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Purchase Planning Handbook

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Business Airplanes 2014

For now, there remains **a chasm in demand** between the long-range, large-cabin class and the rest of the turbofan market.

BY **FRED GEORGE** fred.george@aviationweek.com

Business jet apartheid remained the dominant theme in 2013, as it has for the last five years since the world economy struggles to recover from its deepest downturn in eight decades. Most long-range, large-cabin business aircraft manufacturers flourished while most light and midsize jet makers floundered. Total jet deliveries stabilized at 678, essentially in line with deliveries a decade ago, according to GAMA statistics.

Jet deliveries actually dipped about 1% from 2012 to 2013, but billing soared 23% with Gulfstream leading the way with 144 large-cabin deliveries. Bombardier shipped 62 Global 5000 and 6000 aircraft, Dassault Falcon Jet delivered 77 units and Embraer logged 21 Legacy 600/650 shipments.

Corporate profitability has more than doubled since the bottom of the recession. The S&P index is up 170% since first quarter 2009. For now, the DJIA seems solidly locked in above 16,000. So, large corporations, especially multinationals, have fat profits to renew their large-cabin aircraft fleets.

Public companies aren't the only beneficiaries of the post-recession recovery. There now are more than 60,000 high net worth individuals (HNWIs) around the globe who have $100 million or more in disposable assets, according to some surveys. The largest concentration of uber-rich isn't in North American, it's in Asia.

Large corporations and top tier HNWIs, as a result, are fueling the sales of purpose-built business aircraft with $30-million-plus price tags, ones that can fly 4,000+ nm. Top tier aircraft that can fly 5,000 to 7,000 nm and that sell for $50- to $100-million, are doing especially well. Bombardier, for instance, delivered 94% more Global 5000/6000 aircraft than shorter range Challenger 605 jets.

Gulfstream doesn't disclose delivery numbers for individual large-cabin aircraft, but it's well known that the G550 and G650 are faring much better than the G450, judging from relative resale prices.

Dassault shipped more Falcon 7X trijets than all other Falcon models combined. Industry sources say that Dassault plans to announce another large cabin aircraft at EBACE 2014 in Geneva, capitalizing on the sales strength of Falcon 7X.

In the light-jet segment, it was a different, if not depressing, story. Textron Aviation's Cessna was hit particularly hard, delivering fewer Citations in 2013 than in any year since 1996. Deliveries of Bombardier Learjet 60XR continue to wind down as customers shift their interest toward the Learjet 85, which just made its first flight in April. The Canadian firm delivered 18 of its Learjet 70/75 aircraft, thoroughly revamped versions of Learjet 40XR/45XR, late in the fourth quarter. The late year, Learjet 70/75 delivery rush buoys prospects for a better 2014. But, company chairman Guy Hachey cautions that the overall "global economy has remained persistently sluggish," damping expectations for a full-blown business aircraft recovery in 2014.

Beechcraft, newly merged into Textron Aviation, fared even more poorly with its turbofan aircraft. It ceased production of all jets and disposed of its remaining Hawker 4000 aircraft at fire sale prices.

Deep discounting by U.S. light jet makers remained a dominant practice in 2013. The downside of new aircraft discounting, though, is pronounced price softness in the used light-jet market. Many older light jets have so little residual value that operators are facing stiff cash outlays when trading up to new aircraft. That's another drag on new light jet sales.

Undeterred, Eclipse Aerospace is pressing ahead with its Eclipse 550 very light jet, having a $2.85 million base price. Eclipse is betting that the upgraded Eclipse 500 will hold its own in the market because of its rock bottom operating costs.

Equally optimistic is Honda Aircraft Company, proceeding amain with development of its $4.5 million, twin-turbofan HA-420 HondaJet. It's a direct competitor with Embraer Phenom 100 and Cessna Citation M2, the upgraded version of CJ1+.

Bombardier is pressing ahead at full speed with Learjet 85, the Canadian firm's new midsize jet that made its first flight in mid-April. The entry-into-service data for the all-composite, transcontinental U.S. range jet has yet to be determined, but it should reach full production rates by 2018, according to RBC Europe's market analyst Robert Stallard.

At present, Embraer remains in a strong position with its Phenom light jets. Last year, it delivered 60 Phenom 300 light jets, grabbing market share mainly at the expense of Cessna Citation CJ3 and CJ4. Admittedly, the Brazilian firm saturated the entry level jet segment in 2009 and 2010 when it delivered a total of 197 Phenom 100 aircraft. But, it still delivered more Phenom 300 units in 2013 than either Citation Mustang or M2.

Cessna is fighting back against Phenom 300 with upgraded versions of its existing models, including the CJ3+ that is making its *Purchase Planning Handbook* debut this year.

Some in the industry, though, say that Cessna's historic reliance on derivative designs, many of which have their roots in the original 1969 FanJet 500, is leaving the door open for Embraer to enter with its clean sheet designs, such as the Phenoms, and also for planemaker HondaJet. Buyers are no longer satisfied with evolutionary Mr. Potato Head derivatives, distinguished mainly by changes in their plug-in body parts.

Now, Embraer is again introducing disruptive technology with its Legacy 500, the first fly-by-wire midsize business jet. (See our flight test report on page 62 in this issue). It's priced $2 million higher than Citation Sovereign, but it's a clean-sheet design with a much larger cabin having a flat floor. It has higher cruise speeds and more tanks-full payload.

With 3,000 nm range and a $20 million price tag, Legacy 500 also will compete with the midsize Learjet 85. Its super-midsize cabin even makes competitive with Bombardier Challenger 300, the bestselling super-midsize aircraft. Bombardier is countering the Brazilians by offering Challenger 350, a longer range, more capable, more fuel efficient version of Challenger 300.

Potentially dealing another one-two body punch to Cessna, similar to Phenom 100 and 300, Embraer's Legacy 450 is slated to enter service in 2015. It will compete head-to-head against Citation Latitude, a larger fuselage version of Citation Sovereign. Both aircraft have 2,500 nm range and similar price tags, but Legacy 450 has fly-by-wire flight controls, higher cruise speeds and a larger cabin.

The Legacy 450 is priced $2 million above the Learjet 60XR, but it does virtually everything better than the aging Bombardier midsize jet, having a considerably larger cabin, more range and more tanks-full payload.

The growth in turboprop shipments was a boon to manufacturers. Deliveries grew more than 10% in 2013, according to GAMA. Leading the way was Textron Aviation's Beechcraft unit that experienced a 50+ surge in King Air shipments. More than half were King Air 350 models, many of which were delivered to Wheels Up, a "members only" firm that placed the largest turboprop order in history.

Piaggio Aero remains a notable exception to the success in the twin turboprop segment. Shipments sagged to just two new Avanti II aircraft last year as the firm reels from the crash of fractional ownership firm Avantair, leaving behind dozens of unairworthy Avanti aircraft because of shoddy maintenance. Many former Avantair aircraft now face cannibalization. (See "The Avantair Failure, Part 2" on page 30 in this issue.)

The single-engine turboprop segment was a bright spot last year. Deliveries of Cessna's 208 Caravan and 208B Grand Caravan reached 105 units, only two down from 2012 and higher than the annual average of the last two decades. Quest delivered 28 Kodiak 100 utility aircraft, the larger number in its history.

Deliveries of pressurized singles remain robust. Piper shipped 34 Meridian aircraft, Socata delivered 40 TBM 850 G1000 turboprops and Pilatus shipped 65 PC-12s. Socata's 330 KTAS TBM 900 is appearing for the first time in this year's Handbook. It has 21% shorter takeoff distances, superior time to climb and 17-kt. faster cruise speeds than TBM 850, along with slower stall speeds, more docile low speed handling and a quieter cabin. It's actually faster than some light jets on trips up to two hours duration.

