
# Airbus A318 Elite

## A big beau-monde cruise ship for transatlantic crossings

Photography courtesy of Airbus

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*By Fred George*

Typical A318 Elite interiors will have 11 full berths, provided by seven pairs of facing chairs and four pull-out sleepers.

Think that an Airbus is too big for routine business travel between North America and Europe? Try boarding 11 company employees on a conventional large-cabin business jet for a nine-hour overnight flight between the continents. Then, count the number of fully berthable seats. Most purpose-built, large-cabin business aircraft will sleep no more than six or seven. These 11 travelers are likely to lament this mission as another transatlantic "red eye."

If those same 11 passengers had boarded an 18-passenger Airbus 318 Elite for the overnight flight, they would have been able to nestle into 11 full berths, provided by seven pairs of individual facing chairs and four pull-out sofa-sleepers. The sofa-sleepers actually are double berths, potentially offering sleeping arrangements for 15.

A separate, forward crew rest compartment has either two facing passenger chairs or up to four first-class airline seats, so the cabin attendants and relief flight crew can retreat into their own refuge after the passengers are tucked in for the evening. In addition, the forward crew lavatory and galley are located ahead of the crew lounge, assuring that the passengers won't be disturbed when they're asleep.

For operators who want even more space per passenger, Airbus also offers the 14-passenger A318 Elite+. It has full berths for eight, comprised of five pairs of facing chairs and three sofa-sleepers. The forward lounge compartment has two facing chairs that can be used as passenger seats, but operators may want to reserve them for crew rest.

The A318 Elite program was launched in November 2005 as a joint-venture between Airbus and Lufthansa Technik. With nearly 4,000 nm of range and a $45 million price tag, the A318 Elite was introduced as a lower cost, shorter range alternative to the 6,000 nm, $55 million-plus A319 ACJ. The Elite is intended to compete head-on with transatlantic range, purpose-built business jets, such as the Bombardier Global 5000, Dassault Falcon Jet 900DX and Gulfstream 450.

Since program launch, Airbus is racking up impressive sales for the aircraft. Launch customer Comlux, a Zurich-based charter operator, took delivery of its first Elite+ in December 2006 and it now has four more on order. Jeddah-based National Air Services placed an order for five aircraft and five options little more than one week after the Comlux order, becoming the launch customer for the Middle East.

Austria-based JetAlliance, another European charter operator, ordered its first Elite in May 2006 and later added two more orders. Minnesota-based Petters Group Worldwide, the firm that owns Sun Country Airlines, became the first U.S. customer in October 2006. Petters Group will use the aircraft for corporate business trips rather than public-transport charter operations. Airbus insiders told *B&CA* that the planemaker plans to make an announcement at EBACE 2007 regarding a significant number of new Elite orders by a U.S. customer. With the new sales, Airbus has tallied more than 30 orders and options for the Elite.

Cabin comfort, range and price are the A318 Elite's big selling points. But don't think the trade-off is lackluster runway performance. The aircraft has the best power loading and lowest wing loading of any current production jetliner-derivative business aircraft. It also has a 6,900-pound tanks-full payload, a limit that's virtually impossible to reach — unless you load the underfloor cargo hold with 3,000 pounds of extra baggage. Top the tanks, fill all 18 seats and you'll use less than half of the available tanks-full payload. Maximum takeoff weight seldom, as a result, exceeds 142,200 pounds.

As shown by the accompanying Range/Payload Profile graph, this results in being able to depart 5,120-foot runways at sea-level, assuming standard-day temperatures. Even if the OAT rises to ISA+20°C, the A318 Elite needs less than 5,500 feet of

The sofa-sleepers actually are double berths, potentially offering sleeping arrangements for 15 passengers.

Photography courtesy of Airbus

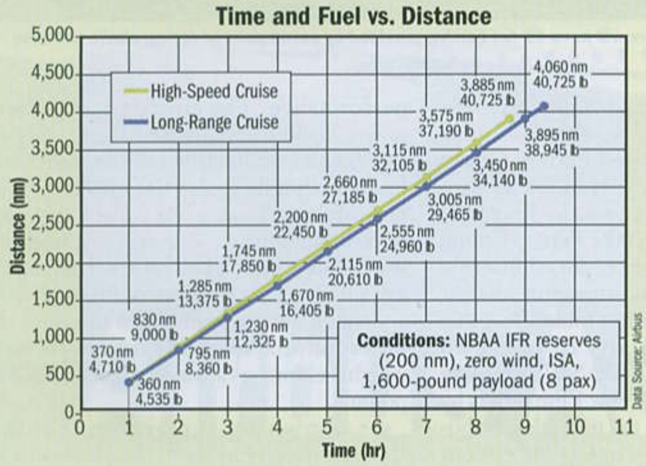
## Airbus 318 Elite

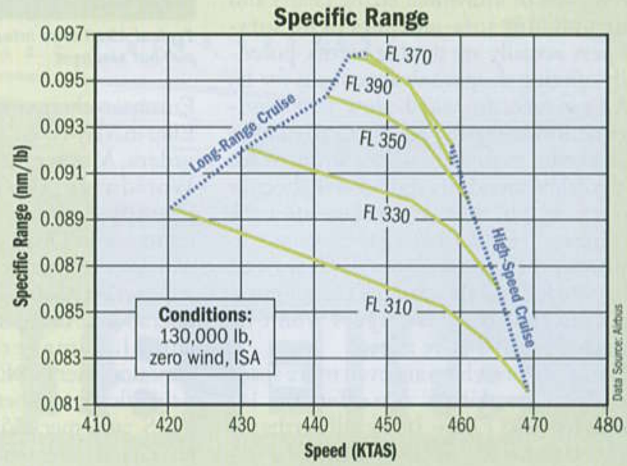
These graphs are designed to illustrate the performance of the Airbus A318 Elite under a variety of range, payload, speed and density altitude conditions. Do not use these data for flight planning purposes because they are gross approximations of actual aircraft performance.

