

NORTHROP GRUMMAN

Aircraft	A-10A Thunderbolt	B-2 Spirit	E-2C Hawkeye	E-8C JSTARS	EA-6B Prowler	F-5E Tiger	F-14D Tomcat	T-38
Mission	Attack	Bomber	AEW	Ground surveillance	EW	Fighter/attack	Air superiority	Trainer
Powerplant	2 x GE TF-34	4 x GE F118-100	2 x R-R T56	4 x P&W JT3D-3B	2 x P&W J52-408	2 x GE J85-21	2 x GE F110-400	2 x GE J85
Max power (shp)/ thrust dry/wet (lb)	9,065	19,125	5,100	18,000	11,200	3,500	16,110/26,775	2,680/3,850
Wing span (m)	17.53	52.42	24.56	44.42	16.15	8.13	19.54/11.63	7.7
Wing area (m ²)	47.01	477.5	65.03	283	49.1	17.3	52.5	15.79
Length (m)	16.26	21.03	17.6	46.61	18.2	14.68	19.1	14.14
OEW (kg)	9,770	69,715	18,364	77,564	14,589	4,346	18,950	3,254
MTOW (kg)	22,680	170,550	24,689	152,407	29,483	11,192	33,725	5,670
Max load (kg)	7,258	18,145	-	41,657	1,770	3,175	6,577	-
Range (km)	3,950	11,100	2,855	12,086	3,861	1,595	2,965	1,610km
Endurance	-	-	5.3h	11h	-	-	-	-
Hardpoints	11	bay	-	-	5	5	-	-
Cruise (kt)	-	M0.78	259	525	420	-	M0.72	M0.88
M _{mo}	450kt	M0.8	-	M0.84	-	M1.63	M2	M1.23
Ceiling (ft)	-	50,000	37,000	42,000	42,200	52,000	53,000	53,600
Crew	1	2	5	21	4	1	2	2
Internal fuel (kg)	4,855	60,000	5,624	70,307	6,995	2,562 litres	7,348	2,207 litres
Fuel, opt ext (litre)	6,813	-	-	-	7,570	1,040	2,022	-
Air refuel?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No

tronic-attack version, potentially a two-seater, to replace USN/USMC EA-6Bs.

The Lockheed Martin-led team participated in a fly-off against Boeing's X-32. First flight of the CTOL X-35A was on 24 October 2000. The aircraft was later converted to the X-35C CV variant. First flight of the X-35C - fitted with larger wing and tail surfaces to provide carrier suitability - was on 16 December 2000. Hover pit testing of the STOVL X-35B was completed in April 2001, leading to a first flight in June 2001.

The Lockheed Martin JSF resembles a scaled-down, single-engined F/A-22. The STOVL variant's propulsion system has an R-R-developed lift fan shaft-driven by the main engine. The lift fan provides a flow of cold air balanced by an R-R three-bearing vectoring nozzle on the propulsion engine.

After several iterations, the F-35 emerged with an enlarged wing to meet a higher, 9g manoeuvre requirement, redesigned lift-fan nozzle and smaller, lighter air inlets. The diverterless inlets have been redesigned from a two- to a three-sided configuration for improved high angle-of-attack performance.

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F-2

Formerly known as the FS-X, the F-2 is a Mitsubishi-developed derivative of the Lockheed Martin F-16, powered by the GE F110-129. The aircraft first flew in October 1995 and four prototypes were used for flight testing.

The Japan Defence Agency (JDA) declared the F-2 ready for deployment in September 2000, and the first aircraft was delivered for operational service that month. The JASDF requires 83 single-seat F-2As and 47 two-seat F-2Bs.

Development problems included cracks in the wing during static testing, and excessive loads at the base of the fin during high subsonic flight. Flight testing slipped by around a year. Costs rose significantly, with the aircraft costing three to four times as much as a basic F-16. The unit cost for initial production aircraft is estimated at \$100 million.

The F-16 was selected in 1987 as the basis of the FS-X. Changes include a 25% bigger composite wing and a larger radome housing a Mitsubishi-developed active array radar. The F-2A is taking over the F-1's ground attack/maritime strike roles, armed with ASM-1 and ASM-2 anti-ship missiles. Mitsubishi is proposing development of an air-superiority variant to replace JASDF F-4EJ Kais from around 2010. This would require upgrades to the radar and avionics to allow the aircraft to carry more air-to-air missiles.

The two-seat F-2B is intended to replace Mitsubishi T-2/2A trainers. Fuji and Kawasaki, as well as Lockheed Martin, are major airframe subcontractors.

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A-10 Thunderbolt II

Northrop took over responsibility for supporting the former Fairchild A-10 in 1987. In February 2001, Lockheed Martin was awarded an A-10 multiple upgrade programme, potentially worth \$226 million. Savings will accrue from pulling the 367 A-10s out of service for modification only once. It also provides the aircraft with enhanced close air support and precision strike capability a year early.

The aircraft are receiving a digital stores management system, situational awareness datalink and 1760 weapons databus as well as a DC gen-

erator upgrade, JDAM and WCMD integration, and Sniper targeting pod compatibility.

The USAF has requested information on re-engining the A-10. The GE CF34-8, a commercial engine derived from the A-10's TF34, is considered the favourite. It would be derated to 11,000lb-thrust and would replace the 8,000lb-thrust TF34.

B-2 Spirit

The B-2 stealth bomber was declared operational in April 1997 with delivery of the 13th aircraft to the USAF. It was used operationally for the first time during the 1999 Kosovo crisis, when raids were launched from the home base of Whiteman AFB, Missouri. The six B-2s that took part dropped more than 454,000kg of GPS-guided munitions, mostly JDAMs.

Northrop Grumman has provided a range of pricing options to restart production of an updated version of the B-2. Options include 40 more aircraft at \$550 million each - compared with a \$2 billion unit price for the initial 21 - but production resumption is considered unlikely.

Since the final B-2 rolled off the production line in 1998, the focus has been on upgrading the fleet to a common and more capable Block 30 configuration. This was accomplished in early 2001, except for a test aircraft at Edwards AFB, which is to become a Block 30-plus standard aircraft.

Northrop Grumman and Raytheon are developing an active array antenna, which has revived interest in a Block 40 package. Upgrading the APQ-181 with an AESA will improve bombing accuracy and change its Ku-band frequency to avoid interference with commercial signals from 2007. The all-new AESA would be fitted to the current radar. Northrop Grumman is hoping for money in 2005 for other incremental enhancements, which could include updating computer software and processors, adding fibre-optic buses, an