Attack Aircraft

[Argentine Attack Aircraft]
[British Attack Aircraft]
[Chinese Attack Aircraft]
[French Attack Aircraft]
[International Attack Aircraft]
[Israeli Attack Aircraft]
[Italian Attack Aircraft]
[Russian Attack Aircraft]
[US Attack Aircraft]

FMA IA-58 Pucara

Notes: This is an Argentine ground attack aircraft that is robust and easy to fly, and not as fuel thirsty as jet aircraft, nor as expensive or difficult to maintain. While not advanced, it is reliable. The Pucara was first delivered to the Argentine Air Force in 1975; the Argentines used them for home counterinsurgency as well as in the Falklands conflict of 1982. The Sri Lankans bought a number of Pucaras in 1993, and used them for counterinsurgency work. (They were not happy with the Pucaras due to the lack of SAM countermeasures, and replaced them with a combination of Mi-24 helicopter gunships and MiG-27s.)

The crew have ejection seats, but the aircraft is not capable of in-flight refueling. The cockpit has dual controls for the pilot and weapons officer. The undercarriage is tall to aid in loading the aircraft, especially when loading a fuel tank on the centerline and when loading clusters on bombs on the wing hardpoints. The two 20mm autocannons are mounted under the cockpit, while two MAG machineguns are mounted on the sides of the fuselage. The fuselage has two 400-liter fuel tanks, while each wing has a 230-liter fuel tank. The wing fuel tanks are self-sealing, but the fuselage tanks are not, allowing the designers to save a little weight. The fuselage hardpoint may carry 1000 kilograms, while each wing hardpoint may carry 500 kilograms, but the Pucara itself may carry only 1.62 tons of external ordnance. The weapons are aimed with a simple reflex sight. The Pucara is powered by two Turbomeca Astazou XVIG turboprops each with 978 horsepower. Note that while the Pucara can reach and still function up to 10000 meters altitude, operation at that height is iffy, as the Pucara has no oxygen equipment.

Uruguayan Pucaras

The Uruguayans modified their Pucaras with the addition of Litton LTN-211 GPS navigation systems. Minor structural modifications were made to allow their Pucaras to carry Mk 82 Snakeye bombs and a 1000-liter drop tank on the centerline. Other modifications included the installation of an L3 WX-500 Stormscope secure communications package.

IA-58D Pucara Delta

After many starts, stops, and missteps, the Argentines finally upgraded their Pucaras in 2009, producing the IA-58D Pucara Delta. The primary modifications were in the avionics package, and the cockpit avionics are as close as possible to the IA-63 Pampa II aircraft (below) to consolidate and streamline at least a part of Argentine aircraft production. The communications suite was overhauled, with all communications having secure features, and including data-capable radios. IFF was added to help curb mistaken friendly fire, along with a GPS device. A radar warning receiver increased defensive measures, and the front of the cockpit is equipped with a HUD, making aiming much easier. The 20mm autocannons were replaced with more effective 30mm DEFA 554 guns. The engines have also been replaced with PT6A-62 950-horsepower turboprop engines – not as powerful as the IA-58A's engines, but more fuel efficient. The new engines and avionics are simpler to maintain and service or replace as necessary.

The Uruguayans are considering this upgrade for their Pucaras.

IA-58 Pucara Fenix

In 2019, the Argentine Air Force retired the IA-58A Pucara from active counterinsurgency work. Some IA-58A Pucaras were converted into the Pucara Fenix standard, with new four-bladed propellers (the standard Pucara and Pucara Delta have three-bladed propellers) for additional tractive power, a podded Fixview electro-optical/IR sensor turret, and a datalink capability to other such equipped vehicles and units. They are also armed with the DEFA 554 30mm autocannons. The Fenix is meant for the border surveillance and patrol job. The Fenix is still capable of being heavily armed, especially in its gun armament.

Twilight 2000 Notes: This aircraft gained more customers around the world as the Twilight War wore on, before shipping finally stopped. The Pucara Delta and Pucara Fenix are not available in the Twilight 2000 timeline.

Merc 2000 Notes: The Pucara gained acceptance all around the world, as it was far less expensive than aircraft like the A-10. The US even bought about a squadron's worth, supplementing their A-10s in actions which were less heavy in EW, AAA/SAM, and enemy aircraft.

Aircraft	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
IA-58A Pucara	$9,018,350	JP4	1.62 tons	6.8 tons	2	23	None	Enclosed
IA-58A Pucara (Uruguayan)	$10,347,840	JP4	1.62 tons	6.8 tons	2	23	None	Enclosed
IA-58D Pucara Delta	$13,650,920	JP4	1.62 tons	6.6 tons	2	25	None	Enclosed
IA-58 Pucara Fenix	$15,326,820	JP4	1.47 tons	6.95 tons	2	25	2nd Gen Image Intensification (900 m), Thermal Imaging (3 km)	Enclosed

Aircraft	Tr Mov	Com Mov	Mnvr/Acc Agl/Turn	Fuel Cap	Fuel Cons	Ceiling	
IA-58A Pucara	1211	336 (75)	NA 34 8/5 70/35	1260	1308	10000	FF7 CF7 RF6 T5 W4*
IA-58A Pucara (Uruguayan)	1211	336 (75)	NA 34 8/5 70/35	1260	1308	10000	FF7 CF7 RF6 T5 W4*
IA-58D Pucara Delta	1234	342 (72)	NA 34 8/5 70/35	1260	1269	10000	FF7 CF7 RF6 T5 W4*
IA-58 Pucara Fenix	1173	326 (72)	NA 33 8/5 70/35	1260	1269	10000	FF7 CF7 RF6 T5 W4*

Aircraft	Combat Equipment	Minimum Landing/Takeoff Zone	RF	Armament	Ammo
IA-58A Pucara	None	615/745m Primitive Runway	+1	2x20mm HS-404 Autocannons, 4xMAG, 3 Hardpoints	540x20mm, 3600x7.62mm
IA-58A Pucara (Uruguayan)	Secure Radios, GPS	615/745m Primitive Runway	+1	2x20mm HS-404 Autocannons, 4xMAG, 3 Hardpoints	540x20mm, 3600x7.62mm
IA-58D Pucara Delta	Secure Radios, GPS, IFF, RWR, HUD	615/745m Primitive Runway	+2	2x30mm DEFA 554 Autocannons, 4xMAG, 3 Hardpoints	360x30mm, 3600x7.62mm
IA-58 Pucara Fenix	Secure Radios, GPS, IFF, RWR	615/745m Primitive Runway	+1	2x30mm DEFA 554 Autocannons, 4xMAG, 3 Hardpoints	360x30mm, 3600x7.62mm

*The AV of the cockpit is 9.

FMA IA-63 Pampa

Notes: This small aircraft was built to be a trainer during peacetime and a light attack aircraft during wartime. Though it was presented as a contender for the US Joint Primary Training System competition, it lost in that competition to the European Hawk aircraft (which became the T-45 Goshawk), and never saw any other foreign sales. By the 2020, almost all Argentine pilots had received their initial jet training on the Pampa. It is an economical aircraft to operate, but has only rudimentary avionics. First flight of the Pampa was in October 1984. Though influenced by the Dassault/Dornier Alpha Jet design, the Pampa is a smaller aircraft than the Alpha Jet and has numerous design differences, most notably in its unswept wings. Though several times the Pampa almost had export sales, the only user so far has been the Argentine Air Force.

The IA-63 Pampa was deliberately designed to be as easy to use and maintain as possible, and initial cockpit avionics were similar to that of the IA-58A Pucara, with targeting for air-to-ground and air-to-air combat done via a simple reflex sight. The avionics are simple, reflecting its primary role as an advanced trainer, though it does have secondary use as a ground attack aircraft. There are five hardpoints, with the centerline and outboard wing hardpoints able to take 250 kilograms each, and the two inboard wing hardpoints able to take 400 kilograms each. The landing gear is reinforced, and the Pampa can operate from poorly prepared runways, roads, and dirt strips. The IA-63 is powered by a Honeywell TFE731-2 turbofan engine developing 3500 pounds of thrust.

A common ground attack configuration, particularly for the COIN role, has the four wing hardpoints occupied by Colibri 7.62mm machinegun pods. In this role, the Pampa's autocannon and the machineguns may be fired simultaneously or separately.

AT-63 Pampa II

In recognition of the Pampa's increasing COIN and ground support mission, the Pampa II was redesignated the AT-63. The AT-63 took a lot of cues about its avionics from the A-4M version used by the Argentine Air Force, designated the A-4AR. Though some of the more innovative (and heavy) components of the A-4AR were not duplicated in the Pampa II (such as the deception jamming capability and the radar), many useful pieces of avionics were installed in the Pampa II. The brain of the Pampa II is an Elbit MDP/MMRC mission computer, which manages information and the avionics and helps prevent workload overload for the crew. An uprated version of the TFE731 engine replaces the Pampa's engine, this one designated TFE731-2C and developing 4250 pounds of thrust.

IA-63GT Pampa III

The Pampa III is the latest version of the IA-63; the primary difference between the Pampa II and Pampa III are specific upgrades in the avionics. The Pampa III has an all-glass cockpit, with the only analog instrument being the magnetic compass. Backup power systems complement the main systems. Perhaps the greatest upgrade in avionics is the addition of a Helmet/Sight Interface, with much flight and targeting information being projected onto the pilot's modified helmet visor. The engine, a TFE731-40-2N, has 5000

pounds of thrust at the command of its crew.

Unfortunately, the Pampa III has largely been delayed due to the financial razor's edge of the Argentine economy.

Twilight 2000 Notes: A new aircraft in the *Twilight 2000 2/2.2* timeline, the Argentines had only 12 of them in service at the beginning of the Twilight War. None were built after the beginning of hostilities, with production shifting primarily to the Pucara and an Argentine copy of the Israeli Nesher. The Pampa II is exceedingly rare; the Pampa III is unavailable in the Twilight 2000 timeline. However, the Guatemalans had four Pampa IIs, and the Colombians had three, in the Twilight 2000 timeline.

Merc 2000 Notes: The Pampa was the primary jet trainer for the Argentine Air Force, and was also sold across South and to an extent Central America.

Aircraft	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
IA-63 Pampa	$2,435,590	JP4	1.16 tons	7.72 tons	2	19	None	Enclosed
AT-63 Pampa II	$5,892,970	JP4	1.5 tons	8.03 tons	2	21	None	Enclosed
IA-63GT Pampa III	$6,002,040	JP4	1.5 tons	8.28 tons	2	21	None	Enclosed

Aircraft	Tr Mov	Com Mov	Mnvr/Acc Agl/Turn	Fuel Cap	Fuel Cons	Ceiling	
IA-63 Pampa	1190	330 (80)	NA 90 8/5 80/50	1300	1066	12900	FF4 CF4 RF4 T3 W4
AT-63 Pampa II	1380	383 (75)	NA 103 8/5 80/50	1300	1290	12900	FF4 CF4 RF4 T3 W4
IA-63GT Pampa III	1567	435 (75)	NA 117 8/5 80/50	1300	1515	12900	FF4 CF4 RF4 T3 W4

Aircraft	Combat Equipment	Minimum Landing/Takeoff Zone	RF	Armament	Ammo
IA-63 Pampa	RWR, Flare/Chaff Dispensers (12/8), IFF, INS	890/565m Primitive Runway	+1	30mm DEFA 554 Autocannon, 5 Hardpoints	145x30mm
AT-63 Pampa II	Secure Radios, RWR, Flare/Chaff (20/15), ECM 2, IFF, GPS, Laser Designator (6 km), HUD	890/565m Primitive Runway	+2	30mm DEFA 554 Autocannon, 5 Hardpoints	145x30mm
IA-63GT Pampa III	Secure Radios, RWR, Flare/Chaff (20/15), ECM 2, IFF, GPS, Laser Designator (6 km), HUD, Helmet/Sight Interface	890/565m Primitive Runway	+3	30mm DEFA 554 Autocannon, 5 Hardpoints	145x30mm

Blackburn Buccaneer

Notes: This was one the first British jet carrier aircraft, and were designed specifically to oppose the Soviet *Sverdlov* class of light cruisers. The Buccaneer's first flight was in 1958, and it entered service with the Royal Naby in 1962. When the Buccaneer was designed, it was one of the very few strike aircraft able to attack in the clean configuration, due to its internal weapons bay. When Britain went to the smaller carriers with Harriers, the Buccaneers were relegated to land bases, usually as anti-ship planes, and then were eventually phased out. They were also operated by South Africa, usually in the long-range strike role, but were also phased out by that country. The Buccaneer has an internal bomb bay, unusual for an aircraft of its size; this bay can hold 1.81 tons or 2040 liters of fuel. The aircraft has ejection seats and is capable of in-flight refueling. The Buccaneer is capable of nuclear weapons delivery. The Buccaneer's aviators and crews affectionately call the Buccaneer the "Banana Jet" due to the type's developmental name, the BANA (Blackburn Advanced Naval Aircraft).

The Buccaneer is sort of wedge-shaped, with bulbous air intakes and large, round engine fairings. It has a T-tail and medium-length wings. The Buccaneer is designed for a supersonic low-level dash to its target (it is capable of Mach 1.2 at sea level), and a supersonic high flight if necessary. It did not see combat service in the Royal Navy but did with the Royal Air Force during the Gulf War, and had combat service as a strike and interdiction aircraft with the South African Air Force. Blackburn was not able to make weapon bay doors that were stable in the low-level high speed run up to the target that the designers envisioned, so Blackburn came up with a rotating bomb release mechanism which turned around the axis of the weapons bay and exposed the stores in the weapons bay to the slipstream, at which point they could be released, singly or all at once. (The original envisioned weapon to put in the bay was the 900-kilogram Red Beard 20-kiloton nuclear bomb.)

Buccaneer S.1/S.2

The Buccaneer S.1 designation applied to the initial prototypes and a handful of production examples. These were found wanting in their short service due to their underpowered de Havilland Gyron Junior engines, with the pair fitted to the S.1 developing 14,200 pounds thrust, much too low for the weight and requirements of the aircraft. To land on board an aircraft carrier, the Buccaneer was dependent on using blown flaps, and the lack of adequate engine power would make the blown flap system fail as the worst moment, leading to a sudden stall as it was about to set down on the deck. They were replaced quickly by the S.2, but eight S.1s saw continued service as Buccaneer aircrew training aircraft until 1970.

The S.2 differs from the S.1 in being powered by an iteration of the Rolls Royce Spey turbofan, which has 40% more thrust and much less fuel consumption, due to the Spey being a turbofan and not a turbojet like the Gyron Junior.

The Buccaneers That Never Were…

After Hawker Siddeley acquired Blackburn, they put forward some proposed updates and changes to the Buccaneer, largely by incorporating avionics from the cancelled TSR.2. Two ideas were put forward: the upgraded S.2*, and the further-upgraded S.2**. (It is probable that if they had been adopted, they would have been designated the S.3 and possibly S.4.) Changes may be seen in the tables below. Hawker stated that they could supply an aircraft with the same capabilities as the F-111K but at half the cost. In the end, however, neither the TSR.2, F-111K, nor the upgraded Buccaneers were proceeded with.

Twilight 2000 v2.2 Notes: Buccaneers were also used against land targets in the Twilight War, though by that war they were largely replaced by Tornadoes and were operated only in a secondary role or to replace Tornado losses. South Africa also used some of these aircraft in the Twilight War.

Aircraft	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
Buccaneer S.1	$22,619,513	JP8	7.26 tons	28.12 tons	2	19	Radar (90 km), FLIR (12 km)	Shielded
Buccaneer S.2	$24,000,768	JP8	7.26 tons	28.65 tons	2	19	Radar (90 km), FLIR (12 km)	Shielded
Buccaneer S.2*	$29,663,490	JP8	7.26 tons	28.8 tons	2	19	Radar (120 km), FLIR (12 km)	Shielded
Buccaneer S.2**	$36,777,979	JP8	7.26 tons	28.9 tons	2	19	Radar (120 km), FLIR (12 km)	Shielded

Aircraft	Tr Mov	Com Mov	Mnvr/Acc Agl/Turn	Fuel Cap	Fuel Cons	Ceiling	
Buccaneer S.1	1322	367 (140)	NA 99 7/4 70/40	9240	4323	13715	FF5 CF6 RF5 T4 W4
Buccaneer S.2	1805	501 (140)	NA 135 7/4 70/40	9240	3026	13715	FF5 CF6 RF5 T4 W4

Buccaneer S.2*	1795	499 (140)	NA 135 7/4 70/40	9240	3026	13715	FF5 CF6 RF5 T4 W4
Buccaneer S.2**	1789	497 (140)	NA 134 7/4 70/40	9240	3026	13715	FF5 CF6 RF5 T4 W4

Aircraft	Combat Equipment	Minimum Landing/Takeoff Zone	RF	Armament	Ammo
Buccaneer S.1	IFF, Secure Radios, RWR, Stealth 1	1800/1600 Hardened Runway	+3	Internal Weapon Bay (1.81 tons), 4 hardpoints	None
Buccaneer S.2	IFF, Secure Radios, RWR, Stealth 1	1800/1600 Hardened Runway	+3	Internal Weapon Bay (1.81 tons), 4 hardpoints	None
Buccaneer S.2*	IFF, Secure Radios, RWR, ECM 1, Stealth 1, HUD, Flare/Chaff (30/20)	1800/1600 Hardened Runway	+3	Internal Weapon Bay (1.81 tons), 4 hardpoints	None
Buccaneer S.2**	IFF, Secure Radios, RWR, ECM 1, IRCM 1, Flare/Chaff (30/20), EW Suite, Stealth 1, HUD Interface	1800/1600 Hardened Runway	+4	Internal Weapon Bay (1.81 tons), 4 hardpoints	None

Hawker Hunter

Notes: This jet is a mid-1960s relic that is still in wide use by Lebanon, though recently they have been looking at ex-US F-16Cs and Ds to replace them. Its low-power engine does not lend itself to speed, maneuverability, or lifting power, and its lack of an afterburner does not give it good acceleration. However, it is a decent ground attack aircraft, and its four 30mm autocannons pack quite a punch. The Hunter formed part of the air forces of 21 nations at one time, though as stated only Lebanon still flew them as late as 2014. Two seat advanced trainers remained in RAF service until the 1990s. The Hunter has seen combat service in conflicts ranging from the Suez Crisis of 1956 to assorted tangles in the Mideast as late as the 1990s. The Hunter has an ejection seat, but is not capable of inflight refueling.

Though the aircraft has a lot of hardpoints, eight of these may only be used for rocket pods or single rockets, with a load limit of 100 kg per hardpoint; if these hardpoints are used, the two center wing hardpoints may not be used. If the two center hardpoints are used, the eight rocket hardpoints may not be used. The other two fuselage and two wing hardpoints may be used normally. The Hunter has the rare ability to fire only half its cannons at a time, if desired, usually done to save ammunition when attacking soft targets or to load different guns with different types of ammunition. The initial P.1067 prototype was powered by a Rolls Royce Avon 103 turbojet developing 6500 pounds thrust; the second prototype was powered by an Avon 107 developing 7550 pounds thrust, and the third prototype was powered by an Armstrong Siddeley Sapphire 101 developing 8000 pounds of thrust. The first two engines tended to flameout if gun exhaust got into the air intakes in some situations; the Sapphire engine does not have this problem, but the Sapphire tended to wear fast and needed a lot of work to forestall engine failures in flight. Production F.1s use the Avon 107 engine, along with the F.4, while the F.2 and F.5 use the Sapphire engine. F.4s and F.5s had more and larger fuel tanks, including four flexible bag-type tanks for the wings. The F.4s and F.5s also have diverted gun exhaust to solve the engine flameout problems, and features a collection mechanism and space for the cannon armament links instead of the links being ejected overboard and striking the aircraft's underside. (The links were collected to blisters under the cockpit, leading for the aircraft to be called "Sabrinas" by the crews, after a contemporary movie star.) F.1s and F.2s suffered from short legs, able to remain in flight for less than an hour, severely restricting their use. F4s and F5s have much larger fuel tankage but are still restricted in flight duration.

The F.6 was powered by an Avon 207 turbojet with an axial compressor, wringing more thrust out a small engine, to produce 10,145 pounds thrust. The F.6 could haul more ordnance and fly faster and climb faster, and some late versions were modified to carry AIM-9 Sidewinder air-to-air missiles on the outboard wing hardpoints. The F.6 has leading edge dog-tooth extensions halfway down the wing, giving the aircraft better low-speed flight characteristics. When the BAe Lightning took over the interceptor role from the F.6, the F.6 was modified into the FGA.9 dedicated ground support aircraft, with a gunsight designed for ground attack and the addition of an IFF to help prevent fratricide, and avionics to increase pilot stick authority during ground attack maneuvers. The wings are also strengthened.

The T.7 and T.8 are the trainer versions of the F.4 and F.5, respectively. These versions are heavier than their base aircraft, and the pilot and student sit side by side in a widened fuselage. The T.8 was used primarily as Blackburn Buccaneer conversion trainers, and were often equipped with pared-down versions of Buccaneer systems; the T.8B has the cannons and gun ranging-radar removed and replaced with TACAN and IFIS as well as a lesser variant of the Buccaneer's avionics suite. The T.8 and T.8B are equipped with arresting hooks.

Twilight 2000 Notes: The Hunter's primary playground during the Twilight War was the Middle East; they were taken out of storage by several Middle Eastern countries during that war to replace aircraft losses.

Merc 2000: Another non-descript aircraft used by mercs.

Aircraft	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
Hunter F.1	$6,014,811	JP8	2.54 tons	11.16 tons	1	17	None	Enclosed

Hunter F.2	$6,066,264	JP8	2.54 tons	11.31 tons	1	17	None	Enclosed
Hunter F.4	$6,015,611	JP8	2.54 tons	11.61 tons	1	17	None	Enclosed
Hunter F.5	$6,067,064	JP8	2.54 tons	11.81 tons	1	17	None	Enclosed
Hunter F.6	$6,591,053	JP8	3.4 tons	12.18 tons	1	17	None	Enclosed
Hunter FGA.9	$6,594,827	JP8	3.4 tons	12.18 tons	1	17	None	Enclosed
Hunter T.7	$6,015,154	JP8	2.54 tons	12.01 tons	2	17	None	Enclosed
Hunter T.8	$6,066,607	JP8	2.54 tons	12.16 tons	2	17	None	Enclosed
Hunter T.8B	$5,236,821	JP8	2.54 tons	12.35 tons	2	18	Radar (40 km)	Enclosed

Aircraft	Tr Mov	Com Mov	Mnvr/Acc Agl/Turn	Fuel Cap	Fuel Cons	Ceiling	
Hunter F.1	1760	489 (140)	NA 132 7/4 70/40	1200	2299	15000	FF5 CF4 RF4 T4 W4
Hunter F.2	1838	510 (140)	NA 138 7/4 70/40	1200	2434	15000	FF5 CF4 RF4 T4 W4
Hunter F.4	1693	470 (140)	NA 127 7/4 70/40	1800	2299	15000	FF5 CF4 RF4 T4 W4
Hunter F.5	1761	489 (140)	NA 132 7/4 70/40	1800	2434	15000	FF5 CF4 RF4 T4 W4
Hunter F.6	1962	600 (135)	NA 162 7/4 70/40	1740	3091	15000	FF5 CF4 RF4 T4 W4
Hunter FGA.9	1962	600 (120)	NA 162 7/4 70/40	1740	3091	15000	FF5 CF4 RF4 T4 W4
Hunter T.7	1638	455 (140)	NA 123 7/4 70/40	1800	2299	15000	FF5 CF4 RF4 T4 W4
Hunter T.8	1711	475 (140)	NA 128 7/4 70/40	1800	2434	15000	FF5 CF4 RF4 T4 W4
Hunter T.8B	1685	468 (140)	NA 126 7/4 70/40	1800	2434	15000	FF5 CF4 RF4 T4 W4

Aircraft	Combat Equipment	Minimum Landing/Takeoff Zone	RF	Armament	Ammo
Hunter F.1	None	1200/800m Hardened Runway	+2	4x30mm Aden Autocannons, 14 Hardpoints*	600x30mm
Hunter F.2	None	1200/800m Hardened Runway	+2	4x30mm Aden Autocannons, 14 Hardpoints*	600x30mm
Hunter F.4	None	1200/800m Hardened Runway	+2	4x30mm Aden Autocannons, 14 Hardpoints*	600x30mm
Hunter F.5	None	1200/800m Hardened Runway	+2	4x30mm Aden Autocannons, 14 Hardpoints*	600x30mm

Hunter F.6	None	1200/700m Hardened Runway	+3	4x30mm Aden Autocannons, 14 Hardpoints*	600x30mm
Hunter FGA.9	IFF, Secure Radios	1200/700m Hardened Runway	+3	4x30mm Aden Autocannons, 14 Hardpoints*	600x30mm
Hunter T.7	None	1200/800m Hardened Runway	+2	4x30mm Aden Autocannons, 14 Hardpoints*	600x30mm
Hunter T.8	None	1200/800m Hardened Runway	+2	4x30mm Aden Autocannons, 14 Hardpoints*	600x30mm
Hunter T.8B	IFF, Secure Radios, RWR	1200/800m Hardened Runway	+2	14 Hardpoints*	None

*See Notes Above

BAC Strikemaster

Notes: This light strike aircraft was developed from a jet trainer known as the Jet Provost. It is an unsophisticated aircraft for basic ground support missions, and is easy to maintain and inexpensive to operate. The aircraft has ejection seats, but is not capable of in-flight refueling. The Strikemaster is advertised as a light attack aircraft, but most customers who bought the Strikemaster actually employed it as an advanced trainer that could also train aircrews on ground attack missions. The Strikemaster did see combat service in the air forces of Ecuador, Oman, and Yemen (though the status of Yemen's Strikemasters is unknown at this time). The Strikemaster is or was flown by several African nations as well as Saudi Arabia, Kuwait, and New Zealand; a total of ten countries flew or still fly the Strikemaster. Several Strikemasters were sold off to civilian concerns, and some of these are still flying. The Strikemaster is still in service in 2025, though sourcing spare parts is getting difficult since BAC does not make them anymore.

The Strikemaster is powered by a single uprated Armstrong Siddeley Viper turbojet developing 3140 pounds of thrust. The wings are straight and the fuselage wide, with wider section for the cockpit. The pilot and weapons officer sit side by side. The wings each have two hardpoints; there are no fuselage hardpoints. In addition, each wingtip carries conformal fuel tanks with a capacity of 284 liters each. In the nose of the Strikemaster are a pair of machineguns; these are similar to the coaxial armament of some of the world's tanks and AFVs, being modified MAG-58 machineguns. (The nose cone houses a G90 gun camera.)

Twilight 2000 Notes: Generally used as a Sandy by NATO air forces, they were also adapted to operate from carriers, and often found themselves operating from US carriers. Many of their roles were taken over by Jaguar strike aircraft.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
$1,436,300	JP8	1.4 tons	5.22 tons	2	13	None	Enclosed

Tr Mov	Com Mov	Mnvr/Acc Agl/Turn	Fuel Cap	Fuel Cons	Ceiling	Armor
1425	324 (95)	NA 87 9/6 90/60	1660	929	12200	FF4 CF3 RF3 T3 W3

Combat Equipment	Minimum Landing/Takeoff Zone	RF	Armament	Ammo
Secure Radios	400/500m Primitive Runway	+1	2xMAG, 4 Hardpoints	1100x7.62mm

Xi'an JH-7A Flying Leopard

Notes: This aircraft was at first rejected by the Chinese military in favor of the Su-27, but as the design improved from the initial JH-7 to its JH-7A standard, they were taken on in strength. Its low-thrust engines do not lend themselves to speed or lifting capability, and weapons load is small for an aircraft of its size. In addition, the JH-7A's design allows only poor agility. However, 110-120 examples of the JH-7A remain in service with both the PLANAF and PLAAF as of 2025. The JH-7A has ejection seats for its crew but is not capable of in-flight refueling.

The JH-7A has a total of nine hardpoints, three under each wing, one under the fuselage, and two on the wingtips (which may only be used for light air-to-air missiles). Under the port side of the nose is the GSh-23L (or its Chinese equivalent) 23mm autocannon, which is matched by a decent ammunition load. The JH-7A's cockpit has multifunction displays in a glass cockpit layout, with just a few analog instruments; the crew may choose to have the MFDs show color or black and white, which is better for night operations. The JH-7A is capable of ground-hugging supersonic flights with its TFR, potentially making ingress into a target area easier. The JL-10A radar set is a digital pulse doppler radar that is designed for engaging ground targets, though it is also capable of tracking and engaging air targets as well. It can track 15 targets and engage six of them, and has modes for tracking air targets, ground targets, and radar-emitting targets for engagement with antiradiation missiles.

The engines of the JH-7A are a pair of Xian WS-9 Qinling turbofans, which are license-produced copies of the Rolls-Royce Spey Mk 202. They produce 12,200 pounds of thrust in military power, and 20,520 pounds thrust in afterburner. The swept wings have a dogtooth leading edged extension to the outboard of their spans, which allows better control authority at low speeds, as well as curbing stall speed to an extent.

JH-7B

The Chinese are currently working on a comprehensive upgrade to the JH-8A, designated the JH-7B. The upgrade centers around the upgraded avionics, including the tying together of the electronic warfare functions into an integrated EW Suite, which coordinates the ECM, IRCM, and flares and chaff to make them more effective and automatically operate. A related part of this upgrade is the reduction of RCS, particularly from the frontal aspect, by use of composites and reshaping of the nose, air intake inlets, and wing leading edges. (The effect is minimal and present enemy radar installations with a -2 penalty.) The JH-7B is capable of aerial refueling, something its older brother cannot do. The JH-7B is powered by WS-9A engines which have 15% more thrust than the WS-9. The JH-7B was supposed to enter production in 2015, but production timelines have slipped, and the JH-7B is still not in serial production.

Twilight 2000 Notes: With the escalation of hostilities between China and Russia, the supply of Su-27s to China was abruptly cut off. The JH-7A was thus put into high production. The JH-7B does not exist in the Twilight 2000 timeline.