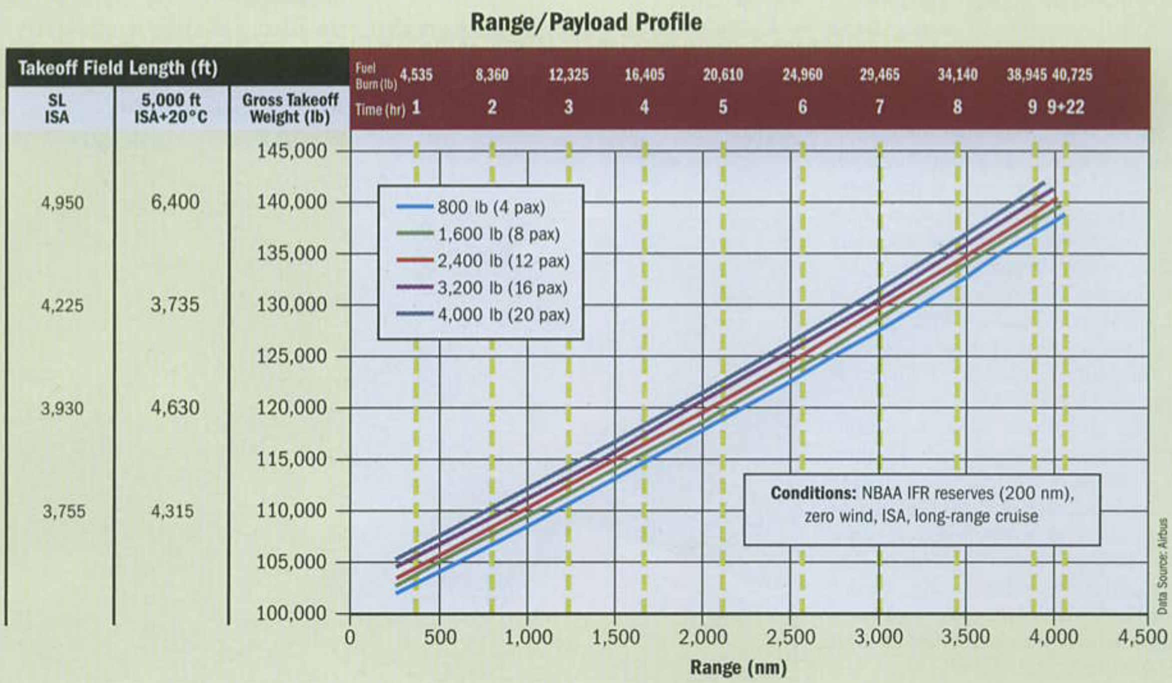
**Time and Fuel vs. Distance** — This graph shows the relationship among distance flown, block time and fuel consumption. There is a 4-percent range penalty for flying the A318 Elite at 0.80 Mach high-speed cruise rather than 0.78 Mach long-range cruise. This graph shows that flying at high-speed cruise saves about 20 minutes on the longest trips. But it also costs almost 1,600 pounds more fuel burn.

**Specific Range (Mid-Range Weight, ISA)** — This graph shows the relationship between cruise speed and fuel consumption for the A318 Elite at representative cruise altitudes for a 130,000-pound, mid-weight aircraft. We had no opportunity to verify these estimates when we flew the aircraft in August 2006. Flying the A318 Elite at 0.78 Mach at high cruise altitudes yields 99 percent range efficiency. At lower altitudes, the aircraft must be flown as slow as 0.72 Mach for maximum range performance. Commercial airlines, for example, typically cruise the A318 at 0.78 Mach between FL 370 and FL 390.

**Range/Payload Profile** — The purpose of this graph is to provide simulations of various trips under a variety of payload and two airport density altitude conditions, with the goal of flying the longest distance at 0.78 Mach. Each of the four payload/range lines was plotted from multiple data points by Airbus performance engineers, ending at the maximum range for each payload condition. The time and fuel burn dashed lines are based upon 0.78 Mach long-range cruise based upon the Time and Fuel vs. Distance graph. Runway distances for sea-level standard day and for *B&CA*'s 5,000-foot elevation, ISA+20°C airport accompany the takeoff weights.



runway. Up at *B&CA*'s 5,000-foot elevation, ISA+20°C airport, the takeoff field length is about 6,700 feet assuming full tanks and 18 passengers. Indeed, you can depart Jackson Hole, Wyo., on a 22°C (72°F) day and fly 18 passengers more than 2,600 nm. With one stop, you can fly to virtually any business destination in the Americas, Asia, Europe or the Middle East.

The A319 Elite's combination of range, runway performance and, most especially, cabin comfort is resonating with business aircraft operators in Europe, the Middle East and, increasingly, the United States. That's the thumbnail sketch and here's the rest of the story.

### Passenger Accommodations

The Airbus A318 Elite doesn't just seat 14 to 18 passengers. It coddles them in a cabin that has more than twice the floor area and two and one-half to three times the volume of most purpose-built, large-cabin business aircraft. The cabin is 70.2 feet long, 12.2 feet wide and 7.4 feet high. The usable width is even more impressive. There's almost eight feet of side-to-side headroom at six-foot standing height, and the floor width is 11.6 feet, which is almost twice that of typical long-range business jets and nearly the same as the maximum inside cabin diameter of a BBJ. The result is that passenger seating areas feel more like suites and less like sections of tubes.

The Elite is equipped with a new digital Cabin Management System (CMS), operated through a console at the front of the passenger cabin. The CMS controls cabin wash lighting and audio/visual equipment. It also provides prerecorded passenger advisory messages and emergency evacuation alerts, and monitors fresh and waste water levels.

A three-zone temperature control system allows selection of separate temperatures in the cockpit, forward cabin and aft cabin. When both air-conditioning packs are in operation, 1,700 cubic feet of fresh air per minute enters the pressure vessel. Vent fans recirculate another 1,296 cubic feet of air per minute through the cabin.

