is assumed to be as follows, unless otherwise noted:

	Pilots	*Passengers*
Helicopters (twin engine or over 12,500 Lbs/5,700 Kilo)	2	4
Helicopters (single engine)	1	4*

** Or maximum seating capacity if less than 4 passenger seats are available*

The flight profile used for helicopter fuel burn calculations is as follows:

- Start, taxi and take–off (include fuel for 10 minutes ground time)
- ISA, Standard Day (sea–level, 59F/15C)
- Normal climb at ISA Standard conditions, no wind to 2,000 Feet (600 Meters) cruise altitude with ISA temperature
- Cruise speed to be at a recommended constant speed
- Normal descent at ISA Standard conditions (no winds, 59F/15C at sea-level)
- Trip time is measured from take – off to touchdown

No additional fuel allowance to account for real-world conditions is added to the helicopter fuel burn because most of the factors experienced in fixed wing flight operations do not occur in helicopter operations. This is supported by extensive operator data collected by our company over many years.

Fuel Additives

This is the cost per gallon or liter of fuel additives used for anti-icing or as a fungicide.

Lubricants

Cost of all lubricants such as engine oil, transmission oil and hydraulic fluid is used for all helicopters (at a standard 1%) and all piston aircraft (at 2%). Surveys have confirmed these to be realistic estimates. This cost is not calculated for jets and turboprops, since the cost for these items is included in the parts cost.

Maintenance

All fixed-wing aircraft (jets, turboprops and piston aircraft) and helicopter maintenance costs are estimated using our FulLife™ cost approach. Under the FulLife™ approach we estimate the funds that should be set aside in order to pay for all scheduled and unscheduled, near-term and eventual maintenance of the aircraft over one operational life cycle of each inspection, component overhaul, engine overhaul and replacement of life limited items.

This includes labor, parts and components for the entire aircraft, including a standard interior and standard avionics and cockpit displays. Optional interior furnishings or equipment as well as optional avionics and displays are not included.

Maintenance - Labor

Maintenance labor costs assume one full operational life cycle of the aircraft. An aging factor is applied to the aircraft costs during the aircraft’s operational life cycle.

Maintenance labor cost is composed of two parts: the cost per labor hour and the number of labor hours.

Cost per Labor Hour

The cost per labor hour is an average of the cost per hour experienced by operators at various manufacturers’ authorized maintenance facilities in the US for the different types of aircraft (jets, turboprops, pistons and helicopters). This cost is surveyed and adjusted annually. A similar approach is used for the other regions around the world.

Labor Hours per Flight Hour

Labor included in our aircraft labor calculation is all labor required for:

- Scheduled maintenance to include all inspections for a FulLife™ period, including the labor required for major periodic inspections due on many jets at 96 months or on one manufacturer’s helicopters at 12 years
- Discrepancies found during scheduled maintenance inspections/events for the airframe and avionics (on condition)
- Routine engine maintenance not covered during engine overhaul
- Labor for the removal/replacement of components requiring overhaul/inspection/servicing as well as life limited components
- Unscheduled maintenance discrepancies
- Troubleshooting unscheduled maintenance discrepancies
- Minor airworthiness directives and service bulletins

Labor not included in our labor calculation is labor required for:

- Major engine maintenance covered by our estimated engine restoration costs
- Off aircraft overhaul and repair of major components, such as landing gear, propellers and main rotor gearboxes
- Maintenance labor required for optional equipment, aircraft completion items (interior), aircraft cleaning and washing, any administrative labor, stocking of aircraft supplies or travel to repair aircraft

Maintenance - Parts

Parts included in our aircraft parts cost calculation:

- All airframe, avionics and minor engine consumable parts required for routine scheduled maintenance including for major inspections
- Unscheduled maintenance, including for standard avionics and cockpit displays
- On-condition maintenance
- An average of 20% of the total component overhaul and life limited parts cost has been added to account for premature removal of these parts due to failure (Helicopters only)
- Parts associated with airworthiness directives and mandatory service bulletins

Not included in our parts cost calculation:

- Parts used in the normal overhaul of components, life-limited parts and engines
- Parts required for inventory costs, optional equipment, and aircraft completion items (interior)
- Shipping, import duties and taxes/VAT

Engine Restoration

The engines used on all aircraft require major periodic maintenance to maintain and/or restore their integrity and performance. For most turbine and all piston powered aircraft (fixed-wing and helicopter), these major engine maintenance events occur on a fixed interval inspection schedule. However, for some large and long range corporate fixed-wing aircraft and almost all airliner aircraft the major engine maintenance occurs on an “on-condition” basis. To obtain a clear understanding of the long-term cost of engine maintenance we show the cost per hour that should be set aside to cover the estimated cost of the major maintenance when it is due – i.e. the total estimated cost of the engine major maintenance divided by the major inspection interval in hours or the average number of hours between on-condition removals. The source for these estimated costs per flight hour are as follows:

Turbine Powered Fixed-Wing Aircraft

Engine allowances for turbine powered fixed-wing aircraft use the Jet Support Services Essential+ LLC plan to cover the cost of scheduled and unscheduled maintenance, all required inspections and overhauls and replacement of any Life Limited Components (LLC) such as the turbine disks or impeller). Aircraft for which no JSSI plan rate is available are estimated using our engine cost database.

Piston Powered Fixed-Wing Aircraft and Helicopters

All piston powered fixed-wing aircraft and helicopters use a set aside estimate to cover the cost of an overhaul of the engine. The cost per flight hour estimate for the overhaul is based on the recommended Time between Overhaul (TBO).

Turbine Powered Helicopters

The engine costs for turbine powered helicopters are estimated using our engine overhaul cost database for an “average” engine. This cost includes the labor and parts for all scheduled and unscheduled maintenance, repair, overhaul or replacement of accessories and replacement of Life Limited Components (LLC) if required. The cost per flight hour estimate for the overhaul is based on two cycles per hour and the recommended Time between Overhaul (TBO).

Major Periodic Maintenance

In addition to the engines, many fixed and rotary wing aircraft require major periodic inspections and/or overhauls of major components. Examples include the landing gear overhaul at a specified number of landings on almost all fixed-wing aircraft and the main rotor gearbox after a certain number of hours on almost all helicopters. As with the engines, it is important to have a clear understanding of the long-term cost of this type of major maintenance. For this reason, we show the cost per hour that should be set aside to cover the estimated cost of these major inspections and overhauls when they are due – i.e. the total estimated cost of the inspection or component overhaul divided by the major inspection/overhaul interval in hours.

The costs per flight hour shown are estimated using our major inspection and component overhaul costs included in our FulLife™ cost database. Included in the cost per hour for this element are:

Major Component Overhauls

This includes the inspection labor plus the maintenance labor and parts, as well as the required testing for the major component overhaul.

Life Limited Parts

Only the cost of the parts is included here since the cost of labor is included in the airframe maintenance labor cost. For example, an item with a life of 20,000 cycles and a cost of $20,000 would have a cost of $1 per hour.

Thrust Reverser Allowance (Jets Only)

This is the cost of parts and labor required to overhaul the thrust reversers that have a fixed overhaul interval. Routine costs for on-condition thrust reversers are included in the maintenance-parts and labor. On some aircraft this cost is included with the engine restoral cost.

Propeller Allowance (Turboprop and Piston Aircraft)

This is an estimate of the maintenance labor and parts costs required to overhaul the propeller(s), including the cost of any life-limited parts. This cost is divided by the overhaul interval to arrive at a cost per hour.

APU Maintenance Allowance

This cost element includes all costs associated with the maintenance and overhaul of the Auxiliary Power Unit (APU) except routine maintenance and minor servicing which is included with the general maintenance labor and parts cost. For Honeywell units, if covered by a JSSI APU maintenance plan, it is the annual fee divided by the aircraft's annual flight hours; otherwise it is the Honeywell Maintenance Service Program (MSP) hourly rate. For units manufactured by other than Honeywell, we use JSSI's hourly rates. If the unit is not covered by JSSI we estimate the hourly cost.