Asking prices for most new single-engine turboprops, as a result, are firm. There's little motivation for most manufacturers, particularly Pilatus and Socata, to negotiate on list price.

Looking ahead at the remainder of 2014, small businesses in the U.S., firms that historically have purchased the majority of light jets, continue to struggle. Owners remain unsettled about the prospects for a broad-based economic recovery, as well as the threat of new federal mandates. Most historic light jet buyers are in no mood to purchase new aircraft, keeping a tight rein on purse strings, preserving capital for unknown threats ahead.

The Federal Reserve has expressed concerns that U.S. economic inflation is too low at 1%, half the target rate for healthy economic growth. Low consumer prices would seem to be a boon, but low inflation also signifies poor wage growth, high unemployment and excess economic capacity. European economic inflation is near zero, prompting concerns that the world economy could be at risk for deflation. Such news rattles the confidence of small businesses.

Moreover, the pre-owned light jet market remains awash with great deals to be scooped up by savvy shoppers. True, a certain segment of buyers only purchases new aircraft. For them, only a new Mustang, M2 or Eclipse 550, HondaJet or Learjet 75, will suffice.

But, large numbers of prospects, outside of that select few that only buy new, find themselves tempted by $1.5 million Mustangs, $1.9 million CJ1+ aircraft and Phenom 100s, and $3.5 million Learjet 45XR aircraft, among other bargains in the basement.

So, for now, there remains a huge chasm in demand between the long-range, large-cabin class and the rest of the turbofan market. If you're shopping for a new aircraft with less than 5,000 nm of range, you'll find sales staffs willing to sharpen their pencils to get you to sign their purchase contracts. This year will be another bonanza for many buyers. **B&CA**

B&CA's digital edition contains Used Airplanes and Regional Aircraft comparative tables. The Purchase Planning Handbook is available for download at **AviationWeek.com/bca**

How to Use the Airplane Charts

For an aircraft to be listed in the *Purchase Planning Handbook,* a production conforming article must have flown by May 1 of this year. The dimensions, weights and performance characteristics of each model listed are representative of the current production aircraft being built or for which a type certificate application has been filed. The Basic Operating Weights we publish should be representative of actual production turboprop and turbofan aircraft because we ask manufacturers to supply us with the average weights of the last 10 commercial aircraft that have been delivered. However, spot checks of some manufacturers' BOW numbers reveal anomalies. Prospective buyers are advised to verify the actual weights of aircraft with options.

The takeoff field length distances are based on Maximum Takeoff Weight unless otherwise indicated in the tables.

Please note that "all data preliminary" in the remarks section indicates that actual aircraft weight, dimension and performance numbers may vary considerably after the model is certified and delivery of completed aircraft begins.

Manufacturer, Model and Type Designation

In some cases, the airplane manufacturer's name is abbreviated, but the company's full name and address can be found in the "Airframe Suppliers Directory" at our website. The model name and the type designation also are included in this group.

B&CA Equipped Price

Price estimates are first quarter, current year dollars for the next available delivery. Some aircraft have long lead times, thus the actual price will be higher than our published price. Note well, manufacturers may adjust prices without notification.

▶ **Piston-powered airplanes —** Computed retail price with at least the level of equipment specified in the *B&CA* Required Equipment List.

▶ **Turbine-powered airplanes —** Average price of 10 of the last 12 commercial deliveries, if available. Some manufacturers

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decline to provide us with actual prices of delivered aircraft. The aircraft serial numbers aren't necessarily consecutive because of variations in completion time and because some aircraft may be configured for non-commercial, special missions.

Characteristics

▶ **Seating —** Crew + Typical Executive Seating/Maximum Seating.

For example, 2+8/19 indicates that the aircraft requires two pilots, there are eight seats in the typical executive configuration and the aircraft is certified for up 19 to passenger seats. A four-place single-engine aircraft is shown as 1+3/3, indicating that one pilot is required and there are three other seats available for passengers. We require two pilots for all turbofan airplanes, except for single-pilot certified aircraft such as the Eclipse 550, Cessna Citation CJ series and Syberjet SJ30-2, which have, or will have, a large percentage of single-pilot operators. Four crewmembers are specified for ultra-long-range aircraft — three pilots and one flight attendant.

Each occupant of a turbine-powered airplane is assumed to weigh 200 lb., thus allowing for stowed luggage and carry-on items. In the case of piston-engine airplanes, we assume each occupant weighs 170 lb. There is no luggage allowance for piston-engine airplanes.

▶ **Wing Loading —** MTOW divided by total wing area.

▶ **Power Loading —** MTOW divided by total rated horsepower or total rated thrust.

▶ **FAR Part 36 certified noise levels —** Flyover noise in A-weighted decibels (dBA) for small and turboprop aircraft. For turbofan-powered aircraft, we provide Part 36 EPNdB (effective perceived noise levels) for takeoff, sideline and approach.

Dimensions

▶ **External length, height and span dimension**s are provided for use in determining hangar and/or tie-down space requirements.

Internal length, height and width are based on a completed interior, including insulation, upholstery, carpet, carpet padding and fixtures. Note well: These dimensions are not based upon metal-to-metal measurements. They must reflect the actual net dimensions with all soft goods installed. Some manufacturers provide optimistic measurements, thus prospective buyers are advised to measure aircraft themselves.

As shown in the Cabin Interior Dimensions illustration, for small airplanes other than "cabin-class" models, the length is measured from the forward bulkhead ahead of the rudder pedals to the back of the rearmost passenger seat in its normal, upright position.

For so-called cabin-class and larger aircraft, we show the overall length of the passenger cabin, measured from the aft side of the forward cabin divider to the aft-most bulkhead of the cabin. The aft-most point is defined by the rear side of a baggage compartment that is accessible to passengers in flight or the aft pressure bulkhead. The overall length is reduced by the length of any permanent mounted system or structure that is installed in the fuselage ahead of the aft bulkhead. For example, some aircraft have full fuselage cross-section fuel tanks mounted ahead of the aft pressure bulkhead.

The second length number is the net length of the cabin that may be occupied by passengers. It's measured from the aft side of the forward cabin divider to an aft point defined by the rear of the cabin floor capable of supporting passenger seats, the rear wall of an aft galley or lavatory, an auxiliary pressure bulkhead or the front wall of the pressurized baggage compartment. Some aircraft have the same net and overall interior length because the manufacturer offers at least one interior configuration with the aft-most passenger seat located next to the front wall of the aft luggage compartment.

Interior height is measured at the center of the cross section. It may be based on an aisle that is dropped several inches below the main cabin floor that supports the passenger seats. Some aircraft have dropped aisles of varying depths, resulting in less available interior height in certain sections of the cabin, such as the floor sections below the passenger seats.

Two width dimensions are shown for

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multiengine turbine airplanes — one at the widest part of the cabin and the other at floor level. The dimensions, however, are not completely indicative of the usable space in a specific aircraft because of individual variances in interior furnishings.

Power

▶ **Number of engines,** if greater than one, and the abbreviated name of the manufacturer: Honeywell, CFMI — CFM International, TCM — Teledyne Continental, IAE —International Aero Engines, Lyc — Textron Lycoming, P&WC — Pratt & Whitney Canada, RR — Rolls-Royce and Wms — Williams International.