Passengers enter the main cabin by means of a standard, folding air-stair with dual handrails. It retracts into a pocket below the main entry door, a conventional 32-inch-wide-by-73-inch-tall Type B door. Chromed handrails and step lighting for the ladder are options.

The crew lav and galley are just forward of the entry area, adjacent to the left and right sides of the aft cockpit bulkhead. The right side of the fuselage also has a second Type B entry door that can be used to replenish galley stores while the passengers are entering through the main door on the left side of the aircraft. The aircraft is equipped with left- and right-side 40.1-by-20.0-inch Type III overwing emergency exits in the main cabin.

Proceeding aft, there is a forward seating section that measures about 12.2 feet wide by 11.5 feet long. It can be configured either as a crew lounge or semi-private passenger compartment with a large carry-on luggage closet. There is a 4.0-foot-deep-by-2.8-foot-long cutout in the forward compartment that opens into the galley for additional food and beverage service items.

The center compartment, called the Executive Seating Area by Airbus, is about 12.2 feet wide by 27.8 feet long. It can be

## Airbus A318 Elite

***B&CA* Equipped Price** ..... $45,000,000

**Characteristics**

| | |
|---|---|
| Seating | 4+18/132 |
| Wing Loading | 110.2 |
| Power Loading | 3.12 |
| Noise (Takeoff) (EPNdB) | 82.2 |

**Dimensions (ft/m)**

| | |
|---|---|
| External | |
| *See Three-View* | |
| Internal | |
| *Length* | 70.2/21.4 |
| *Height* | 7.4/2.3 |
| *Width* (Maximum) | 12.2/3.7 |

**Power**

| | |
|---|---|
| Engine | 2 CFMI CFM56-5B9* |
| Thrust (lb ea.) | 23,300 |
| SL Flat Rating | ISA+30°C |
| Inspection Interval | OC |

**Weights (lb/kg)**

| | |
|---|---|
| Max Ramp | 146,390/66,402 |
| Max Takeoff | 145,505/66,001 |
| Max Landing | 126,765/57,500 |
| Zero Fuel | 120,150c/54,500c |
| BOW | 93,720/42,511 |
| Max Payload | 26,430/11,989 |
| Useful Load | 52,670/23,891 |
| Executive Payload | 3,600/1,633 |
| Max Fuel | 45,770/20,761 |
| Payload With Max Fuel | 6,900/3,130 |
| Fuel With Max Payload | 26,240/11,902 |
| Fuel With Exec. Payload | 45,770/20,761 |

**Limits**

| | |
|---|---|
| MMO | 0.820 |
| Trans. Alt. FL/VMO | FL 264/350 |
| PSI | 8.2 |

**Climb**

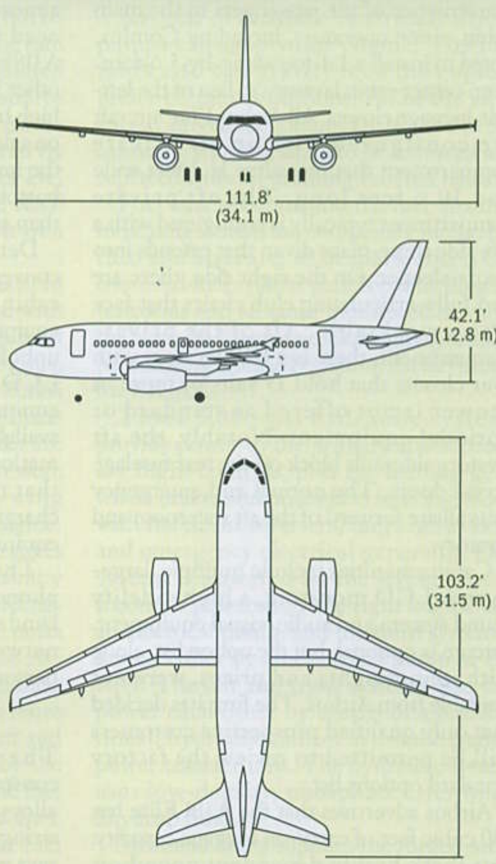
| | |
|---|---|
| Time to FL 370 | 24 min. |
| FAR Part 25 | |
| OEI Rate (fpm/mpm) | NA |
| FAR Part 25 | |
| OEI Gradient (ft/nm, m/km) | NA |

**Ceilings (ft/m)**

| | |
|---|---|
| Certificated | 41,000/12,497 |
| All-Engine Service | 41,000/12,497 |
| OEI Service | 19,000/5,791 |
| Sea Level Cabin | 22,000/6,706 |

**Certification** ..... FAR Part 25, 2003

*Also available with P&WC PW6124A engines.



**The windshield panes are glass/acrylic laminate panels and they're designed to be replaced in two hours.**

configured with various combinations of four-place conference seating groups and divans that function as sofa-sleepers. The center compartment has a small carry-on luggage closet that's handy for tote bags, laptops and briefcases. Immediately aft of the center compartment, there are two large closets for carry-on baggage. For the convenience of the passengers in the main cabin, some operators, including Comlux, opted to install a 3.4-foot-long-by-5.6-foot-deep center cabin lavatory in lieu of the left-side luggage closets. All Airbus Elite aircraft are configured with an aft private compartment that measures 12.2 feet wide and 10.6 feet long. The aft private compartment typically is configured with a left-side three-place divan that extends into a sofa-sleeper. On the right side, there are two fully-articulating club chairs that face into a worktable. Aft of the private compartment, there is a VIP lavatory with four closets that hold 15 suits or more. A shower is not offered as standard or optional equipment. Notably, the aft lavatory sidewalls block off the rear fuselage access doors. The normal and emergency exits all are forward of the aft stateroom and lavatory.

Cabin amenities include multiple, large-format LCD monitors, a high-fidelity sound system and audio/visual equipment. Satcom is optional, but the option list, along with item weights and prices, were not available from Airbus. The firm has decided that only qualified prospective customers will be permitted to review the factory standard options list.