Landing and Parking Fees

This cost element represents typical charges associated with landing and parking the aircraft away from home base. These charges vary widely from airport to airport. In general, landing charges are based on the maximum take-off gross weight of the aircraft and parking charges are based on the weight of the aircraft and the duration of the stay. However, every airport and FBO uses its own formula. For that reason we use an average of a variety of airports to calculate the average hourly cost. Costs for airports outside the US tend to be higher, sometimes by a very significant margin. Our approach has been to obtain the basic formula for various representative airports in a particular region from data published on the internet by these airports or from operators familiar with these airports/countries. The resulting data is then averaged to obtain an average cost per hour for Landing and Parking fees for the US and other regions/countries.

Air Traffic Control (ATC) Fees

The cost of providing air traffic control services in the US is not paid separately, but is paid indirectly by the operators by means of the federal fuel tax for non commercial operators and the Federal Excise Tax FET) for commercial operators.

In most other countries, the cost of ATC services is charged directly to the operator (private or commercial). In general, these charges, which include ATC services during departure, cruise and approach, as well as communications services, are based on distance flown and maximum takeoff gross weight of the aircraft. Many countries publish their ATC fee structure on the internet and where available, we have used that information to establish formulas for the ATC charges. Where this information is not available on the internet, our formulas are based on discussions with operators.

Crew Expenses

If shown, this is the cost incurred by the flight crew (Pilots and Flight Attendant), when away from home base, for accommodations, transportation and meals. The costs for the US are typical of a major metropolitan area and use a formula that includes $250 per person per night (Hotel $150, Meals $50, Misc. $50). For other regions we adjust these costs by means of the US State Department allowances in the different countries or regions for these expenses. This information is then cross checked with local operators and adjusted if appropriate.

Small Supplies and Catering

This is the costs incurred for minor supplies for the cabin and cockpit (flashlight batteries, napkins, toilet paper, etc.) and all in-flight catering for the crew and passengers. We use a formula based on the number of crew, number of passenger seats and class of aircraft.

Fixed Costs

Crew Salaries

This shows the annual base salary of a full-time Captain, Copilot and, for super midsize and larger aircraft, Flight Attendant for each category of aircraft.

Crew salaries for US-based aircraft are obtained from the National Business Aviation Association survey (90th percentile), Professional Pilot magazine salary survey and other surveys. Crew salaries for aircraft based in other countries/regions are generally obtained from the local business aviation community and operators familiar with the region or country.

Crew Salaries - Benefits

This cost covers expenses that are paid by the employer in behalf of the employee in the form of:

- Payroll taxes (such as the employer's portion of a government run retirement plan (Social Security in the US), medical care program (Medicare in the US), unemployment insurance, etc.
- Benefits that are typically offered by the organization, such as life insurance, loss of license insurance, medical insurance (if not provided through a government program), uniform allowances, retirement plan contributions, cell phone plans, etc.

In the US this cost is typically 30% of the salary. The percentage in other countries/regions is based on internet research and discussions with operators familiar with the region or country.

Hangar

Hangar space rental costs vary by aircraft size and location. The square footage size for fixed-wing aircraft is calculated by multiplying aircraft length by wingspan. For helicopters with three or more rotor blades, the square footage is calculated by multiplying the rotor diameter and the overall length. For two-bladed helicopters, the square footage is calculated by multiplying the maximum width of the fuselage and the overall length of the helicopter. For a given aircraft, the hangar cost will be highest at busy airports with limited real estate space in major metropolitan areas.

For the US, yearly hangar rental costs per square foot is the average of an annual survey of a number of major business aviation airports in large metropolitan areas. Hangar costs for other regions/countries are based on operator data.

Insurance - Hull

All-risk hull insurance cost in the Aircraft Operating Costs & Performance Guide is calculated by applying a percentage to the hull value of the aircraft. The percentage rates we use are valid for operators who have a good safety record, use professional, simulator-based pilot training programs at least annually and are audited by outside auditors on a regular scheduled basis. Operators who do not meet these standards are likely to have higher insurance costs.