▶ **Output —** Takeoff rated horsepower for propeller-driven aircraft or pounds thrust for turbofan aircraft. If an engine is flat rated, enabling it to produce takeoff rated output at a higher than ISA (standard day) ambient temperature, the flat rating limit is shown as ISA+XXC. Highly flat rated engines, i.e. engines that can produce takeoff rated thrust at a much higher than standard ambient temperature, typically provide substantially improved high density altitude and high-altitude cruise performance.

▶ **Inspection Interval** is the longest, scheduled hourly major maintenance interval for the engine, either “t” for TBO or “c” for compressor zone inspection. OC is shown only for engines that have “on condition” repair or replace parts maintenance.

Weights (lb.)

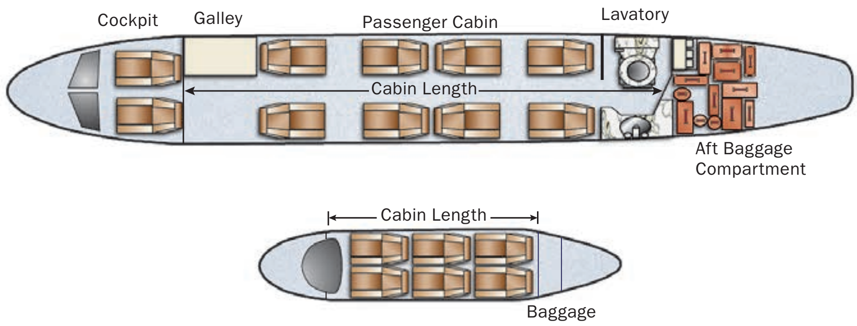
Weight categories are listed as appropriate to each class of aircraft.

▶ **Max Ramp —** Maximum ramp weight for taxi

▶ **Max Takeoff —** Maximum takeoff weight as determined by structural limits

▶ **Max Landing —** Maximum landing weight as determined by structural limits

Cabin Length



▶ **Zero Fuel —** Maximum zero fuel weight, shown by “c,” indicating the certified MZFW or “b,” a *B&CA*-computed weight based on MTOW minus the weight of fuel required to fly 1.5 hr. at high-speed cruise

▶ **Max ramp, max takeoff and max landing** weights may be the same for light aircraft that may only have a certified max takeoff weight.

▶ **EOW/BOW —** Empty Operating Weight is shown for piston-powered airplanes. Basic Operating Weight, in contrast, is based on the average EOW weight of the last 10 commercial deliveries, plus 200 lb. for each required crewmember. We require four crewmembers, three flight crew and one cabin attendant for ultra-long-range aircraft.

Basic Operating Weight, which essentially is EOW plus required flight crew, is shown for turbine-powered airplanes. EOW is based on the factory standard weight, plus items specified in the *B&CA* Required Equipment List, less fuel and oil.

There is no requirement to add in the weight of cabin stores, but some manufacturers choose to include galley stores and passenger supplies as part of the BOW build up. Life vest, life rafts and appropriate deep-water survival equipment are included in the weight buildup of the 80,000+ lb., ultra-long-range aircraft.

▶ **Max Payload —** Zero Fuel weight minus EOW or BOW, as appropriate. For piston-engine airplanes, Max Payload frequently is a computed value because it is based on the *B&CA* (“b”) computed maximum ZFW.

▶ **Executive Payload —** Based on 170 lb. per occupant for multiengine piston-engine airplanes and 200 lb. per occupant for turbine-engine airplanes, as shown in the executive seating section of the “Characteristics” section. Both pilots and passengers, however, are counted as occupants in piston-engine airplanes. Only passengers are counted as occupants in turbine-powered airplanes because the required crew is included in the BOW.

If the Executive Payload exceeds the Maximum Payload, we use Maximum Payload. Executive payload is not computed for single-engine piston airplanes.

▶ **Max Fuel —** Usable fuel weight based on 6.0 lb. per U.S. gallon for avgas or 6.7 lb. per U.S. gallon for jet fuel. Fuel capacity includes optional, auxiliary and long-range tanks, unless otherwise noted.

▶ **Available Payload With Full Fuel —** Max Ramp weight minus the tanks-full weight, not to exceed Zero Fuel weight minus EOW or BOW.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▶ **Available Fuel With Maximum Payload** – Maximum Ramp weight minus Zero Fuel weight, not to exceed maximum fuel capacity.

▶ **Available Fuel With Executive Payload** – Available fuel weight based on max ramp minus BOW plus executive payload, up to the actual fuel capacity.

Limits

B&CA lists V speeds and other limits as appropriate to the class of airplane. These are the abbreviations used on the charts:

▶ **VNE** – Never exceed speed (red line for piston-engine airplanes).

▶ **VNO** – Normal operating speed (top of the green arc for piston-engine airplanes).

▶ **VMO** – Maximum operating speed (red line for turbine-powered airplanes).

▶ **MMO** – Maximum operating Mach number (red line for turbofan-powered airplanes and a few turboprop airplanes).

▶ **FL/VMO** – Transition altitude at which VMO equals MMO (large turboprop and turbofan aircraft).

▶ **VA** – Maneuvering speed (except for certain large turboprop and all turbofan aircraft).

▶ **VDEC** – Accelerate/stop decision speed (multiengine piston and light multiengine turboprop airplanes).

▶ **VMCA** – Minimum control airspeed, airborne (multiengine piston and light multiengine turboprop airplanes).

▶ **VSO** – Maximum stalling speed, landing configuration (single-engine airplanes)

▶ **VX** – Best angle-of-climb speed (single-engine airplanes).

▶ **VXSE** – Best angle-of-climb speed, one-engine inoperative (multiengine piston and multiengine turboprop airplanes under 12,500 lb.).

▶ **VY** – Best rate-of-climb speed (single-engine airplanes).

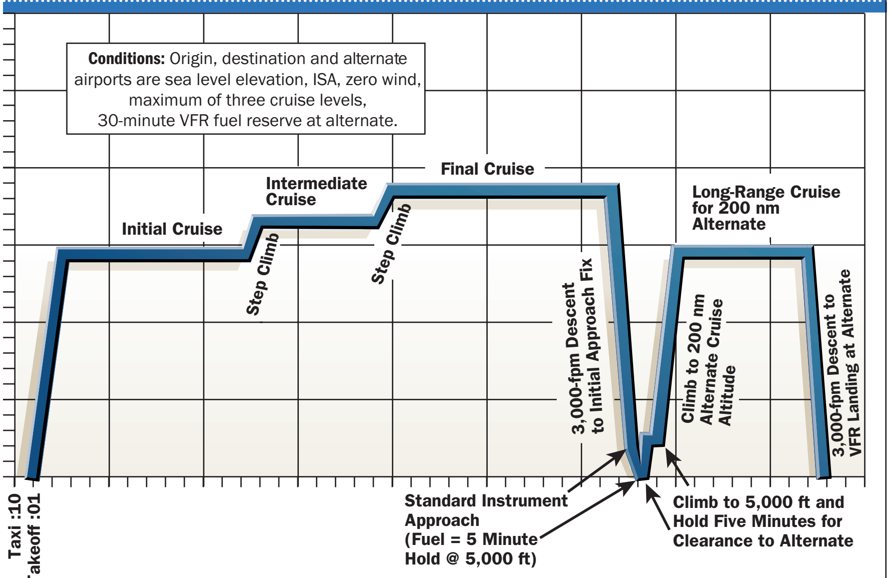
▶ **VYSE** – Best rate-of-climb speed, one-engine inoperative (multiengine piston and multiengine turboprop airplanes under 12,500 lb.).