	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
JH-7A	$87,266,683	Chinese Equivalent of JP5	9 tons	28.48 tons	2	32	Radar (104 km)	Shielded
JH-7B	$59,853,092	Chinese Equivalent of JP5	9.3 tons	28.56 tons	2	32	Radar (104 km)	Shielded

	Tr Mov	Com Mov	Mnvr/Acc Agl/Turn	Fuel Cap	Fuel Cons	Ceiling	
JH-7A	2224	618 (110)	NA 167 6/2 60/20	6580	4958	16000	FF5 CF6 RF4 T4 W5*
JH-7B	2530	703 (110)	NA 190 6/2 60/20	6580	5666	16000	FF5 CF6 RF4 T4 W5*

	Combat Equipment	Minimum Landing/Takeoff Zone	RF	Armament	Ammo
JH-7A	All-Weather Flight, IFF, RWR, HUD, IR Uncage, Look-Down Radar, Multitarget (2), Track While Scan, Target ID, TFR, Auto Track, SAR, Laser Designator (20 km), Helmet/Sight Interface, ECM 2, IRCM 1, Flare/Chaff (30/20), GPS	1100/1050m Hardened Runway	+3	23mm GSh-23L autocannon, 9 hardpoints	300x23mm
JH-7B	All-Weather Flight, IFF, RWR, HUD, IR Uncage, Look-Down Radar, Multitarget (6), Track While	1100/1050m Hardened Runway	+4	23mm GSh-23L autocannon, 9	300x23mm

	Scan, Target ID, TFR, Auto Track, SAR, Laser Designator (30 km), Helmet/Sight Interface, ECM 2, ECCM 2, IRCM 1, Flare/Chaff (45/30), EW Suite, GPS	hardpoints

*The cockpit is protected by light armor plates and has an AV of 7.

Shenyang J-16 Red Eagle

Notes: The J-16 began as a license-built Su-30MKK (called J-11A in China), imported from Russia. However, the original aircraft diverged significantly from the Su-30MKK, and earned the right to be considered its own aircraft. It was modified/designed to partially replace the JH-7, and had almost totally replaced it in the PLAAF by 2018. The airframe and most of the working parts are those of the Su-30MKK, but the avionics, engines, and flight computers are all of Chinese make and tailored for its mission as a strikefighter. The J-16 is similar in role and capabilities to the US F/A-18E/F.

The attack suite is formed around a new AESA radar which also has ground attack and look-down shoot-down capabilities. Most Chinese AAMs can be carried, even to the exclusion of other ordnance if necessary. Thus, the J-16 can also function as an interceptor or an escort fighter, though its primary role is that of a strike aircraft with some air-to-air capability. The J-16 also has an updated version of the VADS system called EOTS (Electro-Optical Targeting System), which greatly enhances the BVR engagement range and allows the J-16 to fire against ground targets and air-to air targets, depending upon the ordnance used, before the aircraft is within the engagement range of most SAMs and AAA. If all that fails, the J-16 has IRST capability. Perhaps one of the most easily seen differences is the two-seat tandem cockpit, with a pilot and a WSO in the rear. The J-16 is capable of carrying almost all Chinese air-to-ground and air-to-air munitions. The J-16 is also often seen carrying ECM and IRCM jamming pods, and pods with extra flares and chaff. This is in addition to the J-16's own internal jammers. In the starboard wing is a GSh-30-1 30mm autocannon.

The J-16 makes use of many panels of RAM and carbon fiber construction, giving it a smaller RCS. The engines are a pair of WS-10A turbofans with afterburning; though these are based on the original engines that came with the Su-30MKK, which are themselves are close copies of the American F101.They develop 22000 pounds of thrust dry, or 33000 pounds each in afterburner. The cockpit sits in a titanium "bathtub" similar to that of the Russian SU-25, though not as strong as the A-10's cockpit armor.

Though originally designed as a land-based aircraft, the PLAN has also taken delivery of J-16s, to give its aircraft carriers a significant strike capability. This is opposite from the normal deployment routine – normally, the PLAN gets first pick of new aircraft and air-launched weapons.

J-16D

The D variant of the J-16 is also known as the Red Eagle (or its Chinese translation of that); however, instead of being a strike aircraft, it is an electronic warfare aircraft, carrying a combination of ECM/ECCM/IRCM/Radio Jamming pods and ARMs. It is similar in concept and function, though reportedly not in capability, to the US Navy's EA-18G Growler, with the wing hardpoints carrying two or four EW pods, the wingtips carrying light ARMs, EW pods, sensors, designators, or even chaff and flare pods, and two or four of the hardpoints carrying two heavy or four light ARMs. The centerline hardpoint is wet and normally carries an extra fuel tank, though it too can carry a jamming pod or clusters of heavy or light ARMs. The J-16D is also capable of employing heat-seeking missiles or other non-ARM munitions; it does have a laser designator and can launch GPS-guided munitions, in pursuit of its SEAD mission. Though early reports place it as being not quite as effective in the EW field as the Growler, it is probably very close in capability, as the Chinese are known to have a strong electronics-manufacturing and testing capability, and though they can't seem to produce a jet engine worth a damn, their avionics almost equal European designs and even rival those of the Americans.

One thing the J-16D is not meant to do is get in short-range knife fights; in fact, the J-16D has no internal cannon (the gun being replaced with avionics) and has no IRST (having replaced with a more powerful AESA radar setup). In fact, the entire radome is reshaped to accommodate this more powerful radar. The surface of the aircraft is festooned with a plethora of conformal radar receivers, radio antennas, radar detectors and analyzers (to determine the exact frequency of incoming radar emissions to more precisely jam radar, IR tracks, and radios), making them easier to jam, MIJI, spoof, or otherwise make them less effective or completely ineffective.

They say that every plus has an equal minus, and the J-16D's minus is air-to-air combat. Supposedly, a fully loaded J-16D maneuvers like a pig, and if you are in a fighter or even many attack aircraft, and you catch up with a J-16D, it is a sitting duck in most cases.

Twilight 2000 Notes: Despite the early embargo the Russians put on technology transfer with the Chinese, espionage and reverse engineering really paid off in this case.

	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
J-16	$137,482,030	Chinese Equivalent of JP5	12.98 tons	35 tons	2	51	AESA Radar (320 km), EOTS (100 km), IRST (60 km)	Shielded
J-16D	$381,650,387	Chinese	12.98	35 tons	2	58	AESA Radar	Shielded

			Equivalent of JP5	tons		(500 km), EOTS (150 km), SAR (50 km)	

	Tr Mov	Com Mov	Mnvr/Acc Agl/Turn	Fuel Cap	Fuel Cons	Ceiling	
J-16	2854	718 (195)	NA 72 4/2 40/20	4341	3447	17300	FF6 CF6 RF5 T4 W5*
J-16D	2854	718 (215)	NA 55 6/4 60/40	4341	3447	17300	FF6 CF6 RF5 T4 W5*

	Combat Equipment	Minimum Landing/Takeoff Zone	RF	Armament	Ammo
J-16	All-Weather Flight, IFF, Radar Warning Receiver, HUD, IR Uncage, Look-Down Radar, Multitarget (5), Track While Scan, Target ID, Terrain-Following Radar, Auto Track, Laser Designator, Stealth 2, ECM 2, IRCM 2, Flares/Chaff (30 each), GPS, Satcom Radio, Secure Radios	900/850m Hardened Runway	+4	GSh-30-1 30mm Autocannon, 9 Hardpoints (3 Wet, 2 Wingtip)	300x20mm
J-16D	All-Weather Flight, IFF, Radar Warning Receiver, HUD, Look-Down Radar, Track While Scan, Target ID, Terrain-Following Radar, Auto Track, Laser Designator (2) Stealth 2, ECM 4, ECCM 4, IRCM 3, Flares/Chaff (50 each), GPS, Deception Jamming, Active Jamming, ELINT Suite, EW Suite, Laser Spot Tracker, Satcom Radio, Secure Radios	900/850m Hardened Runway	+4	9 Hardpoints (3 Wet, 2 Wingtip)	Nil

*The cockpit and canopy have light extra armor and is AV7.

Dassault Mirage 5/50

Notes: This is the ground attack variant of the Mirage III. The Mirage 5 can carry a heavier weapon load, and has two extra hardpoints on the rear fuselage for bombs. The Mirage 5 has no air-to-air radar in its base variant; the Israelis, for which the design was made, said that the weather over the Mideast was usually clear and sunny, and an air intercept radar would not be necessary in an attack aircraft. They are used by Abu Dhabi, Argentina, Columbia, Egypt, Gabon, Libya, Pakistan, Peru, Zaire, Chile, and Venezuela. They were never used by France, but Israel received a number of them, which they developed into the Nesher and the Kfir. (The Israelis were embargoed due Mideast tensions; unofficially, the Israelis got their 50 Mirage 5s packed in crates labeled as other merchandise; officially, they received the blueprints for the Mirage 5 and with some improvements, built the IAI Nesher.) The Mirage 5 is powered by a SNECMA Atar 9K-9C turbojet, with 9442 pounds thrust, or 13241 pounds thrust in afterburner.

Belgian Variants (Not actually flown by Belgium…)

The Belgians flew Mirage 5s for some time, long enough for them to consider an upgrade. This upgrade program was called MIRSIP, and after doing all that work on an upgraded Mirage 5, the Belgian government cancelled the upgrade program, and though SABCA (the Belgian aircraft plant) was allowed to complete the initial upgrades, the Belgian government would not allow the Belgian Air Force to receive them. Instead, the 20 MIRSIP Mirage 5s, along with five non-upgraded Mirage 5s, were sold to Chile. The MIRSIP Mirage 5s were modified to mount canards on the upper air intakes to improve takeoff, landing, and low-speed performance. Other upgrades included a more modern cockpit, a new ejection seat, and a laser rangefinder. The Chileans designated the MIRSIP Mirage 5s Mirage 5MA Elkans.

The Argentine Air Force flew the slightly upgraded Mirage 5P Mara, equipped with a new ejection seat, a more modern cockpit, and a laser rangefinder; it is identical to the Mirage 5MA Elkan for game purposes.

Standard Belgian Mirage 5s were designated Mirage 5BAs. They were filled mostly with US-designed and built avionics, but are otherwise the same as standard Mirage 5s for game purposes (except for parts hunters and scroungers).

Columbian Mirage 5s

A two-seat Mirage 5 is designated the Mirage 5D. Columbian Mirage 5CODs have updated electronics in both their navigation and attack suites, and have canards for enhanced maneuverability and low-speed handling.

Egyptian Mirage 5s

The base Egyptian Mirage 5 is radar-equipped and is equivalent to the Mirage IIIE, found in French Fighters (and designated the Mirage 5SDE). The Mirage 5E2 is a standard Mirage 5, without radar, but with the navigation and attack suite found in the Alpha Jet MS2.

Peruvian Mirage 5s

The Mirage 5P3 is a version built for Peru, with all the improvements of the Mirage 5P Mara/Mirage 5MA Elkan, and also an inertial navigation system, a radio altimeter and an IFF. The Mirage 5P4, also built for Peru, builds on the Mirage 5P3, and adds a heads-up display, HOTAS controls, and an in-flight refueling probe. The Mirage 5DP3 two-seat version has the same improvements as on the Mirage 5P3. The Mirage DP4 has all the improvements of the Mirage 5P4, except for the refueling probe.

Pakistani Mirage 5s

The Mirage 5PA was originally a standard Mirage 5, but was later modernized with a HUD and INS. The Mirage 5PA2s were new build aircraft, and modernized with the same ingredients as the Mirage 5PA, as well as an Agave radar set in the nose. The Mirage 5PA3 is the same as the Mirage 5PA2, but also has software and special hardpoints able to carry the Exocet antishipping missile. Other Pakistani Mirage 5s were modernized under Project ROSE, which done under a consortium with Australia and Italy. This gave the Mirage 5 ROSE aircraft a short-range radar, primarily used to find and designate ground targets, though it has air-to-air value as well. Two extra hardpoints are mounted under the forward fuselage. The Pakistanis gathered together a number of second-hand Mirage IIIEs and Mirage 5s; however, Project ROSE was terminated due to the poor shape most of the second-hand Mirages were in. (Ex-Australian and ex-Belgian Mirage 5s were generally in good condition, while those bought from Lebanon, Libya and Spain had seen hard times and poor maintenance.)

Mirage 50

The Mirage 50 is a Mirage 5 with a more powerful engine and a radar set, as well as more sophisticated ground attack avionics and air-to-air radar. It can carry heavier loads and radar-homing missiles. The engine of the Mirage 50 is a more powerful Atar 9K-50 turbojet, with 11055 pounds thrust, or 15872 pounds in afterburner. Many Mirage 50s are upgraded Mirage 5s.

Chilean Mirage 50s

Chilean Mirage 50s incorporate some of the improvements of the Israeli Kfir series of fighters, and have a Kfir's nose as well as a Kfir's canards and nose strakes. These variants are known as ENAER Panteras. They also have modernized avionics.

Venezuelan Mirage 50s

The Mirage 50EV is fitted with Kfir-like canards, a longer-range Cyrano IVM3 radar, an INS, and a HUD tuned to air-to-air and air-to-ground combat (the option is switchable, much like the F/A-18). The Mirage 50EV is equipped with an in-flight refueling probe. The Mirage 50DV is a two-seat trainer/attack version, with more compact, shorter-range radar, and a nonfunctional fuel probe (the probe can connect for training purposes, but no fuel transfer is possible), but otherwise has the same avionics as the Mirage 50EV.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
Mirage 5	$7,587,949	JP5	4.2 tons	13.7 tons	1	19	None	Enclosed
Mirage 5D	$7,588,292	JP5	4.2 tons	13.9 tons	2	19	None	Enclosed
Mirage 5MA Elkan	$7,587,999	JP5	4.2 tons	13.75 tons	1	19	None	Enclosed
Mirage 5COD	$7,588,342	JP5	4.2 tons	13.95 tons	2	19	None	Enclosed
Mirage 5E2	$7,797,179	JP5	4.2 tons	13.74 tons	1	20	None	Enclosed
Mirage 5P3	$9,306,379	JP5	4.2 tons	13.79 tons	1	20	None	Enclosed
Mirage 5P4	$9,443,597	JP5	4.2 tons	13.8 tons	1	20	None	Enclosed
Mirage 5DP3	$9,309,809	JP5	4.2 tons	13.99 tons	2	20	None	Enclosed
Mirage 5DP4	$9,447,940	JP5	4.2 tons	14 tons	2	20	None	Enclosed
Mirage 5PA (Modernized)	$8,068,149	JP5	4.2 tons	13.71 tons	1	20	None	Enclosed
Mirage 5PA2/PA3	$9,762,569	JP5	4.2 tons	13.81 tons	1	21	Radar (74 km)	Enclosed
Mirage 5PA ROSE	$11,276,434	JP5	4.2 tons	13.9 tons	1	22	Radar (75 km), FLIR (20 km)	Enclosed
Mirage 50	$10,530,203	JP5	4.88 tons	14.7 tons	1	22	Radar (75km)	Enclosed
ENAER Pantera	$10,739,605	JP5	4.88 tons	14.71 tons	1	22	Radar (75km)	Enclosed
Mirage 50EV	$11,422,003	JP5	4.88 tons	14.74 tons	1	23	Radar (100km)	Enclosed
Mirage 50DV	$10,856,053	JP5	4.88 tons	14.81 tons	2	23	Radar (74 km)	Enclosed

Vehicle	Tr Mov	Com Mov	Mnvr/Acc Agl/Turn	Fuel Cap	Fuel Cons	Ceiling	Armor
Mirage 5	1793	498 (160)	NA 134 6/3 60/30	3900	2876	13500	FF5 CF4 RF4 T3 W5
Mirage 5D	1768	491 (160)	NA 133 6/3 60/30	3700	2876	13500	FF5 CF4 RF4 T3 W5
Mirage 5MA Elkan	1787	496 (140)	NA 134 7/4 70/40	3900	2876	13500	FF5 CF4 RF4 T3 W5
Mirage 5COD	1762	489 (140)	NA 132 7/4 70/40	3700	2876	13500	FF5 CF4 RF4 T3 W5
Mirage 5E2	1788	497 (160)	NA 134 6/3 60/30	3900	2876	13500	FF5 CF4 RF4 T3 W5

Mirage 5P3	1782	495 (140)	NA	134	7/4	70/40	3900	2876	13500	FF5 CF4 RF4 T3 W5
Mirage 5P4	1781	495 (140)	NA	134	7/4	70/40	3900	2876	13500	FF5 CF4 RF4 T3 W5
Mirage 5DP3	1757	488 (140)	NA	132	7/4	70/40	3700	2876	13500	FF5 CF4 RF4 T3 W5
Mirage 5DP4	1756	488 (140)	NA	132	7/4	70/40	3700	2876	13500	FF5 CF4 RF4 T3 W5
Mirage 5PA (Modernized)	1792	498 (160)	NA	134	6/3	60/30	3900	2876	13500	FF5 CF4 RF4 T3 W5
Mirage 5PA2/PA3	1779	494 (160)	NA	133	6/3	60/30	3900	2876	13500	FF5 CF4 RF4 T3 W5
Mirage 5PA ROSE	1768	491 (160)	NA	133	6/3	60/30	3900	2876	13500	FF5 CF4 RF4 T3 W5
Mirage 50	1954	543 (160)	NA	147	6/3	60/30	3900	3367	13500	FF5 CF4 RF4 T3 W5
ENAER Pantera	1953	542 (140)	NA	146	7/4	70/40	3900	3367	13500	FF5 CF4 RF4 T3 W5
Mirage 50EV	1949	541 (140)	NA	146	7/4	70/40	3900	3367	13500	FF5 CF4 RF4 T3 W5
Mirage 50DV	1940	539 (140)	NA	146	7/4	70/40	3700	3367	13500	FF5 CF4 RF4 T3 W5

Vehicle	Combat Equipment	Minimum Landing/Takeoff Zone	RF	Armament	Ammo
Mirage 5/5D	All-Weather Flight, RWR, Chaff/Flares (30/50), Stealth 1	700/800m Hardened Runway	+1	2x30mm DEFA 552 Autocannons, 7 Hardpoints	250x30mm
Mirage 5MA Elkan/Mirage 5COD	All-Weather Flight, RWR, Chaff/Flares (30/50), Stealth 1	650/750m Hardened Runway	+1	2x30mm DEFA 552 Autocannons, 7 Hardpoints	250x30mm
Mirage 5E2	All-Weather Flight, RWR, INS, IFF, Chaff/Flares (30/50), Stealth 1	700/800m Hardened Runway	+1	2x30mm DEFA 552 Autocannons, 7 Hardpoints	250x30mm
Mirage 5P3/DP3	All-Weather Flight, RWR, INS, IFF, Chaff/Flares	650/750m Hardened Runway	+2	2x30mm DEFA 552 Autocannons, 7 Hardpoints	250x30mm

	(30/50), Stealth 1				
Mirage 5P4/DP4	All-Weather Flight, RWR, INS, IFF, HUD, Chaff/Flares (30/50), Stealth 1	650/750m Hardened Runway	+3	2x30mm DEFA 552 Autocannons, 7 Hardpoints	250x30mm
Mirage 5PA (Modernized)/PA2/PA3	All-Weather Flight, RWR, HUD, INS, Chaff/Flares (30/50), Stealth 1	700/800m Hardened Runway	+3	2x30mm DEFA 552 Autocannons, 7 Hardpoints	250x30mm
Mirage 5PA ROSE	All-Weather Flight, Secure Radios, RWR, HUD, INS, IFF, Target ID, Chaff/Flares (30/50), ECM 1, Stealth 1	700/800m Hardened Runway	+3	2x30mm DEFA 552 Autocannons, 9 Hardpoints	250x30mm
Mirage 50	All-Weather Flight, RWR, IR Uncage, HUD, Chaff/Flares (40/70), Stealth 1	650/750m Hardened Runway	+3	2x30mm DEFA 552 Autocannons, 9 Hardpoints	250x30mm
ENAER Pantera	All-Weather Flight, IFF, RWR, IR Uncage, HUD Interface, Chaff/Flares (40/70), Stealth 1	650/750m Hardened Runway	+3	2x30mm DEFA 552 Autocannons, 9 Hardpoints	250x30mm
Mirage 50EV/DV	All-Weather Flight, RWR, IR Uncage, HUD, INS, Chaff/Flares (40/70), Stealth 1	650/750m Hardened Runway	+3	2x30mm DEFA 552 Autocannons, 9 Hardpoints	250x30mm

Dassault Mirage 2000D

Notes: This is the ground-attack variant of the Mirage 2000 fighter-bomber, with an extra crewman (weapons officer) and different avionics. It may be distinguished from the Mirage 2000 fighter-bomber by its longer nose, internal fuel probe, and larger hardpoints. It is capable of aerial refueling and has ejection seats for its crew. It is used only by France.

The Mirage 2000D is based on the Mirage 2000B two-seat trainer, but has considerable changes, not the least of which is heavy strengthening for long-distance high-speed low-level penetration flights. The Mirage 2000D is fitted with an Antilope 5 radar system (Antilope 50 in the R2), which provides terrain-following radar, targeting, and short-range air-to-air radar. (Mirage 2000Ds normally carry a pair of Matra Magic or Mica AAMs on strike missions.) Terrain following can be provided at up to 1112 kilometers per hour (Tr Mov 2224, Com Mov 1653). Penetration is aided by the Sabre ECM/IRCM system and the Spirale Flare/Chaff system, unified (in the case of the R2) by the Samir EW Suite. The second seat displaces a fuel tank, and the Mirage 2000D does not carry as much internal fuel as the Mirage 2000 fighter bomber; Mirage 2000Ds normally overcompensate for this by carrying a pair of 2000-liter drop tanks, which were specially designed for the Mirage 2000 series. The Mirage 2000D is powered by a SNECMA M53-P2 turbofan, with 14000 pounds of thrust, or 21400 pounds thrust in afterburner.

The R1 and R2 are differentiated by the R2's increased avionics fit, and by the R1 being unable to use cruise missiles such as the Apache and Scalp. The R1 does not have the software or the hardpoints necessary to carry and use cruise missiles. The Mirage 2000N-K1 is a nuclear strike platform designed to replace the Mirage IVP bomber; the Mirage 2000N-K2 is also a nuclear-capable aircraft, but has a secondary conventional strike mission, and is equivalent to the Mirage 2000D-R2 for game purposes. The Mirage 2000N-K3 is a K1 updated and given a secondary ELINT role; the K3 carries an ELINT suite as well as an automatic ELINT recording system which records the enemy electronic emitters in its path of flight for later analysis. Two of its hardpoints are dedicated to the ELINT suite. In addition, a further hardpoint is used by a digital photographic pod with four apertures. The Mirage 2000N-K3 is still able to undertake strike missions or nuclear strike missions while doing reconnaissance.

Twilight 2000 Notes: Some of the Mirage 2000Ns were responsible for nuclear strikes against German forces in the Rhineland.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
Mirage 2000D-R1	$17,115,763	JP5	6.3 tons	17 tons	2	22	Radar (60 km)	Shielded
Mirage 2000D-R2	$19,559,683	JP5	6.3 tons	17.1 tons	2	23	Radar (80 km)	Shielded

Mirage 2000N-K3	$19,239,403	JP5	4.2 tons	17.2 tons	2	24	Radar (60 km)	Shielded

Vehicle	Tr Mov	Com Mov	Mnvr/Acc Agl/Turn	Fuel Cap	Fuel Cons	Ceiling	Armor
Mirage 2000D-R1	2140	594 (120)	NA 160 9/5 90/50	3780	2846	18300	FF5 CF5 RF4 T3 W5*
Mirage 2000D-R2	2128	591 (120)	NA 160 9/5 90/50	3780	2846	18300	FF5 CF5 RF4 T3 W5*
Mirage 2000N-K3	2115	588 (120)	NA 159 9/5 90/50	3780	2846	18300	FF5 CF5 RF4 T3 W5*

Vehicle	Combat Equipment	Minimum Landing/Takeoff Zone	RF	Armament	Ammo
Mirage 2000D-R1	All Weather Flight, Secure Radios, RWR, IFF, INS, Flare/Chaff (80/50), ECM 3, IRCM 1, IR Uncage, TFR (20 km), Look Down Radar, Stealth 1	700/800m Hardened Runway	+4	9 Hardpoints	None
Mirage 2000D-R2	All Weather Flight, Secure Radios, RWR, IFF, INS, Flare/Chaff (80/50), ECM 3, IRCM 1, EW Suite, IR Uncage, TFR (20 km), Look Down Radar, Stealth 1, Laser Designator (25 km)	700/800m Hardened Runway	+4	9 Hardpoints	None
Mirage 2000N-K3	All Weather Flight, Secure Radios, RWR, IFF, INS, Flare/Chaff (80/50), ECM 3, IRCM 1, ELINT 3, IR Uncage, TFR (20 km), Look Down Radar, Stealth 1, ELINT Suite, EW Suite, ELINT Recording Suite, Digital Photographic Suite	700/800m Hardened Runway	+4	6 Hardpoints	None

*The Mirage 2000D has an armored cockpit and canopy which have an AV of 7.

Dassault-Breguet Super Etendard

Notes: This French-made strike fighter was first introduced in 1978. The only other buyer of this aircraft is Argentina, who used them with great success in the Falklands War against Britain, especially in the sinkings of the *HMS Sheffield* and *Atlantic Conveyor*. The Iraqis used some on a temporary lease, where their typical pray was oil tankers in the Persian Gulf. French examples saw action in the Kosovo War, Afghanistan, and Libya, and against ISIS targets in Iraq and Syria. French models were upgraded starting in 1990 with additional avionics to increase their survivability and accuracy in strikes, but they are being increasingly replaced with the naval model of the Rafale. They are largely carrier-based aircraft in the French Navy, but land-based in Argentine service, as the single Argentine aircraft carrier suffered from reliability problems.

It is possible that ex-Argentine Super Etendards will be supplied to Ukraine, after upgrading to French standards.

The Super Etendard is an upgrade of the 1950s Etendard IVP, slightly longer to accommodate a SNECMA Atar 8K-50 turbojet with 11025 pounds thrust. Unlike on the same engine on the Mirage 50, the Atar 8K-50 on the Super Etendard is not equipped with an afterburner. The Super Etendard also has a new wing, with a longer wingspan and more sweep. The nose is also longer, to accommodate a radar set, in the case of the Argentine and early French Super Etendards an Agave radar set of the same sort as installed in some variants of the Mirage 5. Post-upgrade French Super Etendards are equipped with a Thomson-CSF Anemone radar set which has almost double the range of the Agave. The Super Etendard is equipped with a UAT-40 computerized targeting and navigation suite. The 1990s upgrades gave the Super Etendard an extensive attack and defensive suite and a new computer to manage these avionics. The upgrade also included a new cockpit with MFD screens and HOTAS controls for the stick and throttle. The French Super Etendards could also deliver tactical nuclear weapons; Argentine versions were not rated for such weapons. Early French Super Etendards could employ only unguided gravity nuclear bombs, but upgraded versions could carry the ASMP nuclear missile. As the Rafale was not equipped with a laser designator, upgraded French Super Etendards often designated targets for the Rafales as well as for each other. Like most naval aircraft, the wings of the Super Etendard fold, at about the midpoint of the wing. The Super Etendard has an ejection seat and is capable of aerial refueling; with the appropriate pods and drop tanks, it is also capable of buddy refueling.

All Etendards could carry reconnaissance pods of various types, whether using photographic, radar, or ELINT-based pods. They will not be further detailed here, as they are merely standard Super Etendards with a different stores fit.

Twilight 2000 Notes: By the Twilight War, the design was a bit dated, but it was still used in large numbers by France and smaller numbers by Argentina.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
Argentine	$9,391,299	JP5	2.1 tons	12 tons	1	20	Radar (74 km)	Enclosed
French (Upgraded)	$21,269,490	JP5	2.1 tons	12.4 tons	1	20	Radar (140 km)	Shielded

Vehicle	Tr Mov	Com Mov	Mnvr/Acc Agl/Turn	Fuel Cap	Fuel Cons	Ceiling	Armor
Argentine	2383	662 (110)	NA 179 6/3 60/30	3460	3361	13700	FF4 CF4 RF4 T3 W4
French (Upgraded)	2307	641 (110)	NA 173 6/3 60/30	3460	3361	13700	FF4 CF4 RF4 T3 W4

Vehicle	Combat Equipment	Minimum Landing/Takeoff Zone	RF	Armament	Ammo
Argentine	RWR, Flare/Chaff (30/20), HUD	825/415m Hardened Runway	+2	2x30mm DEFA 552 Autocannons, 5 Hardpoints	250x30mm
French (Upgraded)	RWR, Flare/Chaff (30/20), HUD, ECM 2, Target ID, INS, Laser Designator (13 km), Look-Down Radar	825/415m Hardened Runway	+4	2x30mm DEFA 552 Autocannons, 5 Hardpoints	250x30mm

Dassault/Dornier Alpha Jet

Notes: This is an aircraft that is a trainer during peacetime and a light strike aircraft during wartime. It is used by Belgium, Egypt, France, Ivory Coast, Morocco, Nigeria, Qatar, Togo, Portugal, Germany, and Cameroon. The aircraft's two-seat version is used as a trainer or FAC aircraft, but during wartime strike missions, the back seat is removed and replaced by an electronics suite that gives it a RWR and ECM emitter. Of its five hardpoints, only the wings' 4 hardpoints may be used for drop tanks. The fuselage station is normally used by a gun pod, as the aircraft has no internal guns, but it may be used for other stores.

The Alpha Jet's airframe is kept intentionally simple; it won't soak up much damage, but maintenance is easier than most aircraft of its size and role. The wings and air intakes are likewise simple and fixed in construction, with conventional flight surfaces, though power-assisted. Combat variants are designed to have quick turn-around times, with the Alpha Jet A having a 10-minute turn around when the ground crew is ready, positioned, and equipped for such. Attack versions can carry a wide variety of stores, from ECM pods to laser designators to smart bombs. The avionics of the basic versions is likewise austere, though versions like the Alpha Jet 2 and Lancier have more modern instrumentation. Most Alpha Jets are powered by two SNECMA Larzac 04-C5 turbofans each with 2980 pounds thrust, while the Alpha Jet 2 and Lancier are powered by twin Larzac 04-C20 turbofans each with 3278 pounds thrust.

The Alpha Jet MS2 is a version designed for Egypt and also sold to Cameroon. It featured a SAGEM ULISS 81 INS, a Thomson-CSF VE-110 HUD, a TMV630 laser rangefinder in a modified nose, a TRT AHV 9 radio altimeter, and avionics linked through a digital computer. The Alpha Jet ACAS adds a laser rangefinder in a modified nose, as well as INS and a computerized attack system. The Alpha Jet 2 uses a more powerful engine and is capable of air-to-air combat with heat-seeking missiles (usually Matra Magics or AIM-9 Sidewinders); it does not have the laser designator, but otherwise has a blend of the ACAS's and MS2's electronics. (Egyptian Alpha Jets were reportedly upgraded to the Alpha Jet 2 standard in the late 1980s.)