All-risk hull insurance covers the aircraft while in flight, as well as on the ground while parked or in the hangar, taxiing and/or during engine run-ups by the pilot(s) or qualified maintenance personnel.

The hull insurance rates we use are averages obtained from major insurance underwriters for coverage of US-based aircraft as well as for aircraft based in other regions/countries.

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Insurance - Combined Single Limit Liability

Aircraft liability insurance protects you if your aircraft injures other people or damages other peoples' property. The most comprehensive version of this insurance is Combined Single Limit Liability Insurance. The cost for this liability insurance is shown in the *Aircraft Operating Costs & Performance Guide*.

The Combined Single Limit Liability insurance we use combines coverage for both property damage and bodily injury per occurrence into a single limit with no further limitation. In other words, regardless of whether the claim against you arises from injuries or death to persons or from damage to another's property, the amount of protection you have is the Combined Single Limit. It is usually expressed as a single number, for example $50 Million for each occurrence.

The liability limits used for the *Aircraft Operating Costs & Performance Guide* are:

- Jets (12 seats or more): $200 Million
- Jets (11 seats or less): $100 Million
- VLJ's: $25 Million
- Turboprops: $50 Million
- Turbine Helicopter: $25 Million
- Piston Helicopter: $1 Million
- Piston Aircraft: $1 Million

The liability insurance rates we use are averages obtained from major insurance underwriters for coverage of US-based aircraft as well as for aircraft based in other regions/countries.

Note: *Your insurance cost may be different from ours as these costs are based on aircraft mission as well as pilot training and flight department safety records. Our insurance premium costs assume professional pilots who attend regular, simulator-based professional refresher training at least annually and who have an accident free record. Consult with your aviation insurance broker to determine your risks and recommended coverage.*

Recurrent Training

There are two types of recurrent flight training, one time and full service contract recurrent flight training. We use the cost for one-time recurrent flight crew training using a professional, full-motion simulator-based training program, such as provided by FlightSafety, CAE/Simuflite, Textron or SimCom, or the equivalent for aircraft that do not have a full-motion simulator-based training program available. This cost includes a $1,000 allowance for travel and lodging per pilot to the location of a simulator training program appropriate for the aircraft for which training is needed.

Full-service contract recurrent training covers training twice a year on one aircraft or once a year on one aircraft and once a year on another less expensive aircraft. The cost is approximately 60% more than one-time recurrent flight training.

Aircraft Modernization & Uninsured Damage

This accrual covers the cost of installing desired optional service bulletins, avionics and cockpit instrumentation and displays, avionics upgrades required by the FAA or other aviation authorities, as well as the cost of repairing damage to the aircraft that is not covered by the insurance (i.e. the cost of the hull insurance deductible or small claims not submitted to the insurance company). These costs are not necessarily expended every year but usually will accrue for several years.

This cost is based on the aircraft group (Long Range jet, Medium jet etc.) and aircraft age. We have three cost groups for aircraft age; new, used less than 10 years and older than 10 years. We assume a new aircraft will have a lower modernization cost than an older one and a large jet like the Global 7500 will have a higher Modernization cost than a VLJ like the Cirrus Vision. A new aircraft like the Falcon 2000S will have a lower Modernization cost than a used Falcon 2000.

Costs are estimated for US-based aircraft and adjusted for non-US regions/countries using adjustment factors that take into account the cost and productivity of labor.

Navigation Chart Service

This is the cost for an annual subscription to an enroute and approach chart service tailored to the aircraft's operation. This cost will differ depending on aircraft mission. For example, helicopters and piston fixed-wing get regional subscriptions; long-range jets get a worldwide subscription. Subscription costs are essentially the same for all countries.

Refurbishing

This an accrual cost for maintaining the appearance of the interior and exterior of the aircraft in excellent condition. Included is routine cleaning and the repairs of the cockpit and cabin furnishings. Periodic minor interior refurbishment is included. This includes touch-ups, plus repairs of upholstery and other fabrics. One major interior refurbishment to include replacement of fabrics and seat reupholstering is assumed to be done in conjunction with an exterior repainting every 7 to 10 years.