▶ **V2** – Takeoff safety speed (large turboprops and turbofan airplanes).

▶ **VREF** – Reference landing approach speed (large turboprops and turbofan airplanes, four passengers, NBAA IFR reserves; eight passengers for ultra-long-range aircraft).

▶ **PSI** – Cabin pressure differential (all pressurized airplanes).

NBAA IFR Range Profile



Airport Performance

▶ Approved Flight Manual takeoff runway performance is shown for sea-level, standard day and for 5,000-ft. elevation/25C day density altitude. All-engine takeoff distance (TO) is shown for single-engine and multiengine piston, and turboprop airplanes with an MTOW of less than 12,500 lb. Takeoff distances and speeds assume Maximum Takeoff weight, unless otherwise noted.

▶ **Accelerate/Stop distance (A/S)** is shown for small multiengine piston and small turboprop airplanes. Takeoff field length (TOFL), the greater of the one-engine inoperative (OEI) takeoff distance or the accelerate/stop distance, is shown for FAR Part 23 Commuter Category and FAR Part 25 airplanes. If the accelerate/stop and accelerate/stop distances are equal, the TOFL is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the balanced field length.

▶ **Landing distance (LD)** is shown for FAR Part 23 Commuter Category and FAR Part 25 Transport Category airplanes. The landing weight is BOW plus four passengers and NBAA IFR fuel reserves. We assume that 80,000+ lb. ultra-long-range aircraft will have eight passengers on board.

The V2 and VREF speeds are useful for reference when comparing the TOFL and LD numbers because they provide an indication of potential minimum-length runway performance when low RCR or runway gradient is a factor.

B&CA lists two additional numbers for large turboprop- and turbofan-powered airplanes. First, we publish the mission weight, which is the lower of: (1) the actual takeoff weight with four passengers (eight passengers for ultra-long-range aircraft) and full fuel when departing from a 5,000-ft./25C airport or (2) the maximum allowable takeoff weight when departing with the same passenger load and at the same density altitude.

For two-engine aircraft, the mission weight, when departing from a 5,000-ft./ISA+20C airport, may be less than the MTOW because of FAR Part 25 second-segment, one-engine-inoperative, climb performance requirements. Aircraft with highly flat-rated engines are less likely to have a Mission Weight that is performance limited when departing from hot and high airports.

For three-engine aircraft, the mission weight usually is based on full tanks and the actual number of passengers, rather than being performance limited.

Second, we publish the NBAA IFR range for the hot and high departure mission weight, assuming a transition into standard day, ISA flight conditions after takeoff. For purposes of computing NBAA IFR range, the aircraft is flown at the long-range cruise speed shown in the "Cruise" block or at the same speed as shown in the "Range" block.

Climb

The all-engine time to climb provides an indication of overall climb performance, especially if the aircraft has an all-engine service ceiling well above our sample top-of-climb altitudes. We provide the all-engine time to climb to one of three specific altitudes, based on type of aircraft departing at MTOW from a sea-level, standard-day airport: (1) FL 100 (10,000 ft.) for normally aspirated single-engine and multiengine piston aircraft, plus pressurized single-engine piston aircraft and unpressurized turboprop aircraft; (2) FL 250 for pressurized single-engine and multi-engine turboprop aircraft; or (3) FL 370 for turbofan-powered aircraft. These data are published as time-to-climb in minutes/climb altitude. For example, if a non-pressurized twin-engine piston aircraft can depart from a sea-level airport at MTOW and climb to 10,000 ft. in 8 min., the time to climb is expressed as 8/FL 100.

We also publish the initial all-engine climb feet per nautical mile gradient, plus initial engine-out climb rate and gradient, for single-engine and multiengine pistons and turboprops with MTOWs of 12,500 lb. or less.

The one-engine-inoperative (OEI) climb rate for multi-engine aircraft at MTOW is derived from the Airplane Flight Manual. OEI climb rate and gradient is based on landing gear retracted and wing flaps in the takeoff configuration used to compute the published takeoff distance. The climb gradient for such airplanes is obtained by dividing the product of the climb rate (fpm) in the Airplane Flight Manual times 60 by the VY or VYSE climb speed, as appropriate.

The OEI climb gradients we show for FAR Part 23 Commuter Category and FAR Part 25 Transport Category aircraft are the second-segment net climb performance numbers published in the AFMs. Please note: The AFM net second-segment climb performance numbers are adjusted downward by 0.8% to compensate for variations in pilot technique and ambient conditions.

The OEI climb gradient is computed at the same flap configuration used to calculate the takeoff field length.

Ceilings (ft.)

▶ **Maximum Certificated Altitude —** Maximum allowable operating altitude determined by airworthiness authorities.

▶ **All-Engine Service Ceiling —** Maximum altitude at which at least a 100-fpm rate of climb can be attained, assuming the aircraft departed a sea-level, standard-day airport at MTOW and climbed directly to altitude.

▶ **OEI (Engine Out) Service Ceiling —** Maximum altitude at which a 50-fpm rate of climb can be attained, assuming the aircraft departed a sea-level, standard-day airport at MTOW and climbed directly to altitude.

▶ **Sea-Level Cabin (SLC) Altitude —** Maximum cruise altitude at which a 14.7-psia, sea-level cabin altitude can be maintained in a pressurized airplane.

Cruise

Cruise performance is computed using EOW with four occupants or BOW with four passengers and one-half fuel load. Ultra-long-range aircraft carry eight passengers for purposes of computing cruise performance.

Assume 170 lb. for each occupant of a piston-engine airplane and 200 lb. for each occupant of a turbine-powered aircraft.

▶ **Long Range —** True Air Speed (TAS), fuel flow in pounds/hour, flight level (FL) cruise altitude and specific range for long-range cruise by the manufacturer.

▶ **Recommended** (Piston-Engine Airplanes) — TAS, fuel flow in pounds/hour, FL cruise altitude and specific range for normal cruise performance specified by the manufacturer.

▶ **High Speed —**TAS, fuel flow in pounds/hour, FL cruise altitude and specific range for short-range, high-speed performance specified by the aircraft manufacturer.

▶ **Speed, fuel flow, specific range and altitude** in each category are based on one mid-weight cruise point and these data reflect standard day conditions. They are not an average for the overall mission and they are not representative of the above standard day temperatures at cruise altitudes commonly encountered in everyday operations.

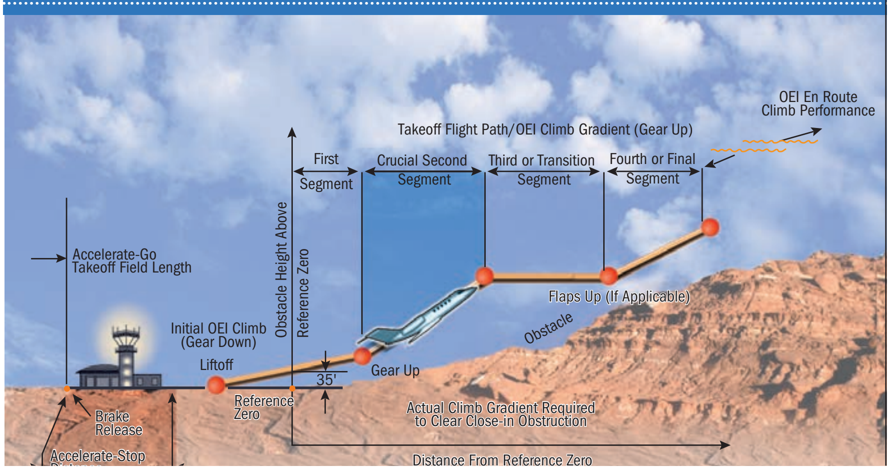
B&CA imposes a 12,000-ft. maximum cabin altitude requirement on CAR3/FAR Part 23 normally aspirated aircraft. Turbocharged airplanes are limited to FL 250, providing they are fitted with supplemental oxygen systems having sufficient capacity for all occupants for the duration of the mission. Pressurized CAR3/FAR Part 23 aircraft are

NOTICE TO READERS

During recent years, the U.S. Federal Trade Commission has conducted investigations into the practice of certain industries in fixing and advertising list prices. It is the position of the FTC that it is deceptive to the public and against the law for list prices of any product to be specified or advertised in a trade area if the majority of sales are made at less than those prices.