The Alpha Jet Lancier (also known as the Alpha Jet 3) adds radar, a multifunction display, a laser rangefinder, an internal cannon, and integral smart munition delivery capability, as well as expanding air-to-air combat capability. The Alpha Jet Lancier sacrifices its belly hardpoint for the cannon installation. German-built aircraft use the Mauser autocannon, while French-built Lanciers use the DEFA autocannon.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
Alpha Jet E	$2,013,780	JP5	2.5 tons	7.5 tons	2	15	None	Enclosed
Alpha Jet A	$4,539,170	JP5	2.5 tons	7.55 tons	1	15	None	Enclosed
Alpha Jet MS2	$3,637,976	JP5	2.5 tons	7.6 tons	1	15	None	Enclosed
Alpha Jet ACAS	$10,861,856	JP5	2.5 tons	7.62 tons	1	12	None	Enclosed
Alpha Jet 2	$7,070,460	JP5	2.55 tons	8.03 tons	1	12	FLIR (12 km)	Enclosed
Alpha Jet Lancier	$18,648,274	JP5	2.55 tons	9.53 tons	2	16	FLIR (30 km), Radar (74 km)	Enclosed

Vehicle	Tr Mov	Com Mov	Mnvr/Acc Agl/Turn	Fuel Cap	Fuel Cons	Ceiling	Armor
Alpha Jet E	2060	572 (110)	NA 154 6/3 60/30	2160	1208	13700	FF3 CF4 RF3 T2 W3
Alpha Jet A	2047	569 (110)	NA 154 6/3 60/30	2160	1208	13700	FF3 CF4 RF3 T2 W3
Alpha Jet MS2	2034	565 (110)	NA 153 6/3 60/30	2160	1208	13700	FF3 CF4 RF3 T2 W3
Alpha Jet ACAS	2028	563 (110)	NA 152 6/3 60/30	2160	1208	13700	FF3 CF4 RF3 T2 W3
Alpha Jet 2	2117	588 (110)	NA 159 6/3 60/30	2160	1330	13700	FF3 CF4 RF3 T2 W3
Alpha Jet Lancier	1788	497 (110)	NA 134 6/3 60/30	2160	1330	13700	FF3 CF4

					RF3 T2 W3

Vehicle	Combat Equipment	Minimum Landing/Takeoff Zone	RF	Armament	Ammo
Alpha Jet E	None	550/495m Hardened Runway	+2	5 Hardpoints	None
Alpha Jet A	RWR, ECM 2	550/495m Hardened Runway	+2	5 Hardpoints	None
Alpha Jet MS2	RWR, INS, HUD, Laser Rangefinder	550/495m Hardened Runway	+4	5 Hardpoints	None
Alpha Jet ACAS	RWR, ECM 2, INS, Laser Designator (6 km)	550/495m Hardened Runway	+3	5 Hardpoints	None
Alpha Jet 2	RWR, ECM 2, INS, HUD	550/495m Hardened Runway	+3	5 Hardpoints	None
Alpha Jet Lancier	RWR, ECM 3, INS, HUD, Flare/Chaff (34/25), IR Uncage, Laser Designator (12 km)	550/495m Hardened Runway	+4	27mm Mauser BK-27 or 30mm DEFA 552, 4 Hardpoints	300x27mm or 30mm

AMX International A-1/A-11 Ghibli

Notes: This is a joint project of Italy and Brazil, but initiated by the Italians, who wanted a replacement for their outdated Aeritalia G.91 attack aircraft. The Brazilians signaled their interest in the program, as they wanted to replace almost equally outdated Aermacchi MB326s, and they had worked with the Italians successfully before. Aermacchi, Aeritalia and Brazilian aircraft manufacturer Embraer set up a consortium, calling it AMX International. The Brazilians designated their version the A-1; the Italians called theirs the A-11 Ghibli (the Italian word for a scirocco). The Italian and Brazilian models are similar avionics-wise, but the autocannons equipping the two versions are very different.

The aircraft has a day-night capability and is very stable at low speeds as well as high speeds. Brazilian aircraft have two 30mm cannons, while Italian versions have a 20mm Vulcan; the US at the time denied the sale of Vulcans to Brazil. The two wingtip hardpoints may only be used for air-to-air missiles or EW pods; the four underwing hardpoints are “wet,” able to use drop tanks. The A-1 is also set up to carry a pallet-mounted reconnaissance suite on the centerline hardpoint. The radar mounted is different for each customer. The A-11 is fitted for air-to-air refueling, while the A-1 is not. Both aircraft are powered by a Rolls-Royce Spey 807 turbofan, with 11,000 pounds thrust; the US again denied the sale of the original choice of GE turbofans. In addition, the A-11 has some extra low-speed handling control surfaces and can takeoff, land, and handle low-speed flight easier. A-11s were upgraded in 2005 with INS modules, a new cockpit display, and software enabling the A-11 to drop JDAM-equipped bombs. This version is designated the A-11A. A-1s were upgraded in 2007 with new cockpits, updated avionics, and the ability to carry a wider array of weapons. This is designated the A-1A. In both cases, new, miniaturized avionics lightens the aircraft slightly.

A-1s and A-11s normally operate in pairs, one carrying a laser designator on a hardpoint and spotting for the other. Italian A-11s saw combat service in Bosnia and in Kosovo (noted for their use of Mk 82 500-pound bombs fitted with Israeli laser-guided bomb Opher kits). Italian A-11s replaced Tornadoes in the reconnaissance role in Afghanistan. In 2011, A-11s were again in combat, in the Libyan Intervention. Italian A-11s were retired from Italian service in 2024. Brazilian A-1s have seen combat service in a number of counterinsurgency roles, and the latest upgrade will see them in service until at least 2027.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
A-1	$11,361,790	JP5	3.8 tons	13 tons	1	16	Radar (40 km)	Shielded
A-1A	$10,026,190	JP5	3.8 tons	12.95 tons	1	16	Radar (40 km)	Shielded
A-11	$12,274,832	JP5	3.8 tons	13.17 tons	1	17	Radar (50 km)	Shielded
A-11A	$10,826,402	JP5	3.8 tons	13.12 tons	1	17	Radar (50 km)	Shielded

Vehicle	Tr Mov	Com Mov	Mnvr/Acc Agl/Turn	Fuel Cap	Fuel Cons	Ceiling	Armor
A-1	2189	608 (120)	NA 164 8/4 50/25	3555	2226	13000	FF3 CF3 RF3 T2 W3
A-1A	2197	610 (120)	NA 165 8/4 50/25	3555	2226	13000	FF3 CF3 RF3 T2 W3
A-11	2161	600 (110)	NA 162 8/4 50/25	3555	2226	13000	FF3 CF3 RF3 T2 W3
A-11A	2169	602 (110)	NA 163 8/4 50/25	3555	2226	13000	FF3 CF3 RF3 T2 W3

Vehicle	Combat Equipment	Minimum Landing/Takeoff Zone	RF	Armament	Ammo
A-1	RWR, Flare/Chaff (30/20), ECM 2, Secure Radios, All-Weather Flight	1178/982m Hardened Runway	+2	2x30mm DEFA 554, 7 Hardpoints	400x30mm
A-1A	RWR, Flare/Chaff (30/20), ECM 2, Secure Radios, All-Weather Flight	1178/982m Hardened Runway	+3	2x30mm DEFA 554, 7 Hardpoints	400x30mm
A-11	RWR, Flare/Chaff (35/35), ECM 2, IRCM 1, Secure Radios, All-Weather Flight	600/500m Hardened Runway	+2	20mm M61A1 Vulcan, 7 Hardpoints	400x20mm
A-11A	IFF, INS, RWR, Flare/Chaff (35/35), ECM 2, IRCM 1, Secure Radios, All-Weather Flight,	600/500m Hardened Runway	+3	20mm M61A1 Vulcan, 7 Hardpoints	400x20mm

McDonnell Douglas AV-8B Harrier II

Notes: The Harrier is a VSTOL multirole aircraft able to perform as both a fighter and attack aircraft. It is used by Britain, the US Marines, Italy, India, and Spain. It has a raised cockpit for superior visibility, a composite material wing for lightness and strength, and a redesigned nose with air-to-air/ground radar. It is based on the first generation of the Harrier strikefighter, pioneered by Britain, hence the Harrier *II*. It was designed from the start to be an improved Harrier; efforts centered around a larger and more powerful version of the Rolls-Royce Pegasus engine which powered the original Harrier. Consequently, the Harrier II is a larger version of the Harrier, with larger wings and more hardpoints. Later upgrades added night vision, producing the AV-8B(NA) (for Night Attack) and the AV-8B Harrier II Plus. Harrier IIs have seen action in Gulf War, Iraq War, Afghanistan War, and in Libya in 2011. Italian and Spanish Harriers have likewise seen combat service as part of NATO coalitions in those wars and in the former Yugoslavia. Harrier IIs have suffered from a high accident rate, and the Harrier II is a rather unforgiving aircraft to fly, particularly in the transition phase from vertical to forward flight and vice versa. USMC Harrier IIs are almost totally replaced by the F-35B (one assault carrier must still have its deck reinforced for the F-35B's hotter exhaust; as of November 2025; final US Harrier retirement is scheduled for the second half of 2027), and Italian AV-8Bs are also being replaced by the F-35B. Spain is considering the move to F-35Bs. Spain designated their Harriers the EAV-8B, with the trainer versions designated TAV-8B. Royal Navy variants are designated the Harrier GR.7.

The Harrier II has a larger wing, and is equipped with leading edge root extensions (LERX) for improved low-speed handling. The aircraft has an ejection seat and is capable of in-flight refueling. When performing VIFF flight, the Harrier has an especially high heat signature, and attacks with heat-seeking missiles are one level easier. VTO flight may only be performed by removing 2.4 tons from the cargo capacity or fuel of the stock AV-8B or 1.1 tons from later models. The Harrier II is powered by an F402-RR-404A engine with a power of 21,450 pounds of thrust. The Harrier II features a supercritical wing for increased high-speed (subsonic) handling and a HOTAS stick and throttle layout. To further increase handling at both low and high speeds, the taller vertical stabilizer of the Sea Harrier is used instead of the shorter stabilizer of the AV-8A (the USMC designation of the original Harrier). The Harrier uses an early Direct Voice Input version, later used in other aircraft.

Variants include the TAV-8B trainer (not elaborated here), the AV-8B(NA) version with a long-range FLIR and more powerful Pegasus 11 engine (23500 pounds thrust), and the AV-8B Harrier II Plus with improvements on the AV-8B(NA) like increased chaff and flare capacities and inertial navigation and a radar. The AV-8B(NA) and plus normally sacrifice one of their wing hardpoints to carry a Litening targeting pod.

For a short time in the late 1990s, the US considered an upgrade into a Harrier III variant. This version would have a helmet-mounted cueing system, an upgraded Pegasus engine that produced 4000 pounds more thrust (25,450 pounds thrust total), a larger wing with an extra hardpoint on each one and carrying more fuel (and due to their increased wingspan, the wingtips would fold), the use of the F-16's APG-66 radar, and the ability to use weapons like the AIM-132 ASRAAM and AIM-120 AMRAAM, advanced defensive measures such as ECM, ECCM, and IRCM, and Link 16 communications and data-sharing measures. A "what-if" version is presented below.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
AV-8B Harrier II	$11,393,694	JP4, JP8	6 tons	14.1 tons	1	25	None	Enclosed
Harrier GR.7	$11,987,080	JP4, JP8	6 tons	14 tons	1	25	None	Enclosed
AV-8B(NA) Harrier II	$16,050,780	JP4, JP8	6 tons	14.45 tons	1	26	FLIR (30 km)	Enclosed
AV-8B Harrier II Plus	$16,516,530	JP4, JP8	6 tons	14.69 tons	1	27	Radar (70 km), FLIR (30 km)	Enclosed
AV-8C Harrier III	$24,911,611	JP4, JP8	7 tons	15.9 tons	1	27	Radar (150 km), FLIR (35 km)	Enclosed

Vehicle	Tr Mov	Com Mov*	Mnvr/Acc Agl/Turn	Fuel Cap	Fuel Cons	Ceiling	Armor
AV-8B Harrier II	3925	1090 (110)	NA 294 9/5 60/40	4200	4358	15200	FF6 CF6 RF6 W5 T5
Harrier GR.7	3953	1098 (110)	NA 296 9/5 60/40	4200	4358	15200	FF6 CF6 RF6 W5 T5
AV-8B(NA) Harrier II	4195	1165 (110)	NA 315 9/5 60/40	4200	4776	15240	FF6 CF6 RF6 W5 T5
AV-8B Harrier II Plus	4127	1146 (110)	NA 309 9/5 60/40	4200	4776	15240	FF6 CF6 RF6 W5 T5
AV-8C Harrier III	4129	1147 (100)	NA 310 9/5 60/40	4620	5172		FF6 CF6 RF6 W6 T5

Vehicle	Combat Equipment	Minimum Landing/Takeoff Zone	RF	Armament	Ammo
AV-8B Harrier II	All-Weather Flight, Flare/Chaff (40/25), RWR	450/16m (VSTOL) or 450/505m (Conventional) Primitive Runway	+2	25mm GAU-12/A, 7 Hardpoints	300x25mm
Harrier GR.7	All-Weather Flight, Flare/Chaff (40/25), RWR	450/16m (VSTOL) or 450/505m (Conventional) Primitive Runway	+2	2x25mm ADEN, 7 Hardpoints	200x25mm
AV-8B(NA) Harrier II	All-Weather Flight, Flare/Chaff (40/25), HUD, RWR	450/16m (VSTOL) or 450/505m (Conventional) Primitive Runway	+3	25mm GAU-12/A, 7 Hardpoints	300x25mm
AV-8B Harrier II Plus	All-Weather Flight, Flare/Chaff (50/30), HUD, RWR, INS	450/16m (VSTOL) or 450/505m (Conventional) Primitive Runway	+3	25mm GAU-12/A, 7 Hardpoints	300x25mm
AV-8C Harrier III	All-Weather Flight, Secure Radios, IFF, Flare/Chaff (55/40), ECM 2, ECCM 1, IRCM 1, HUD, Helmet/Sight Interface, RWR, INS	450/16m (VSTOL) or 450/505m (Conventional) Primitive Runway	+4	25mm GAU-12/A; 9 hardpoints	300x25mm

YuRom IAR-93 Vultur/J-22 Orao

Notes: This is a strike aircraft jointly produced by Romania and Yugoslavia. The Soko factory in then-Yugoslavia (now Bosnia) was dismantled in 1992 and never reassembled after that, but the Romanian Avioane Craiova factory continued to produce Vulturs. However, in the early 2000s, the Romainians retired the Vultur, and as of July 2019, the Serbian J-22 Oraos were the only examples of this type still flying. Current status is unknown. This is a light aircraft with a limited weapons load, but it is cheap and easy to produce.

The Vultur and Orao are powered by a pair of Rolls-Royce Vipers (produced by license in Bosnia and designated the Viper Mk 632-41), each outputting 4000 pounds thrust. This was not the engine the designers wanted; other, more powerful British engines were preferred, but due to Romania being part of the Warsaw Pact, Britain would not license any other engine to YuRom. They tried to fit a domestically designed afterburner to the Viper, but this proved unsuccessful, and YuRom had to settle for a subsonic aircraft that could only exceed Mach 1 in a dive. The design is entirely conventional, with swept wings and tail. From there, the Yugoslavians and Romanians diverged somewhat in design, producing the Orao and Vultur.

J-22 Orao

The Orao (Eagle) is designed primarily for close air support and ground attack, with a secondary mission of low-level interceptor. Two seat variants, designated NJ-22s, were also produced in small numbers; these were used for tactical reconnaissance (with the addition of a reconnaissance pod), armed reconnaissance, and as tactical trainers. The aircraft has gyroscopic navigation, a HUD, semi-stabilized controls, and two radios, one VHF and one slaved to the instrument landing system. It is equipped with the Iskra SO-1

RWR and three chaff/flare dispensers (an individual dispenser could carry flares or chaff bundles; a typical loadout is presented below).

The Serbian government undertook a comprehensive upgrade of the Orao's avionics in the 1990s, designated J-22B Orao 2. This variant incorporated a more powerful engine with an afterburner, integral wing fuel tanks, higher weight rated hardpoints (the hardpoints of the Orao were a weak point), and a more advanced Thomson-CSF HUD. The breakup of Yugoslavia interrupted these upgrades and only 57 were built before the Yugoslavian Civil War. A two-seat version was planned, but only one prototype was produced before the Civil War.

After the Civil War, the Serbians produced a further upgraded J-22, the J-22M1A. This version adds a Safran Sigma 95 INS, multifunction displays in a glass cockpit, a HUD interface feature, a compact radar set, and an attack mission computer. These versions were made using NJ-22s, with the back seat taken out and the space used for avionics, particularly the mission computer.

IAR-93 Vultur

The IAR-93A Vultur (Eagle) is mostly the same as the J-22, differing only in detail. The engines are the same and the avionics are likewise also the same, though perhaps a little more comprehensive. Relatively more two-seat versions were produced as a percentage of aircraft, and designated IAR-93ADC. The IAR-93A is a little lighter than the J-22, and its hardpoints do not have the capacity of the J-22. The IAR-93B (and its BDC two-seat counterpart), diverge more from its J-22B cousin; the Romanians did not develop the Vultur as much as did the Serbians develop the J-22, since after they entered NATO and prior to that from the Soviet Union, they had access to better aircraft. One thing they did do, however, was to place cameras all around the aircraft, which the pilot could access in his MFD. The J-22B's afterburning, uprated engine is also used on the IAR-93B, along with an increased fuel load. The Vultur has dog-tooth leading edge extensions, giving it better low-speed handling.

Twilight 2000 Notes: The Romanian factory manufacturing the Vultur (and some other aircraft) was put out of action permanently by air strikes in 1999.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
J-22 Orao	$6,000,747	JP8	2.8 tons	11.08 tons	1	15	None	Enclosed
NJ-22 Orao	$7,090,622	JP8	2.8 tons	11.28 tons	2	15	None	Enclosed
J-22B Orao 2	$6,352,501	JP8	3.3 tons	12.19 tons	1	15	None	Enclosed
J-22M1A Orao 2.0	$9,363,405	JP8	3.3 tons	12.49 tons	1	17	Radar (50 km)	Enclosed
IAR-93A Vultur	$6,008,897	JP8	2.5 tons	10.9 tons	1	15	None	Enclosed
IAR-93ADC Vultur	$7,254,247	JP8	2.5 tons	11.1 tons	2	15	None	Enclosed
IAR-93B Vultur	$9,299,476	JP8	2.5 tons	12.01 tons	1	15	4 CCD Cameras (F, R, RS, LS)	Enclosed
IAR-93BDC Vultur	$10,986,360	JP8	2.5 tons	12.21 tons	2	15	4 CCD Cameras (F, R, RS, LS)	Enclosed

Vehicle	Tr Mov	Com Mov	Mnvr/Acc	Agl/Turn	Fuel Cap	Fuel Cons	Ceiling	Jaguar
J-22 Orao	1875	521 (115)	NA 141	9/5 90/50	3120	2434	15000	FF4 CF4 RF3 T3 W3
NJ-22 Orao	1842	512 (115)	NA 138	9/5 90/50	3000	2434	15000	FF4 CF4 RF3 T3 W3
J-22B Orao 2	2128	591 (115)	NA 160	9/5 90/50	3200	3045	15000	FF4 CF4 RF3 T3 W3
J-22M1A Orao 2.0	2078	577 (115)	NA 156	9/5 90/50	3200	3045	15000	FF4 CF4 RF3 T3 W3

IAR-93A Vultur	1906	529 (110)	NA	143	9/5	90/50	3120	2434	15000	FF4 CF4 RF3 T3 W3
IAR-93ADC Vultur	1872	520 (110)	NA	140	9/5	90/50	3000	2434	15000	FF4 CF4 RF3 T3 W3
IAR-93B Vultur	2160	600 (110)	NA	162	9/5	90/50	3300	3045	15000	FF4 CF4 RF3 T3 W3
IAR-93BDC Vultur	2125	590 (110)	NA	159	9/5	90/50	3180	3045	15000	FF4 CF4 RF3 T3 W3

Vehicle	Combat Equipment	Minimum Landing/Takeoff Zone	RF	Armament	Ammo
J-22/NJ-22 Orao	Flare/Chaff (27/18), HUD, RWR	950/600m Primitive Runway	+1	2xGSh-23L 23mm Autocannons, 5 Hardpoints	400x23mm
J-22B Orao 2	Flare/Chaff (27/18), HUD, RWR	950/600m Primitive Runway	+2	2xGSh-23L 23mm Autocannons, 5 Hardpoints	400x23mm
J-22M1A Orao 2.0	Flare/Chaff (27/18), HUD, HUD Interface, RWR, INS	950/600m Primitive Runway	+2 (+3 Air to Ground)	2xGSh-23L 23mm Autocannons, 5 Hardpoints	400x23mm
IAR-93A/ADC Vultur	Secure Radios, Flare/Chaff (27/18), HUD, RWR, IFF	940/560m Primitive Runway	+2	2xGSh-23L 23mm Autocannons, 5 Hardpoints	400x23mm
IAR-93B/BDC Vultur	Secure Radios, Flare/Chaff (36/27), HUD, RWR, IFF	940/560m Primitive Runway	+3	2xGSh-23L 23mm Autocannons, 5 Hardpoints	400x23mm

SEPECAT Jaguar

Notes: This is an attack aircraft produced by an international effort of France and Britain. It was built by SEPECAT, which is a consortium between Breguet and BAC, with the engines made by a separate consortium of Rolls-Royce and Turbomeca, simply called Rolls-Royce Turbomeca. It is also used by Ecuador, India, Nigeria, and Oman. Two seat versions of this aircraft exist. This aircraft was a standout in the 1991 Gulf War, in Indian attacks on Kashmir and Kurdistan, and in Mauritania, Iraq, Chad, Bosnia and Pakistan. The pilot has an ejection seat, and the aircraft is capable of inflight refueling. It is also capable of nuclear weapon delivery. It was replaced in the RAF in 2007 by the Typhoon and in French service in 2005 by the Rafale; the Indians still fly theirs.

The design of the Jaguar is orthodox, with a swept wing and tail and twin Adour engines. The landing gear is long to allow for a variety of large stores to be carried, most notably a large drop tank on the centerline hardpoint. Two of its seven hardpoints are unusual; they are on top of the wing, to be used by air-to-air missiles such as Sidewinders, AIM-132 ASRAAMs, or Matra Magics; French Jaguars do not have these overwing hardpoints and have only five hardpoints. Three of its hardpoints (centerline and the two inner wing hardpoints) may be used for drop tanks in addition to weapons.

The first complicated part of the Jaguar partnerships is its Adour turbofans. In French service, Jaguars were introduced with the base Mk 101 engines, capable of 5000 pounds thrust each, and equipped with an afterburner. The first RAF Jaguars were equipped with the Mk 102, which is nearly identical to the Mk 101, but has a higher-efficiency afterburner and greater acceleration, and is capable of providing 5110 pounds of thrust per engine. The RAF later changed the engines out for Mk 104s in 1981, which have 5500 pounds thrust, and in 1999 with the Mk 106, with 6500 pounds thrust. The Mk 804 was an export version powering Indian Air Force Jaguars and with 7500 pounds thrust; the Mk 811 was another Indian version developing 8400 pounds thrust. France was constantly jockeying for the Adours to be built more and more in France, maximizing profit for Turbomeca, and this caused friction; Rolls-Royce constantly pushed back, causing more friction.

French Jaguars have a double gyroscopic navigation system, while RAF Jaguars and Indian Jaguars have an inertial navigation system. French Jaguars do not have a HUD, while British and Indian Jaguars do. British GR.1s also have the controversial LRMTS (Laser Ranging and Marked Targeting System) to help increase bombing and weapons accuracy; this system is controversial because while the British insisted in its inclusion in their Jaguars, its reliability is quite low. French aircraft gained the Atlis II conformal targeting pod starting in the early 1990s; the conformal pod is low-drag, but does use one of the outer wing hardpoints. GR.1As were upgraded

with the NAVWASS II (NAVigation and Weapon Aiming SubSystem) to allow accurate navigation and weapon delivery with a radar set being installed. British GR.1 Jaguars gained a TIALD laser designator in a conformal pod. (These were designated GR.1B.) The GR.1B was also powered by the more powerful Mk 104 engines. The GR.3 could carry either the TIALD or a camera pod in its conformal configuration; the GR.3A was also re-engined with the Mk 106 engines. Both have mild EW protection.

RAF Trainer versions are also capable of attack missions, but have two seats instead of one, and are longer and heavier like the Jaguar E. The T2 is based on the GR.1, the T2A on the GR.1A, the T2B on the GR.1B, and the T4 is based on the GR.3 (but is actually a T2A upgraded to GR.3-like capabilities). The T2 sacrifices one of its ADEN autocannons, as the ammunition drum would go where the rear seat and its avionics go. Another reason to delete the second gun was to counteract the increase in weight from the second cockpit.

Indian Jaguars (designated Jaguar IS) were fitted with the Agave radar system, the NAVWASS navigation and weapon-aiming system (in the case of the first few BAe-built aircraft), and the DARIN (Display Attack and Ranging Inertial Navigation) mission computer system (in the case of the subsequent Indian-built Jaguars). The Indians swapped the TIALD pod for a US-made Litening Pod, which is lighter in weight. The IAF also equipped their Jaguars with radar, initially the Agave, then in the early 2000s the radars were changed to the much more capable EL/M-2052 AESA radar. Late production DARIN III upgrades brought GPS to the Indian Jaguars and kept the INS set as a backup. The Indians initially used the Mk 804 engine, upgrading to the Mk 811 engine in the early 2000s. The IM maritime strike model is the same as the IS, but has no NAVWASS-equipped model, and is rigged to carry the Sea Eagle antiship missiles. The Jaguar IB is the two-seat trainer/strike version, similar in concept if not execution to the British T2.

The Indians were actually the largest user of the Jaguar and are currently the only Air Force to be still operating the Jaguar. The Indians do not use the Jaguar in a nuclear deterrent role, though the Indian Jaguar is capable of nuclear weapon delivery.

Twilight 2000 Notes: The DARIN III-equipped model of the IS does not exist in the Twilight 2000 timeline, nor are any Indian Jaguars fitted with the EM/M-2052 radar.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
Jaguar A (French)	$13,694,792	JP5	4.76 tons	15.7 tons	1	23	None	Shielded
Jaguar A (French w/Atlis II)	$15,739,592	JP5	4.48 tons	15.98 tons	1	24	None	Shielded
Jaguar E (French)	$14,663,774	JP5	4.76 tons	16.14 tons	2	23	None	Shielded
Jaguar E (French w/Atlis II)	$16,487,774	JP5	4.48 tons	16.42 tons	2	24	None	Shielded
Jaguar S (RAF GR.1)	$13,739,437	JP5	4.76 tons	15.08 tons	1	23	None	Shielded
Jaguar S (RAF GR.1A)	$14,044,027	JP5	4.76 tons	15.24 tons	1	23	None	Shielded
Jaguar S (RAF GR.1B)	$15,863,047	JP5	4.48 tons	15.52 tons	1	24	None	Shielded
Jaguar S (RAF GR.3)	$19,271,047	JP5	4.48 tons	15.6 tons	1	25	None	Shielded
Jaguar S (RAF GR.3A)	$19,560,727	JP5	4.48 tons	16.28 tons	1	25	None	Shielded
Jaguar B (RAF T2)	$12,303,610	JP5	4.76 tons	15.12 tons	2	23	None	Shielded
Jaguar B (RAF T2A)	$12,492,850	JP5	4.76 tons	15.28 tons	2	23	None	Shielded
Jaguar B (RAF T2B)	$14,439,997	JP5	4.48 tons	15.56 tons	2	24	None	Shielded
Jaguar B (RAF T4)	$18,087,970	JP5	4.48 tons	15.64 tons	2	25	None	Shielded
Jaguar IS (NAVWASS-Equipped, Agave Radar)	$21,656,647	JP5	4.48 tons	17.05 tons	1	25	Radar (74 km)	Shielded
Jaguar IS (DARIN-Equipped, Agave Radar, Mk 804 Engines)	$20,800,387	JP5	4.62 tons	16.91 tons	1	25	Radar (74 km)	Shielded
Jaguar IS (DARIN-Equipped, Agave Radar, Mk 811	$21,969,247	JP5	4.62 tons	17.51 tons	1	25	Radar (74 km)	Shielded

Engines)								
Jaguar IS (DARIN-Equipped, EM/M-2052 Radar, Mk 804 Engines)	$21,550,147	JP5	4.62 tons	17.31 tons	1	25	Radar (200 km)	Shielded
Jaguar IS (DARIN-Equipped, EM/M-2052 Radar, Mk 811 Engines)	$21,810,007	JP5	4.62 tons	17.91 tons	1	25	Radar (200 km)	Shielded
Jaguar IS (DARIN III, EM/M-2052 Radar, Mk 811 Engines)	$22,662,007	JP5	4.62 tons	17.91 tons	1	26	Radar (200 km)	Shielded
Jaguar IB (NAVWASS-Equipped, Agave Radar)	$20,956,210	JP5	4.48 tons	17.09 tons	2	25	Radar (74 km)	Shielded
Jaguar IB (DARIN-Equipped, Agave Radar, Mk 804 Engines)	$19,725,010	JP5	4.62 tons	16.95 tons	2	25	Radar (74 km)	Shielded
Jaguar IB (DARIN-Equipped, Agave Radar, Mk 811 Engines)	$20,003,170	JP5	4.62 tons	17.55 tons	2	25	Radar (74 km)	Shielded
Jaguar IB (DARIN-Equipped, EM/M-2052 Radar, Mk 804 Engines)	$20,527,570	JP5	4.62 tons	17.35 tons	2	25	Radar (200 km)	Shielded
Jaguar IB (DARIN-Equipped, EM/M-2052 Radar, Mk 811 Engines)	$20,805,730	JP5	4.62 tons	17.95 tons	2	25	Radar (200 km)	Shielded

Vehicle	Tr Mov	Com Mov	Mnvr/Acc Agl/Turn	Fuel Cap	Fuel Cons	Ceiling	Jaguar
Jaguar A (French)	1648	458 (120)	NA 124 8/4 80/40	4200	2015	14000	FF4 CF4 RF3 T3 W4
Jaguar A (French w/Atlis II)	1631	453 (120)	NA 122 8/4 80/40	4200	2015	14000	FF4 CF4 RF3 T3 W4
Jaguar E (French)	1615	449 (120)	NA 121 8/4 80/40	4200	2015	14000	FF4 CF4 RF3 T3 W4
Jaguar E (French w/Atlis II)	1588	441 (120)	NA 119 8/4 80/40	4200	2015	14000	FF4 CF4 RF3 T3 W4
Jaguar S (RAF GR.1)	1762	489 (120)	NA 136 8/4 80/40	4200	2072	14000	FF4 CF4 RF3 T3 W4
Jaguar S (RAF GR.1A)	1744	484 (120)	NA 135 8/4 80/40	4200	2072	14000	FF4 CF4 RF3 T3 W4
Jaguar S (RAF GR.1B)	1844	512 (120)	NA 143 8/4 80/40	4200	2234	14000	FF4 CF4 RF3 T3 W4
Jaguar S (RAF GR.3)	1835	510 (120)	NA 143 8/4 80/40	4200	2234	14000	FF4 CF4 RF3 T3 W4
Jaguar S (RAF GR.3A)	2075	576 (120)	NA 161 8/4 80/40	4200	2642	14000	FF4 CF4 RF3 T3 W4