We use a formula to calculate this cost based on aircraft type, size and mission. Large cabin, long-range aircraft assume a higher level of materials and furnishings, plus a more extensive galley than do smaller aircraft, such as small jets, turboprops and helicopters used for regional or local flights.

Costs are estimated for US-based aircraft and adjusted for non-US regions/countries using adjustment factors that take into account the cost and productivity of labor.

Computerized Maintenance Program

This is the cost for an annual subscription cost of a typical computerized tracking and record keeping service for scheduled aircraft maintenance and components. Subscription costs are essentially the same for all countries. Costs are determined by the group of the aircraft.

Weather Service

This is the cost of an annual subscription for a typical computerized weather forecasting service. Again, subscription costs are essentially the same for all countries.

Market Depreciation

Market Depreciation is a widely changing variable based on the residual value of the aircraft in the marketplace. Until the aircraft is sold no one really knows the exact market value of the aircraft. Once an aircraft is sold the difference between what the aircraft was purchased for and the eventual selling price (Residual Value) is referred to as Market Depreciation. Aircraft tend to retain more of their value for a longer period of time than trucks or machinery. However, until the aircraft is sold, market depreciation is an estimate.

In the Aircraft Operating Costs & Performance Guide, we assume market depreciation of 7% per year for Jets, 6% per year for Turboprops and Piston and 8% per year for Helicopters. Market depreciation percentages are based on our historical residual value data for these aircraft types and are reviewed on a regular basis.

General Specification

The dimensions, volumes, weights, etc. shown in the General Specification section of the *Aircraft Operating Costs & Performance Guide* and discussed in the following paragraphs may be shown in the English system (Feet, Inches, Lbs, Gallons, Feet, Miles, Knots, etc.) or the Metric system (Meters, Centimeters, Kilos, Liters, Kilometers Kilometers/Hour, etc.), depending on the selection made by the user when the program is opened. The English system is the default selection.

Similarly, the purchase price shown in the *Aircraft Operating Costs & Performance Guide may be shown* in a number of different currencies, as selected by the user when the program is opened. The default currency selection is the US Dollar ($).

Cabin Dimensions

Cabin Height, Width and Length

These dimensions are based on a completed interior. On "cabin-class" aircraft, the length is measured from the cockpit divider to the aft pressure bulkhead (or aft cabin bulkhead if unpressurized). For small cabin aircraft, the distance is from the cockpit firewall to the aft bulkhead. Height and width are the maximum available within that cabin space.

Cabin Volume

The total passenger cabin volume equals (empty volume from cockpit divider/back of pilot seat to aft-most point of rear seating) + (front passenger area [if single pilot]. It is measured with headliner in place with no chairs or other furnishings. We calculate this based on Computer Aided Design (CAD) drawings of the interior and not manufacturer provided data.

Internal Baggage Storage: If there is an area in the cabin that is clearly defined as baggage space and readily accessible by the passengers in flight, then it is calculated and displayed as a separate value from the cabin volume.

In the case of helicopters with rear clamshell doors we assume the cabin/baggage space ends at the rear perimeter of the flat floor.

We assume a standard 20 cubic feet for the front passenger area of all single pilot aircraft.

Cabin Door Height and Width

These are the measurements of the main passenger cabin entry door.

Baggage Volume

Internal Baggage Volume

Is accessible in flight by the passenger. This amount may vary with the interior layout.

External Baggage Volume

Is not available in flight (nacelle lockers, etc.).

Typical Crew/Passenger Seating

This is the crew and passenger seating commonly used on the aircraft. Since the focus of the aircraft is usually passenger comfort, the seating capacity shown may be less than the maximum certificated seating capacity of the aircraft. These numbers may vary for different operations (Corporate, Commercial, EMS, Utility, etc.).

Weights

Maximum Take-off Weight

The maximum permissible weight of the aircraft at take-off as determined during the aircraft certification.

Basic Operating Weight

This is the empty weight, typically equipped, including the interior, the flight crew @ 200 pounds (90 Kg) each and their supplies, unusable fuel and liquids and galley supplies. The flight crew includes the pilot (s) and the flight attendant on super-midsize and larger aircraft. Generally speaking, no dedicated mission equipment is included in the Basic Operating Weight shown.