B&CA is not in a position to know the prices for most of the sales in each trading area in the United States for each of the products in this issue. Therefore, the prices shown in the tables and text in the *Purchase Planning Handbook* are based on suggested list prices furnished to us by the manufacturers or distributors, or on prices estimated by the editors. It may be possible to purchase some items in your trading area at prices less than those reported in this issue of *B&CA*. Also, almost all manufacturers and distributors caution that prices are subject to change without notice.

FAR Part 25 and Part 23 Commuter Category OEI Climb Performance



limited to a maximum cabin altitude of 10,000 ft. For FAR Part 23 Commuter Category and FAR Part 25 aircraft, the maximum cabin altitude for computing cruise performance is 8,000 ft.

To conserve space, we use flight levels (FL) for all cruise altitudes, which is appropriate considering that we assume standard day ambient temperature and pressure conditions. Cruise performance is subject to B&CA's verification.

Range

B&CA shows various paper missions for each aircraft that illustrate range versus payload tradeoffs, runway and cruise performance, plus fuel efficiency. Similar to the cruise profile calculations, *B&CA* limits the maximum altitude to 12,000 ft. for normally aspirated, non-pressurized CAR3/FAR Part 23 aircraft, 25,000 ft. for turbocharged airplanes with supplemental oxygen, 10,000 ft. cabin altitude for pressurized CAR 3/FAR Part 23 airplanes and 8,000 ft. cabin altitude for FAR Part 23 Commuter Category or FAR Part 25 aircraft.

▶ **Seats-Full Range (Single-Engine Piston Airplanes) —** Based on typical executive configuration with all seats filled with 170 lb. occupants, with maximum available fuel less 45-min. IFR fuel reserves. We use the lower of seats full or maximum payload.

▶ **Tanks Full Range (Single-Engine Piston Airplanes) —** Based on one 170-lb. pilot, full fuel less 45-min. IFR fuel reserves.

▶ **Executive Payload (Multiengine Piston Airplanes and Single-Engine Turboprops)** — Based on typical executive configuration with all seats filled with 170-lb. occupants, maximum available fuel less 45-min. IFR fuel reserves. We use the lower of seats full or maximum payload.

▶ **Maximum Fuel With Available Payload (Single-Engine Turboprops) —** Based on BOW, plus full fuel and the maximum available payload up to maximum ramp weight. Range is based on arriving at destination with NBAA IFR fuel reserves, but only a 100-mi. alternate is required.

B&CA Required Equipment List

	Single-Engine Pistons	Single-Engine Pistons, Turbocharged	Single-Engine Pistons, Pressurized	Multiengine Pistons	Multiengine Pistons, Turbocharged	Single-Engine Turboprops	Turboprops ≤12,500 lb	Turboprops >12,500 lb	Jets <20,000 lb	Jets ≥20,000 lb
POWERPLANT SYSTEMS										
Batt temp indicator (nicad only, for each battery)						●	●	●	●	●
Engine synchronization									●	●
Fire detection, each engine						●	●	●	●	●
Fire extinguishing, each engine								●	●	●
Propeller, reversible pitch						●	●	●		
Propellers, synchronized							●	●		
Thrust reversers/attenuators									●	●
AVIONICS										
ADF						●	●	◉	◉	◉
Air data computer							●	◉	◉	◉
Altitude alerter						●	●	●	●	●
Altitude encoder	●	●	●	●	●	●	●	◉	◉	◉
Antennas, headsets, microphones	●	●	●	●	●	●	◉	◉	◉	◉
Audio control panel	●	●	●	●	●	●	◉	◉	◉	◉
Automatic flight guidance, 2-axis, alt hold	●	●	●							
Automatic flight guidance, 3-axis, alt hold				●	●	●	●	●	●	◉
DME						●	●	◉	◉	◉
EFIS							●	◉	◉	◉
ELT	●	●	●	●	●	●	●	●	●	●
Flight director							●	◉	◉	◉
FMS, TSO C115 or GPS, TSO C129 IFR approach	●	●	●	●	●	●	●	●	●	◉
Glideslope receiver	●	●	●	●	●	●	◉	◉	◉	◉
HSI, slaved (or equivalent EFIS function)	●	●	●	●	●	◉	◉	◉	◉	◉
Marker beacon receiver	●	●	●	●	●	●	◉	◉	◉	◉
Radio altimeter						●	●	●	●	●
Radiotelephone								●	●	●
RMI (or equivalent function on EFIS display)						●	◉	◉	◉	◉
RVSM certification									●	●
TAWS									●	●
TCAS I/II (FAR Part 25 airplanes only)									●	●
Transponder	●	●	●	●	●	●	◉	◉	◉	◉
VHF comm, 25-kHz spacing	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉
VHF comm, 8.33-kHz spacing									◉	◉
VHF nav, 360-channel	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉
Weather radar						●	●	●	●	●
GENERAL										
Air conditioning, vapor cycle (not required with APU)			●			●	●	●	●	●
Anti-skid brakes								●	●	●
APU (required for air-start engines, ACM air conditioning)										●
Cabin/cockpit dividers								●	●	●
Corrosion-proofing, internal	●	●	●	●	●	●	●	●	●	●
Exterior paint, tinted windows	●	●	●	●	●	●	●	●	●	●
Fire extinguisher, cabin						●	●	●	●	●
Fire extinguisher, cockpit	●	●	●	●	●	●	●	●	●	●
Fuel tanks, long-range	●	●	●	●	●	●	●	●		
Ground power jack	●	●	●	●	●	●	●	●	●	●
Headrests, air vents, all seats	●	●	●	●	●	●	●	●	●	●
Lavatory								●	●	●
Lights, strobe/anti-collision beacon, navigation, landing/taxi	●	●	●	●	●	●	●	●	●	●
Lights, internally lighted instrument, cockpit flood, courtesy	●	●	●	●	●	●	●	●	●	●
Oxygen, supplemental, all seats		●			●	●	●	●	●	●
Refreshment center							●	●	●	●
Seats, crew, articulating	●	●	●	●	●	●	●	●	●	●
Seats, passenger, reclining	●	●	●	●	●	●	●	●	●	●
Shoulder harness, all seats and crew with inertia reel	●	●	●	●	●	●	●	●	●	●
Tables, cabin work						●	●	●	●	●
ICE AND RAIN PROTECTION										
Alternate static pressure source (not required with 2 DADC)	●	●	●	●	●	●	●			
Approval, flight into known icing			●	●	●	●	●	●	●	●
Ice protection plates							●	●		
Pitot heat	●	●	●	●	●	●	●	●	●	●
Static wicks	●	●	●	●	●	●	●	●	●	●
Windshield rain removal, mechanical or repellent coating							●	●	●	●
INSTRUMENTATION										
Angle-of-attack stall margin indicator									●	◉
EGT	●	●	●	●	●					
IVSI (or equivalent EFIS, DADC function)							●	◉	◉	◉
Outside air temperature gauge	●	●	●	●	●	●	●	●	●	●
Primary flight instruments	●	●	●	●	●	◉	◉	◉	◉	◉

● Required ◉ Dual required

▶ **Ferry (Multiengine Piston Airplanes and Single-Engine Turboprops) —** Based on one 170-lb. pilot, maximum fuel less 45-min. IFR fuel reserves.