Jaguar B (RAF T2)	1757	488 (120)	NA	136	8/4	80/40	4200	2072	14000	FF4 CF4 RF3 T3 W4
Jaguar B (RAF T2A)	1739	483 (120)	NA	135	8/4	80/40	4200	2072	14000	FF4 CF4 RF3 T3 W4
Jaguar B (RAF T2B)	1840	511 (120)	NA	143	8/4	80/40	4200	2234	14000	FF4 CF4 RF3 T3 W4
Jaguar B (RAF T4)	1830	508 (120)	NA	143	8/4	80/40	4200	2234	14000	FF4 CF4 RF3 T3 W4
Jaguar IS (NAVWASS-Equipped, Agave Radar)	2280	633 (120)	NA	171	8/4	80/40	4200	3044	14000	FF4 CF4 RF3 T3 W4
Jaguar IS (DARIN-Equipped, Agave Radar, Mk 804 Engines)	2299	639 (120)	NA	173	8/4	80/40	4200	3044	14000	FF4 CF4 RF3 T3 W4
Jaguar IS (DARIN-Equipped, Agave Radar, Mk 811 Engines)	2484	690 (120)	NA	186	8/4	80/40	4200	3410	14000	FF4 CF4 RF3 T3 W4
Jaguar IS (DARIN-Equipped, EM/M-2052 Radar, Mk 804 Engines)	2246	624 (120)	NA	168	8/4	80/40	4200	3044	14000	FF4 CF4 RF3 T3 W4
Jaguar IS (DARIN-Equipped, EM/M-2052 Radar, Mk 811 Engines)	2430	675 (120)	NA	182	8/4	80/40	4200	3410	14000	FF4 CF4 RF3 T3 W4
Jaguar IS (DARIN III, EM/M-2052 Radar, Mk 811 Engines)	2430	675 (120)	NA	182	8/4	80/40	4200	3410	14000	FF4 CF4 RF3 T3 W4
Jaguar IB (NAVWASS-Equipped, Agave Radar)	2275	632 (120)	NA	171	8/4	80/40	4200	3044	14000	FF4 CF4 RF3 T3 W4
Jaguar IB (DARIN-Equipped, Agave Radar, Mk 804 Engines)	2293	637 (120)	NA	172	8/4	80/40	4200	3044	14000	FF4 CF4 RF3 T3 W4
Jaguar IB (DARIN-Equipped, Agave Radar, Mk 811 Engines)	2479	689 (120)	NA	186	8/4	80/40	4200	3410	14000	FF4 CF4 RF3 T3 W4
Jaguar IB (DARIN-Equipped, EM/M-2052 Radar, Mk 804 Engines)	2241	623 (120)	NA	168	8/4	80/40	4200	3044	14000	FF4 CF4 RF3 T3 W4
Jaguar IB (DARIN-Equipped, EM/M-2052 Radar, Mk 811 Engines)	2424	673 (120)	NA	182	8/4	80/40	4200	3410	14000	FF4 CF4 RF3 T3 W4

Vehicle	Combat Equipment	Minimum Landing/Takeoff Zone	RF	Armament	Ammo

Jaguar A/E (French)	RWR, Secure Radios, Flare/Chaff (50/40)	785/580m Hardened Runway	+1	2x30mm DEFA 552 autocannons, 5 hardpoints	300x30mm
Jaguar A/E (French w/Atlis II)	RWR, Secure Radios, Flare/Chaff (50/40), Laser Designator (30 km)	785/580m Hardened Runway	+2	2x30mm DEFA 552 autocannons, 4 hardpoints	300x30mm
Jaguar S (RAF GR.1)	RWR, Secure Radios, Flare/Chaff (50/40), HUD	785/580m Hardened Runway	+2	2x30mm ADEN autocannons, 7 hardpoints	300x30mm
Jaguar S (RAF GR.1A)	RWR, Secure Radios, Flare/Chaff (50/40), HUD, IFF	785/580m Hardened Runway	+3	2x30mm ADEN autocannons, 7 hardpoints	300x30mm
Jaguar S (RAF GR.1B)	RWR, Secure Radios, Flare/Chaff (50/40), HUD, IFF, Laser Designator (30 km)	785/580m Hardened Runway	+3	2x30mm ADEN autocannons, 6 hardpoints	300x30mm
Jaguar S (RAF GR.3/3A)	RWR, Secure Radios, Flare/Chaff (50/40), HUD, IFF, ECM 1, ECCM 1, Laser Designator (30 km)	785/580m Hardened Runway	+3	2x30mm ADEN autocannons, 6 hardpoints	300x30mm
Jaguar B (RAF T2)	RWR, Secure Radios, Flare/Chaff (50/40), HUD	785/580m Hardened Runway	+2	30mm ADEN Autocannon, 7 hardpoints	150x30mm
Jaguar B (RAF T2A)	RWR, Secure Radios, Flare/Chaff (50/40), HUD, IFF	785/580m Hardened Runway	+3	30mm ADEN Autocannon, 7 hardpoints	150x30mm
Jaguar B (RAF T2B)	RWR, Secure Radios, Flare/Chaff (50/40), HUD, IFF, Laser Designator (30 km)	785/580m Hardened Runway	+3	30mm ADEN Autocannon, 6 hardpoints	150x30mm
Jaguar B (RAF T4)	RWR, Secure Radios, Flare/Chaff (50/40), HUD, IFF, ECM 1, ECCM 1, Laser Designator (30 km)	785/580m Hardened Runway	+3	30mm ADEN Autocannon, 6 hardpoints	150x30mm
Jaguar IS (NAVWASS-Equipped)	RWR, Secure Radios, Flare/Chaff (50/40), HUD, IFF, ECM 1, ECCM 1, Laser Designator (30 km)	785/580m Hardened Runway	+3	2x30mm ADEN autocannons, 6 hardpoints	300x30mm
Jaguar IS (DARIN-equipped)	RWR, Secure Radios, Flare/Chaff (50/40), HUD, IFF, INS, ECM 1, ECCM 1, Laser Designator (30 km)	785/580m Hardened Runway	+3	2x30mm ADEN autocannons, 6 hardpoints	300x30mm
Jaguar IS (DARIN III)	RWR, Secure Radios, Flare/Chaff (50/40), HUD, IFF, GPS, INS, ECM 1, ECCM 1, Laser Designator (30 km)	785/580m Hardened Runway	+4	2x30mm ADEN autocannons, 6 hardpoints	300x30mm
Jaguar IB (NAVWASS-Equipped)	RWR, Secure Radios, Flare/Chaff (50/40), HUD, IFF, ECM 1, ECCM 1, Laser Designator (30 km)	785/580m Hardened Runway	+3	30mm ADEN Autocannon, 6 hardpoints	150x30mm
Jaguar IB (DARIN-equipped)	RWR, Secure Radios, Flare/Chaff (50/40), HUD, IFF, INS, ECM 1, ECCM 1, Laser Designator (30 km)	785/580m Hardened Runway	+3	30mm ADEN Autocannon, 6 hardpoints	150x30mm

PAC K-8 Karakorum/Hongdu JL-8

Notes: This basic trainer/light attack aircraft is a joint product of China and Pakistan. The Chinese name is the Hongdu JL-8, but at the suggestion of the Pakistani president, the name was changed to reflect its status as an internationally produced aircraft. Like most aircraft of its class, it is an unsophisticated aircraft with a light weapon load, being primarily a trainer with secondary strike capability. Originally, the K-8 was to be produced using a large amount of components sourced from the US, but embargoes after the Tiananmen massacre of 1989 caused the developing parties to find their parts elsewhere. In the end, much of the avionics were approved for the Chinese variant, and even an American engine was approved for the Pakistani variant.

The K-8 looks much like the Bae Hawk, being a low-wing aircraft with wings that are straight at the leading edge. Some of the control surfaces, like the tail surfaces, are electrically actuated, and some, like the wing surfaces, are hydraulically actuated. The control surfaces are also hydraulically boosted, with artificial feel qualities. The cockpit of the K-8 and JL-8 are designed to be as close as possible to a combat aircraft, while retaining a basically simple layout so as to not confuse or overload students. The ejection seats are of the zero-zero type, meaning that safe ejection is possible at zero speed and altitude. Though the JL-8 and K-8 was designed to have a secondary strike capability, the first air to ground munitions were only first tested in 2011, even though the first flight was back in 1993. The K-8/JL-8 have UHF and VHF radios along with a TACAN receiver and an automatic direction finder. Optionally, an

Instrument Landing System is available, and these are believed to be present in Chinese JL-8s. Air conditioning and heating are available, even when stationary on the ground. The JL-8 is powered by a WS-11 turbofan engine developing 3800 pounds thrust. This engine is a license-produced version of the Ukrainian AL-25TL. The K-8 is powered by a license-produced Honeywell TFE731 turbofan developing 3600 pounds thrust. Four hardpoints are on the JL-8 and K-8, two under each wing; there is no centerline hardpoint, except for attachments for a 23mm autocannon pod. This is reflected below.

The JL-8 is used by the PLAAF for basic jet training and basic combat training. The K-8 is used by the Pakistani Air Force for the same thing; the K-8P is the same aircraft with new avionics, a glass cockpit, and updated ejection seats. The K-8W is an export variant used by the Venezuelan Bolivarian Air Force and Bangladeshi Air Force. It has no US-controlled parts and features an improved cockpit layout and a HUD. The K-8VB is a standard K-8 used by the Venezuelan Bolivarian Air Force; it is identical to the K-8P for game purposes. The K-8E is another export model supplied to Egypt, has a cockpit layout modified to suit Egyptian requirements, and is identical to the JL-8 for game purposes. The K-8NG (New Generation) is an advanced trainer/strike aircraft with an air-to-ground precision strike capability, and able to mount laser designators, smart munitions, and reconnaissance pods. The centerline hardpoint is added, and able to mount things like laser designators and camera pods; it is not rated to mount weapons or fuel tanks, except for a 23mm autocannon.

Twilight 2000 Notes: China only began ordering the K-8 just before the Twilight War, and few were available to Chinese forces. Pakistan built large numbers of them and used them in conflicts against Indian forces throughout the Twilight War.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
JL-8	$3,019,571	JP5	943 kg	4.33 tons	2	13	None	Enclosed
K-8	$2,973,161	JP5	943 kg	4.33 tons	2	13	None	Enclosed
K-8P	$4,092,461	JP5	943 kg	4.33 tons	2	14	None	Enclosed
K-8W	$4,149,791	JP5	943 kg	4.33 tons	2	14	None	Enclosed
K-8NG	$4,231,691	JP5	943 kg	4.33 tons	2	15	None	Enclosed

Vehicle	Tr Mov	Com Mov	Mnvr/Acc Agl/Turn	Fuel Cap	Fuel Cons	Ceiling	Armor
JL-8	1136	316 (100)	NA 85 6/3 60/30	1855	770	13600	FF3 CF3 RF3 T2 W3
K-8	1075	299 (100)	NA 81 6/3 60/30	1855	728	13600	FF3 CF3 RF3 T2 W3
K-8P	1075	299 (100)	NA 81 6/3 60/30	1855	728	13600	FF3 CF3 RF3 T2 W3
K-8W	1075	299 (100)	NA 81 6/3 60/30	1855	728	13600	FF3 CF3 RF3 T2 W3
K-8NG	1075	299 (100)	NA 81 6/3 60/30	1855	728	13600	FF3 CF3 RF3 T2 W3

Vehicle	Combat Equipment	Minimum Landing/Takeoff Zone	RF	Armament	Ammo
JL-8	None	440/400m Hardened Runway	+1	23mm ZU-23 autocannon, 4 hardpoints	200x23mm
K-8	None	440/400m Hardened Runway	+1	23mm ZU-23 autocannon, 4 hardpoints	200x23mm
K-8P	None	440/400m Hardened Runway	+1	23mm ZU-23 autocannon, 4 hardpoints	200x23mm
K-8W	Secure Radios, HUD	440/400m Hardened Runway	+2	23mm ZU-23 autocannon, 4 hardpoints	200x23mm
K-8NG	Secure Radios, HUD	440/400m Hardened Runway	+3	23mm ZU-23 autocannon, 4 hardpoints	200x23mm

Panavia Tornado IDS

Notes: This is the strike version of the Tornado multirole aircraft (IDS stands for InterDictor/Strike). It was a joint venture of

Germany, Britain, and Italy, and is or was in service with those countries and with Saudi Arabia. BAC in Britain and MBB in Germany each had a 42.5% stake in the project, while Aeritalia in Italy had a 15% stake in the project. A separate composite entity, Turbo-Union, was formed to produce the RB199 engines for the Tornado, with Rolls-Royce in Britain and MTU in Germany each having a 40% interest in the engine project, and Fiat of Italy having the remaining 20%. (Side note, the Tornado was originally called the Panther; I do not know why they changed the name.)

The Tornado is a variable geometry aircraft with automatic sweep; the wings change their angle of sweep in response to changes in airspeed; the automatic sweep angle may be overridden by the pilot, but the manufacturer does not recommend this. The wing hardpoints also pivot as the wings' sweep angle changes. The crew has ejection seats, and the aircraft is capable of in-flight refueling. Up to 4 of its hardpoints may be used for drop tanks. The prototypes were capable of a Mach 1.2 supercruise, but production Tornados with external stores did not have this ability. Initial Tornado IDSs were powered by two RB199 Mk 101 turbofans, developing 8700 pounds thrust dry and 14840 pounds thrust in afterburner. The RB199 Mk 103 turbofan engines have a thrust rating of 9105 pounds of thrust each, or 16000 pounds each in afterburner. The Mk 103 powered the IDS for the longest period of time, including during Desert Storm. These engines were later replaced with the RB199 Mk 105, with 9555 pounds thrust dry and 16700 pounds in afterburner. The RB199 is an evolutionary development of the engines used in the Concorde jetliner. Controls are hydraulic, but actuated by the fly-by-wire architecture. The fly-by-wire system also makes dozens of micro-adjustments per second to keep the aircraft stable during its flight and maneuvers. The Tornado IDS has seven hardpoints, three under the flat fuselage belly and four under the wings. The Tornado IDS may be configured with up to four large drop tanks and an underfuselage buddy refueling pod to allow the Tornado to operate as a tanker. Tornados are able to carry and deploy virtually any weapon employed by the user country, including in the case of the RAF, nuclear weapons. The GR.1B is a dedicated antishipping aircraft; it has software to carry and employ several antishipping weapons, but is otherwise like the GR.1 for game purposes. BAE has tested a Tornado with components made by 3D printing, and has subsequently been used to replace some parts that required spares, saving up to 1.2 million Pounds.

Upgrades began in earnest in the 1990s after experience in Desert Storm. The RAF Tornado IDSs were made over into GR.4s, with the addition of a FLIR, a wide-angle HUD, and the software and hardware to carry a slew of new weapons, from Paveway III smart bombs to Storm Shadow cruise missiles. The software was almost wholly replaced, with the installation of a new mission computer. The GR.4 can also use the RAPTOR reconnaissance pod. The GR.4 was further improved into the GR.4A, with the capability to use the Paveway IV bomb and new radios compatible with the Link 16 system. In 2000, German IDSs received the ASSTA 1 upgrade, which gave the ability to use new weapons including the HARM, the Taurus KEPD 350 cruise missile, the Litening II targeting pod, and Paveway III smart bombs, as well as the Mk 105 engines. The ASSTA 2 upgrade began in 2005, with new digital avionics and an EW suite; the ASSTA 3 upgrade in 2008 gave the German Tornados the ability to pack the JDAM and further upgraded software. The ASSTA 2 and 3 upgrades were applied only to 85 Tornados, since the Tornado is slated to be replaced by the Eurofighter Typhoon in a short time.

Initial Italian and Saudi Tornados correspond to the RAF GR.1 and German IDS Mk 1 variants of the aircraft. The Italians designate their Tornadoes as A-200s. In 2010, the A-200s received a major upgrade to digital systems and architecture, and the ability to use a number of new munitions; in game terms, these upgraded A-200s are otherwise equivalent to the standard A-200 for game purposes. Saudi GR.1s received upgrades in the 1990s and early 2000s to make them equivalent to the GR.4A for game purposes, except perhaps for parts scroungers.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
RAF GR.1/German IDS (Mk 101 Engines)	$66,945,221	JP5	9 tons	27.95 tons	2	23	Radar (90 km), VAS (30 km)	Shielded
RAF GR.1/German IDS (Mk 103 Engines)	$67,497,301	JP5	9 tons	28.22 tons	2	23	Radar (90 km), VAS (30 km)	Shielded
RAF GR.4	$71,711,237	JP5	9 tons	28.58 tons	2	24	Radar (90 km), FLIR (60 km), VAS (30 km)	Shielded
RAF GR.4A	$72,428,350	JP5	9 tons	28.58 tons	2	24	Radar (90 km), FLIR (60 km), VAS (30 km)	Shielded
ASSTA 1 Upgrade	$67,752,741	JP5	9 tons	28.04 tons	2	23	Radar (90 km), VAS (30 km)	Shielded
ASSTA 2 Upgrade	$71,047,741	JP5	9 tons	28.04 tons	2	23	Radar (90 km), VAS (30 km)	Shielded
ASSTA 3 Upgrade	$71,789,228	JP5	9 tons	28.04 tons	2	24	Radar (90 km), VAS	Shielded

(30 km)

Vehicle	Tr Mov	Com Mov	Mnvr/Acc Agl/Turn	Fuel Cap	Fuel Cons	Ceiling	Armor
RAF GR.1/German IDS (Mk 101 Engines)	2436	677 (130)	NA 183 9/6 90/60	8000	3536	19800	FF6 CF6 RF6 W5 T5*
RAF GR.1/German IDS (Mk 103 Engines)	2523	701 (130)	NA 189 9/6 90/60	8000	3698	19800	FF6 CF6 RF6 W5 T5*
RAF GR.4/4A	2615	726 (130)	NA 197 9/6 90/60	8000	3884	19800	FF6 CF6 RF6 W5 T5*
ASSTA 1/2/3 Upgrade	2664	740 (130)	NA 200 9/6 90/60	8000	3884	19800	FF6 CF6 RF6 W5 T5*

Vehicle	Combat Equipment	Minimum Landing/Takeoff Zone	RF	Armament	Ammo
RAF GR.1/German IDS	Flare/Chaff (75/50), RWR, Deception Jamming (200 km), HUD, IR Uncage, TFR (30 km), Look-Down Radar, Track While Scan, Laser Designator (60 km), ECM 3, ECCM 2, IRCM 2	760/500m Hardened Runway	+4	27mm Mauser BK-27 autocannon, 7 hardpoints	180x27mm
RAF GR.4/4A	Flare/Chaff (75/50), RWR, GPS, Deception Jamming (200 km), HUD, HUD Interface, IR Uncage, TFR (30 km), Look-Down Radar, Track While Scan, Laser Designator (60 km), ECM 3, ECCM 2, IRCM 2, EW Suite	760/500m Hardened Runway	+4	27mm Mauser BK-27 autocannon, 7 hardpoints	180x27mm
ASSTA 1 Upgrade	Flare/Chaff (75/50), RWR, Deception Jamming (200 km), HUD, IR Uncage, TFR (30 km), Look-Down Radar, Track While Scan, Laser Designator (60 km), ECM 3, ECCM 2, IRCM 2	760/500m Hardened Runway	+4	27mm Mauser BK-27 autocannon, 7 hardpoints	180x27mm
ASSTA 2/3 Upgrade	Flare/Chaff (75/50), RWR, GPS, Deception Jamming (200 km), HUD, IR Uncage, TFR (30 km), Look-Down Radar, Track While Scan, Laser Designator (60 km), ECM 3, ECCM 2, IRCM 2, EW Suite	760/500m Hardened Runway	+4	27mm Mauser BK-27 autocannon, 7 hardpoints	180x27mm

*The cockpit has a Kevlar antispalling liner and has an AV of 7.

Nesher

Notes: The Nesher (Griffon Vulture) is an Israeli development of the Mirage V, a stop on the way to the Kfir. It is a dedicated ground attack aircraft, and has no radar except for a radar gunsight. The aircraft has part of the improvements of the Kfir, such as the more powerful engine, but it is mostly a Mirage in design. It is used by Israel and Argentina, where it is called the Dagger.

The Nesher's airframe is identical to the Mirage 5, but internally, it is an all-Israeli aircraft, with an Israeli version of a Martin-Baker ejection seat and Israeli avionics and cockpit design. A wider array of air-to-air missiles may be carried by the Nesher, including heat-seeking missiles of US, French, and Israeli make. A wider variety of air-to-ground munitions may be carried, ranging from gravity bombs to ASMs. The high point of the Nesher in Israeli service was during the 1973 Yom Kippur War, where they performed well and were known for their accurate bombing, and for over 100 air-to-air kills. In 1974, the Nesher began to be replaced in service by the Kfir (see Israeli Fighters). Neshers also saw combat service with Israel's only export customer for the Nesher, Argentina. These Neshers saw combat service in the 1978 Begle Conflict with Chile, and in the 1982 Falklands War, where they flew 153 sorties against land targets and shipping, damaging six British vessels, though 11 were lost in combat, including nine to British Harriers. The remaining Argentine Neshers were upgraded to the Finger standard. The Nesher is powered by a SNECMA 9C turbojet with 9500 pounds thrust, or 13690 pounds thrust in afterburner.

The Nesher S was the standard single-seat fighter version. Ten two-seat trainers were also produced by the Israelis, the Nesher Ts. The Nesher is somewhat less maneuverable than the Mirage 5, as well as having simplified avionics. However, it has a longer combat range and larger payload. The Argentine Dagger is equivalent to the basic Nesher, being simply Neshers with some refurbishment and cockpit labeling replaced with that of the Spanish language. The Finger is upgraded almost to the Kfir C2 standard, with radar, laser rangefinder, and avionics added, but without the airframe improvements and not using the J79 engine.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
Nesher S/Dagger A	$14,128,481	JP5	5.77 tons	13.5 tons	1	15	None	Enclosed
Nesher T/Dagger B	$15,432,208	JP5	5.33 tons	13.94 tons	2	15	None	Enclosed
Finger	$14,327,015	JP5	5.77 tons	13.92 tons	1	16	Radar (74 km)	Enclosed

Vehicle	Tr Mov	Com Mov	Mnvr/Acc Agl/Turn	Fuel Cap	Fuel Cons	Ceiling	Armor
Nesher S/Dagger A	1830	508 (160)	NA 137 5/3 50/25	4000	2893	17680	FF3 CF4 RF4 T3 W4
Nesher T/Dagger B	1773	493 (160)	NA 133 5/3 50/25	4000	2893	17680	FF3 CF4 RF4 T3 W4
Finger	1776	493 (160)	NA 133 5/3 50/25	4000	2893	17680	FF3 CF4 RF4 T3 W4

Vehicle	Combat Equipment	Minimum Landing/Takeoff Zone	RF	Armament	Ammo
Nesher S/Dagger A	Secure Radios, IFF, ECM 2, IRCM 1	700/800m Hardened Runway	+2	2x30mm DEFA 552 Autocannons, 7 Hardpoints	280x30mm
Nesher T/Dagger B	Secure Radios, IFF, ECM 2, IRCM 1	700/800m Hardened Runway	+2	2x30mm DEFA 552 Autocannons, 7 Hardpoints	280x30mm
Finger	Secure Radios, IFF, RWR, ECM 2, IRCM 1, Flare/Chaff Dispensers (50/30)	700/800m Hardened Runway	+3	2x30mm DEFA 552 Autocannons, 7 Hardpoints	280x30mm

Fiat G.91

Notes: The G.91R reconnaissance and ground attack aircraft was adopted by Italy, Portugal, and Germany in the 1950s. (Germany designated this aircraft the G.91R/3, and they were armed with DEFA 552 autocannons.) The pilot has an ejection seat, and the aircraft is not capable of in-flight refueling. It is not an advanced aircraft, but is cheap to buy and maintain. The G.91 has a strengthened underfuselage and undercarriage to operate from minimally-prepared road surfaces and grass strips. The G.91 is powered by a Bristol Siddeley Orpheus turbojet with 4520 pounds thrust. The four M2HB machineguns arming the G.91 are mounted in a removable tray that is easily serviced and reloaded. Gunsights are rudimentary and consist of a simple gunsight projected onto the forward canopy.

The G.91T is primarily a trainer variant, but also has a useful attack capability. It differs only in the extra seat, less machineguns, half the hardpoints, and less carrying ability. (Germany designated this aircraft the G.91R/4.)

The G.91Y (often known as the Yankee), on the other hand, is virtually a new aircraft. It replaced the single engine of earlier models with two General Electric J85 engines, offering greater thrust than the single-engined G.91R; each engine offered 2725 pounds thrust dry, and were equipped with afterburners to give the engines 4080 pounds in each engine in afterburner. The fuel capacity was also almost doubled. The machineguns were replaced by twin 30mm autocannons. The avionics suite, almost not present in the R model, was upgraded with Doppler navigation, a flight computer, radar altimeter, and a HUD. Maneuverability was increased with the addition of leading-edge slats. The Yankee can also be fitted with RATO bottles to decrease the takeoff run by half.

The G.91 saw combat use with the Portuguese Air Force during the Portuguese Colonial War in Angola and Mozambique.

Twilight 2000 Notes: The G-91s were brought back into service to replace aircraft losses in the Twilight War.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
G.91R	$3,774,393	JP5	1.18 tons	5.5 tons	1	15	None	Enclosed
G.91R/3	$3,434,046	JP5	1.18 tons	5.85 tons	1	15	None	Enclosed
G.91T	$1,596,336	JP5	980 kg	6.05 tons	2	15	None	Enclosed
G.91Y	$5,116,910	JP5	1.91 tons	7.8 tons	1	16	None	Enclosed

Vehicle	Tr Mov	Com Mov	Mnvr/Acc Agl/Turn	Fuel Cap	Fuel Cons	Ceiling	Armor
G.91R	1595	443 (110)	NA 120 6/3 50/25	1610	1354	13100	FF4 CF4 RF4 T3 W3*
G.91R/3	1500	417 (110)	NA 113 6/3 50/25	1610	1354	13100	FF4 CF4 RF4 T3 W3*
G.91T	1452	404 (110)	NA 109 6/3 50/25	1610	1354	12190	FF4 CF4 RF4 T3 W3*
G.91Y	1818	505 (100)	NA 136 7/4 60/30	3200	1660	12500	FF4 CF4 RF4 T3 W3*

Vehicle	Combat Equipment	Minimum Landing/Takeoff Zone	RF	Armament	Ammo
G.91R	None	615/745m Primitive Runway	+1	4xM-2HB, 4 Hardpoints	1200x.50
G.91R/3	None	615/745m Primitive Runway	+1	2x30mm DEFA 552, 4 Hardpoints	240x30mm
G.91T	None	615/745m Primitive Runway	+1	2xM-2HB, 2 Hardpoints	600x.50
G.91Y	Radar Warning Receiver, HUD, Inertial Navigation	600/915m Primitive Runway	+2	2x30mm DEFA 552, 4 Hardpoints	240x30mm

*The cockpit is lightly armored and has an AV of 6.

Mikoyan-Gurevich MiG-27 Utkonos

Notes: This is the tactical strike variant of the MiG-23 interceptor; the name Utkonos is Russian for Platypus, and refers to its flattened nose; this is a colloquialism and not the type's official name. Another name, common among Russian and Ukrainian troops, is the Krokodil Gena (after a Russian cartoon character, Gena the Crocodile). The Indians called the MiG-27 the Bahadur (Valiant); the NATO reporting name is the same as the MiG-23, the Flogger. As of 2023, the Russian, Indian, Sri Lankan, Ukrainian, and Kazakh Air Forces have retired the MiG-27, and they were the last countries to use the type.

The MiG-27 was devised due to dissatisfaction with the MiG-27BN, the strike variant of the MiG-23 fighter. In particular, the MiG-23BN had poor forward visibility, a poor strike avionics package, and had features such as variable geometry air intake ramps that a strike aircraft did not need and needlessly increased complexity and weight without a significant increase in performance at low speeds and altitudes. The cockpit also had increased armor, and new strike avionics were installed at the expense of interception-type avionics. The landing gear was beefed up and raised to accommodate larger weapons and to operate from poorer-quality forward airfields. The MiG-27 is powered by a Tumansky R-29-B-300 turbojet with 17600 pounds thrust dry and 25400 pounds thrust in afterburner.

The MiG-27 has a three-position swing-wing; in the forward position, handling characteristics are as shown (this is the normal position for strike configuration), but maximum speed is Tr Mov 450 and Com Mov 413. If wings are in mid-sweep, maximum speed is Tr Mov 605 and Com Mov 553, but minimum Com Mov is 160, Agl is -2/-1, and Turn is -20/-10. If wings are in full sweep, maximum speeds are as shown, but minimum Com Mov is 200, Agl is -3/-2, and Turn is -30/-20. It takes one phase to change sweep by one setting; during this phase, the plane may only fly level or be in a shallow dive and no weapons may be fired or launched. The MiG-27's pylons rotate when the wings sweep to keep the pylons and ordnance pointed into the slipstream.

The first version of the MiG-27 was also known as the MiG-23BM. Its NATO reporting name is the Flogger-D. Later versions of the MiG-27 had the ability to attack in inclement weather, and the dielectric head above the glove pylons was used to house electro-optical and radio frequency gear for guiding weapons. The MiG-27K had the NATO reporting name the Flogger-J2; it is the most advanced Soviet variant, equipped with a laser designator and compatible with a wide variety of Soviet TV-guided and command-guided ordnance. The MiG-27M has the NATO reporting name Flogger-J; it is a later, cheaper alternative to the MiG-27K, despite the NATO reporting name. It deletes the glove-box electro-optical and radio frequency heads, and therefore cannot carry the full range of Soviet ordnance of the time period. Initial marks of the MiG-27M were armed with the GS-6-23M Gatling gun, but this was later replaced with the GSh-30-6 gun. Despite the ordnance delivery system being somewhat dumbed down, the MiG-27M received a better ECM system and an improved nav/attack system. However, the heavy recoil from the autocannon tended to damage the new nav/attack system, and bursts longer than two seconds could also damage the airframe. Many MiG-27Ms are actually MiG-27Ds, which are MiG-23BMs upgraded and modified into the MiG-27M standard; these are identical to MiG-27Ms for game purposes. The MiG-27ML is an export variant supplied to India; it had the addition of an IRST sensor under the nose. They were sent to India in kit form, for assembly in India. India later upgraded these MiG-27MLs into MiG-27Hs, which have French-designed avionics of (in game terms) a higher Tech Level, a partial glass cockpit, and the addition (due to the avionics used being more miniaturized) of a joint GPS/GLONASS receiver, a mission computer, Sextant Ring Laser Gyro navigation with a digital map module, a HUD with HUD interface, secure long-range radios with a data link and communications with ground units, and an improved EW suite. The MiG-27H is the pinnacle of MiG-27 development, but it was not exported outside India.