Airbus advertises that the A318 Elite has 330 cubic feet of carry-on luggage capacity. But that's highly dependent upon how buyers configure the aircraft interior. For example, if the forward compartment is configured as a four-seat crew lounge and if the optional center compartment lavatory is installed, it's closer to 230 cubic feet — about the same as a G550's aft baggage compartment.

But the Elite also has a 620-cubic-foot underfloor cargo hold that can accommodate almost any amount of baggage passengers need for an extended business trip. The A318's cargo doors are smaller than those of other 320-series airplanes, measuring 4.0 feet high by 4.1 feet wide. Operators should plan on taking a tall stepladder to gain access to the underfloor baggage compartment. The bottom of the door sill appears to be more than six feet high.

Details on other passenger amenities and conveniences, including chair dimensions, cabin interior noise levels and optional equipment, plus choices of cabinet finishes, upholstery fabrics and carpets, along with LCD monitor sizes and locations, AV equipment and security systems, were not available from Airbus. In addition, no information was available on electrical outlets that might be available for cell phone charging, laptop computers or other office equipment.

There is no plan to offer an Iridium phone option or a space-to-plane broadband satcom Internet link. But a pico-cell network is in the works that will allow personal cell phones to access the satcom.

### Structure and Systems

The A318's airframe primarily is constructed from high-strength aluminum alloys, using conventional skin, frame and stringer semi-monocoque construction. To save weight and assembly time, reinforcing stringers are laser-welded to the lower aft fuselage skin rather than riveted or bonded. About 17 percent of the structure is aramid, glass- or carbon-reinforced composites, including an all-composite vertical fin and horizontal stabilizer, the belly fairing skin, cargo hold deck panels and all control surfaces.

The windshield panes are glass/acrylic laminate panels and they're designed to be replaced in two hours. The 9.0-inch-wide-by-13.0-inch-tall cabin windows are made of stretched acrylic and are designed for quick replacement.

The basic A318 airliner has a 130,071-pound MTOW, a 123,458-pound max landing weight and a 116,844-pound max zero fuel weight. The A318 Elite, though, incorporates a factory-standard modification that raises those three weights to 145,504 pounds, 126,765 pounds and 120,151 pounds, respectively. The fuselage also is reinforced to accommodate a single 3,540-pound capacity auxiliary center tank in the aft cargo hold that extends range by about 330 nm.

The A318 uses the generic 1,320-square-foot A320-series wing, having an advanced, aft-loaded super-critical airfoil, 25 degrees of wing sweep, a relatively thick chord section for volumetric efficiency and a 9.4:1 aspect ratio. It's a conventional box structure, with front and rear spars, chord-wise ribs and span-wise stringers that stiffen the skin panels.

The airfoil is fine tuned for efficient cruise at 0.78 Mach, depending upon aircraft weight and cruise altitude. This is the long-range cruise speed in the accompanying Time and Fuel vs. Distance graph. Cruising at 0.80 Mach reduces range by about 5 percent. Conversely, slowing the aircraft to 0.74 or 0.75 Mach at very light cruise weights improves fuel burn by less than 1 percent overall.

Airbus has test flown the aircraft with winglets from Wichita-based Winglet Technologies, among other designs, but the firm has yet to make a business case for this drag reduction modification. The current, split-fin, wingtip fences reduce drag by about 2 percent. The A318 Elite, though, has been fitted with a new wing-to-fuselage belly fairing, along with nacelle modification and revised NACA fuel tank vents that cut drag by an additional 1 to 2 percent.

The A318 Elite is available with either 23,300-pound-thrust CFM56-5B9 or 23,800-pound-thrust Pratt & Whitney Canada PW6124A turbofans. The higher thrust PW6124A engines weigh less than the CFM56 powerplants, but they don't get as good fuel economy, and an aircraft powered with the Pratts won't fly 4,000 nm. The CFM56-5 engines also are 180-minute ETOPS qualified and they are the only

***The A318 Elite has been fitted with a new wing-to-fuselage belly fairing, along with nacelle modification and revised NACA fuel tank vents that cut drag by an additional 1 to 2 percent.***

engines currently available on FAA type-certified airplanes. EASA-certified airplanes are available with either engine. Thus far, all A318 Elite buyers have opted for the heavier CFM56-5B9 engines.

The Hamilton Sundstrand/Labinal APIC APS 3200 is the standard fit APU, but the aircraft also is available with a Honeywell GTCP 36-300 APU. The APU is designed for removal and replacement in 75 minutes. Both APUs are rated for inflight operations, capable of supplying 90 kVA electrical power up to 25,000 feet. Above that altitude, limited electrical power is available up to the aircraft maximum certified altitude. While the APU is not designed to pressurize the cabin during hot-and-high bleeds-off takeoffs, that shouldn't be a limitation. The engines are flat-rated at 23,300 pounds of thrust to ISA+30°C, so there are very wide temperature margins at takeoff rated thrust.

Left and right engine-driven 90 kVA integrated drive generators supply three-phase, 115/200 VAC, 400 Hz electrical power during normal operations. The APU also has a 90 kVA generator, providing a third source of electrical power. On the ground, a GPU can supply 90 kVA AC power to the aircraft prior to APU or engine start, but there is no external DC power receptacle. DC power is supplied by two transformer rectifier units as long as there is a source of AC power. Two 23 AH nicad batteries provide power to start the APU. They also provide emergency DC power and the essential AC inverter in the event of a total generator failure.

A fourth emergency AC generator can be powered by the hydraulic pump on the ram air turbine (RAT) and can provide limited electrical power in flight if no other source is available. A third, essential bus transformer rectifier unit (TRU), powered by the emergency generator, supplies DC power to essential equipment. The RAT deploys automatically in the event of a complete generator failure.