Please note: None of the missions for piston-engine aircraft includes fuel for diverting to an alternate. However, single-engine turboprops are required to have NBAA IFR fuel reserves, but only a 100 mi. alternate is required.

NBAA IFR range format cruise profiles, having a 200 mi. alternate, are used for FAR Part 25 Transport Category turbine-powered aircraft. In the case of FAR Part 23 turboprops, including those certified in the Commuter Category, and FAR Part 23 turbofan aircraft, only a 100 mi. alternate is needed. The difference in alternate requirements should be kept in mind when comparing range performance of various classes of aircraft.

▶ **Available Fuel With Maximum Payload (Multiengine Turbine Airplanes) —**Based on aircraft loaded to maximum zero fuel weight with maximum available fuel up to maximum ramp weight, less NBAA IFR fuel reserves at destination.

▶ **Available Payload With Maximum Fuel (Multiengine Turbine Airplanes) —**Based on BOW plus full fuel and maximum available payload up to maximum ramp weight. Range based on NBAA IFR reserves at destination.

▶ **Full/Maximum Fuel With Four Passengers (Multiengine Turbine Airplanes) —**Based on BOW plus four 200-lb. passengers and the lesser of full fuel or maximum available fuel up to maximum ramp weight. Ultra-long-range aircraft must have eight passengers on board.

▶ **Ferry (Multiengine Turbine Airplanes) —** Based on BOW, required crew and full fuel, arriving at destination with NBAA IFR fuel reserves.

We allow 2,000-ft. increment step climbs above the initial cruise altitude to improve specific range performance, even though current air traffic rules in North America provide for 4,000-ft. altitude semicircular directional traffic separation above FL 290. The altitude shown in the range section is the highest cruise altitude for the trip — not the initial cruise or mid-mission altitude.

The range profiles are in nautical miles, and the average speed is computed by dividing that distance by the total flight time or weight-off-wheels time en route. The Fuel Used or Trip Fuel includes the fuel consumed for start, taxi, takeoff, cruise, descent and landing approach but not after-landing taxi or reserves.

The Specific Range is obtained by dividing the distance flown by the total fuel burn. The Altitude is the highest cruise altitude achieved on the specific mission profile shown.

Missions

Various paper missions are computed to illustrate the runway requirements, speeds, fuel burns and specific range, plus cruise altitudes. The mission ranges are chosen to be representative for the airplane category. All fixed-distance missions are flown with four passengers on board, except for ultra-long-range airplanes, which have eight passengers on board. The pilot is counted as a passenger on board piston-engine airplanes. If an airplane cannot complete a specific fixed distance mission with the appropriate payload, *B&CA* shows a reduction of payload in the remarks section or marks the fields NP (Not Possible) at our option.

Runway performance is obtained from the Approved Airplane Flight Manual. Takeoff distance is listed for single-engine airplanes; accelerate/stop distance is listed for piston twins and light turboprops; and takeoff field length, which often corresponds to balanced field length, is used for FAR Part 23 Commuter Category and FAR Part 25 large Transport Category airplanes.

Flight Time (takeoff to touchdown, or weight-off-wheels, time) is shown for turbine airplanes. Some piston-engine manufacturers also include taxi time, resulting in a chock-to-chock, Block Time measurement. Fuel Used, though, is the actual block fuel burn for each type of aircraft, but it does not include fuel reserves. The cruise altitude shown is that which is specified by the manufacturer for fixed-distance missions.

▶ **200 nm —** (Piston-engine airplanes)
▶ **500 nm —** (Piston-engine airplanes)
▶ **300 nm —** (Turbine-engine airplanes, except ultra-long range)
▶ **600 nm —** (Turbine-engine airplanes, except ultra-long range)
▶ **1,000 nm —** (All turbine-engine airplanes)
▶ **3,000 nm —** (Ultra-long-range turbine-engine airplanes)
▶ **6,000 nm —** (Ultra-long-range turbine-engine airplanes)

Remarks

In this section, *B&CA* generally includes the base price, if it is available or applicable; the certification basis and year; and any notes about estimations, limitations or qualifications regarding specifications, performance or price. All prices are in 2014 dollars, FOB at a U.S. delivery point, unless otherwise noted. The certification basis includes the regulation under which the airplane was originally type certified, the year in which it was originally certified and, if applicable, subsequent years during which the airplane was re-certified.

General

Abbreviations are used throughout the tables: "NA" means not available; "—" indicates the information is not applicable; and "NP" signifies that specific performance is not possible. **B&CA**

JETS LESS THAN 10,000-LB. MTOW

Manufacturer			Textron Aviation
Model			Citation Mustang CE-510
B&CA Equipped Price			$3,465,000
Characteristics		Seating	1+5/5
		Wing Loading	41.2
		Power Loading	2.96
		Noise (EPNdB): TO/Sideline/APR	73.9/85.0/86.0
External Dimensions (ft.)		Length	40.6
		Height	13.4
		Span	43.2
Internal Dimensions (ft.)		**Length:** OA/Net	9.8/9.8
		Height	4.5
		Width: Max/Floor	4.6/3.1
Baggage		**Internal:** Cu. ft./lb.	6/98
		External: Cu. ft./lb.	57/620
Power		Engine(s)	2 P&WC PW615F
		Output (lb. each)/Flat Rating	1,460/ISA+10C
		Inspection Interval	3,500t
Weights (lb.)		Max Ramp	8,730
		Max Takeoff	8,645
		Max Landing	8,000
		Zero Fuel	6,750c
		BOW	5,595
		Max Payload	1,155
		Useful Load	3,135
		Executive Payload	1,000
		Max Fuel	2,580
		Available Payload w/Max Fuel	555
		Available Fuel w/Max Payload	1,980
		Available Fuel w/Executive Payload	2,135
Limits		MMO	0.630
		Trans. Alt. FL/VMO	FL 271/250
		PSI	8.3
Airport Performance		TOFL (SL elev./ISA temp.)	3,110
		TOFL (5,000' elev.@25C)	6,600
		Hot/High Weight Limit	8,645
		NBAA IFR Range	988
		V2@SL ISA, MTOW	97
		VREF w/4 Pax, NBAA IFR Res.	88
		Landing Distance w/4 Pax, NBAA IFR Res.	2,139
Climb		Time to Climb/Altitude	20/FL 370
		FAR 25 Engine-Out Rate (fpm)	432
		FAR 25 Engine-Out Gradient (ft./nm)	267
Ceilings (ft.)		Certificated	41,000
		All-Engine Service	41,000
		Engine-Out Service	26,900
		Sea-Level Cabin	21,280
Cruise	Long Range	TAS	319
		Fuel Flow	499
		Altitude	FL 390
		Specific Range	0.639
	High Speed	TAS	339
		Fuel Flow	609
		Altitude	FL 350
		Specific Range	0.557
NBAA IFR Ranges (100-nm alternate)	Max Payload (w/available fuel)	Nautical Miles	716
		Average Speed	294
		Trip Fuel	1,300
		Specific Range/Altitude	0.551/FL 410
	Max Fuel (w/available payload)	Nautical Miles	1,159
		Average Speed	305
		Trip Fuel	1,948
		Specific Range/Altitude	0.595/FL 410
	Four Passengers (w/available fuel)	Nautical Miles	967
		Average Speed	301
		Trip Fuel	1,669
		Specific Range/Altitude	0.579/FL 410
	Ferry	Nautical Miles	1,205
		Average Speed	316
		Trip Fuel	1,965
		Specific Range/Altitude	0.613/FL 410
Missions (4 passengers)	300 nm	Runway	2,496
		Flight Time	1+00
		Fuel Used	670
		Specific Range/Altitude	0.448/FL 370
	600 nm	Runway	2,695
		Flight Time	1+56
		Fuel Used	1,134
		Specific Range/Altitude	0.529/FL 390
	1,000 nm	Runway	3,109
		Flight Time	3+19
		Fuel Used	1,717
		Specific Range/Altitude	0.582/FL 410
Remarks		Certification Basis	FAR 23, 2006 1,000-nm mission flown with 753-lb. payload.