Except for the base MiG-27s, the MiG-27 is capable of nuclear delivery, with both bombs and missiles.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
MiG-27 (Early)	$17,832,520	JP5	4 tons	20.3 tons	1	19	None	Enclosed
MiG-27 (Late)	$21,393,208	JP5	4 tons	20.4 tons	1	19	None	Enclosed
MiG-27K	$29,461,636	JP5	4 tons	19.3 tons	1	21	Radar (50 km), Image Intensification (9 km)	Enclosed
MiG-27M (Early)	$29,941,845	JP5	4 tons	19.1 tons	1	20	Radar (50 km)	Enclosed
MiG-27M (Late)	$30,457,036	JP5	4 tons	19.3 tons	1	20	Radar (50 km)	Enclosed
MiG-27ML	$30,741,436	JP5	4 tons	19.33 tons	1	21	Radar (50 km), IRST (30 km)	Enclosed
MiG-27H	$32,387,401	JP5	4 tons	19.3 tons	1	22	Radar (74 km), IRST (30 km)	Enclosed

Vehicle	Tr Mov	Com Mov	Mnvr/Acc Agl/Turn	Fuel Cap	Fuel Cons	Ceiling	Armor
MiG-27	2236	621 (130)	NA 168 8/4 80/40	6000	5332	14000	FF6 CF6 RF6 W5 T5*
MiG-27K	2351	653 (120)	NA 177 8/5 80/50	6000	5332	14000	FF7 CF7

								RF6 W5 T5**
MiG-27M (Early)	2375	660 (120)	NA	178	8/5	80/50	6000	5332	14000	FF7 CF7 RF6 W5 T5**
MiG-27M (Late)	2351	653 (120)	NA	177	8/5	80/50	6000	5332	14000	FF7 CF7 RF6 W5 T5**
MiG-27ML	2347	652 (120)	NA	176	8/5	80/50	6000	5332	14000	FF7 CF7 RF6 W5 T5**
MiG-27H	2351	653 (120)	NA	177	8/5	80/50	6000	5332	14000	FF7 CF7 RF6 W5 T5**

Vehicle	Combat Equipment	Minimum Landing/Takeoff Zone	RF	Armament	Ammo
MiG-27 (Early)	RWR, Flare/Chaff (40/30)	700/500m Hardened Runway	+2	GSh-6-30M Autocannon, 7 Hardpoints	260x30mm
MiG-27 (Late)	All-Weather Flight, RWR, Flare/Chaff (45/35)	700/500m Hardened Runway	+2	GSh-6-30M Autocannon, 7 Hardpoints	260x30mm
MiG-27K	All Weather Flight, RWR, Flare/Chaff (50/40), Laser Designator (6 km), ECM 1	700/500m Hardened Runway	+3	GSh-6-30M Autocannon, 7 Hardpoints	260x30mm
MiG-27M (Early)	All Weather Flight, RWR, Flare/Chaff (50/40), ECM 2	700/500m Hardened Runway	+3	GSh-6-23M Autocannon, 7 Hardpoints	260x23mm
MiG-27M (Late)	All Weather Flight, RWR, Flare/Chaff (50/40), ECM 2	700/500m Hardened Runway	+3	GSh-6-30M Autocannon, 7 Hardpoints	260x30mm
MiG-27ML	All Weather Flight, RWR, Flare/Chaff (50/40), ECM 2	700/500m Hardened Runway	+3	GSh-6-30M Autocannon, 7 Hardpoints	260x30mm
MiG-27H	All Weather Flight, Secure Radios, GPS, RWR, HUD, HUD Interface, IFF, Laser Designator (10 km), Flare/Chaff (50/40), ECM 2, IRCM 1, EW Suite	700/500m Hardened Runway	+4	GSh-6-30M Autocannon, 7 Hardpoints	260x30mm

*The cockpit has additional armor and has AV 8.
**The cockpit has additional armor and has AV 9.

Sukhoi Su-7 Fitter

Notes: This elderly ground-attack aircraft first flew in the 1950s. Fitter is the NATO reporting name. It remains in service with many Third-World countries that were former Soviet client states. Its highly swept wings do not lend themselves to maneuverability, and its underpowered engine does not give it high speed or good cargo capability. The aircraft has an ejection seat, but is not capable of in-flight refueling.

The Su-7A was the initial version; it was not a strike aircraft at this point, but a low-level tactical air superiority fighter. It did not prove particularly good at that role, for the reasons noted above. It remained in service from 1959-65, but experiments began in 1959 to turn the disappointing fighter into a strike aircraft, producing the Su-7B. The Su-7A (and B) used the Lyulka AL-7F turbojet engine, which produced 15000 pounds of thrust dry and 21200 pounds thrust in afterburner. It was not a particularly reliable version of that engine, and it tended to fail at the wrong moment; it also suffered from high fuel consumption.

The Su-7B was the first ground-attack version, manufactured from 1960-62. It has an improved gunsight optimized for ground attack. It should be noted that despite the high fuel consumption, the Su-7A and Su-7B have no wet hardpoints, and cannot carry external fuel tanks, limiting their combat radius significantly. The Su-7BM is a heavily modified version of the Su-7B, equipped with a more reliable and less maintenance-hungry AL-7F-1 engine with the same power as the AL-7F, though the engine is just as fuel hungry. Fuel tanks were installed in the wings (the Su-7A and B do not have wing fuel tanks); a way to tell a Su-7BM or later from the Su-7A and B is the external fuel pipes mounted on either side of the fuselage spine. The Su-7BM also has a pair of wet hardpoints on the inside wings. The Su-7BM is capable of nuclear gravity bomb delivery. The Su-7BKL is a rough-field-capable version of the BM,

with small skids on the sides of the main landing gear and provision for a pair of SPRD-110 JATO rockets; when used, takeoff run is cut in half. The Su-7BKL also pops two braking parachutes when landing, cutting landing run distance. The Su-7BMK is a simplified version of the Su-7BM, with reduced maintenance requirements and not fitted for nuclear weapons delivery.

The Su-7U is a two-seat trainer version of the Su-7B, instead of lengthening the fuselage like most such aircraft, the Russians simply removed one fuel tank behind the cockpit and installed the second cockpit there. The Su-7UM is a trainer version of the Su-7BM; the Su-7UMK is a trainer version of the Su-7BMK. All have the NATO reporting name of Moujik.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
Su-7A	$11,425,608	JP-A	2.5 tons	13.5 tons	1	17	None	Enclosed
Su-7B	$11,611,608	JP-A	2.5 tons	13.5 tons	1	17	None	Enclosed
Su-7BM	$12,080,328	JP-A	2.5 tons	13.58 tons	1	15	None	Enclosed
Su-7BKL	$13,020,093	JP-A	2.5 tons	13.72 tons	1	16	None	Enclosed
Su-7BMK	$12,082,653	JP-A	2.5 tons	13.58 tons	1	14	None	Enclosed
Su-7U	$11,616,258	JP-A	2.5 tons	13.94 tons	2	17	None	Enclosed
Su-7UM	$12,084,978	JP-A	2.5 tons	14.02 tons	2	15	None	Enclosed
Su-7UMK	$12,087,303	JP-A	2.5 tons	14.02 tons	2	14	None	Enclosed

Vehicle	Tr Mov	Com Mov	Mnvr/Acc Agl/Turn	Fuel Cap	Fuel Cons	Ceiling	Armor
Su-7A	2154	599 (150)	NA 162 5/3 50/30	4260	4567	17600	FF4 CF4 RF4 T3 W3
Su-7B	2154	599 (150)	NA 162 5/3 50/30	4260	4567	17600	FF4 CF4 RF4 T3 W3
Su-7BM	2141	595 (150)	NA 161 5/3 50/30	4680	4567	17600	FF4 CF4 RF4 T3 W3
Su-7BKL	2120	589 (150)	NA 160 5/3 50/30	4680	4567	17600	FF4 CF4 RF4 T3 W3
Su-7BMK	2141	595 (150)	NA 161 5/3 50/30	4680	4567	17600	FF4 CF4 RF4 T3 W3
Su-7U	2087	580 (150)	NA 157 5/3 50/30	3810	4567	17600	FF4 CF4 RF4 T3 W3
Su-7UM	2075	576 (150)	NA 156 5/3 50/30	4240	4567	17600	FF4 CF4 RF4 T3 W3
Su-7UMK	2075	576 (150)	NA 156 5/3 50/30	4240	4567	17600	FF4 CF4 RF4 T3 W3

Vehicle	Combat Equipment	Minimum Landing/Takeoff Zone	RF	Armament	Ammo
Su-7A	Flare/Chaff (25/15), RWR	905/950m Hardened Runway	+1	2x30mm NR-30 autocannons, 9 hardpoints	140x30mm
Su-7B/U	Flare/Chaff (25/15), RWR	905/950m Hardened Runway	+1 (+2 air-to-ground)	2x30mm NR-30 autocannons, 9 hardpoints	140x30mm
Su-7BM/UM	Flare/Chaff (30/20), RWR	905/950m Hardened Runway	+1 (+2 air-to-ground)	2x30mm NR-30 autocannons, 9 hardpoints	140x30mm
Su-7BKL	Flare/Chaff (40/30), RWR, IFF	680/950m Primitive Runway	+2	2x30mm NR-30 autocannons, 9 hardpoints	140x30mm
Su-7BMK/UMK	Flare/Chaff (30/20), RWR, IFF	905/950m Hardened Runway	+2	2x30mm NR-30 autocannons, 9 hardpoints	140x30mm

Sukhoi Su-17/Su-20/Su-22

Notes: The Su-17 Fitter is basically an Su-7 Fitter equipped with variable geometry wings and a more powerful engine; the Soviets

realized the shortcomings of the Su-7 within months of its introduction and ordered a “perfected” form of the Su-7. To this end, the Russians put variable geometry wings on an Su-7BM (the Su-7IG testbed, later lost in a crash), then steadily upgraded the product until the Su-17 (NATO reporting name: Fitter-C) was okayed for series production in 1969. Production of the Su-17/20/22 was long enough that a plethora of modified and improved versions were devised.

The swing wing has two positions, fore and aft, for low or high speeds. The wing sweep may be changed only when the aircraft spends 4 phases or more in straight-line or minimal turn rate flight. Unless the wings are swept, the maximum combat move is 500; but if the wings are swept, minimum speed is 150 and all agility ratings are -1 and turn rates are -20/-10.

The Su-17 was the initial design, little more than a production variant of the Su-7IG prototype, with only minimum upgrades to avionics and extra power boosting in the controls. It used the same Lyulka AL-7F-1 afterburning turbojet engine as the Su-7BM, but its hardpoints were partially redistributed and made able to pivot when the wings were swept or unswept.

While the Su-17 was little more than a production prototype, the Su-17M has a large number of upgrades and modifications to make into a much more capable combat aircraft. Its NATO reporting name was also the Fitter-C. The engine was replaced with the Lyulka AL-21F-3 afterburning turbojet with 17200 pounds thrust dry or 24700 pounds thrust in afterburner. This engine was coupled with a variable position intake to give it greater efficiency at high speeds. The fuselage was modified to allow for two more fuselage hardpoints, and incorporated a wing sweep mechanism that deleted the driveshafts. A minor form of navigation gear, a radio compass, was incorporated into the avionics. The Su-17M-28 and Su-17MKG were minor variants of the Su-17M used to test air-to-surface missiles such as the Kh-28, Kh-25, and Kh-29. The Su-17M was exported under the designation Su-20. A small number of Su-17Ms were rigged to carry several reconnaissance pods, including photographic and ELINT pods; these were designated Su-17Rs.

The Su-17M2, NATO reporting name Fitter-D, was a further heavily modified version of the Su-17M. The nose is extended 38 centimeters, not only to incorporate a droop for better visibility, but to house a laser rangefinder, enhanced aiming avionics, and a laser designator; the ranging radar of previous versions was removed as obsolete. However, underneath the nose was a fairing for a Doppler navigation radar and the KN-23 navigation system taken from the MiG-23. The Su-17M2 is also equipped with a transponder, and this transponder was replaced several times during the Su-17M2’s service lifespan. Under the wing in a pod was carried a command guidance emitter for air-to-ground ordnance requiring such guidance. Due to the Doppler radar fairing, the Su-17M2 was given the nickname Borodoy, by its aircrews and ground crews, which means “with a beard.”

The Su-17M2D featured the installation of a Tumansky/Khatchaturov R-29BS-300 afterburning turbojet, which offered somewhat higher thrust at 17640 pounds thrust dry and 25360 pounds thrust in afterburner. It also has higher fuel consumption, and for this reason was not used by the Soviets, being used only in export models, which were designated Su-22 (NATO reporting name: Fitter-F).

The Su-17M3, NATO reporting name Fitter-H, was the most numerous of the Su-17 series, with almost 1000 being built between the Soviet version and its export versions. Based on the Su-17UM, the second cockpit was removed and a large fuel tank installed as well as an avionics bay. The electronics were improved and miniaturized, having what in game terms a higher Tech Level than on the Su-17M or Su-17M2. The Doppler navigation radar was moved internally. Two more hardpoints were added; these extra pylons could carry only R-13 or R-60 air-to-air missiles. The Su-17M3 has a ventral fin on the underside of the rear fuselage; this fin also incorporated some communications antennas. Extensive autopilot systems were installed; the pilot could basically have his aircraft auto-navigate to up to four waypoints and then to the target, and the autopilot could also automate some of the weapons dropping and firing. The export version was designated the Su-22M. The Su-22M3 had special hardpoints which could mount gun pods on the wings facing to the front or rear (this depends upon which way they were mounted on the ground; they could not pivot to the rear or to the front during flight); when firing to the rear, the RF bonus is only +1.

The Su-17M4 (NATO reporting name: Fitter-K) was the final production version of the Su-17 series. The Su-17M4 had the addition of RSDN navigation (the Russian version of LORAN) and INS. There were several ram-air inlets along the fuselage to improve engine cooling; the inlet cone was also fixed. While this decreased the maximum speed dramatically, it also simplified production and maintenance and allowed for a more powerful laser rangefinder to be installed in the nose cone.

The Su-22M5 was a Russian-French upgrade package for the Su-17 and Su-22 series. This package further miniaturized electronics, modernized the cockpit instruments, and replaced the nose cone-mounted laser rangefinder with a Phazotron/Thomson-CSF radar set, with the designator moved to the port wing box. The stick and throttle are a HOTAS set.

The Su-17UM is a two-seat trainer version of the Su-17M2, which also retains its full combat capability. It carries less fuel, as with the Su-7U series it is made by removing a fuel tank behind the first cockpit and installing the second cockpit in its place. The port cannon was also deleted on the Su-17UM. Flight testing revealed longitudinal instability at high angles of attack and the tail fin was enlarged as a result. The export version has an R-29BS-300 engine and is designated Su-22U. The Su-17UM and Su-22U have the NATO reporting name of Fitter-E.

The Su-17UM3 is a trainer version of the Su-17M3, which retains full Su-17M3 combat capability, but with reduced fuel load. The export version with the R-29 engine is designated the Su-22UM3. Some export versions of these aircraft were powered by an AL-21 engine and were designated Su-22UM3K.

The Su-17 in all its marks is not capable of air-to-air refueling. All variants could be converted to tactical reconnaissance aircraft by the mounting of a KKR (Combined Reconnaissance Pod) which contained cameras for day and night as well as having ELINT functions. All Su-17 variants are capable of nuclear gravity bomb delivery; the M3 and M4 are also capability of nuclear missile delivery. Export variants are not capable of nuclear weapons delivery.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
Su-17	$20,678,618	JP5	2.5 tons	19.5 tons	1	14	None	Enclosed

Su-17M	$22,834,456	JP5	4 tons	19.67 tons	1	14	None	Enclosed
Su-17M2	$29,132,019	JP5	4.25 tons	19.7 tons	1	16	None	Enclosed
Su-17M2D	$29,521,119	JP5	4.25 tons	19.85 tons	1	16	None	Enclosed
Su-17M3	$32,665,319	JP5	4.25 tons	19.54 tons	1	16	None	Enclosed
Su-17M4	$33,459,319	JP5	4.25 tons	19.54 tons	1	17	None	Enclosed
Su-17M5	$34,312,869	JP5	4.25 tons	19.59 tons	1	18	Radar (100 km)	Enclosed
Su-17UM	$18,907,423	JP5	4.25 tons	19.56 tons	2	14	None	Enclosed
Su-17UM3	$28,339,924	JP5	4.25 tons	19.6 tons	2	16	None	Enclosed

Vehicle	Tr Mov	Com Mov	Mnvr/Acc Agl/Turn	Fuel Cap	Fuel Cons	Ceiling	Armor
Su-17	1997	555 (110)	NA 150 7/4 70/40	4260	4567	14200	FF4 CF4 RF3 T3 W4
Su-17M	2269	630 (110)	NA 170 7/4 70/40	4260	5242	14200	FF4 CF4 RF3 T3 W4
Su-17M2	2265	629 (110)	NA 170 7/4 70/40	4260	5242	14200	FF4 CF4 RF3 T3 W4
Su-17M2D	2305	640 (110)	NA 173 7/4 70/40	4260	5377	14200	FF4 CF4 RF3 T3 W4
Su-17M3	2284	634 (110)	NA 171 7/4 70/40	4850	5242	14200	FF4 CF4 RF3 T3 W4
Su-17M4	2284	634 (110)	NA 171 7/4 70/40	4850	5242	14200	FF4 CF4 RF3 T3 W4
Su-17M5	2278	633 (110)	NA 171 7/4 70/40	4850	5242	14200	FF4 CF4 RF3 T3 W4
Su-17UM	2281	634 (110)	NA 171 7/4 70/40	3820	5242	14200	FF4 CF4 RF3 T3 W4
Su-17UM3	2277	632 (110)	NA 171 7/4 70/40	4410	5242	14200	FF4 CF4 RF3 T3 W4

Vehicle	Combat Equipment	Minimum Landing/Takeoff Zone	RF	Armament	Ammo
Su-17	Flare/Chaff (30/20), RWR	905/950m Hardened Runway	+1 (+2 air-to-ground)	2x30mm NR-30 autocannons, 7 hardpoints	160x30mm
Su-17M	Flare/Chaff (40/30), RWR, IFF	905/950m Hardened Runway	+2	2x30mm NR-30 autocannons, 9 hardpoints	160x30mm
Su-17M2	Flare/Chaff (40/30), RWR, IFF, Laser Designator (6 km), TFR (20 km)	905/950m Hardened Runway	+2	2x30mm NR-30 autocannons, 9 hardpoints	160x30mm
Su-17M2D	Flare/Chaff (40/30), RWR, IFF, Laser Designator (6 km), TFR (20 km)	905/950m Hardened Runway	+2	2x30mm NR-30 autocannons, 9 hardpoints	160x30mm
Su-17M3	Flare/Chaff (40/30), RWR, IFF, Laser Designator (6 km), TFR (20 km), ECM 1	905/950m Hardened Runway	+3	2x30mm NR-30 autocannons, 9 hardpoints	160x30mm
Su-17M4	Flare/Chaff (40/30), RWR, IFF, INS, Laser Designator (6 km), TFR (20 km), ECM 1	905/950m Hardened Runway	+3	2x30mm NR-30 autocannons, 11 hardpoints	160x30mm
Su-17M5	Secure Radios, Flare/Chaff	905/950m Hardened	+3	2x30mm NR-30	160x30mm

	(40/30), RWR, IFF, INS, Laser Designator (9 km), TFR (30 km), ECM 1, ECCM 1	Runway		autocannons, 11 hardpoints	
Su-17UM	Flare/Chaff (40/30), RWR, IFF	905/950m Hardened Runway	+2	30mm NR-30 autocannon, 9 hardpoints	80x30mm
Su-17UM3	Flare/Chaff (40/30), RWR, IFF, Laser Designator (6 km), TFR (20 km), ECM 1	905/950m Hardened Runway	+3	30mm NR-30 autocannon, 9 hardpoints	80x30mm

SukhoiSu-24 Fencer

Notes: This is the one of the Russian's primary strike aircraft. It is also in use by several former Russian republics, Iran, Libya, and Syria. It is a medium bomber in the same class as the US F-111. One of the conditions the Soviet leaders put on Sukhoi when the Su-7B was adopted was that a more advanced strike aircraft be developed, and they later let Sukhoi know that the Su-17 wasn't good enough. They saw the development of the US F-111 and said, "This is what we want." While Sukhoi developed the airframe of the Su-24, a design firm called OKB-794 (now known as Lennets) developed the avionics; OKB-794 developed an avionics package called Puma. (This package was similar enough the avionics on early prototypes of the F-111 to make the US suspect espionage.)

The Fencer is capable of delivering nuclear weapons. The Su-24 has ejection seats but is not capable of in-flight refueling. The Fencer has a variable geometry wing with auto sweep features. The avionics suite was comprehensive, though short of what the F-111 delivered. For the first time, a Soviet strike aircraft had an all-weather day/night attack capability. Power is provided by a pair of Saturn/Lyulka AL-21F-2A afterburning turbojets developing 17175 pounds thrust dry and 24675 pounds thrust in afterburner. The air intakes had variable position inlet ramps, improving high speed performance, but since the Su-24's missions would primarily take place at low-altitude and low speeds, the actuators of the inlet ramps were removed to save weight and maintenance; this dramatically reduces maximum speed, but simplifies maintenance. The original Su-24s (designated Fencer-A by NATO) had a boxy rear fuselage, but a revised variant (designated Fencer-B by NATO, but not given a separate designation by the Soviets) had a more streamlined rear fuselage, as well as three fairings for antennas on the nose, a repositioned landing parachute, and a new ram-air intake at the base of the tail. The cannon armament is a GSh-6-23 Gatling gun, unusual for the time period, the firing barrel is covered by an eyelid shutter, similar to the gun installation that would become more common on aircraft like the F-22 and F-35A. Initial Su-24s had basic ECM jammers, while later Su-24s (designated Fencer-C by NATO), though again the Soviets did not give it a separate designation) have Active Jamming and Deception Jamming capabilities, again something that the US was also working on. Basic variants had fairings near the fuselage rear for flare and chaff dispensers, while Fencer-Cs had additional dispensers on added wing fences on the upper parts of the non-sweeping parts of the wing.

The first official subtype of the Su-24 was the Su-24M (Fencer-D in NATO parlance). The Su-24M had in-flight refueling capability and had a 76-centimeter extension of the nose to house the inflight refueling probe and additional avionics. In addition, additional radar avionics were installed along with a longer-range radar. INS was added along with a TV-optical/laser designator type system were installed in the port side of the lower fuselage; this is similar to the Pave Tack system used in the F-111. Systems were added to the Su-24M to widen the aircraft's compatibility with air-to-ground ordnance. However, all the new systems led to a slight reduction of internal fuel, despite the lengthening of the nose.

The Su-24M2 (also Fencer-D in NATO speak) began in 1999. This upgrade began with a comprehensive refurbishment in Su-24M airframes, and modernized the avionics with miniaturization and upgrades (again, in game terms, on a higher Tech Level). The Su24M2 received a new navigation system, using GLONASS with an inertial navigation backup. A HUD interface system was installed, along with an Auto Track feature to help keep track of a larger amount of targets; this HUD system is borrowed from the Su-27. An even wider array of air-to-ground munitions may be carried, ranging from TV-guided bombs to cruise missiles. The Su-27MK is an export version with downgraded capability. It is also known as the Fencer-D to NATO.

The Su-24MR is a dedicated reconnaissance platform; the Su-24MP is a dedicated ELINT variant. These will not be detailed here, but may be in a future page (I have some ideas).

Twilight 2000 Notes: Many tragic mistakes resulted from the Su-24's resemblance to the F-111, so much so that many aircraft of both types were mistakenly shot down by both sides.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
Su-24 Fencer-A	$78,877,943	JP5	8 tons	36 tons	2	23	Radar (100 km)	Shielded
Su-24 Fencer-B	$79,434,343	JP5	8 tons	36 tons	2	23	Radar (100 km)	Shielded
Su-24 Fencer-C/MK	$101,438,983	JP5	8 tons	36.12 tons	2	24	Radar (150 km)	Shielded
Su-24M	$121,146,868	JP5	8 tons	36.19 tons	2	25	2nd Gen FLIR (12 km), Radar (200 km)	Shielded
Su-24M2	$119,082,740	JP5	8 tons	35.88 tons	2	26	2nd Gen FLIR	Shielded

						(12 km), Radar (300 km)	

Vehicle	Tr Mov	Com Mov	Mnvr/Acc Agl/Turn	Fuel Cap	Fuel Cons	Ceiling	Armor
Su-24 Fencer-A	2473	687 (110)	NA 186 6/2 60/20	13200	10471	11000	FF8 CF8 RF8 W5 T5
Su-24 Fencer-B	2473	687 (110)	NA 186 6/2 60/20	13200	10471	11000	FF8 CF8 RF8 W5 T5
Su-24 Fencer-C/MK	2465	685 (110)	NA 185 6/2 60/20	13200	10471	11000	FF8 CF8 RF8 W5 T5
Su-24M	2461	683 (110)	NA 184 6/2 60/20	13115	10471	11000	FF8 CF8 RF8 W5 T5
Su-24M2	2482	689 (100)	NA 186 6/3 60/20	13115	10471	11000	FF8 CF8 RF8 W5 T5

Vehicle	Combat Equipment	Minimum Landing/Takeoff Zone	RF	Armament	Ammo
Su-24 Fencer-A	Flare/Chaff (30/20), ECM 2, IRCM 2, TFR (20 km)	1305/945m Hardened Runway	+2	23mm GSh-6-23 autocannon, 9 hardpoints	500x30mm
Su-24 Fencer-B	Flare/Chaff (30/20), RWR, ECM 2, IRCM 2, TFR (20 km)	1305/945m Hardened Runway	+2	23mm GSh-6-23 autocannon, 9 hardpoints	500x30mm
Su-24 Fencer-C/MK	Flare/Chaff (50/40), RWR, Deception Jamming (100 km), Active Jamming (ECM 3, IRCM 2), HUD, TFR (20 km)	1305/945m Hardened Runway	+3	23mm GSh-6-23 autocannon, 9 hardpoints	500x30mm
Su-25M	Flare/Chaff (50/40), RWR, INS, Deception Jamming (100 km), Active Jamming (ECM 4, IRCM 3), HUD, TFR (30 km), Laser Designator (12 km)	1305/945m Hardened Runway	+3	23mm GSh-6-23 autocannon, 9 hardpoints	500x30mm
Su-25M2	Flare/Chaff (50/40), RWR, GLONASS/INS, Deception Jamming (100 km), Active Jamming (ECM 4, IRCM 3), EW Suite, HUD, HUD Interface, TFR (30 km), Laser Designator (12 km), Auto Track	1305/945m Hardened Runway	+4	23mm GSh-6-23 autocannon, 9 hardpoints	500x30mm

Sukhoi Su-25 Grach

Notes: This is the Russian counterpart of the A-10, being a dedicated ground attack aircraft. In addition to Russia, the Frogfoot is operated by Afghanistan, Angola, Bulgaria, Czechoslovakia, Iran, Iraq, North Korea, and Peru. This aircraft was first used in combat in the Soviet-Afghan War, and it has seen combat in almost a dozen conflicts since, up to the current Russian-Ukrainian War. The Su-25 was built in Tbilisi, Georgia, and construction stopped in 2010. Attempts were made to resume production both in Georgia and Russia, but these so far have ended in failure.

The pilot of the Su-25 has an ejection seat, and the aircraft is capable of inflight refueling. The wing has high-lift devices including slats and flaps, and the wing has a high aspect ratio which further increases low-speed lift. Construction of the Su-25 is largely of duralumin, with titanium in areas requiring high strength (such as the nose, wing leading edges, and the “bathtub” of armor surrounding the pilot), and even stainless steel. The early marks of the Su-25 are powered by a pair of Tumansky R-95Sh non-afterburning turbojets, each developing 8970 pounds thrust. The latest versions of the Su-25, such as the Su-25T and TM, are powered by R-195 turbojets, improved versions of the R-95Sh, which develop 9930 pounds thrust each. Gun armament is under the cockpit; this consists of a double-barreled 30mm autocannon. The cockpit is described by many Su-25 pilots as cramped; in addition, the pilot sits low in the cockpit, hindering all-around visibility. Rearward visibility is especially poor, and the canopy has a rearward-facing periscope. The Su-25 is not equipped to guide TV-guided weapons but has a laser designator and rangefinder. The Su-25 is equipped for night and adverse weather attack conditions. Communications include air-to-air and air-to-ground radios. The Su-25 has a weakness, in that when rockets are salvo-fired from the wing pylons, the exhaust from the rockets can get ingested into the air intakes. This can cause the engines to flame out.

Variants include the Su-25K, which is the export version and has some minor differences in avionics; the Su-25K is identical to the Su-25 for game purposes. The Su-25UB is a two-seat trainer version of the Su-25; this version retains full combat capability, and can be called upon for combat missions, though the combat capability is retained primarily for training purposes. The Su-25UBK is a two-seat variant of the Su-25K, again retaining full combat capability. It is identical to the Su-25UB for game purposes. The Su-25UTG was designed to train naval pilots to take off from a flight deck equipped with a ski jump ramp, but also retains full combat capability. Other than having an arresting hook, it is almost identical to the Su-25UB, except for some differences in weight.

The Su-25T is a dedicated antitank version. It is based on the Su-25UB, but the rear seat is replaced with additional avionics and fuel. The Su-25T can carry a wider variety of weapons than the Su-25; most notably, it can carry TV-guided weapons, as well as the Kh-25ML SALH-guided missile. The Su-25T can also use the 9K121 Vikhr ATGM, which is its primary tank-hunting weapon. The Su-25T's nose in enlarged, and carries a laser rangefinder, a laser designator and an optical TV aiming system. Despite the upgrade, the Su-25T's upgrade program was very much stopgap and ended in 2000 in favor of the Su-25TM.

The Su-25TM, aka the Su-39 (also known as the Frogfoot-B) is a development of the Frogfoot using lessons learned from the War in Afghanistan. It is a two-seat trainer with the rear seat removed and replaced with additional fuel and avionics, and a radar set is carried in a pod beneath the nose. The cannon has been increased to 6 barrels for a greater fire rate, and ammunition supply has been increased. Armor in the fuselage has been increased. IR suppression has been achieved through cooling intakes in the upper fuselage and a new center body that masks hot turbines. The Su-25TMis rated for attacks against all sorts of targets, including air-to-air threats and shipping, as well as its staple diet of armored vehicles.