The left, center and right wing tanks hold 42,230 pounds of fuel. That, combined with the center aux tank's contents, brings total fuel capacity to 45,770 pounds. Airbus, though, rates total fuel capacity at 45,666 pounds to provide margin for lower-than-standard density fuel. All four tanks are refueled by means of a single-point pressure refueling receptacle in the right-wing leading edge, inboard of the right engine. Refueling a completely empty aircraft takes less than 25 minutes. The fuel refill quantity can be preselected for precise fuel loading.

The left and right main aircraft fuel tanks each have two 115 VAC three-phase AC electrically driven, fuel boost pumps in their sumps. The center wing tank has two more fuel boost pumps, used to feed the left and right engines. Jet pumps, powered by the boost pumps, are used throughout the fuel system to scavenge fuel from low points. Cabin air pressure is used to transfer fuel from the ACT to the center wing tank, which vents to ambient air. In normal operations, the engines feed from the center tank, then the wing tanks.

Any one of the three electrically driven pumps can supply one engine. The fuel tanks also can gravity feed the engines under certain conditions. All of the electrically driven fuel pumps are housed in dry canisters, allowing them to be removed and replaced without draining the fuel tanks.

Fuel tank selection and the fuel quantity indicating system are completely integrated into the aircraft, with main and ACT overhead fuel system panels controlling all functions and all tanks monitored through the aircraft's Electronic Centralized Aircraft Monitoring (ECAM) system, Airbus's term for EICAS.

Three 3,000-psi hydraulic systems provide power to the primary and secondary flight controls, plus the landing gear, wheel brakes and nosewheel steering, along with the thrust reversers, cargo hold doors and emergency electrical generator. One system is powered by the left engine, a second is powered by the right engine and an electrical pump, and the third system is driven either by an electrical pump or the RAT. The left and right systems also can power each other by means of a bidirectional, hydraulic motor/hydraulic pump, power transfer unit. The hydraulic system uses low-density, phosphate ester (e.g., Skydrol) fluid.

Messier-Dowty supplies the forged-steel landing gear. Uplocks hold the gear in the retracted position and internal ground locks

## A318 Elite Avionics

The Airbus A318 Elite's standard avionics package includes six, 7.25-inch square Thales LCDs, triple Northrop Grumman (nee Litton) air data inertial reference units, twin Thales or Honeywell FMSes, dual Rockwell Collins multimode radios, dual Rockwell Collins VHF comm, VOR nav, DMEs, Mode S transponders and HF transceivers. It also includes a Rockwell Collins solid-state weather radar, Rockwell Collins ADF, dual Thales radio altimeters, a Thales solid-state LCD integrated standby instrument system, digital standby RMI and distance indicator, Rockwell Collins TCAS II and Honeywell EGPWS, along with a Thales central maintenance monitoring and event logging system. Options include a Thales HUD, a third FMS, satcom and steep approach certification.

hold the gear down, and thus hydraulic pressure is not required except for actuation. Ground lock pins are not required for towing, but gear pins can be installed for maintenance procedures. All three landing gear are fully enclosed in the wheel wells with doors when up and locked. Gravity fall is used for emergency landing gear extension.

Goodrich or Messier-Dowty provide rolling stock and long-life carbon/carbon brakes for the A318 Elite. Three levels of automatic braking are available. The aircraft features an electrically controlled, hydraulically actuated brake-by-wire system, with a conventional pedal cylinder/wheel cylinder powered hydraulic backup system. Differential braking, but not anti-skid, is available when using the backup braking system. The brake packs are designed for 40-minute changes.

Leibherr supplies the electrically controlled, hydraulically actuated steer-by-wire nosewheel steering system. Limited, speed-proportionate steering is available through the rudder pedals, and tillers provide up to 75 degrees of steering authority for maneuvering in tight quarters.

Airbus was the first firm to certify a civil aircraft with fly-by-wire (FBW) primary flight controls. Hydraulic control servos, controlled by electric inputs supplied by three types of computers, actuate the control surfaces. The rudder, though, uses conventional mechanical linkages from the foot pedals to control the hydraulic actuators. The horizontal stabilizer normally is trimmed automatically by the FBW computers, but it can be trimmed manually by means of pitch wheels on the sides of the cockpit center console. The conventional rudder and manually trimmable stab provide "get home" emergency control of the aircraft in the event of a total electrical failure.

Sidestick controllers are used for pitch and roll control inputs to the FBW computers. The sidesticks, in essence, are rate controllers, metering pitch and roll rates. The control law logic is a derivative of C*, an algorithm in which g rate and pitch rate are combined as appropriate to the phase of flight. At very low speeds, such as at rotation, pitch rate is primary in the control law logic. As speed increases, g rate becomes primary.

During normal operations, the sidestick controller functions somewhat like an autopilot's control-wheel-steering (CWS) function. You only need to use the CWS to change pitch or roll attitude. Release the stick and the aircraft remains in the preset pitch and roll attitude, subject to certain limits and feedback functions.

In addition, envelope protection prevents the crew from stalling, over-speeding or over-stressing the aircraft. Envelope protection also assures that maximum aircraft performance is available with full stick deflection during an escape or evasion maneuver.

Bleed air is used for air-conditioning and pressurization, wing and engine anti-ice and engine starting, along with pressurizing the fresh water and hydraulic systems. Twin air-cycle machines (packs) supply chilled air, and hot bleed air is used for heating. Both cold and hot flows are mixed in the cabin to provide individually selectable temperatures in three zones. Pressurization is automatically controlled through twin digital controllers that receive departure field elevation, cruise altitude and landing field elevation from the FMSes. Normal pressurization differential is 8.3 psi and maximum differential is 9.0 psi, providing an 8,000-foot cabin at the aircraft's 41,000-foot maximum cruise altitude. An emergency oxygen bottle is provided for the crew, but details regarding the passenger oxygen system were not available from Airbus.