Useable fuel

Useable fuel is the fuel available for consumption by the power plants and/or APU. It does not include the trapped fuel that may exist in the fuel tanks that cannot be collected by the fuel system. Fuel is measured in gallons or liters when dispensed into the aircraft and measured in pounds or kilos when used for performance calculations. The conversions we use are:

Jet fuel	6.7 Lbs/Gallon	0.80 Kg/Liter
AvGas	6.0 Lbs/Gallon	0.72 Kg/Liter

Payload - Full Fuel

This is the useful load minus the useable fuel. The useful load is based on the maximum ramp weight minus the basic operating weight. The maximum ramp weight is the maximum take-off gross weight plus an allowance for engine start and taxi out fuel. This weight is determined during aircraft certification. For many aircraft (particularly piston and rotary wing aircraft), the maximum ramp weight is the same as the maximum take-off gross weight.

Payload - Maximum

This is the maximum zero fuel weight minus the basic operating weight. The maximum zero fuel weight is the maximum certificated total weight of the aircraft without any usable fuel on board. For almost all jet aircraft it is less than the maximum take-off weight, while for almost all other aircraft it is the same as the maximum take-off weight.

Certified/IFR Certified

“Certified” indicates whether the aircraft is certificated or not. New models in flight test are not certificated. “IFR Certified” refers to whether the aircraft is certificated for flight in Instrument Meteorological Conditions (IMC).

Price

Price - New (Typical)

This is the selling price of a typically equipped new aircraft. For current production aircraft this is the price of the current year's model. For out of production aircraft, this refers to the selling price from the last year the model was produced. For aircraft not yet in production, it reflects the proposed price for an early delivery. This figure is in thousands of US Dollars or other currency if that has been selected. New aircraft prices do not reflect escalation factors for future delivery dates.

Price - Pre-owned Range

This shows the low and high current selling prices of used aircraft. The prices shown for fixed-wing aircraft and most helicopters are based on the latest available edition of The Aircraft Bluebook Price Digest and other price guides.

Performance Specifications

Range

Range - NBAA IFR Res - Seats Full

This is used for jet and turboprop aircraft and is the maximum IFR range of the aircraft with all passenger seats occupied. This uses the NBAA IFR alternate fuel reserve calculation for a 200 NM (365 Km) alternate.

Range - NBAA IFR Res - Tanks Full

This is used for jet and turboprop aircraft and is the maximum IFR ferry range of the aircraft with the maximum fuel on board and no passengers. This uses the NBAA IFR alternate fuel reserve calculation for a 200 NM (365 Km) alternate.

Range - 30 Min Res - Seats Full

This is used for all piston fixed-wing aircraft and helicopters. It is the maximum VFR (Visual Flight Rules) range of the aircraft with all passenger seats occupied. This uses a fuel reserve of 30 minutes at cruise speed and altitude.

Range - 30 Min Res - Tanks Full

This is used for all piston fixed-wing aircraft and helicopters. It is the maximum VFR range of the aircraft with the maximum fuel on board and no passengers. This uses a fuel reserve of 30 minutes at cruise speed and altitude.

Balanced Field Length/Take-off Distance

The **Balanced Field Length** (*BFL*) is the length of runway required to permit two takeoff scenarios. In scenario 1, the aircraft accelerates with all engines operating to a speed just less than a speed called V1. At this point one engine fails, the pilot initiates a rejected takeoff and stops the aircraft on the remaining runway. In scenario 2, the aircraft again accelerates with all engines to the speed called V1, where the engine fails but then the pilot continues the takeoff and achieves a height above the runway of 35 (10.7 Meters) feet at a certain point over the runway. When the distance required for scenario 1 is the same as for scenario 2, that distance is called the Balanced Field Length. From a practical point of view this means that if the runway length available is the same as or greater than the BFL, the pilot can either come to a complete stop if one engine fails at or below V1 or continue the take-off if one of its engines fails at or above the critical speed (V1). For our analysis, this is based on four passengers and maximum fuel on board, as well as a Dry Level Runway, No Wind, NBAA IFR Reserves and 86 degrees F (30 degrees C). No thrust reversers or propeller reversal may be used to establish this distance. The BFL is used for all multi-engine jet aircraft as well as multi-engine turboprop aircraft over 12,500 Lbs (5,670 Kg) or certificated to FAR Part 25 (transport category) standards.