The Su-25SM is described as an "affordable" variant of the Su-25TM, with Western-derived (and pirated), more efficient electronics and a few reductions in electronics in favor of podded systems, most notably in EW equipment. Some improvements have also been made, such as the new HUD which has double the field of view of the electro-optical sight on the Su-25TM. The Su-25SM's pilot navigates with a GLONASS system with an INS backup. The new engines of the Su-25SM are similar to the R-195, but have an antisurge system which makes them much more resistant to the ingestion of exhaust particles from air-to-ground rockets.

The further upgraded Su-25SM3 features a new electro-optics nose module which integrates a laser designator and rangefinder, a radar set, a 16x zoom optical sight, a thermal imager, and a TV sight and tracker. The wingtips mount a pair of integral ECM pods, restoring the onboard EW capability.

The Su-25KM is a proposed upgrade kit based on advancements at the original Su-25 manufacturing plant in Georgia in conjunction with Elbit of Israel. A prototype has been produced for testing and evaluation. The Su-25KM features advanced avionics with a glass cockpit, digital map generator, a helmet-sight interface, and fully redundant backups for vital systems. The navigation suite is fully GPS/GLONASS compliant with an INS backup. The Su-25KM can use several Israeli air-to-ground weapons in addition to Soviet and Russian weapons.

The Su-25M1 is a Ukrainian upgrade of the basic Su-25. The Su-25M1 has a GPS receiver, new NATO-compliant radios, more accurate sights and weapon delivery, and a new digital flight recorder. In addition, safe rocket delivery has been restored to the Su-25M1. A two-seat Su-25UBM1 version has also been built.

Twilight 2000 Notes: Russia had about two-dozen of the Su-25TMs at the start of the Twilight War. The Su-25SM, SM3, KM, M1 and UBM1 do not exist in the Twilight 2000 timeline.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
Su-25	$21,567,781	JP5	4.4 tons	18.6 tons	1	21	None	Enclosed
Su-25T	$21,982,481	JP5	4.4 tons	18.6 tons	1	21	None	Enclosed
Su-25TM	$43,155,724	JP5	4.4 tons	19.4 tons	1	22	Radar (57 km), FLIR (12 km)	Enclosed
Su-25SM	$28,846,085	JP5	4.4 tons	18.6 tons	1	22	FLIR (12 km)	Enclosed
Su-25SM3	$35,915,125	JP5	4.4 tons	18.8 tons	1	23	Radar (57 km), FLIR (12 km)	Enclosed
Su-25KM	$30,626,105	JP5	4.4 tons	18.1 tons	1	23	Radar (57 km), FLIR (12 km)	Enclosed
Su-25M1	$20,266,261	JP5	4.4 tons	18.3 tons	1	22	None	Enclosed
Su-35UB	$21,574,161	JP5	4.4 tons	19.04 tons	2	21	None	Enclosed
Su-25UBM1	$20,655,441	JP5	4.4 tons	18.74 tons	2	21	None	Enclosed

Vehicle	Tr Mov	Com Mov	Mnvr/Acc Agl/Turn	Fuel Cap	Fuel Cons	Ceiling	Armor
Su-25	1874	521 (100)	NA 141 6/3 60/30	3200	5467	7000	FF8 CF8 RF8 W5 T5*
Su-25T	2072	576 (100)	NA 156 6/3 60/30	3735	6052	7000	FF8 CF8 RF8 W5 T5*
Su-25TM	1988	552 (100)	NA 149 6/3 60/30	3735	6052	7000	FF9 CF9 RF8 W6 T5*
Su-25SM	2072	576 (100)	NA 156 6/3 60/30	3735	6052	7000	FF9 CF9

									RF8 W6 T5*
Su-25SM3	2051	569 (100)	NA	154	6/3	60/30	3735	6052	7000	FF9 CF9 RF8 W6 T5*
Su-25KM	2129	592 (100)	NA	160	6/3	60/30	3735	6052	7000	FF9 CF9 RF8 W6 T5*
Su-25M1	1905	529 (100)	NA	142	6/3	60/30	3200	5467	7000	FF8 CF8 RF8 W5 T5*
Su-35UB	1832	509 (100)	NA	137	6/3	60/30	3200	5467	7000	FF8 CF8 RF8 W5 T5*
Su-25UBM1	1861	517 (100)	NA	140	6/3	60/30	3200	5467	7000	FF8 CF8 RF8 W5 T5*

Vehicle	Combat Equipment	Minimum Landing/Takeoff Zone	RF	Armament	Ammo
Su-25/UB	Flare/Chaff (40/30), IFF, RWR, Laser Designator (12 km)	600/600 Primitive Runway	+2	GSh-2-30 Autocannon, 11 Hardpoints	250x30mm
Su-25T	Flare/Chaff (40/30), IFF, RWR, Laser Designator (12 km)	600/600 Primitive Runway	+2	GSh-2-30 Autocannon, 11 Hardpoints	250x30mm
Su-25TM	RWR, IFF, Flare/Chaff (50/30), INS, ECM 2, HUD, Target ID, Laser Designator (12 km), IR Suppression	600/600 Primitive Runway	+3	GSh-6-30 Autocannon, 11 Hardpoints	400x30mm
Su-25SM	RWR, IFF, Flare/Chaff (50/30), GLONASS/INS, HUD, Target ID, Laser Designator (12 km), IR Suppression	600/600 Primitive Runway	+4	GSh-2-30 Autocannon, 11 Hardpoints	250x30mm
Su-25SM3	RWR, IFF, Flare/Chaff (50/30), GLONASS/INS, ECM 2, HUD, Target ID, Laser Designator (15 km), IR Suppression	600/600 Primitive Runway	+4	GSh-2-30 Autocannon, 11 Hardpoints	250x30mm
Su-25KM	RWR, IFF, Flare/Chaff (50/30), GPS/GLONASS/INS, ECM 2, HUD, Target ID, Laser Designator (15 km), IR Suppression	600/600 Primitive Runway	+4	GSh-2-30 Autocannon, 11 Hardpoints	250x30mm
Su-25M1/UBM1	Flare/Chaff (40/30), IFF, GPS, RWR, Laser Designator (12 km)	600/600 Primitive Runway	+4	GSh-2-30 Autocannon, 11 Hardpoints	250x30mm

*The area just around the cockpit is armored with titanium and reinforced Perspex and has an AV of 12.

Sukhoi Su-34 Sych

Notes: This widened, two seat version of the SU-30MK was meant to replace the SU-24 Fencer in Russian service. The Su-34's NATO reporting name was at first the Flanker-F, denoting its origin as a variant of the Su-27 Flanker, but this was later changed to Fullback, denoting its dramatic differences from the Su-30MK and Su-27. It is an advanced weapons-delivery platform, with the improvements of the SU-30MK, and terrain following radar, and is in a class with the US F-15E Strike Eagle. It is meant to replace the Su-24 and in some roles the Tu-22M bomber. The Su-34 is known to its crews as the Duckling, Hellduck or Platypus, and the nose as its Duckbill.

The bulbous profile of the Su-34 has less streamlining and less speed than the SU-30MK; though propelled by the same engines, the Su-34 is not as aerodynamic and is much heavier, and its maximum speed is limited to Mach 1.8. However, the wing structure, tail, and engine nacelles are the same as on the Su-30MK, and the Su-34 has canards taken from the Su-30MKI. The Su-34 can handle high-G maneuvers and perform acrobatics when not loaded down with stores. The crew has ejection seats and the aircraft is capable of in-flight refueling. The two wingtip hardpoints may only be used for AAM or electronics pods. The center fuselage hardpoint may be loaded the heaviest, up to four tons. The bulbous nose not only houses the two crewmembers side by side, but also houses the Leninets V004 PESA radar, an advanced FLIR, an advanced electro-optical viewer, a laser rangefinder, and a laser designator. The wide nose is not simply crew comfort, it is to reduce crew stress. The crew is also not required to wear oxygen masks below 10,000 meters, as the cabin is pressurized, another nod to reducing crew stress. Finally, there is a space between the seats where crewmembers can take turns lying down on long flights. There is even a small microwave, just enough to heat up water for coffee. The long rear tail stinger was at first thought to be a tail radar, but is actually a housing for an APU (which balances out the

aircraft with the large nose) and ECM gear. The Su-34 is powered by a pair of Saturn AL-31FM1 afterburning turbofan engines, with 17200 pounds thrust dry and 27560 pounds thrust in afterburner.

The Su-34M update brings a glass cockpit to the Su-34, and updates nearly all of the avionics (takes it up a Tech Level). The radar system is replaced with a Pika-M system from BKR; this radar has more range and is more miniaturized, with more utility against ground targets.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
Su-34	$101,557,265	JP5	12 tons	45.1 tons	2	29	Radar (200 km), 3rd Gen FLIR (20 km), 2nd Gen Image Intensification (12 km)	Shielded
Su-34M	$89,094,815	JP5	12 tons	44.92 tons	2	29	Radar (300 km), 3rd Gen FLIR (20 km), 2nd Gen Image Intensification (12 km)	Shielded

Vehicle	Tr Mov	Com Mov	Mnvr/Acc Agl/Turn	Fuel Cap	Fuel Cons	Ceiling	Armor
Su-34	1984	551 (115)	NA 149 9/7 90/70	12100	6992	17000	FF6 CF6 RF5 T5 W5*
Su-34M	1992	553 (115)	NA 149 9/7 90/70	12100	6992	17000	FF6 CF6 RF5 T5 W5*

Vehicle	Combat Equipment	Minimum Landing/Takeoff Zone	RF	Armament	Ammo
Su-34	Secure Radios, All-Weather Flight, RWR, IFF, Flare/Chaff (60/40), INS, ECM 3, Auto Track, HUD, Look-Down Radar, IR Uncage, Track While Scan, TFR (20 km), Laser Designator (12 km)	750/700m Hardened Runway	+3	GSh-30-1 30mm Autocannon, 12 Hardpoints	180x30mm
Su-34M	Secure Radios, All-Weather Flight, RWR, IFF, Flare/Chaff (60/40), GLONASS/INS, ECM 3, IRCM 1, Auto Track, HUD, Look-Down Radar, IR Uncage, Track While Scan, TFR (30 km), Laser Designator (15 km)	750/700m Hardened Runway	+4	GSh-30-1 30mm Autocannon, 14 Hardpoints	180x30mm

*The area just around the cockpit is armored with titanium and reinforced Perspex and has an AV of 10.

Douglas A-1 Skyraider

Notes: Originally designed in the wake of World War 2 as a dive bomber, the Skyraider did not see any service in that war; however, it saw considerable use during the Korean War. The Skyraider was progressively upgraded between the late 1940s and early 1980s, despite questions about how relevant the Skyraider was in modern air power. The Skyraider, however, came into its own in the Vietnam war, where it's slow speed and long loitering capability, as well as its ability to haul heavy loads, made the aircraft of choice as a "Sandy." Sandies gave cover to helicopter extraction missions, able to provide accurate support due to its slow speed and the bravery of Sandy pilots in dragging their aircraft in low. Their heavy armament, including four 20mm wing cannons, proved invaluable. In addition to US Air Force service, is was used by the Navy, Marine corps, the VNAF, and RAF, Sweden (where they were only used as target tugs, with armament and hardpoints removed), and the French Air Force. A variety of Southeast Asian and African countries also procured retiring Skyraiders. The A-1 continued to be used by the reunited Vietnam until the late 1980s. Though it is controversial as to whether it is regarded to be a kill, four Skyraiders outmaneuvered and shot down a MiG-19 in 1967. It often took two or more MiGs to down a Skyraider, due to the Skyraider's maneuverability and the low heat given off by its engine. Skyraiders were involved in several – ah, unusual exploits, including the rescue of a Special Forces trooper, with the Green Beret standing on the wing, and in 1965, the dropping of a toilet on Viet Cong (commemorating the pilot's 6 million pounds of ordnance dropped).

AD-1

The original production was designated AD-1; this designation was assigned before the joint service common designation redesignation, and for the fact that the Skyraider was originally a Naval aircraft. 242 were built. The AD-1 was powered by a 2500-horsepower Wright R-3350-24W Duplex Cyclone Radial, with 18 cylinders. The engine was canted slightly downward, reducing the need for trim changes. It was a tail-dragger, and the main wheels rotated 90 degrees to lay flush with the airframe when flying. Being originally a Naval aircraft, the wings folded up near the middle. Both the wings and tail carried ailerons and elevators, increasing maneuverability, and had effective flaps and an undercarriage suitable for rough-field operations. Weapon carriage consisted of its internal armament of an M3 20mm autocannon in each wing. A centerline hardpoint, a hard point under each wing, six pylons under each outer wing, for a total of 15 pylons – 1.63 tons on the centerline pylon, each inboard pylon could handle 1.36 tons, and each outer wing pylons could carry 225 kg each. However, the outer wing in totality could not carry more than 1.135 tons, and since the hardpoints were tightly spaced, clearance issues resulted; while the outer wing could handle 6 rockets, it could carry only 3 bombs on the outer wing. Essentially, if loaded with more than 250 kg of weapons, the pilot may load only every other of these hardpoints, as the heavier ordnance was literally hooked to two hardpoints. (Most Sandies did in fact carry rockets underwing. The centerline and inner wing pylons were wet; this was good, since the AD-1 was not capable of aerial refueling. Occasionally, an AD-1 was "bombed up," overloaded with ordnance; these configurations were not regarded as being a sane thing to do. Along with bombs, napalm, and rockets, the AD-1 could carry torpedoes; this was only done once, against a dam in North Korea. The AD-1 had no ejection seat, and clearing the big tail could be a problem in a bailout. The pilot sits in an armored cockpit.

The AD-1Q was a variant of the AD-1 that carried a second operator in the rear. His cockpit could be charitably described as cozy; he entered through a door on the right side below the canopy. (In an emergency, this could be difficult to get out of quickly.) He had limited view through the canopy, and his main window was on left side. Under the right-wing outboard was a jammer pod, and a chaff dispenser was carried under the left wing outboard. The other hardpoints were not occupied and could carry normal ordnance, and the cannons remained. The AD-1Q had extra antennas for the ECM pod. In order to not lose the fuel tankage, a spine ran down the fuselage to the tail.

AD-2/AD-3/AD-4

Some 156 AD-2s were built, though some were converted to the variants below. The upgrades included airframe strengthening, allowing for better maneuverability, an increase in internal fuel, and the replacement of the engine by a later version, the Wright 3350-26W, developing 3020 horsepower. The AD-2 included doors for the main landing gear, something the AD-1 did not have. The engine mounting was improved and made more solid, and the cockpit arrangement was made more intuitive. This version entered service in 1948.

An AD-2Q was also produced, similar to the AD-1Q, but with a jammer with more capability.

The AD-3 was similar to the AD-2, had a further-strengthened airframe, lengthened main gear struts, and an updated propeller. The tailwheel was no longer retractable, the rudder was redesigned, and the cockpit layout was further revised. The tail pitot tube was removed, replaced by a simple inlet. 125 of these were built or converted in 1949.

The AD-3Q was an ECM platform version of the AD-3; it had an updated equipment configuration. Only 23 were built or converted.

The AD-3N was a night attack variant, with a second crewmember crammed into the rear canopy like on the AD-2Q. A second door, with a window, was put in the RIO space. Under one wing was an AN/APS-4 radar pod, while the other wing had a 1 million-candlepower searchlight. The fuselage dive brakes were deleted, though the belly dive brakes were retained. On some AD-3Ns, the cannons were given flash suppressors to keep from blinding the crew in the dark. 15 were built or converted.

The AD-3W was an AEW variant, with a large belly radome for an AN/APS-20A search and tracking radar. In addition, the fuselage had a spine that held more equipment. Again, two crewmembers were jammed in where only one should have gone. The cannons were deleted, and the inboard wing pylons were retained for fuel tanks (the extra equipment gave the AD-3W a considerable hit on fuel tankage); the outer wing hardpoints were removed. The AD-3W had the nickname "Guppy" during its service. 31 were built or converted.

The AD-4 was built in larger numbers than any other Skyraider, with 372 built, though most were later converted or upgraded to later models. A more fuel-efficient Wright R-3350-26WA engine, providing 2700 horsepower, was fitted, though there was a loss of speed. The windshield was made wider and made of armored glass. Firepower was increased by adding another 20mm autocannon in each wing.

The AD-4B was, unbelievably, fitted out for tactical nuclear delivery, though they could also carry conventional stores. 165 of these were built, with another 37 being modified from standard AD-4s. They could carry a Mk 7 or Mk 8 nuclear bomb on a reinforced centerline pylon. Pilots of the AD-4B had no great faith that they would survive such a mission; they knew the Skyraider was too slow to avoid the blast and radiation effects of the bomb. They did have a special bomb direction system, optimized for nuclear delivery; it was not useful for conventional ordnance.

The AD-4N (A-1D) was the night attack variant, similar in concept to the AD-3N. This version did not have the second cannon in each wing, remaining with two cannons. After redesignation, this aircraft became the A-1D

The AD-4Q was an ECM carrier, similar to the AD-3Q.

AD-4W was an AEW version, with 168 built, and similar to the AD-3W.

The AD-4L was a winterized version, specifically for fighting in Korea. It featured deicing boots on the leading edges of the wings and control surfaces, and an engine preheater. There were 63 conversions. The AD-4NL was a winterized AD-4N, with 38 conversions. Both are identical to the standard AD-4 or AD-4N for game purposes.

Near the start of the Korean War, 100 AD-4Ns were converted back to a day attack role. They were stripped of all night attack equipment, and had their hardpoints restored. They retained, however, their twin 20mm cannons, with flash suppressors. The rear seat remained, though it was normally empty.

Korean War Skyraiders: AD-5/AD-6/AD-7

In the Korean War, the Skyraider acquired the nickname “Able Dog,” from its designation of AD. They had a legendary reputation, as being easy to fly, maneuverable, able to haul lots or ordinance, and capable of sustaining incredible damage and bringing its pilot home. Later, after the tri-service designation system, the AD-5 would be redesignated the A-1E. The first AD-5s were rebuilt AD-4s.

The AD-5 was a significant upgrade for the Skyraider, with a stretched fuselage to carry more fuel, a width increase to allow even more fuel, a second crewmember, or specialized equipment. In some configurations, up to four crewmembers could be accommodated in the Skyraider, if so equipped. The fuselage airbrakes were deleted as unnecessary with all the brakes and slats already present. The outer wing pylons were moved so they just projected beyond the front of the wings; this helped maintain the center of gravity when carrying stores. The two-seat configuration was used, with the second seat beside the pilot; this seat was often unoccupied, but often carried an observer with binoculars.

The AD-5N was a night attack version, similar in concept to the AD-4N, though the radar operator was beside the pilot instead of being crammed in the back. 239 were built. After redesignation, this became the A-1G.

The AD-5W was an AEW aircraft, similar to the AD-4W, and equipped with a tracking and scanning radar underneath the fuselage. The AD-1W had two radar operators and one EW officer; the radar operators in the rear needed their cockpit area dark, to see the radar scopes better. The Plexiglas of the canopy in the rear was replaced with aluminum sheets, and small windows were made in the sides of the rear section to supply what light was needed. Equipment included a searchlight and a chaff pod. After redesignation, this became the EA-1E.

The AD-5S was a one-off; it was an attempt to turn the Skyraider into an ASW platform. It had radar and searchlight on the wings and a MAD tail stinger, was a four-seater, and generally carried torpedoes and sonobuoys on its wings. The Navy decided to use the S-2 Tracker instead. It will not be covered here.

The AD-5Q was an EW aircraft; like other AD-xQs, it carried chaff and ECM pods, and it also carried a four-man crew to operate the increase in ECM gear as well as chaff. Under its wings, there were two ECM pods and two chaff pods; there was some additional internal electronic gear in a spine fairing. After redesignation, this became the EA-1F.

Theoretically, the AD-5 was to an extent modular; literature suggests that it could be outfitted as an air ambulance with a capacity of four stretchers, a personnel transport able to carry eight passengers, a target tug, a photoreconnaissance aircraft, and a cargo aircraft with a capacity of 900 kg. I have not seen any hard evidence that the AD-5 was ever used in any of these roles, though the conversion kits were produced and distributed. At any rate, I have no hard information, or even something nebulous that I could fudge with, so they will not be included here. On a few occasions, the AD-5 has been used as a buddy refueler, with the inner wing hardpoints used as a kit for this purpose; only a few mentions of this use appear anywhere.

The AD-6, later redesignated the A-1H, was an even bigger upgrade, with its engine replaced by a Wright R-3350-26WD 2700-horsepower engine, which was easier to service. Hardpoints were modernized to be able to take any sort of ordinance in the US military. It also inherited the AD-4B’s alternate mission as a nuclear delivery platform. The avionics were simplified and improved. The airframe was reinforced, as were the landing gear. The AD-6 had a long ventral airbrake atop the fuselage. The AD-6/A-1H appeared to be optimized for air-to ground operations; the AD-6 had a rudimentary targeting computer. No other variants were built.

The AD-6/A-1H introduced a controversial feature – the rocket extraction device. This was not an ejection seat; attached to the pilot’s harness, it simply yanked him out of the plane. The pilot still had to pull his own rip cord. It is not sure what confidence the crews had in this system.

The AD-7/A-1J simply was an AD-6 with longer, stronger wings, and stronger landing gear. 72 were built, with the last one built in 1957.

The A-1E, A-1H, and A-1J later went on to glory as Sandies in the Vietnam War, with the last being retired from US service in

1972.

What Could Have Been: The Skyshark

In Jun 1945 the military asked Douglas to produce a prototype of a turboprop-powered Skyraider. It was to have more speed and better lifting capability, but be able to operate off *Essex* and *Casablanca*-class escort carriers, which were not big enough to operate jets. They would also provide an alternative for general ground support to thirsty jets. The result was the A2D Skyshark. While the Skyraider was clearly the base of the aircraft, the Skyshark was also a clearly different airplane.

The Skyshark was built around the new Allison XT-40-A2 5100-horsepower turboprop powering a two-layer contra-rotating propeller. The wing root thickness was decreased to increase streamlining, but the height and area of the tail grew.

The Skyshark program, however, was fraught with problems from the beginning. The Allison engine was not available until 1950; in the meantime, an underpowered GE TE-100 was used for flight tests. In addition, the engine that Allison delivered at first were prototype engines; a production did not appear until 1953. During one of the first test flights, the gearbox, which had been troublesome, could not handle the power of the engine, seized it up, and caused the nose to shed all of its propeller blades. Which is too bad, because when it was working, the Allison engine was capable of delivering near-sonic speeds.

By 1954, the A-4 Skyhawk was ready to fly; Douglas now had a much better design to sell to the Navy. Meanwhile, the escort carriers were being mothballed. Allison had still not delivered a reliable powerplant. Time was up for the troubled Skyshark. Of the 12 built, four were destroyed in testing, seven were scrapped, and one is now on display at the airport in Idaho Falls, Idaho.

I am including the Skyshark in this entry as a “what-if.”

Twilight 2000 Notes: By the Twilight War, very few of these aircraft were flying, but the few remaining -- perhaps 25 in all -- were recalled late in the war as ground support aircraft and Sandies.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
AD-1	$2,900,490	AvG	1.55 tons	4.76 tons	1	8	None	Enclosed
AD-1Q	$15,251,131	AvG	1.4 tons	4.81 tons	2	11	None	Enclosed
AD-2	$2,923,620	AvG	1.71 tons	4.76 tons	1	9	None	Enclosed
AD-2Q	$17,221,924	AvG	1.4 tons	4.81 tons	2	11	None	Enclosed
AD-3	$2,923,620	AvG	1.71 tons	4.86 tons	1	9	None	Enclosed
AD-3N	$19,715,380	AvG	1.46 tons	5.86 tons	2	13	Radar (50 km), WL Searchlight	Enclosed
AD-3W	$29,840,588	AvG	1.56 tons	5.48 tons	2	15	Radar (75 km), WL Searchlight	Enclosed
AD-4	$5,354,340	AvG	1.68 tons	4.9 tons	1	9	None	Enclosed
AD-4B	$5,527,530	AvG	1.68 tons	4.93 tons	1	11	None	Shielded
AD-4N	$15,531,153	AvG	1.43 tons	5.9 tons	2	13	Radar (60 km), WL Searchlight	Enclosed
AD-4Q	$17,464,996	AvG	1.37 tons	5.05 tons	2	11	None	Enclosed
AD-4W	$30,083,660	AvG	1.53 tons	5.52 tons	2	13	Radar (70 km), WL Searchlight	Enclosed
AD-4N (Stripped)	$3,338,860	AvG	1.79 tons	4.79 tons	1(2)	8	None	Enclosed
AD-5	$8,749,780	AvG	2.13 tons	5.58 tons	1(2)	8	None	Enclosed
AD-5N	$15,870,697	AvG	1.88 tons	6.68 tons	2	13	Radar (70 km), WL Searchlight	Enclosed
AD-5W	$57,477,478	AvG	1.98 tons	7.3 tons	2	13	Radar (100 km), WL Searchlight	Enclosed
AD-5Q	$19,101,939	AvG	2.04 tons	6.95 tons	4	13	Radar (100 km)	Enclosed
AD-6	$16,996,223	AvG	2.15 tons	6.62 tons	2	11	None	Enclosed
AD-7	$19,252,761	AvG	2.2 tons	6.84 tons	2	11	None	Enclosed
A2D-1 Skyshark	$17,992,767	AvG	2.64 tons	5.86 tons	1	10	None	Enclosed

Vehicle	Tr Mov	Com Mov	Mnvr/Acc Agl/Turn	Fuel Cap	Fuel Cons	Ceiling	Armor
AD-1/AD-1Q	999	200 (45)	6/4 30/20	1400	924	7925	FF7 CF7 RF7 W5 T5*
AD-2/AD-2Q	1098	220 (40)	5/3 32/15	1440	1112	7925	FF7 CF7 RF7 W5 T5*
AD-3/AD-	1109	222 (40)	5/3 33/15	1440	1112	7925	FF7 CF7

3Q							RF7 W5 T5*
AD-3N	1009	202 (45)	5/3 30/15	1440	1222	7925	FF7 CF7 RF7 W5 T5*
AD-3W	1042	209 (45)	6/4 31/20	1356	1178	7925	FF7 CF7 RF7 W5 T5*
AD-4/AD-4B/AD-4Q	1040	208 (40)	5/3 31/15	1440	991	7925	FF7 CF7 RF7 W5 T5*
AD-4N	946	189 (45)	6/4 28/20	1440	1079	7925	FF7 CF7 RF7 W5 T5*
AD-4W	978	196 (45)	6/4 29/20	1356	1054	7925	FF6 CF6 RF5 W5 T5*
AD-4N (Stripped)	1061	212 (40)	5/3 32/15	1440	971	7925	FF7 CF7 RF7 W5 T5*
AD-5	917	196 (40)	5/3 27/15	1670	1060	7925	FF7 CF7 RF7 W5 T5*
AD-5N	834	178 (45)	5/3 25/15	1670	1166	7925	FF7 CF7 RF7 W5 T5*
AD-5W	862	167 (45)	6/4 26/20	1573	1166	7925	FF7 CF7 RF7 W5 T5*
AD-5Q	816	174 (45)	6/4 25/20	1670	1187	7925	FF7 CF7 RF7 W5 T5*
AD-6	834	158 (40)	5/3 25/15	1670	1155	7925	FF7 CF7 RF7 W5 T5*
AD-7	809	153 (35)	5/3 24/15	1670	1190	7925	FF7 CF7 RF7 W5 T5*
A2D-1 Skyshark	1639	328 (35)	5/3 49/15	1837	1887	14664	FF7 CF7 RF7 W5 T5*

Vehicle	Combat Equipment	Minimum Landing/Takeoff Zone	RF	Armament	Ammo
AD-1/2/3	Secure Radios, IFF, TACAN	615/745m Primitive Runway	+1	2x20mm M3 Autocannons, 15 Hardpoints	400x20mm
AD-1Q	Secure Radios, IFF, TACAN, ECM 1, Chaff (20)	615/745m Primitive Runway	+1	2x20mm M3 Autocannons, 13 Hardpoints	400x20mm
AD-2Q/3Q	Secure Radios, IFF, TACAN, ECM 2, Chaff (20)	615/745m Primitive Runway	+1	2x20mm M3 Autocannons, 13 Hardpoints	400x20mm
AD-3N	Secure Radios, IFF, TACAN	615/745m Primitive Runway	+1	2x20mm M3 Autocannons, 13 Hardpoints	400x20mm
AD-3W	Secure Radios, IFF, TACAN, ECM 1, Chaff (20)	615/745m Primitive Runway	+1	2x20mm M3 Autocannons, 2 Hardpoints	400x20mm
AD-4/AD-4B	Secure Radios, IFF, TACAN, RWR, Armored	615/745m Primitive Runway	+1	4x20mm M3 Autocannons, 15 Hardpoints	800x20mm

AD-4N	Windshield Secure Radios, IFF, TACAN, ECM (-3), Chaff (20)	615/745m Primitive Runway	+1	2x20mm M3 Autocannons, 13 Hardpoints	400x20mm
AD-4Q	Secure Radios, IFF, TACAN, ECM 2, Chaff (20)	615/745m Primitive Runway	+1	4x20mm M3 Autocannons, 13 Hardpoints	800x20mm
AD-4N (Stripped)	Secure Radios, IFF, TACAN, RWR,	615/745m Primitive Runway	+1	2x20mm M3 Autocannons, 15 Hardpoints	400x20mm
AD-5	Secure Radios, IFF, TACAN, RWR,	615/745m Primitive Runway	+1	4x20mm M3 Autocannons, 15 Hardpoints	800x20mm
AD-5N	Secure Radios, IFF, TACAN, RWR, ECM 2, ECCM 1, Chaff (20)	615/745m Primitive Runway	+1	4x20mm M3 Autocannons, 13 Hardpoints	800x20mm
AD-5W	Secure Radios, IFF, TACAN,, ECM 1, ECCM 1, Chaff (20), Radio Detection, Track While Scan	615/745m Primitive Runway	+1	4x20mm M3 Autocannons, 2 Hardpoints	800x20mm
AD-5Q	Secure Radios, IFF, TACAN, RWR, ECM 2, ECCM 1, Chaff (40), Radio Detection, Radio Jamming 2	615/745m Primitive Runway	+1	4x20mm M3 Autocannons, 11 Hardpoints	800x20mm
AD-6	Secure Radios, IFF, TACAN, RWR, ECM 1, ECCM 1, Chaff (10)	615/745m Primitive Runway	+1	4x20mm M3 Autocannons, 15 Hardpoints	800x20mm
AD-7	Secure Radios, IFF, TACAN, RWR,, ECM 1, ECCM 1, Chaff (10)	615/745m Primitive Runway	+1	4x20mm M3 Autocannons, 17 Hardpoints	800x20mm
A2D-1 Skyshark	Secure Radios, IFF, TACAN, RWR, ECM 1, ECCM 1, Chaff (10)	615/745m Primitive Runway	+2	4x20mm HS-404 Autocannons, 11 Hardpoints	800x20mm

*The cockpit area of the Skyraider has additional armor and has an AV of 8.