JETS LESS THAN 20,000-LB. MTOW

Manufacturer			Embraer	*Honda Aircraft Co.*
Model			Phenom 100E EMB-500	*HondaJet HA-420*
B&CA Equipped Price			$4,161,000	*$4,500,000*
Characteristics		Seating	1+5/7	*1+5/6*
		Wing Loading	52.5	*NA*
		Power Loading	3.12	*NA*
		Noise (EPNdB): TO/Sideline/APR	70.4/81.4/86.1	*NA/NA/NA*
External Dimensions (ft.)		Length	42.1	*42.6*
		Height	14.3	*14.9*
		Span	40.4	*39.8*
Internal Dimensions (ft.)		**Length:** OA/Net	11.0/11.0	*12.1/12.1*
		Height	4.9	*4.8*
		Width: Max/Floor	5.1/3.6	*5.0/NA*
Baggage		**Internal:** Cu. ft./lb.	10/99	*NA/NA*
		External: Cu. ft./lb.	60/418	*66/NA*
Power		Engines	2 P&WC PW 617F-E	*2 GE Honda HF-120*
		Output (lb. each)/Flat Rating	1,695/ISA+10C	*2,050/NA*
		Inspection Interval	3,500t	*NA*
Weights (lb.)		Max Ramp	10,626	*NA*
		Max Takeoff	10,582	*NA*
		Max Landing	9,877	*NA*
		Zero Fuel	8,554c	*NA*
		BOW	7,220	*NA*
		Max Payload	1,334	*NA*
		Useful Load	3,406	*NA*
		Executive Payload	1,000	*NA*
		Max Fuel	2,804	*NA*
		Available Payload w/Max Fuel	602	*NA*
		Available Fuel w/Max Payload	2,072	*NA*
		Available Fuel w/Executive Payload	2,406	*NA*
Limits		MMO	0.700	*0.720*
		Trans. Alt. FL/VMO	280/275	*FL 300/NA*
		PSI	8.3	*8.7*
Airport Performance		TOFL (SL elev./ISA temp.)	3,123	*NA*
		TOFL (5,000' elev.@25C)	6,609	*NA*
		Hot/High Weight Limit	10,582	*NA*
		NBAA IFR Range	1,071	*NA*
		V2@SL ISA, MTOW	98	*NA*
		VREF w/4 Pax, NBAA IFR Res.	94	*NA*
		Landing Distance w/4 Pax, NBAA IFR Res.	2,466	*NA*
Climb		Time to Climb/Altitude	24/FL 370	*NA/NA*
		FAR 25 Engine-Out Rate (fpm)	560	*NA*
		FAR 25 Engine-Out Gradient (ft./nm)	298	*NA*
Ceilings (ft.)		Certificated	41,000	*43,000*
		All-Engine Service	41,000	*43,000*
		Engine-Out Service	24,045	*NA*
		Sea-Level Cabin	21,280	*NA*
Cruise	Long Range	TAS	332	*NA*
		Fuel Flow	525	*NA*
		Altitude	FL 410	*NA*
		Specific Range	0.632	*NA*
	High Speed	TAS	389	*420*
		Fuel Flow	851	*NA*
		Altitude	FL 330	*FL 300*
		Specific Range	0.457	*NA*
NBAA IFR Ranges (FAR Part 23, 100-nm alternate; FAR Part 25, 200-nm alternate)	Max Payload (w/available fuel)	Nautical Miles	701	*NA*
		Average Speed	319	*NA*
		Trip Fuel	1,411	*NA*
		Specific Range/Altitude	0.497/FL 410	*NA/NA*
	Max Fuel (w/available payload)	Nautical Miles	1,181	*1,180*
		Average Speed	326	*NA*
		Trip Fuel	2,163	*NA*
		Specific Range/Altitude	0.546/FL 410	*NA/NA*
	Four Passengers (w/available fuel)	Nautical Miles	1,050	*NA*
		Average Speed	324	*NA*
		Trip Fuel	1,960	*NA*
		Specific Range/Altitude	0.536/FL 410	*NA/NA*
	Ferry	Nautical Miles	1,234	*NA*
		Average Speed	325	*NA*
		Trip Fuel	2,183	*NA*
		Specific Range/Altitude	0.565/FL 410	*NA/NA*
Missions (4 passengers)	300 nm	Runway	2,722	*NA*
		Flight Time	0+55	*NA*
		Fuel Used	741	*NA*
		Specific Range/Altitude	0.405/FL 390	*NA/NA*
	600 nm	Runway	2,860	*NA*
		Flight Time	1+46	*NA*
		Fuel Used	1,263	*NA*
		Specific Range/Altitude	0.475/FL 390	*NA/NA*
	1,000 nm	Runway	3,050	*NA*
		Flight Time	3+05	*NA*
		Fuel Used	1,874	*NA*
		Specific Range/Altitude	0.534/FL 410	*NA/NA*
Remarks		Certification Basis	FAR 23, 2008	*FAR 23 pending All data preliminary.*