The **Take-off Distance** is applicable to turboprop aircraft with a take-off gross weight less than 12,500 Lbs (5,670 Kg), all piston fixed-wing aircraft and all single engine aircraft. This distance represents the take-off field length required to achieve a 35 Ft (10.7 meters) height above the runway at Maximum Take-off Weight (MTOW). Again, this distance assumes a Dry Level Runway, No Wind and 86 degrees F (30 deg C). No propeller reversal or thrust reverser may be used to establish this distance.

Please refer to Comparative Field Lengths - Jets and Turboprops at the end of this document for a more in- depth explanation.

Landing Runway Length

The landing distance, as required by the regulations, is the distance needed to land and come to a complete stop from a point 50 feet (22.5 meters) above the threshold end of the runway. It includes the air distance required to travel from the 50 foot (15.24 m) height to touchdown plus the stopping distance and assumes a dry, level runway, maximum brakes and no use of thrust reversers. The assumed landing weight consists of the basic operating weight (BOW) plus 4 passengers and reserve fuel for a 200 NM (365 Km) alternate for turbine powered aircraft and 2 passengers and fuel for a 100 NM (185 KM) alternate for piston aircraft.

Note: *Our analysis of runway length requirements is based on the US Federal Aviation Regulations (FARs) requirements for private, not-for-hire operators (FAR Part 91) and for scheduled and unscheduled, commercial, for-hire operators (FAR Part 121, 91-subpart K and 135), as indicated. Other national aviation authorities may use different safety margins for private operators, air carriers and commercial operations.*

Private, not for hire operators who operate under FAR Part 91 do not require any additional safety margin in addition to the calculated landing distance. Therefore, the required landing field length is the same as the calculated landing distance.

Commercial, for-hire operators, such as air carriers and commercial operators operating under FAR Parts 121, 91 subpart K or 135, operate with a different set of requirements. For these operators, the required landing distance at the destination from the 50 foot height cannot exceed 60% of the actual runway length available. For these operators the landing field length at the destination airport is computed by multiplying the FAR Part 91 un-factored landing distance by 1.667.

Under FAR Part 121, 91 Subpart K or 135 the required landing field length at an optional airport runway (normally the planned divert airport runway) is calculated differently. For these operations, the required landing field length cannot exceed 80% of the available runway length. This means the landing field length at the optional airport runway is obtained by multiplying the FAR Part 91 un-factored landing distance by 1.25.

Under FAR Part 135, “Eligible on-demand” operators (those issued authorization by their Operations Specifications for pilots meeting certain crew experience and pairing requirements), when conducting a destination airport analysis, must meet the requirement that the required landing field length equals or exceeds 80% of the available runway length. This means that for these “eligible on-demand” operators, the landing field length at the destination airport runway is obtained by multiplying the FAR Part 91 un-factored landing distance by 1.25.

Note: *All landing distances are calculated assuming optimum landing conditions. No allowances are made for a variety of real-world factors such as rain or snow, worn tires and brakes, non-optimum runway conditions, one engine inoperative, etc. However, the FAA has published various factors that must be used when landing on wet or snow- covered runways.*

Rate of Climb

The rate of climb, given in feet per minute or meters per minute, assumes all engines are operating with the aircraft at its maximum take-off gross weight (MTOW) in ISA conditions.

One Engine Out rate of climb is for a one engine inoperative rate of climb at MTOW and ISA conditions.

All climb rates assume retractable equipment (such as landing gear and flaps) are retracted, and any anti-ice systems (engine, wing or rotor, etc.) are turned off.

Cruise Speed

Max

Is the maximum cruise speed at maximum continuous power. This may also be commonly referred to as High Speed Cruise.