A-4 Skyhawk

Notes: Most versions of the A-4 have a hump behind the cockpit that houses avionics and ECM gear. Although it is small, it can carry a large weapon load for its size, including nuclear weapons. These aircraft were much used in the Twilight War, particularly in the Middle East and by the US, who recalled them from boneyards to replace aircraft losses and to use as close support aircraft.

The A-4A was the first production model, with a low-thrust engine and two hardpoints. The A-4B is the same aircraft with a slightly higher-powered engine. The A-4Q is a refurbished A-4B sold to the Argentine Navy. The A-4C has the addition of terrain-following radar and an autopilot as well as improvements to avionics. The A-4P is a refurbished A-4C supplied to the Argentine Air Force.

The A-4E introduced two new hardpoints to the wings. The A-4F introduced the avionics hump to the rear of the cockpit, housing ECM and equipment for the guidance of command-guided munitions. An A-4G is an A-4F built for the Australian Navy; it does not have the hump. The A-4K is the same aircraft after some years have gone by; it was refurbished, and then passed on the New Zealanders. The A-4H was built for the Israelis; it replaces the cannons with heavier ones. The A-4M was built for the US Marines and was known as the Skyhawk II; it has a more powerful engine, double the cannon ammunition load, and a laser designator. The A-4N

was built for the Israelis; it has 30mm cannons, and more advanced avionics. The A-4Y is an A-4M with a refit to bring it up to the same level as the A-4N.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
A-4A	$13,186,570	JP5	3.59 tons	10.23 tons	1	18	Radar (40 km)	Shielded
A-4B/Q/S	$14,195,740	JP5	3.59 tons	10.23 tons	1	18	Radar (40 km)	Shielded
A-4C/P	$14,653,670	JP5	3.59 tons	10.23 tons	1	18	Radar (40 km)	Shielded
A-4E	$16,133,320	JP5	4.5 tons	11.14 tons	1	18	Radar (40 km)	Shielded
A-4F/K	$32,117,150	JP5	4.5 tons	11.14 tons	1	20	Radar (40 km)	Shielded
A-4G	$30,380,530	JP5	4.5 tons	11.14 tons	1	18	Radar (40 km)	Shielded
A-4H	$32,587,970	JP5	4.5 tons	11.14 tons	1	22	Radar (40 km)	Shielded
A-4M	$40,441,710	JP5	4.76 tons	11.14 tons	1	26	Radar (40 km)	Shielded
A-4N/Y	$40,219,410	JP5	4.76 tons	11.14 tons	1	26	Radar (40 km)	Shielded

Vehicle	Tr Mov	Com Mov	Mnvr/Acc Agl/Turn	Fuel Cap	Fuel Cons	Ceiling	Armor
A-4A	2115	529 (110)	NA 132 7/4 70/40	3120	1610	17100	FF3 CF3 RF3 W3 T2
A-4B/Q/S/C/P	2125	531 (110)	NA 133 7/4 70/40	3120	1647	17100	FF3 CF3 RF3 W3 T2
A-4E/F/K/G/H	2154	538 (110)	NA 135 7/4 70/40	3120	1908	17100	FF3 CF3 RF3 W3 T2
A-4H	2832	596 (110)	NA 149 7/4 70/40	3120	1932	17100	FF3 CF3 RF3 W3 T2
A-4M/N/Y	3097	774 (110)	NA 194 7/4 70/40	3120	2635	17100	FF3 CF3 RF3 W3 T2

Vehicle	Combat Equipment	Minimum Landing/Takeoff Zone	RF	Armament	Ammo
A-4A/B/Q/S	None	1000/600m Hardened Runway	+1	2x20mm Mk 12 Autocannons, 2 Hardpoints	200x20mm
A-4C/P	RWR, Flare/Chaff (30/20), TFR	1000/600m Hardened Runway	+1	2x20mm Mk 12 Autocannons, 2 Hardpoints	200x20mm
A-4E/G	RWR, Flare/Chaff (30/20), TFR, ECM	1000/600m Hardened Runway	+1	2x20mm Mk 12 Autocannons, 4 Hardpoints	200x20mm
A-4F/K	RWR, Flare/Chaff (35/25), TFR, ECM, DJM	1000/600m Hardened Runway	+2	2x20mm Mk 12 Autocannons, 4 Hardpoints	200x20mm
A-4H	RWR, Flare/Chaff (35/25), TFR, ECM 2, DJM, IR Masking	1000/600m Hardened Runway	+2	2x30mm DEFA Autocannons, 4 Hardpoints	200x30mm
A-4M	RWR, Flare/Chaff (40/30), TFR, ECM 2, DJM, Laser Designator (6 km)	1000/600m Hardened Runway	+3	4x20mm Mk 12 Autocannons, 5 Hardpoints	400x20mm
A-4N/Y	RWR, Flare/Chaff (35/25), TFR, ECM 2, DJM, Laser Designator (6 km)	1000/600m Hardened Runway	+3	2x30mm DEFA Autocannons, 5 Hardpoints	100x30mm

A-6 Intruder

Notes: This is an older US Navy attack aircraft, partially replaced in US Navy service by the F/A-18. The Intruder can be refueled in flight and can carry drop tanks. Earlier versions of this aircraft were workhorses in Vietnam and the Gulf War. A tanker version, the KA-6D, remains in service, and carries 9500 liters of fuel in 5 drop tanks for buddy refueling of carrier aircraft.

The A-6A is the basic aircraft; it includes a digital integrated attack suite (the DIANE system). The A-6B is generally similar, but has an updated RWR and is able to use antiradiation missiles. The A-6C is also similar to the A-6B, but carries a FLIR and low-light

TV system under the nose. The A-6E has a comprehensive avionics and ECM suite. The A-6E/TRAM has the TRAM system; this includes a steerable ball turret under the nose housing the FLIR, LLTV, and a laser designator. This aircraft is one of the few in the inventory able to deliver Tomahawk cruise missiles, or anything else in the US Naval inventory.

The A-6F includes better avionics, smokeless engines, higher load-carrying capability, and a new bomb delivery system with better accuracy. In addition, the A-6F adds air-to-air capability. The Navy chose to concentrate on the Super Hornet instead of building the A-6F.

Two electronic warfare versions of the A-6 were produced: the EA-6A, made in extremely limited numbers primarily as an operational experiment, and the EA-6B, the US Navy's primary electronic warfare aircraft. (This version will be detailed in another entry.) Work on the EA-6A started in 1962; it is basically a heavily modified A-6A, distinguished by the canoe fairing on the tail. The fairing carried electronic warfare equipment such as radar and radio detectors and radar and radio jammers. In addition, the EA-6A could carry up to five electronic and/or infrared jamming pods (four under the wings, and under the fuselage). Flare and chaff dispensing pods could be carried in place of the underwing jammers if the mission called for them. The EA-6A retained a limited ground attack capability (though it was seldom used for it); its most common weapon was the Shrike ARM. The radar of the EA-6A is not as powerful as that of the A-6A. Only 27 EA-6As were built, and the survivors of the Vietnam War were retired in 1985, after having been relegated to a training role after the war. Some were also converted into regular A-6As after the Vietnam War.

The KA-6D is a tanker version of the A-6, made by converting existing A-6s (mostly A-6As, though 12 of the 90 made were modified from A-6Es). The KA-6D is basically an A-6A which has been stripped down, with the radar and most of the DIANE system removed. (It retains a visual bombing system, but this was seldom used in Vietnam, and has not been used since.) The KA-6D is fitted with an inertial navigation system, a powerful navigation computer, and long-range radios, to allow it to find the aircraft which depend upon it. (The KA-6D also has a secondary role as an air/sea rescue control aircraft.) Internal fuel tanks are re-arranged, and the wings are strengthened to allow it to carry its huge external fuel tanks. The belly of the fuselage has a hose, reel, and basket-type refueling drogue. A special pod could also be carried on the fuselage hard point, allowing it to refuel Air Force aircraft and other aircraft which cannot be refueled by probe-and-drogue method; this pod would be carried in place of one of the KA-6D's external fuel tanks. Another pod may be carried on the centerline; this one acts as a backup to the primary hose and drogue, or may allow the KA-6D to ferry fuel to other carriers or land bases. The KA-6D may carry up to five external fuel tanks, all of which may be used to refuel other aircraft if necessary; each one of these fuel tanks carry 1900 liters. The bombardier/navigator has greatly reduced duties in the KA-6D; his primary job is as a navigator and to conduct the refueling operations. There is a tiny chance that the hose can get stuck in the unreeled position; if this happens, the aircraft cannot land on a carrier or on land due to the inability to extend the tailhook and the high probability of a catastrophic fire as the unreeled hose drags the ground. Because of this, a device was installed which severs the hose from the aircraft at the fuselage. Though the KA-6D is also called the Intruder, it is more common for US Navy and Marine pilots to refer to the KA-6D by the name of "Texaco."

Twilight 2000 Notes: Many A-6s returned to service to replace aircraft losses during the Twilight War. The A-6F Intruder II aircraft was at first not going to be produced, but with the Twilight War emergency, it was produced in limited quantities (perhaps 50, plus about 25 conversions from A-6E aircraft) during 1998-99. Four EA-6As served in the Twilight War, replacing EA-6B losses after being pulled from boneyards and refurbished; these aircraft had more modern equipment than the original EA-6As.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
A-6A/B	$68,581,910	JP5	8.17 tons	26.58 tons	2	38	Radar (225 km)	Shielded
A-6C	$80,479,490	JP5	8.17 tons	26.78 tons	2	38	Radar (225 km), FLIR (30 km), Image Intensification (20 km)	Shielded
A-6E	$97,047,950	JP5	8.17 tons	27.4 tons	2	40	Radar (300 km), FLIR (40 km), Image Intensification (25 km)	Shielded
A-6E/TRAM	$111,880,910	JP5	8.17 tons	27.4 tons	2	38	Radar (300 km), FLIR (60 km), Image Intensification (40 km)	Shielded
A-6F	$121,465,060	JP5	8.55 tons	27.5 tons	2	40	Radar (300 km), FLIR (70 km), Image Intensification (50 km)	Shielded
EA-6A	$167,424,500	JP5	6.8 tons	24.77 tons	2	40	Radar (245 km)	Shielded
KA-6D	$69,669,500	JP5	9.5 tons	26.6 tons	2	35	Weather Radar (200 km)	Shielded

Vehicle	Tr Mov	Com Mov	Mnvr/Acc Agl/Turn	Fuel Cap	Fuel Cons	Ceiling	Armor
A-6A/B/C/E	2072	1518 (185)	NA 130 8/4 40/30	7300	4898	12925	FF5 CF4 RF3 W4 T3

A-6F	2447	1611 (135)	NA 153 8/4 50/30	9600	7417	13500	FF5 CF4 RF3 W4 T3
EA-6A	2072	1518 (185)	NA 130 8/4 40/30	7300	4898	12925	FF5 CF4 RF3 W4 T3
KA-6D	2092	1550 (185)	NA 130 8/4 40/30	7300	4898	12925	FF5 CF4 RF3 W4 T3

Vehicle	Combat Equipment	Minimum Landing/Takeoff Zone	RF	Armament	Ammo
A-6A/B	Flare/Chaff (45/35), ECM 1, RWR, All Weather Flight	1400/785 Hardened Runway	+2	5 Hardpoints	None
A-6C	Flare/Chaff (45/35), ECM 2, RWR, All Weather Flight, Inertial Navigation	1400/785 Hardened Runway	+3	5 Hardpoints	None
A-6E	EW Suite, Secure Radios, Flare/Chaff (60/50), ECM 3, RWR, Deception Jamming, All-Weather Flight, Inertial Navigation	1400/785 Hardened Runway	+3	5 Hardpoints	None
A-6E/TRAM	EW Suite, Secure Radios, Flare/Chaff (60/50), ECM 3, RWR, Deception Jamming, All-Weather Flight, Laser Designator (10 km), Inertial Navigation	1400/785 Hardened Runway	+4	5 Hardpoints	None
A-6F	EW Suite, Secure Radios, Flare/Chaff (70/60), ECM, RWR, ECM 4, All-weather Flight, HUD, IR Uncage, Track While Scan, TFR, Laser Designator (12 km), Inertial Navigation	1400/785m Hardened Runway	+5	7 Hardpoints	None
EA-6A	Flare/Chaff (45/35), ECM 3, RWR, All Weather Flight, Deception Jamming	1400/785 Hardened Runway	+1	5 Hardpoints	None
KA-6D	Flare/Chaff (45/35), RWR, Secure Radios, Inertial Navigation	1400/785 Hardened Runway	+1	5 Hardpoints	None

A-7 Corsair II

Notes: The story of the A-7 Corsair II began in the early 1960s, when the US Navy realized that, while the A-4 Skyhawk was still hale, it was a small aircraft with limited capacity for external stores or updating, relatively fragile compared to more recent designs, and had limited fuel capacity. The Navy put out a call for a better aircraft, and Vought was able in short order to (extensively) modify their F-8 Crusader fighter into a subsonic ground attack platform able to address most of the design shortcomings perceived by the Navy. Deliveries began in 1967, with initial deliveries to the US Navy continuing until 1971. The US Air Force, in an unusual move (the US Navy and Air Force, out of service rivalries if nothing else, generally refuse to operate the same aircraft), decided to have a version made to their requirements. Then, seeing the Corsair II's successes in Vietnam, was taken up by several NATO and some other countries. The A-7 featured some innovative new technologies, such as the HUD and inertial navigation. The Turkish and Greeks still operate the A-7. Claims to fame included some of the first use of smart bombs (against the Than Hoa bridge in this case) and as one of the favorite steeds of

The First Corsair IIs

The airframe of the A-7A was essentially a shortened and stubby version of the F-8 Crusader's; it quickly acquired the nickname of SLUF (Short Little Ugly Fucker, or "Fellow" in its family-friendly guise). Most of the time, the "II" was omitted from the aircraft's name, leaving the aircraft of simply "Corsair." The Corsair went from first flight to squadron service in little over a year, with full operational service in February in 1967. The Corsair was one of the first aircraft able to do all-weather attack, due to its radar bombing system, which was linked to a weather radar and it's INS. This also linked with a second weapons computer, which allowed it to use some smart bombs and missiles from sometimes long distances (the limiting factor was primarily of the munitions and not of the A-7's bombing system). Another innovative feature was the landing system and autopilot; the A-7 could navigate to and from the pilot and land on the carrier with hands off by the pilot. (In actual service, this rarely done, as the skies over North Vietnam could give the pilot too many unpleasant surprises, as could carrier landings.) The early HUD showed information on the attitude and altitude of the Corsair, told the pilot if his aircraft was drifting off course, and gave the pilot an aiming circle appropriate to the munitions he was using, including for his gun and the pair of Sidewinders he carried (on either side of the aircraft behind and below the cockpit, for air-to-air combat). The INS could show had two scopes, one for attack and one for navigation. The pilot, when using the autopilot, the pilot could set up to nine waypoints for the autopilot to follow, in addition to start and endpoints. Finally, the A-7 was equipped with the latest version of TACAN navigation, normally used as a backup to the INS. The radio could use secured communications between aircraft which were possessed of the same sort of equipment.

However, the A-7A had its problems and teeth-cutting. The Corsair had poor crosswind stability and its brakes were slow to stop the aircraft upon landing on a carrier (before pilots got used to this, landings could miss the number two wire more often than normal, and landings left the aircraft near the edge of the landing deck. Some ended up hanging over the edge of the landing deck by the arrestor cable. The autopilot/INS combination was effective, but took a lot of babysitting by the pilot. The engine was a Pratt & Whitney TF30-P-6, an early version of the engine of the F-111 and early F-14s, omitting the afterburner and providing 11,350 pounds thrust, and this early engine version could be a little slow on the uptake. The A-7A struggled for altitude after launch due to the warm, humid conditions in Southeast Asia; fully-loaded A-7As could spend 20 minutes working up to their cruising speed of 580 miles per hour (933 KMH). (Pilots did what was termed a low-altitude transition phase, which held the A-7A just above the waves to get a wing in ground effect from the water to help it speed up before it climbed to cruising altitude.) The A-7A wings did not have precise control over the takeoff and landing flaps; they were always either fully-extended or completely retracted. The result of the hot, humid conditions led the pilots to hold back on power when being launched in order to be able to throttle up when trying to accelerate. The turbofan engine coupled with the INS and radar led to low fuel consumption compared to other attack aircraft. Wing hardpoints were plentiful, with eight under its wings and one on each side of the fuselage (Sidewinders or later, Sidearm ARMs only). The two inner wing hardpoints are wet.

The A-7B features dogtooth wings, something which increased maneuverability and lifting capacity by increasing wing area. The A-7B also had a full set of leading-edge slats, which further increased maneuverability, especially in combat maneuvering. The wings had less of a sweep than the A-7A, giving the A-7B lesser wing loading, increasing lift and increasing the accuracy of landings and takeoffs. Flap positions were changed so that the inner wing has flaps, while the outer edge had ailerons, even further increasing handling. A spoiler was added to the top of the wing, further enhancing carrier landings, and the ability to slow down dramatically in combat maneuverability and being able to hit more targets during bombing or get the “one that got away.” The A-7B had a probe and drogue assembly, making aerial refueling possible. Doppler radar was added, allowing the A-7 target to be moving and still hit its target (as long as if the target was not moving fast). This system was not designed to be useful in air-to-air combat. The A-7B was equipped with a later version of the A-7A’s engine developing 12,200 pounds thrust.

The A-7 was capable of using virtually all of the Navy’s air-to-ground munitions. The A-7A was not equipped with the Vulcan rotary cannon of later A-7s; instead, the A-7A (and A-7B) were equipped with Mk 12 20mm autocannons, one on each side of the intake.

The A-7C was produced for the US Air Force as a stopgap between the Navy A-7s they had borrowed and the purpose-built A-7Ds that were on order. The A-7Cs were flown by only two squadrons and made only one combat deployment. The A-7C received the ready components of the A-7E, which was not yet in production or service. The A-7C received many of the avionics and weapon upgrades bound for the A-7E, including the replacement of the two Mk 12 cannon by a single M61 Vulcan firing from the outside of the front end of the air intake. It also the improved HUD of the A-7E, and both the bombing computer and air-to-air computers were improved. The A-7C used the TF-30-P8 of the A-7B, due to delays in the engine designed for the A-7E. The carrier that hosted these A-7Cs, the USS *America*, later did two peacetime deployments before swapping it’s A-7Cs for A-7Es.

Used by both the Navy and Air Force, the two-seat TA-7C was a trainer for the A-7. The TA-7C was about 86 centimeters longer than the standard A-7C to accommodate the IP, and there was a reduction in internal fuel carried. Despite having an instruction role, the TA-7C retained full combat capability (though neither the Air Force or Navy used it in combat). Eight TA-7Cs were outfitted as Aggressor aircraft for training; these were designated EA-7L. The EA-7Ls were used to simulate Wild Weasels and electronic warfare aircraft, though they could carry several jamming pods that other A-7s could not, and otherwise retained full combat capability. 49 TA-7Cs and EA-7Ls were upgraded to the Allison engine; these retained the designations of TA-7C and EA-7L.

The Navy replaced it’s A-7s in the early 1980s, largely with the F/A-18.

Later US Corsairs

What’s interesting is that the Air Force originally had no intention of buying the Corsair or any other dedicated ground attack platform. The Army, however, was (and still is) prohibited by law and regulation from owning and operating armed fixed-wing assets (and don’t get me started on that one). The Army need close air support, and none of the aircraft in the Air Force’s inventory really fit that bill, being supersonic attack or fighter aircraft. (The nickname of “fast movers” came about for a reason, and it was not a mark of respect for the Air Force aircraft’s abilities at the time. And don’t get me started on that one either.) The Air Force therefore went looking for something they could deploy quickly and easily and would get the Army off its back. This brought the first true Air Force version, the A-7D. However, the A-7D was not simply a repurposed Navy A-7; the Air Force added another improvements, and the A-7 became a true close air support platform.

The Air Force felt that the Navy A-7s were underpowered, and insisted upon an engine with more power that allowed the A-7 to take more munitions and give a little more speed. They selected the Allison TF41-A-1 turbofan, a license-built Rolls-Royce Spey engine. This boosted the A-7D’s power to 14,500 pounds thrust. The A-7D could then produce near-sonic speeds in level flight and easily break the sound barrier in a dive, yet fly relatively slow for close support missions if necessary due to enlarged flaps. The A-7D had a new, more informative HUD with better visibility, yet did not interfere so much with the pilot’s view of his surroundings. New avionics included a new ECM and ECCM package, increased-capacity chaff and flare launchers, and a further improved bombing avionics package. The A-7D had the M61 Vulcan cannot as standard, instead of the somewhat ad hoc installation on the A-7C. The troublesome brakes of the Navy A-7s were fixed by upgrading the landing gear hydraulic system. The A-7D added “dogfight slats” to the leading edge of the wings, improving low-speed and mid-speed maneuverability. The A-7D was ready for squadron service by 1970, but did not arrive in Southeast Asia until 1972. Even though the A-7D also flew bombing missions against North Vietnam, Cambodia, and Laos, it quickly showed its mettle; in 12,928 sorties, only four A-7Ds were lost to ground fire or SAMs. The A-7D was

largely replaced in the active Air Force by the mid-1980s and the early 90s in the Air National Guard, mostly by A-10s and F-16s.

The improved A-7D impressed the Navy, sufficient enough that it ordered its own navalized version of the A-7D. This was the A-7E. However, there were delays in the deliveries of the Allison engine to the Navy, so the A-7E saw duty at first with TF-30-P-6 engine for several months. 67 such lower-power A-7Es saw service, before they were upgraded to the Allison engine. The A-7E almost totally replaced the A-4 Skyhawk by 1970, as well as the earlier A-7As and A-7Bs (which were moved to reserve units that were not participating in the Vietnam War). Perhaps the A-7E's greatest claim to fame was its participation in the mining of Haiphong Harbor. By the late 1980s, the A-7E had been largely replaced by the F/A-18 in active Navy service, the A-7Es being retired to AMARC. Though the A-7E was largely a Navy/Marine version of the A-7A/A-7B, it featured several upgrades and the addition of new avionics. The A-7E could integrate its fighting and navigation equipment with the AN/AAR-45 FLIR pod, and later other FLIR pods as they became available. The ECM suite was improved and more effective than that of the A-7D.

In the early 1980s, the TA-7D version of the A-7E, later redesignated the A-7K, came into service. The A-7K's fuselage was extended both front and rear, so it did not have to lose any avionics and so the fuel reduction was not as severe. As with the TA-7C, the A-7K retained full combat capability. The A-7K could be easily distinguished by its humpbacked appearance around the canopy and the training edge of the canopy; this occurred because the rear cockpit was raised to give the IP or WSO a better view.

Foreign-Use Corsairs

The Greek A-7H was for the most part the same as the A-7D, with the exception of using some Greek-made avionics built under license. The A-7Hs replaced the Greek F-104s, which were put into storage at AMARC for the Greeks. The Greeks are still flying the A-7H, with avionics replacements and maintenance work, though in some cases there were actual improvements in the avionics. It is rumored that the Greeks had Israeli help for those improvements, but neither country has confirmed this. (The Israelis have done a lot of weapon and vehicle upgrades for several customers; however, on the other hand the Israelis are closer allies to Turkey than Greece.) 49 of Greece's TA-7Cs were upgraded to the Allison engine. At the same time, the Greeks bought a number of TA-7Cs; there are rumors that some were used in border incidents against the Turkish. A-7Hs have a secondary role of air defense and are modified to carry four Sidewinders.

In the early 1980s, some A-7A airframes were taken out of AMARC and largely brought up for the most part to A-7E standards. However, they used TF30-P-408 turbofans (equivalent in game terms to the TF30-P-8), and retained the dual 20mm autocannons of the A-7A. The customer for these A-7s was Portugal, and they were designated A-7P. For unknown reasons, the A-7Ps have heavily suffered from breakdowns and attrition, and Vought ended up providing 20 non-flyable A-7As for spares.

In 1995, 18 A-7Es and TA-7Cs were provided to the Thai Air Force, where they became the first Thai combat jets. Two non-flyable A-7Es were also provided as sources of spare parts.

The Strikefighter: the A-7F

The A-7F (more properly called the YA-7F, as it had very limited production for testing) had its genesis in an Air Force request for prototypes of a Close Air Support/ Battlefield Air Interdictor (CAS/BAI) in 1985. The Air Force thought that it's A-10s might be too vulnerable in the skies of Europe, and that a strike aircraft that could also fulfill the role of a fighter might be a good escort for the A-10s. The official name of the program was Corsair Plus, but its intended role led to the YA-7F being called the Strikefighter. The fuselage has sections added in front of and behind the wings, extending the length by 122 centimeters. The tail fin and rudder were enlarged to provide greater stability and more responsive turning. The wings were enlarged by adding leading edge root extensions. The fuselage was canted upwards, allowing the seat to be mounted a bit reclined (like that of the F-16). The flaps were larger, allowing better stability at low speed and when landing. The cockpit had was a partial glass cockpit, with a HOTAS-type stick and throttle, and the HUD was switchable between air-to-ground and air-to-air modes, and provided more information. This was combined to a precision bombing computer and air-to-air computer, and A-7F more and more conceptually similar to the F/A-18. The A-7F had integral night attack capability. The A-7F had a single Pratt & Whitney F100-PW-220 afterburning turbofan, capable of not only greater lifting power, but supersonic flight.

The YA-7F was not ordered into production; with the Air Force having lots of F-16s and the Navy having growing amounts of F/A-18s, it was considered redundant. In the end, though it was considered a pre-production aircraft, only two were built.

Twilight 2000 Notes: The A-7F was produced mainly for the US Air National Guard units in some states, and few of them were built at that (perhaps 150 of them). Some of them ranged as far as Nome, Alaska, and even one strike over the Bering Straits into Eastern Siberia.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
A-7A	$27,385,439	AvG	6.8 tons	14.49 tons	1	27	Radar (Weather Only) 90 km	Enclosed
A-7B	$30,050,735	AvG	6.8 tons	13.52 tons	1	27	Radar (Weather/Bombing Only; 90 km)	Enclosed
A-7C	$29,957,340	AvG	6.8 tons	17.24 tons	1	30	Radar (100 km)	Enclosed
A-7D	$30,981,759	AvG	6.8 tons	17.24	1	30	Radar (100 km)	Enclosed

				tons				
A-7E	$31,479,759	AvG	6.8 tons	17.24 tons	1	31	Radar (100 km), FLIR (30 km), Image Intensification (20 km)	Enclosed
TA-7C/EA-7L	$33,197,156	AvG	6.8 tons	18.41 tons	2	32	Radar (100 km)	Enclosed
TA-7C/EA-7L (Allison Engine)	$34,193,071	AvG	6.8 tons	18.41 tons	2	32	Radar (100 km)	Enclosed
A-7K	$38,875,606	AvG	6.8 tons	18.44 tons	2	34	Radar (100 km), FLIR (30 km), Image Intensification (20 km)	Enclosed
A-7H (Upgraded)	$24,873,869	AvG	6.8 tons	16.67 tons	1	34	Radar (120 km)	Enclosed
TA-7H (Upgraded)	$31,211,005	AvG	6.8 tons	16.96 tons	2	34	Radar (120 km)	Enclosed
A-7P	$24,203,234	AvG	6.8 tons	16.49 tons	1	32	Radar (120 km), FLIR (35 km), Image Intensification (25 km)	Enclosed
A-7F	$40,060,838	AvG	8.16 tons	21.06 tons	1	34	Radar (150 km), FLIR (45 km), Image Intensification (40 km)	Enclosed

Vehicle	Tr Mov	Com Mov	Mnvr/Acc Agl/Turn	Fuel Cap	Fuel Cons	Ceiling	Armor
A-7A	1376	688 (140)	NA 334 8/5 40/30	5600	1153	14996	FF5 CF5 RF5 W5 T5
A-7B	1400	650 (130)	NA 375 8/5 45/25	5600	1212	13381	FF5 CF5 RF5 W5 T5
A-7C	1350	675 (130)	NA 338 8/5 50/40	5600	1379	11826	FF5 CF5 RF5 W5 T5
A-7D/E	1376	689 (130)	NA 345 8/4 60/35	5600	1393	11826	FF6 CF6 RF6 W5 T5
TA-7C/EA-7L	1332	667 (130)	NA 334 8/5 50/40	5376	1541	11826	FF6 CF6 RF6 W5 T5
TA-7C/EA-7L (Allison Engine)	1359	671 (130)	NA 336 8/5 50/40	5376	1572	11826	FF6 CF6 RF6 W5 T5
A-7K	1359	671 (130)	NA 336 8/5 50/40	5488	1572	11826	FF6 CF6 RF6 W5 T5
A-7H (Upgraded)	1400	699 (130)	NA 350 8/4 60/35	5600	1393	11826	FF6 CF6 RF6 W5 T5
TA-7H (Upgraded)	1382	688 (130)	NA 335 8/5 50/40	5376	1407	11826	FF6 CF6 RF6 W5 T5
A-7P	1328	664 (140)	NA 332 8/5 40/20	5600	1196	14996	FF6 CF6 RF6 W5 T5
A-7F	2208	1020 (125)	NA 510 8/4 40/25	6600	1923	15200	FF7 CF6 RF6 W6 T6

Vehicle	Combat Equipment	Minimum Landing/Takeoff Zone	RF	Armament	Ammo
A-7A	Flare/Chaff (15 Each), Secure Radios, RWR, All Weather Flight, ECM 1	1200/800m Hardened Runway	+1	2x20mm Mk 12 Autocannons, 8 Hardpoints	1200x20mm

A-7B	Flare/Chaff (15 Each), Secure Radios, RWR, All Weather Flight, ECM 2	1200/800m Hardened Runway	+3	2x20mm Mk 12 Autocannons, 8 Hardpoints	1200x20mm
A-7C	Flare/Chaff (15 Each), Secure Radios, RWR, All Weather Flight, ECM 2	1200/800m Hardened Runway	+3	20mm Vulcan Gatling Gun, 8 hardpoints	1032x20mm
A-7D	Flare/Chaff (20 Each), Secure Radios, RWR, All Weather Flight, ECM 2	1200/800m Hardened Runway	+3	20mm Vulcan Gatling Gun, 8 hardpoints	1032x20mm
A-7E/A-7K	Flare/Chaff (20 Each), Secure Radios, RWR, All Weather Flight, Laser Designator (6 km), ECM 2, TFR	1200/800m Hardened Runway	+3	20mm Vulcan Gatling Gun, 8 hardpoints	1032x20mm
TA-7C	Flare/Chaff (15 Each), Secure Radios, RWR, All Weather Flight, ECM 2	1200/800m Hardened Runway	+3	20mm Vulcan Gatling Gun, 10 hardpoints	1032x20mm
A-7H/TA-7H (Upgraded)	Flare/Chaff (15 Each), Secure Radios, RWR, All Weather Flight, ECM 2, TFR	1200/800m Hardened Runway	+4	20mm Vulcan Gatling Gun, 8 hardpoints	1032x20mm
A-7P	Flare/Chaff (15 Each), Secure Radios, RWR, All Weather Flight, ECM 1	1200/800m Hardened Runway	+3	2x20mm Mk 12 Autocannons, 8 Hardpoints	1200x20mm
A-7F	Flare/Chaff (25 Each), HUD Interface, Secure Radios, RWR, All Weather Flight, Laser Designator (6 km), ECM 3, IRCM 2, ECCM 2, Track While Scan, TFR	1200/800m Hardened Runway	+4	20mm Vulcan Gatling Gun, 8 hardpoints	1032x20mm

Fairchild-Republic A-10 Thunderbolt II

The A-10 is heavily armored and carries a massive amount of ordinance to a long range. It is an ugly aircraft, and was quickly nicknamed the Warthog by its crews, and acquired a great reputation for tank-busting and general ground support during the Persian Gulf War of 1991 and the Twilight War. The A-10 may be refueled in air, and has an ejection seat. The A-10 is flown only by the US, though South Korea, Turkey and Iraq have expressed interest in it.