Anti-ice protection includes bleed air heating of the wing leading edges and engine nacelle lips, along with electrical heating of probes, ports, plates and vent masts. The fuel tank vents are positioned so that ice accumulation is extremely improbable. Windshield wipers are used for rain removal. The empennage leading edges are not heated for ice protection.

Fire protection includes detection and halon extinguishing systems for the engines and APU, plus smoke detectors in the cargo holds, avionics compartment and certain other areas of the passenger cabin.

### Flying the A318

The airplane we flew for this report was A318 MSN 1599, a heavily instrumented flight test aircraft that was used for PW6124A engine certification.

Six of us were aboard the aircraft for the one hour, 40 minute demo flight, including Guy Magrin, senior Airbus flight test pilot who was in the right seat, Stéphane Vaux and Gerard Leskerpit, flight test engineers, at the test consoles and David Voskuhl, Airbus press deputy, on board as an observer. In addition, we alternated left-seat pilot duties in the landing pattern with François Barre, engineering flight test pilot, to practice 5.5-degree steep landing approaches.

MSN 1599 was heavy because of all the


***Envelope protection assures that maximum aircraft performance is available with full stick deflection during an escape or evasion maneuver.***

test equipment on board. Its zero fuel weight with five on board was 95,658 pounds, about 2,400 pounds heavier than a fully equipped A318 Elite and 8,400 pounds heavier than a typical A318 airliner. Loaded with 22,660 pounds of fuel, the ramp weight was 118,321 pounds.

Toulouse-Blagnac Airport has a 499-foot field elevation. The OAT that day was 24°C (75°F) and the barometer setting was 29.64 inches Hg. Based on a takeoff weight of 118,000 pounds and high-lift device "Configuration 2" (slats 22 degrees and flaps 15 degrees), Vaux computed takeoff speeds at 115 KIAS for V1117 KIAS for rotation and 121 KIAS for the V2 takeoff safety speed. We used an assumed OAT of 50°C (122°F) to program the auto-throttle takeoff thrust setting to conserve engine life.

Strap into the left seat of the A318 Elite and you'll immediately find that this is one of the most comfortable cockpits available in any business aircraft. It's also one of the most intuitive and automated, at least after a couple of hops in the simulator or airplane. The checklists are short and the switch, knob and lever protocols seem natural, in spite of the aircraft's highly advanced automation.

We had not flown an Airbus 320 series in four years, so we were somewhat surprised how quickly we began to feel comfortable in the A318. We pushed back from the gate at Airbus' flight test center and started the engines, monitoring the progress on the center-panel twin ECAM screens. During the start sequence, bleed air to the ACM packs automatically is shut off. As soon as the start is completed, the packs both come back on line automatically.

After releasing the parking brakes, we checked braking action and found it to be very smooth, especially impressive because of the aircraft's carbon brakes. Nosewheel steering authority through the rudder pedals is ample for tracking the centerline of the taxiway, so the tiller only is needed for tight maneuvering or turning corners.

Once cleared for takeoff on Runway 14R, we advanced the throttles to stabilize the engines at 50-percent N1 fan rpm and then pushed them up to the second detent in the quadrant. Airbus aircraft don't have back-driven throttles, so the crew must monitor commanded engine thrust on the ECAM and through the seats of their pants.

At rotation, we adjusted nose attitude to match the command bars on the flight director and then just let go of the sidestick controller. Pitch attitude remained constant without the need for readjustments. At 2,000 feet msl (1,500 feet agl), we pulled back the throttles to maximum climb detent, accelerated and retracted the flaps. The FBW control system automatically made elevator adjustments to compensate for the configuration change and trimmed the stabilizer. We only had to set pitch attitude to the desired angle to maintain the appropriate climb speed.

Magrin demonstrated and then talked us through Airbus' standard demonstration of envelope protection features, including bank and pitch angle limits, acceleration limits and low-speed stall protection. The takeaway message is that a novice can extract the same maximum performance from the aircraft as the most experienced test pilot, providing consistent, predictable maneuverability within the aircraft's angle-of-attack, speed and g limits. The FBW system, for example, won't let the aircraft stall and it won't allow the crew to impose vertical loads greater than 2.5 g during escape maneuvers.

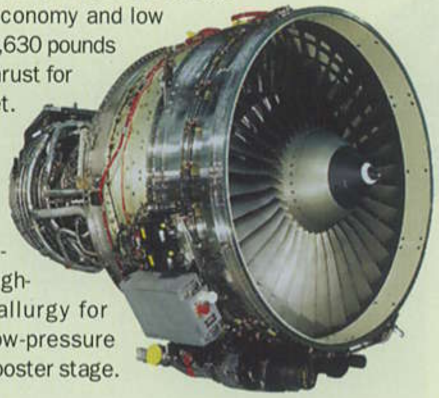
We then returned to Toulouse-Blagnac Airport for a series of normal 3.0-degree and 5.5-degree steep approaches to Runway 14R. In preparation, Vaux computed our VREF landing speed as 121 KIAS, based on a landing weight of 115,000 pounds and high-lift device "Configuration full" (slats 27 degrees and flaps 40 Degrees). Slowing for the approach, we again noted the stability and automatic trimming provided by the FBW system, which minimize pilot workload. We bugged the landing speed at 126 KIAS, VREF + 5, for a margin of safety.

MSN 1599 is equipped with the optional Thales digital head-up display and it's one of the best HUDs we've yet used. The imagery is crisp through the brightness gain range, the contrast is strong and the brightness is fully adjustable. ATC gave us vectors to a visual approach, we dialed in a

## A318 Elite Engines

The Airbus A318 Elite is available with either 23,800-pound-thrust Pratt & Whitney Canada PW6124A or 23,300-pound-thrust CFM56-5B9 turbofans. The CFM56 is the only option on FAA type-certified aircraft and this engine yields better fuel economy than the higher thrust, lighter weight and lower operating cost PW6124A.