Normal

Is the manufacturer’s recommended cruise speed. Sometimes, this speed is the same as Maximum Cruise Speed.

Long Range Cruise

Is the manufacturer's recommended cruise speed for maximum range.

Stall Speed

The stall speed shown is for the aircraft in the landing configuration with four passengers and NBAA IFR Fuel Reserves (turbine) or VSO stall speed (piston). Helicopters do not have a stall speed.

Ceiling

Certified Ceiling

This is the maximum altitude a particular aircraft is certified to operate at. This does not mean the aircraft can reach this altitude at all weights. It also does not mean that the aircraft cannot exceed this altitude under certain weight conditions.

Service Ceiling

This is the lesser of the highest altitude at which a 100 fpm (45 meters/minute) rate of climb is possible at MTOW with all engines running OR the maximum certificated altitude for operation of this fixed or rotary wing aircraft.

Service OEI

Is the service ceiling with one engine inoperative.

Hover In Ground Effect (HIGE - Helicopters only)

HIGE is a condition where the downwash of air from the main rotor is able to react with a hard surface (the ground), and give a useful reaction to the helicopter in the form of more lift force available with less engine power required. It is a condition of improved performance encountered when hovering within up to one rotor diameter of the ground.

Hover Out of Ground Effect (OGE) Helicopters Only

HOGE occurs when the helicopter rotor downwash is not affected by the proximity of the landing surface. In other words, OGE normally occurs when the helicopter is more than one rotor diameter above the ground.

Comparative Field Lengths - Jets and Turboprops

The Balanced Field Length (BFL) performance of aircraft can be very confusing. Most often the confusion arises from the basic differences in operating regulations governing the types of aircraft. There are two regulations that govern runway distance requirements for jets and turboprops. These regulations are FAR Part 23 (aircraft with a gross weight of 12,500 pounds and under) and FAR Part 25 (Air Transport Category aircraft with a gross weight over 12,500 pounds). These two regulations vary significantly. The more stringent rules of FAR Part 25 provide the passenger with greater safety margins than those used for FAR Part 23 private aircraft.

For example, FAR Part 23 makes no allowance for loss of power or an engine or propeller failure. Additionally, the published distance requires no allowance for either being able to stop on the remaining runway or to continue the take-off on one engine after an engine failure.

By contrast, FAR Part 25 regulations intended for Air Transport Aircraft such as business jets and large turboprops assures their passengers and crew that in the unlikely event of a loss of engine power during take-off the aircraft can either:

- Stop within the remaining runway length
- Take-off and climb on the remaining good engine.

This distance is known as Balanced Field Length. BFL is the distance obtained by determining the decision speed (V1) at which the take-off distance and the accelerate-stop distance are equal. Decision speed is the point where the pilot decides to either continue with the take-off or slam on the brakes and stop the aircraft.

To illustrate how these regulations work let’s look at a typical situation involving a small turboprop (FAR Part 23) and a small business jet (FAR 25), both seating six passengers. We’ll assume maximum gross weight, sea level, International Standard Atmospheric (ISA) conditions and a dry, level, hard surface runway.

The small turboprop can legally take-off from a 2,600-ft runway operating under FAR 23. Although it has no requirement to consider an engine failure let’s assume an engine fails at its published rotation speed (Vr) of 94 knots. Rotation speed is the point when the aircraft starts to lift off the ground. Its distance to accelerate to Vr and stop is 3,400 ft, 800 ft longer than the take-off distance. If the take-off is continued after engine failure at Vr, then the runway required jumps to 4,750 ft, 82% longer than the take-off distance of 2,600 ft. Although 4,750 ft is the BFL for the turboprop it is not a legal requirement under Part 23 for runway length decision.

The small business jet has a BFL of 4,500 ft runway in the same conditions, 250 ft shorter than the turboprop under the same contingencies and with the same margin of safety.

Although the small business jet could take-off or accelerate/stop like the turboprop from a shorter runway the pilot is not permitted to base the runway length decision on anything other than the BFL data while operating under FAR Part 25.