JETS LESS THAN 20,000-LB. MTOW

Manufacturer		Textron Aviation	Textron Aviation	Textron Aviation	Nextant Aerospace	Embraer	Textron Aviation
Model		Cessna Citation M2 CE-525	Citation CJ2+ CE-525A	Citation CJ3+ CE-525B	400XTi	Phenom 300 EMB-505	Citation CJ4 CE-525C
B&CA Equipped Price		$4,655,000	$7,270,000	$8,435,000	$5,150,000	$8,955,000	$9,395,000
Characteristics	Seating	1+7/7	1+8/9	1+8/9	2+8/10	1+7/10	2+8/9
	Wing Loading	44.6	47.4	47.2	66.7	58.6	51.8
	Power Loading	2.72	2.51	2.46	2.64	2.67	2.36
	Noise (EPNdB): TO/Sideline/APR	73.2/85.9/88.5	75.5/86.1/89.7	74.0/88.7/88.6	76.9/91.5/88.8	69.9/88.8/88.5	75.4/92.8/89.5
External Dimensions (ft.)	Length	42.6	47.7	51.2	48.4	51.2	53.3
	Height	13.9	14.0	15.2	13.9	16.7	15.3
	Span	47.3	49.8	53.3	43.5	52.2	50.8
Internal Dimensions (ft.)	**Length:** OA/Net	11.0/11.0	13.6/13.6	15.7/15.7	15.5/15.5	17.2/17.2	17.3/17.3
	Height	4.8	4.8	4.8	4.8	4.9	4.8
	Width: Max/Floor	4.8/3.1	4.8/3.1	4.8/3.1	4.9/3.7	5.1/3.6	4.8/3.3
Baggage	**Internal:** Cu. ft./lb.	—/—	—/—	—/—	27/410	10/77	6/40
	External: Cu. ft./lb.	46/725	65/1,000	65/1,000	26/450	74/573	71/1,000
Power	Engines	2 Wms Intl FJ44-1AP-21	2 Wms Intl FJ44-3A-24	2 Wms Intl FJ44-3A	2 Wms Intl FJ44-3AP	2 P&WC PW 535E	2 Wms Intl FJ44-4A
	Output (lb. each)/Flat Rating	1,965/ISA+7C	2,490/ISA+7C	2,820/ISA+11C	3,050/ISA+7°C	3,360/ISA+15C	3,621/ISA+11C
	Inspection Interval	3,500t	4,000t	4,000t	5,000t	5,000t	5,000t
Weights (lb.)	Max Ramp	10,800	12,625	14,070	16,500	18,078	17,230
	Max Takeoff	10,700	12,500	13,870	16,300	17,968	17,110
	Max Landing	9,900	11,525	12,750	15,700	16,865	15,660
	Zero Fuel	8,400c	9,700c	10,510c	13,000c	13,999c	12,500c
	BOW	7,000	8,030	8,580	10,744	11,583	10,460
	Max Payload	1,400	1,670	1,930	2,256	2,416	2,040
	Useful Load	3,800	4,595	5,490	5,556	6,495	6,770
	Executive Payload	1,400	1,600	1,600	1,456	1,400	1,600
	Max Fuel	3,309	3,930	4,710	4,912	5,353	5,828
	Available Payload w/Max Fuel	491	665	780	1,244	1,142	942
	Available Fuel w/Max Payload	2,400	2,925	3,560	3,500	4,079	4,730
	Available Fuel w/Executive Payload	2,400	2,995	3,890	4,912	5,095	5,170
Limits	MMO	0.710	0.737	0.737	0.780	0.780	0.770
	Trans. Alt. FL/VMO	FL 305/263	FL 291/278	FL 293/278	FL 290/320	FL 263/320	FL 279/305
	PSI	8.5	8.9	8.9	9.1	9.4	9.0
Airport Performance	TOFL (SL elev./ISA temp.)	3,210	3,360	3,180	4,217	3,138	3,190
	TOFL (5,000' elev.@25C)	5,580	5,180	4,750	6,396	5,114	5,021
	Hot/High Weight Limit	10,700	12,500	13,870	16,300	17,968	16,968
	NBAA IFR Range	1,198	1,531	1,715	1,929	2,019	1,942
	V2@SL ISA, MTOW	111	116	114	116	112	117
	VREF w/4 Pax, NBAA IFR Res.	101	102	99	106	104	99
	Landing Distance w/4 Pax, NBAA IFR Res.	2,340	2,658	2,424	2,900	2,220	2,281
Climb	Time to Climb/Altitude	18/FL 370	15/FL 370	15/FL 370	16/FL 370	14/FL 370	14/FL 370
	FAR 25 Engine-Out Rate (fpm)	618	611	808	754	911	839
	FAR 25 Engine-Out Gradient (ft./nm)	334	316	425	354	462	430
Ceilings (ft.)	Certificated	41,000	45,000	45,000	45,000	45,000	45,000
	All-Engine Service	41,000	45,000	45,000	45,000	45,000	45,000
	Engine-Out Service	26,800	23,800	26,250	27,500	30,137	28,200
	Sea-Level Cabin	22,027	23,586	23,586	24,000	25,560	23,984
Cruise — Long Range	TAS	323	357	352	406	383	377
	Fuel Flow	516	591	624	740	757	812
	Altitude	FL 410	FL 450	FL 450	FL 450	FL 450	FL 450
	Specific Range	0.626	0.604	0.564	0.549	0.506	0.464
Cruise — High Speed	TAS	401	413	415	447	444	442
	Fuel Flow	920	1,096	1,197	968	1,312	1,470
	Altitude	FL 350	FL 350	FL 350	FL 430	FL 350	FL 370
	Specific Range	0.436	0.377	0.347	0.462	0.338	0.301
NBAA IFR Ranges (FAR Part 23, 100-nm alternate; FAR Part 25, 200-nm alternate) — Max Payload (w/available fuel)	Nautical Miles	812	993	1,172	1,078	1,247	1,425
	Average Speed	361	368	368	374	397	407
	Trip Fuel	1,706	2,071	2,552	2,482	3,109	3,753
	Specific Range/Altitude	0.476/FL 410	0.479/FL 450	0.459/FL 450	0.434/FL 430	0.401/FL 450	0.380/FL 450
Max Fuel (w/available payload)	Nautical Miles	1,369	1,610	1,869	1,982	1,877	1,913
	Average Speed	373	379	378	388	409	413
	Trip Fuel	2,676	3,152	3,850	4,094	4,416	4,904
	Specific Range/Altitude	0.512/FL 410	0.511/FL 450	0.485/FL 450	0.484/FL 450	0.425/FL 450	0.390/FL 450
Four Passengers (w/available fuel)	Nautical Miles	1,177	1,509	1,691	1,955	1,903	1,919
	Average Speed	370	377	376	388	411	414
	Trip Fuel	2,342	2,975	3,518	3,982	4,447	4,911
	Specific Range/Altitude	0.503/FL 410	0.507/FL 450	0.481/FL 450	0.491/FL 450	0.428/FL 450	0.391/FL 450
Ferry	Nautical Miles	1,398	1,646	1,890	2,115	1,944	1,942
	Average Speed	378	384	381	385	418	415
	Trip Fuel	2,704	3,177	3,865	4,029	4,473	4,911
	Specific Range/Altitude	0.517/FL 410	0.518/FL 450	0.489/FL 450	0.525/FL 450	0.435/FL 450	0.395/FL 450
Missions (4 passengers) — 300 nm	Runway	2,626	2,479	2,604	3,015	2,613	2,433
	Flight Time	0+52	0+49	0+49	0+48	0+47	0+46
	Fuel Used	804	899	972	786	1,058	1,089
	Specific Range/Altitude	0.373/FL 370	0.334/FL 370	0.309/FL 370	0.382/FL 390	0.284/FL 390	0.275/FL 390
600 nm	Runway	2,694	2,694	2,617	3,044	2,747	2,449
	Flight Time	1+38	1+35	1+35	1+30	1+29	1+27
	Fuel Used	1,362	1,460	1,576	1,323	1,735	1,868
	Specific Range/Altitude	0.441/FL 390	0.411/FL 410	0.381/FL 410	0.453/FL 430	0.346/FL 410	0.321/FL 410
1,000 nm	Runway	3,006	2,994	2,786	3,101	2,808	2,530
	Flight Time	2+43	2+36	2+37	2+28	2+26	2+24
	Fuel Used	2,018	2,162	2,324	2,145	2,471	2,829
	Specific Range/Altitude	0.496/FL 410	0.463/FL 430	0.430/FL 430	0.467/FL 450	0.405/FL 450	0.353/FL 430
Remarks	Certification Basis	FAR 23, 2013	FAR 23, 2000/05	FAR 23 Commuter category, 2004/2014; Garmin G3000.	FAR 25, 1981/85/2007	FAR 23 Commuter category, 2009	FAR 23 Commuter category, 2010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