The CFM56-5B9, flat-rated to ISA+30°C, is very under-stressed at its 23,300-pound-thrust rating. Swap chips in the FADEC and this engine becomes a 30,000-plus-pound-thrust powerplant for use in larger and heavier Airbus aircraft. It has a 5.9:1 bypass ratio for good fuel economy and low noise signature. The engine can produce 5,630 pounds of thrust for climb and 5,020 pounds of thrust for cruise at ISA, 0.80 Mach and 35,000 feet.



The -5B9 features an advanced 68.3-inch fan, a four-stage axial flow booster and multi-stage axial flow high-pressure compressor borrowed from the highly efficient -5C engine. It also has a low-emissions annular combustor, a single high-pressure turbine with advanced metallurgy for increased durability and a four-stage low-pressure turbine section that powers the fan and booster stage.

desired HUD flight path angle (FPA) of 3.0 degrees and then just flew the aircraft to put the HUD's FPA on the runway touchdown zone markers. The auto-throttles handled the thrust setting chores.

Nearing the runway, the HUD commanded a flare for the touchdown and a computer-generated voice said "Retard." We pulled back the throttles to idle, listened as the radio altimeter voice cues talked us down and nestled in for a 0.7 foot/second touchdown, according to the flight test instrumentation. Notably, the Thales HUD provides easier and more precise guidance cues than what we've observed on some other aircraft.

Magrin reconfigured the aircraft for takeoff and we completed the touch and go, turning right downwind in the visual pattern. On downwind, Magrin took control of the aircraft in preparation for a practice steep approach. MSN 1599 is equipped with a certified FBW steep approach mode, available with either the PW6124A or CFM56-5B9.

London City has an ILS that provides 5.5-degree glideslope guidance. Most other airports with steep approaches have either electronic or visual steep approach guidance aids. The practice steep approach to Runway 14R at Toulouse-Blagnac, in contrast, depends solely on HUD FPA guidance cues. There is no external steep approach guidance system. However, the protocols aboard the aircraft remain the same.

To arm the mode, push the "steep approach" button. Eight knots are added to the VREF landing speed computed by the FMS. Adding the adjustment, we bugged landing speed at 129 KIAS. The steep approach landing configuration requires slats and flaps to be fully extended. At glidepath intercept, the pilot pulls the spoiler lever back fully. But with the steep approach mode armed, that input only partially extends two of five spoiler panels on each wing. The partial spoiler deployment creates just enough drag and loss of lift so that the aircraft can be flown on a 5.5-degree stabilized glidepath. It actually can be flown as steeply as 7.5 degrees because there's a two-degree margin required for 5.5-degree steep approach certification.

At 5.5 degrees and 129 KIAS with seven knots of headwind, the aircraft would be descending at almost 1,200 fpm until the flare for landing. In addition, the AFM required us to disarm the EGPWS to prevent its triggering a "Sink rate! Sink rate!" audio alert during the final portion of the approach.

As Magrin flew the aircraft through 117 feet agl, the steep approach mode alerted us with an aural "Standby!" alert. A second "Standby!" alert was sounded at 90 feet agl. At 63 feet agl, we heard "Flare!" With average reaction times, most pilots flare at 50 to 55 feet. Magrin pulled the thrust levers to idle at the flare command and commenced a smooth round-out.

During the flare, the spoiler panels retract to improve wing lift performance. At touchdown, though, they fully extend for optimum braking performance. Even though Magrin, being strapped in the right seat, didn't have the benefit of the HUD for steep approach guidance, his touchdown was precisely on target and very comfortable for all on board.

The next three steep approaches were ours to fly. We were impressed with how easy the aircraft was to control, especially with the availability of the auto-throttles holding speed precisely at the 128 to 129 KIAS bugged target. We weren't able to fly the desired flight path angle as precisely as Magrin, so our approaches were less than 5.5 degrees. However, using the Thales HUD and listening the to aural "Standby . . . Standby . . . Flare!" cues, all of our round-outs commenced at 52 feet agl and they were smooth, if not as precise as desired.

The last steep approach landing was a maximum effort full-stop maneuver at a landing weight of 110,000 pounds. We used an approach speed of 127 KIAS, including the additional eight-knot buffer for the steep approach configuration. We began the flare at 50 feet, touched down at 1.2 feet/second and chalked up a landing distance of 2,726 feet from the point of flare to the point the aircraft stopped.

The A318 demo flight hardly conformed to the *B&CA* standard profile, but it certainly showed off some of the aircraft's best qualities. All current generation Airbus jetliners share the same FBW design technologies and flight envelope protections. The A318, having one of the lowest wing loadings and best thrust-to-weight ratios among all competitors, offers more sprightly runway performance than even some large-cabin business jets with the same maximum range. Its steep approach certification potentially adds value for some operators who would like to gain access to London City Airport, at least for folks flying non-FAA-registered aircraft. Please note that the FAA has yet to establish a steep approach certification process, so none of the aircraft approved to operate at London City has an "N" number on the side.

### Price and Value

So how does the A318 Elite compare to purpose-built, large-cabin business jets? Airbus and Lufthansa Technik claim the aircraft's $45 million price tag and 4,000-nm range make it competitive in this class. So we've chosen to include the A318 Elite, Gulfstream G350 and G450, Bombardier Global 5000 and Dassault Falcon 900DX in the accompanying Comparison Profile.

However, this is a classic good news/bad news comparison. The good news is that the A318 Elite is a business aircraft based on an airliner. The Comparison Profile illustrates that the A318 excels compared to the composite average in cabin size, maximum payload, available payload with full fuel and the ratio of maximum payload to MTOW, a measure of structural efficiency. The bar graph illustrates that the Elite provides considerably more room for each passenger, so it is indeed a luxurious big ship for transatlantic voyages. The A318 Elite fares well in all of the above areas, in spite of its 25-percent higher price tag.

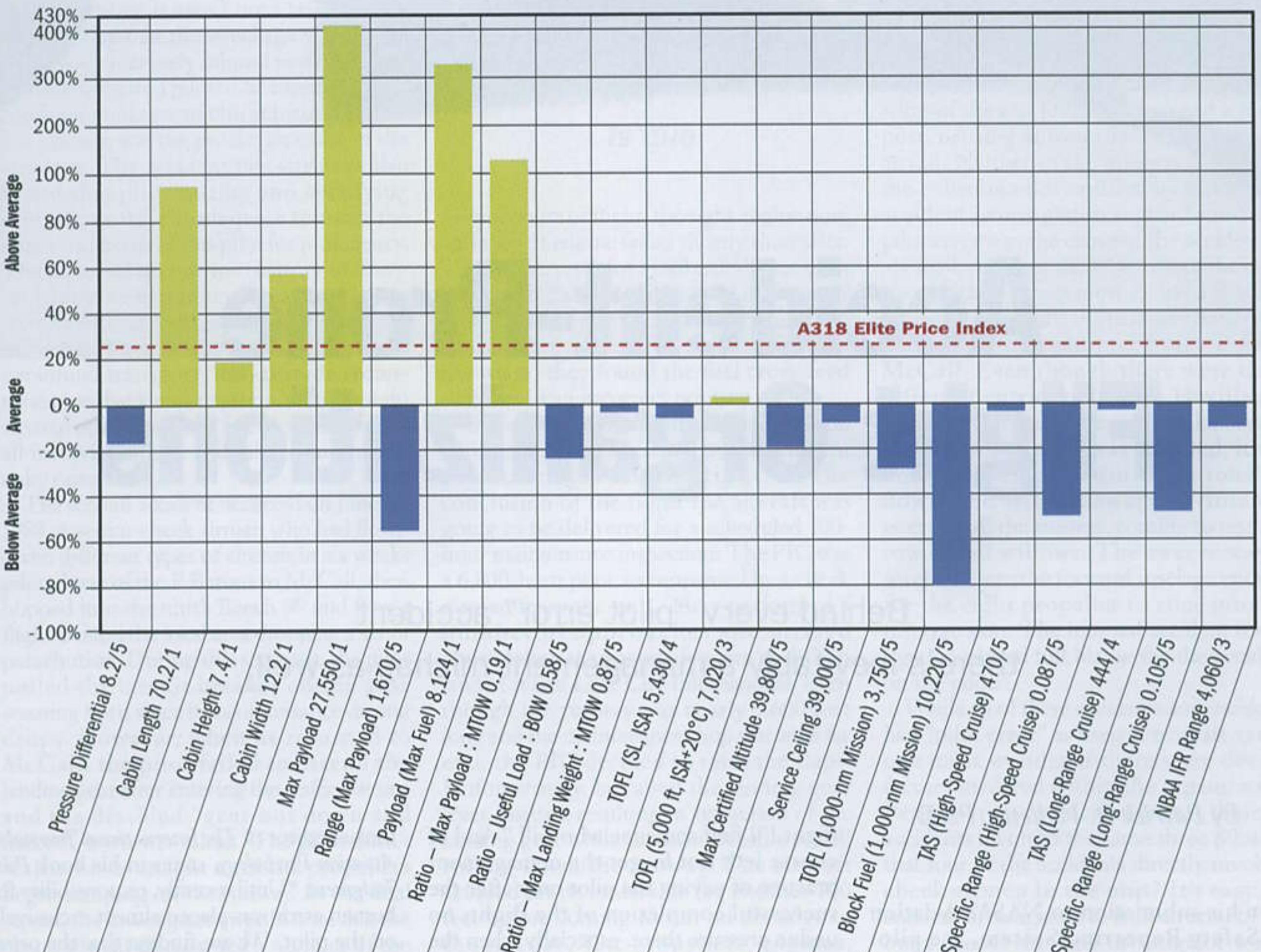
The bad news is that it's an airliner. Fully loaded, the big, beau-monde cruise ship weighs more than 70 tons at takeoff, so it burns nearly twice the fuel as typical large-cabin business aircraft. That's an important consideration when jet fuel is priced at $4.00 to $5.00 per gallon.

In addition, the A318 Elite cruises a little slower and a lot lower than most purpose-built business jets, so after a 4,000-nm trip it will arrive 12 to 15 minutes behind its pure business jet rivals. And it cannot operate out of many smaller general aviation airports that have bans on heavy aircraft, such as Palwaukee and Teterboro.

But the A318 Elite also can carry nearly twice the passengers comfortably between North America and Europe as a typical business jet, so it has appeal for operators who need more passenger seating capacity on longer trips. Its cost-per-seat mile, as a result, may be highly competitive with purpose-built business jets. In addition, the A318 Elite has unfettered access to most popular East Coast U.S. business aircraft airports, such as Westchester County, Stewart and Morristown.

The good news/bad news comparison of the A318 Elite to purpose-built jets boils down to determining how much airplane you need for 3,500- to 4,000-nm trips. If you want an airplane that can coddle, not crowd, 14 to 18 people in its cabin for longer trips, the A318 Elite is an attractive choice. Considering the 30-plus orders already placed for the A318 Elite, it's apparent that many operators believe that stepping up into this ocean-crossing air cruise liner is the best choice for them. **B&CA**

**Comparison Profile**
**(Percent Relative to Average)**




Trade-offs are a reality of aircraft design, although engineers attempt to optimize the blend of capabilities, performance and passenger comfort.

*B&CA* compares the subject aircraft, in this case the Airbus A318 Elite, to the composite characteristics of others in its class, computing the percentage differences for various parameters in order to portray the aircraft's relative strengths and weaknesses. We also include the absolute value of each parameter, along with the relative ranking, for the subject aircraft within the composite group.

This Comparison Profile compares the A318 Elite to four large-cabin aircraft: the Bombardier Global 5000, Dassault Falcon Jet 900DX, and the Gulfstream G350 and G450. The Comparison Profile shows that the A318 Elite's strengths are cabin size, maximum payload and structural efficiency. Being a much larger and heavier aircraft compared to others in its class, it burns more fuel.