The Genesis: The A-X Program

As early as 1966, warfighters such as John P McConnell (then the CoS of the USAF) saw the effectiveness of the A-1 Skyraider in Vietnam, particularly in Close Air Support (CAS) missions, and realized that such aircraft, in that role, performed their duties with effectiveness that far outsized what were supposedly the capabilities of the aircraft. McConnell, however, felt that the Air Force could do better in the CAS mission, particularly with a new aircraft designed for the role. (It also helped that McConnell was not a “Member” of the Fighter or Bomber Mafias, and was, for part of his pre-Air Force Army career, a groundpounder.) He also gained some inspiration from the exploits of the Soviet Il-2 Sturmovik, US P-47 Thunderbolt (once it was taken out of the fighter role and put into the then-new CAS role), the British Hawker Typhoon, and the use of older and supposedly obsolete aircraft for CAS missions in the Korean War. He also looked at what he felt as the mistaken notion that a fast-mover could be effectively used for the CAS mission. He worked up some ideas on the subject with a small team, and in 1969 took those ideas to the Secretary of the Air Force. He asked the then-controversial Pierre Sprey, a civilian think-tank member, to put together a joint military/civilian team to start the A-X program, which eventually led to the A-10 Thunderbolt II (and it’s competitor, the YA-9A).

The A-X was to be unlike any other Air Force aircraft of its time period, with a low maximum speed, low stall speed, excellent maneuverability (primarily using large, straight wings with low wing loading), and the ability to lift heavy weapon loads, along with a general toughness and ability to take ground fire and keep operating, simplified operation, and easy maintenance and quick regeneration time. The initial contracts were issued to six companies, with Fairchild-Republic (who had produced the P-47 in World War II, and was producing the excellent strategic strike aircraft, the F-105, at the time), and Northrop having the final competitions and flyoffs. At about the same time, the GE/Philco-Ford GAU-8 Gatling Gun had been designed for just such a role, and was looking for a plane to be mounted in. Carrying the gun was added to the requirements for the A-X. In the end, only Fairchild-Republic’s prototype (the YA-10) could carry and fire the GAU-8 without significant aerodynamic and recoil problems, and it was chosen as the A-10 in 1975, with first deliveries starting in 1976.

Though designed specifically for the skies of a World War III Europe, it proved itself in several other later conflicts, including the former Yugoslavian Republics, Panama, Desert Storm, and the invasions of Afghanistan and Iraq; in fact, it is still serving with distinction in Afghanistan, and the arrival of A-10s on station can bring a smile to an infantryman’s face, The A-10 has survived dozens of attempts to kill it (something that started almost immediately upon adoption) and update it (both by the pilots in some cases

and the command structure), and has proven its worth each time. Simply put, there is no aircraft in the Air Force inventory that can do the job that the A-10 does. Even most Air Force pilots don't want to fly the A-10 – it's not "sexy."

However, the A-10's days are numbered; some have literally been flown to death, and even the newer ones are reaching the end of repeatedly extended lifetimes. There is a new program to replace the A-10 with perhaps two or three other dedicated CAS aircraft, and in addition replace some of it's missions with modified F-16s or F/A-18s or even the F-35, all of which are woefully inadequate for the CAS role. The Harrier is perhaps a better fit, but it too is being replaced by the F-35 (and the F-35 is woefully inadequate for even the Harrier's mission).

Just a personal note: I don't think the Air Force should ever had the A-10. They didn't want it, and don't really want to fly CAS missions anyway (the pilots feel CAS is better suited to attack helicopters, and that "mud moving" itself is not sexy – it's an ego thing). The Department of Defense and the US Air Force need to get their heads out of their collective asses and let the Army fly the A-10, and produce new-build A-10s. (The prohibition of the US Army flying fixed-wing armed aircraft itself is an ego thing gone too far, despite the excuses the Air Force keeps spinning out.)

The Standard Version: The A-10A

After some minor upgrades needed after its testing phase as the YA-10, The A-10, dubbed the "Warthog" by both its crews and disdainful fighter jocks (because it is, well, an ugly aircraft, and as tough as its new namesake), entered service in 1976 as the A-10A. However, it has not simply remained static in its 40 years of service, instead receiving gradual upgrades which addressed everything to airframe strength and to increase service life length to avionics improvements and upgrades to widen the types of weapons it could deliver and increase the accuracy of its cannon and weapons delivery.

The A-10 is a cruciform, straight, wide-winged aircraft; it's shape led the Iraqi troops and insurgents to give the A-10A the name of "Cross of Death." It is designed for low-speed flying, in recognition of the fact that fast-movers typically cannot pick out small targets on a battlefield. Most control surfaces are larger than normal to enhance control, and the wings and tail surfaces are wider than normal to further increase stability and in the case of the wings, allow for more and heavier weapon carriage while decreasing wing loading. The A-10A is designed to be operated and serviced from anything from rough airfields to straight sections of roads. In most cases, the A-10A can be completely refueled and rearmed in 30 minutes. Perhaps the best-known feature of the A-10A (other than its gun) is it's incredible capability to sustain damage and keep fighting, or at least bring its pilot home. The pilot is surrounded by a "bathtub" of titanium armor lined with Kevlar, and most of the flight control system is also protected by a combination of titanium and Kevlar sheets. Depending upon the angle of impact, these protected surfaces can take impacts from 23mm to 57mm rounds. Much of the aircraft can also take impacts from 20mm rounds, and even some SHORAD and AAM strikes. Even the canopy is resistant to strikes of up to 12.7mm rounds. The cockpit armor itself weighs an astounding 540 kilograms. The hydraulic systems are double-redundant, and if those are lost, there is a mechanical backup to the hydraulic system. (Controls with mechanical input will be noticeably heavier, but will still control the plane.) The entire fuel system is self-sealing, and is protected by a titanium/Kevlar shell. The engines are shielded from the rest of the aircraft by firewalls and have automatic fire detection, suppression, and explosion resistance systems. The ammunition drum for the gun is surrounded by varying degrees of armor and is designed to predetonate most explosive rounds without penetrating the ammunition drum. The A-10A can, in fact, keep flying with the loss of an engine, half the tail, one elevator, and half a wing missing. Supposedly, deadstick (ie, no power) landings in an A-10A are impossible to do safely; however, this was disproven repeatedly in Operation Iraqi Freedom. (It does remain difficult, however.)

The core weapon, the GAU-8/A seven-barreled Gatling Gun, generally fires APDU ammunition; current initiatives are experimenting with APDS-T ammunition based on a tungsten penetrator to reduce the use of toxic and pyrophoric DU ammunition on the battlefield. Other possible rounds include APHE rounds, similar to HEAT ammunition but with an armor piercing hardened ballistic cap nose backed with a HEAT-type filler, and AP ammunition, essentially solid hardened steel shot. The gun can be fired using two motors, at 4200 RPM, or using one motor, at 2100 RPM. Normal ammunition load carried on missions is 1174 rounds, though an overload of up to 1350 rounds will fit in the ammunition drum. (The extra rounds are counted against the Load limit.) The spent cases are not simply thrown out of the aircraft, like many combat aircraft; instead, they are returned automatically to the ammunition drum. The ammunition is linkless, instead of using a belt; this lightens the combat weight of the A-10 considerably. The forward and center of the A-10 are literally built around the GAU-8A and its ammunition drum, with fuel carriage being primarily in or near the center of the aircraft, protected as stated above. (This pattern of fuel carriage is to further increase the A-10's survivability.) The main wheels protrude about one third out from their sponsons when retracted, making belly landings easier and less damaging to the aircraft. The landing gear all open to the rear, and this helps aerodynamic forces to pull on and lock the landing gear if hydraulics are out, assuming the manual overrides are working.

The engines, a pair of 9065-pound-thrust GE TF34-GE-100 turbofans, are not designed for speed, but for lifting power. If compared to a tracked or wheeled vehicle, one would say that the A-10's engines are built more for torque than speed. They are mounted on pylons above and to the sides of the aircraft, shielded from IR detection by the tail surfaces and the pylons themselves. They are also housed in a thicker-than-normal skin, which further masks the IR profile of the engines. This placement also helps keep the damage from an engine hit from damaging the other engine and the fuselage. The high mounting also makes the engines almost immune to FOD damage, contributing in no small way to the A-10s ability to use rough takeoff fields. Crews can also service most of the aircraft while the engines are running, without fear of being sucked into the intakes. The engines are known for their quietness and smokeless operation; in Desert Storm, the Iraqis gave the A-10A the name of "Silent Death," as the GAU-8/A is also *relatively* quiet when firing, and rounds from the GAU-8/A would often impact the Iraqi armor and positions before the engines or gun could be heard.

Various camouflage patterns were used experimentally on the A-10A, including the standard Air Superiority Gray, the Peanut

scheme with a sand base and spots of yellow and OD, black and white colors for winter operations, a tan, green, and mixed brown pattern, the European I woodland camouflage scheme (primarily for A-10s operating in Europe during the Cold War). Most of these patters have a light gray finish on the underside. The current camouflage pattern is called Compass Ghost, originating in the early 1990s. It is a two-tone dark-gray pattern on top and a light gray two-tone pattern underneath. Most A-10s have a false dark gray cockpit painted just behind the gun to further confuse ground gunners and enemy aircraft. Most also sport some kind of shark-mouth or warthog-mouth nose art.

The new A-10s were flown realistically, hard, and moistly at very low altitude when in an attack profile. In addition, the GAU-8 Gatling Gun's recoil, though designed into the A-10A, was still difficult on the airframe (many of the tales of the A-10s include an apocryphal one where the A-10 is stopped in its flight by the recoil of continuous firing of its gun). In addition, many ground crews and pilots were signing off on the carriage on the wing pylons of weapons and fuel tanks that were too heavy or otherwise unsuited to the particular pylon or hardpoint. Therefore, as early as 1979, A-10As were given structural strengthening on the wings and forward section of the aircraft, including the thickening those sections and improving their ability to take stress. Hardpoints and pylons were not strengthened, but many "days off" were given to A-10 crews, which they spent in classes receiving intensive instruction about what ordnance could be put where. A side effect of the airframe strengthening was the increase in (initial) service life from 6000 to 8000 hours. (Service life, in particular, was something repeatedly upgraded in the career of the Warthog, and as at least part of the Warthog fleet may fly until at least 2040, there will probably be more SLEPs.)

Before this, in 1978, the first avionics upgrade was begun, though it was several years before it was completed. The A-10 received a Pave Penny laser receiving pod, which allowed the A-10 to sense the energy from laser designators and pass the information to any laser-guided munitions it may be carrying for targeting. The pod was given a hard mounting projecting below the aircraft on an extension on the right side of the nose almost directly under the cockpit. This gave the Pave Penny a good view of the battlefield. Starting in 1980, the A-10 received an inertial guidance system as part of this upgrade, as well as radios with greater compatibility with those carried by FALO teams (now called TACPs) and some Army and Marine FISTs.

Avionics upgrades continued in the 1990s with the addition of the Low-Altitude Safety and Targeting Enhancement system (LASTE), which gave the Warthog better computerized ordnance and cannon-aiming, an autopilot, and a ground-collision warning system (which could, and reportedly often was, disabled by the pilot). In 1999, the LASTE system itself was upgraded, giving the Warthog improved aiming and delivery assistance with the Integrated Flight & Fire Control Computers system. The upgrade also gave the Warthog some of the elements of a fly-by-wire system, with flight computers helping the A-10's autopilot, fine control, and help in keeping the pilot from flying the aircraft beyond its limits. It also included "wake up" alarms, where the aircraft was able to detect that a pilot may be groggy or unconscious due to hard maneuvering or injury and basically sound loud audio and voice alarms to try to get the pilot back to full consciousness, something which was common on fighter and most strike aircraft.

In 2001, the Warthog was given integrated combat search and rescue beacon and radio locations systems, allowing the aircraft to function as a true CSAR platform in the modern sense. Also in 2001, it was officially recognized that the A-10A needed more engine power; though nothing has yet been done about this problem, some A-10As may yet receive more powerful engines, and the new A-10C does have more powerful engines.

Perhaps the greatest overlooked element of the A-10's design was the lack of any night vision equipment. In Desert Storm, A-10 drivers found a field-expedient solution: They would go ahead and carry night-vision-capable weapons, uplink the night vision cameras and sensors of the weapons to the cockpit and get an *ad hoc* night vision capability of sorts that way. The problem with this approach is that they only had night vision capability as long as they had night-vision-capable ordnance, and the screen in the cockpit used so see through the ordnance was slaved to a single piece of ordnance, which retained the night vision picture seen through the bomb or missile would be retained down to the target, at which point the picture in the cockpit would wink out until the pilot could slave the screen to another piece of ordnance. And when all the night-vision-capable ordnance was expended, the A-10's night vision capability was gone. After Desert Storm, this deficit was officially recognized, and A-10As started to carry a night vision pod (several are used) on one of the outermost stations, and in some cases the cockpit was rearranged to accommodate a new night-vision-dedicated screen. Those A-10As that were not so modified were generally flown at night with the pilot wearing NODs.

The OA-10A: The FAC with a Punch

The OA-10A is a minor variant of the A-10A Warthog; it's primary role is as a FAC (Forward Air Control) aircraft, supervising and controlling air strikes (and to a lesser extent, naval gunfire) and communicating with ground units to ascertain their air support needs. The OA-10A is for the most part the same as the A-10A, including upgrades at different times as was done to the A-10A fleet. In fact, the OA-10A can do the same missions as the A-10A, and can function as a full attack aircraft. The difference between the OA-10A and A-10A is the addition of advanced long-distance observation equipment, along with the associated viewers in the cockpit. The OA-10A is also optimized for the delivery of smoke rockets (primarily WP), though the same rocket pods may be equipped with other types of rockets, and there is a bonus for firing 2.75-inch rockets. The OA-10As also have additional radios for communication with ground units, air units, AWACS-type aircraft, and naval units. The additional equipment that makes an A-10A an OA-10A can be easily removed, turning the OA-10A back into an A-10A, though the OA-10A can function as an A-10A without modification. The OA-10A retains all wing hardpoints and the centerline hardpoint as well as the GAU-8/A cannon and a full load of ammunition.

Many OA-10A and A-10A pilots saw how the increased avionics could be used for other purposes, and asked, "Why don't we modify *all* Warthogs to this standard?" However, like most other things, the answer was the budget crunch, and only about 10% of A-10As were modified to the OA-10A standard.

The A-10B N/AW: What Could Have Been

The A-10B N/AW (or YA-10B) was an experimental version of the A-10 that addresses the A-10's greatest shortcoming -- the lack of night attack capability. The A-10B was a two seat all-weather CAS aircraft, able to deliver accurate ground support strikes at night and to an extent, in bad weather. It had a number of upgrades to accomplish this, as well as a two-seat configuration with a WSO in the rear to operate most of the new avionics. The A-10B began testing in 1979, but the Air Force brass, in love with fast, sexy fighters, let the program drag, and eventually get killed in 1990. In particular, the A-10B's funds were cut and then reassigned to the then-new F-15E Strike Eagle, another fast mover that was not well suited to CAS missions. In addition to those in the Air Force who were looking for a more capable A-10, several countries, such as South Korea, Thailand, Burma, and Spain were very interested in the A-10B, and export sales could have been quite large. However, over 20 years later, the A-10C now has most of the improvements that the A-10B would have provided, though without the valuable WSO.

The A-10B had a complete suite of improvements which gave the A-10B its N/AW (Night/All Weather) capability, as well as upgrades the A-10A pilots had been asking for. This included advanced inertial navigation, a fighter-type HUD, terrain-following radar, and an improved radio suite, amongst other upgrades, such as most of the same upgrades as the OA-10A. The terrain-following radar was in particular wanted by the A-10 pilots, as it made treetop-level attacks much easier to fly. The A-10B was also equipped to take on the same role as the OA-10A, having avionics to allow it to fly FAC missions with no modifications.

The Modernized A-10: The A-10C

The A-10, despite it's ruggedness and simplicity to fly and maintain, is beginning to show its age. This has led to many calls to replace the A-10 with another, newer CAS aircraft with newer technology and avionics, and able to carry a wider variety of ordnance and to function as a general bomb truck if necessary. Some lawmakers and USAF brass have even called for the A-10 to be replaced by the new F-35, though it is so well-known that the F-35 cannot perform the CAS mission that the Air Force is unwilling to conduct a flyoff between the A-10 and F-35. However, there have been just many calls to modernize the A-10, giving it new avionics, particularly advanced night vision and a GPS receiver, and of course the ability to carry a wider selection of ordinance in the USAF inventory, especially the newer generation of missiles and bombs. The cannon also received calls to be modernized, to be able to fire APDS-T ammunition instead of its standard APDSDU rounds. The result of these calls was the "new" A-10C, which began service in 2008 (with some combat trials starting in 2007). The A-10C is "new" because they are all heavily-overhauled and upgraded A-10As, with the overhauling including re-strengthening of the fuselage and wings, essentially bringing them to a zero-hours state.

To a large extent, the A-10C's avionics include features that on the A-10A are simply "tacked on" or otherwise attached in an ad hoc or "temporary-permanent" manner, now internalized or an integrated part of the modernized A-10. This includes GPS, night vision, a helmet-sight interface, fire control upgrades, an all-glass cockpit, an improved fire control system able to delver the newer generation of USAF ordnance such as JDAMs and JASSMs (amongst others) as well as ARMs, a moving map display, HOTAS stick and throttle, situational awareness data link, ECM and IRCM, and an upgraded electrical system. Most of these improvements have been added to earlier A-10s in a graduated process, but the A-10C will have them all, as well as improved radios allowing them to communicate with more types of ground-based radios, other aircraft, and AWACS-type aircraft as well as receive intelligence information from UAVs. The A-10C will also have Link-16 and SATCOM communications, even though most Warthog pilots and armament specialists deem them unnecessary. The nose side-mounted Pave Penny receive-only laser pod is removed, replaced by LITENING AT pods embedded in the wing that function as laser designators as well as laser rangefinders.

Other A-10C upgrades include more powerful 10,000-pound-thrust engines in more protected pods in the same position on the aircraft, and a possible Y-type tail that cures the yawing problem that often occurs when the A-10 is carrying centerline auxiliary fuel tanks. (This new tail is still being considered.) The more powerful engines do not actually do much to improve the A-10's speed, but increase the modernized A-10's lifting capability. The RCS is also reduced, partially due to the new tail and engine housings, but mostly due to the partial use of RAM in strategic places. (Detecting the A-10C with radar or radio, or guiding weapons with this method, is at -3.) Some exhaust cooling is also employed (detection and guidance of IR weapons towards the A-10C is at -2, in addition to the IR Suppression effects).

A Civilian A-10?

After the innumerable tornadoes, microbursts, and supercell thunderstorms and other severe weather conditions which hit Oklahoma in the late 1990s and 2000s, the Fox station in Oklahoma City began looking for a storm-chasing aircraft they could fly themselves instead of having to hire one or use more fragile helicopters. The aircraft had to be relatively light, tough, able to handle rough weather, have easy maintenance, have good loiter characteristics, and lots of room for scientific instruments, radar, and radios, as well as some avionics. After looking into several aircraft, they decided to think out of the box and buy a demilitarized A-10A. It is based on an A-10A initial version, and has had the gun, the centerline hardpoint, and RWR, IFF, Flare and Chaff removed, and radios of a different, civilian-available sort installed (they are still secure). The aircraft, dubbed "WA-10 Stormchaser Warthog" has had several types of radar added in, various night vision and magnified vision devices, and scientific instruments such as barometric measuring, wind speed measuring, cloud density, movement and detection of funnel clouds, supercells, cloud rotation, and microbursts, as well as detection and measurement of intensity of rain, snow, freezing rain, and hail (as well as the approximate size of the hailstones. Lightning can be detected, categorized, and judged for frequency and intensity. It can detect, with its radars, conditions which may lead to severe weather. It is able to perform many of these functions simultaneously, and the aircraft includes several day/night TV-type cameras as well as a camera facing the pilot inside of the aircraft, allowing him to appear on camera. It has several computers to assist flight functions and the scientific instruments and radars. A fly-by-wire system has been added, as a

ground-collision warning system, along with a GPS system and a mapping system. A secondary function of the Stormchaser Warthog is the tracking of fleeing vehicles and criminals, though the latter can be difficult. One the hardpoints often carries a baggage pod for the pilot in case he cannot land at his home base; the others usually carry additional scientific instruments and/or generators for additional power. The place where the cannon was now contains a probe-firing mechanism, with a magazine of 32 Weather Probes. The Stormchaser Warthog is robust enough to penetrate a hurricane, though this has not yet been done in practice.

Twilight 2000 Notes: The A-10 N/AW was very rare in the Twilight War, perhaps 50 being modified from existing A-10 aircraft, and being deployed to the American Southwest. Perhaps 5% of A-10As are modified into OA-10s. Most A-10As will have received the 1990 upgrades, with perhaps 10% still having the 1978 upgrades only, and 3% being original A-10As and OA-10As. The A-10C and WA-10 do not exist in the Twilight 2.2 timeline.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
A-10A (Initial)	$35,298,444	JP4	7.26 tons	22.68 tons	1	38	None	Shielded
A-10A (1978)	$40,671,569	JP4	7.26 tons	22.72 tons	1	40	None	Shielded
A-10A (1990)	$55,334,733	JP4	7.26 tons	23.05 tons	1	42	VAS (20 km), Day Only	Shielded
A-10A (1999)	$55,545,658	JP4	7.26 tons	23.09 tons	1	45	VAS (20 km), Day Only	Shielded
A-10A (2001)	$60,197,283	JP4	7.26 tons	23.09 tons	1	46	VAS (20 km), Day Only	Shielded
OA-10A (Initial)	$60,725,213	JP4	7.26 tons	22.89 tons	1	39	VAS (30 km), Day Only	Shielded
OA-10A (1978)	$60,955,857	JP4	7.26 tons	22.91 tons	1	41	VAS (30 km), Day Only	Shielded
OA-10A (1990)	$65,330,695	JP4	7.26 tons	23.1 tons	1	44	VAS (30 km), Day Only	Shielded
OA-10A (1999)	$65,704,120	JP4	7.26 tons	23.24 tons	1	47	VAS (30 km), Day Only	Shielded
OA-10A (2001)	$65,838,058	JP4	7.26 tons	23.24 tons	1	48	VAS (30 km), Day Only	Shielded
A-10B N/AW	$75,803,050	JP4	7.26 tons	24.15 tons	2	51	FLIR (6 km), Weather Radar (300 km), TFR (10 km), 2nd Gen Image Intensification (40x) , VAS (30 km), Radar Altimeter (14 km)	Shielded
A-10C	$92,246,263	JP4	8.07 tons	24.35 tons	1	53	2nd Gen FLIR (12 km), TFR (12 km), 3rd Gen Image Intensification (x60), VAS (30 km), Weather Radar (300 km), Radar Altimeter (14 km), Radar (40 km), Radar Detection (10 km), RDF (10 km)	Shielded
WA-10	$65,124,833	JP7	3 tons	22.54 tons	1	59	2nd Gen FLIR (12 km), 2nd Gen Image Intensification (40x), VAS (20 km), Radar Altimeter, Radar (40 km), Weather Radar (600 km), 4xLLTV (20 km) on Swivel Mounts, WL/IR Searchlight on swivel mount, Cell Phone Connection, Wi-Fi Internet Connection	Shielded

Vehicle	Tr Mov	Com Mov	Mnvr/Acc Agl/Turn	Fuel Cap	Fuel Cons	Ceiling	Armor
A-10A (Initial)	1052	292 (74)	NA 72 9/6 50/40	3978	920	13636	FF8 CF8 RF8 W8

								T8*
A-10A (1978)	1051	290 (74)	NA	72	9/6	50/40	3978	922	13636	FF8 CF8 RF8 W8 T8*
A-10A (1990)	1037	286 (74)	NA	71	9/6	50/40	3978	936	13636	FF8 CF8 RF8 W8 T8*
A-10A (1999/2001)	1035	286 (74)	NA	71	9/6	50/40	3978	938	13636	FF8 CF8 RF8 W8 T8*
OA-10A (Initial)	1047	291 (74)	NA	72	9/6	50/40	3978	925	13636	FF8 CF8 RF8 W8 T8*
OA-10A (1978)	1046	291 (74)	NA	72	9/6	50/40	3978	926	13636	FF8 CF8 RF8 W8 T8*
OA-10A (1990)	1042	290 (74)	NA	72	9/6	50/40	3978	930	13636	FF8 CF8 RF8 W8 T8*
OA-10A (1999/2001)	1039	290 (74)	NA	72	9/6	50/40	3978	933	13636	FF8 CF8 RF8 W8 T8*
A-10B N/AW	1020	285 (70)	NA	71	9/6	50/40	3903	952	13636	FF8 CF8 RF8 W8 T8*
A-10C	1095	304 (65)	NA	79	9/7	50/50	3978	924	13636	FF8 CF8 RF8 W8 T8*
WA-10	1054	294 (74)	NA	73	9/6	50/40	3978	919	13636	FF8 CF8 RF8 W8 T8*

Vehicle	Combat Equipment	Minimum Landing/Takeoff Zone	Armament	RF	Ammo
A-10A (Initial)	RWR, IFF, Gyrocompass, Transponder, Secure Radios (3 Long Range, 1 Medium Range), Flare/Chaff (50/50), IR Suppression, HUD	440/400m Primitive Runway	GAU-8/A Autocannon, 11 Hardpoints	+1	1174x30mm (Up to 1350 Overload)
A-10A (1978)	RWR, IFF, Gyrocompass, Transponder, Inertial Navigation, Secure Radios (4 Long Range, 2 Medium Range), Laser Spot Tracker (12 km), Flare/Chaff (50/50), IR Suppression, HUD	440/400m Primitive Runway	GAU-8/A Autocannon, 11 Hardpoints	+2	1174x30mm (Up to 1350 Overload)
A-10A (1990)	RWR, IFF, Gyrocompass, Transponder, Inertial Navigation, Secure Radios (4 Long Range, 2 Medium Range), Laser Spot Tracker (12 km), Flare/Chaff (50/50), IR Suppression, HUD	440/400m Primitive Runway	GAU-8/A Autocannon, 11 Hardpoints	+3	1174x30mm (Up to 1350 Overload)
A-10A (1999)	RWR, IFF, Gyrocompass, Transponder, Inertial Navigation, Secure Radios (4 Long Range, 2 Medium Range), Laser Spot Tracke (12 km)r, Flare/Chaff (50/50), IR Suppression, HUD	440/400m Primitive Runway	GAU-8/A Autocannon, 11 Hardpoints	+4	1174x30mm (Up to 1350 Overload)
A-10A (2001)	RWR, IFF, Gyrocompass, Transponder, Inertial Navigation, Secure Radios (5 Long Range, 2 Medium Range), Laser Spot Tracker, Flare/Chaff (50/50), IR Suppression, HUD, Armored Fuselage	440/400m Primitive Runway	GAU-8/A Autocannon, 11 Hardpoints	+4	1174x30mm (Up to 1350 Overload)
OA-10A (Initial)	RWR, IFF, Gyrocompass, Transponder, Secure Radios (4 Long Range, 2 Medium	440/400m Primitive Runway	GAU-8/A Autocannon, 11	+1 (+2	1174x30mm (Up to 1350

	Range), Flare/Chaff (50/50), IR Suppression, HUD		Hardpoints	RP)	Overload)
OA-10A (1978)	RWR, IFF, Gyrocompass, Transponder, Inertial Navigation, Secure Radios (5 Long Range, 3 Medium Range), Laser Spot Tracker (12 km), Flare/Chaff (50/50), IR Suppression, HUD, Armored Fuselage	440/400m Primitive Runway	GAU-8/A Autocannon, 11 Hardpoints	+2 (+3 RP)	1174x30mm (Up to 1350 Overload)
OA-10A (1990)	RWR, IFF, Gyrocompass, Transponder, Inertial Navigation, Secure Radios (1 Very-Long Range, 5 Long Range, 3 Medium Range), Laser Spot Tracker (12 km), Flare/Chaff (50/50), IR Suppression, HUD	440/400m Primitive Runway	GAU-8/A Autocannon, 11 Hardpoints	+3 (+4 RP)	1174x30mm (Up to 1350 Overload)
OA-10A (1999)	RWR, IFF, Gyrocompass, Transponder, Inertial Navigation, Secure Radios (1 Very-Long Range, 5 Long Range, 3 Medium Range), Laser Spot Tracker 12 km), Flare/Chaff (50/50), IR Suppression, HUD	440/400m Primitive Runway	GAU-8/A Autocannon, 11 Hardpoints	+4	1174x30mm (Up to 1350 Overload)
OA-10A (2001)	RWR, IFF, Gyrocompass, Transponder, Inertial Navigation, Secure Radios (1 Very-Long Range, 5 Long Range, 3 Medium Range), Laser Spot Tracker (12 km), Flare/Chaff (50/50), IR Suppression, HUD	440/400m Primitive Runway	GAU-8/A Autocannon, 11 Hardpoints	+4 (+5 RP)	1174x30mm (Up to 1350 Overload)
A-10B N/AW	RWR, IFF, Gyrocompass, Transponder, Inertial Navigation, Secure Radios (1 Very-Long Range, 5 Long Range, 3 Medium Range), Laser Designator (12 km), Flare/Chaff (50/50), IR Suppression, HUD, Target ID, ECM 1, IRCM 1	440/400m Primitive Runway	GAU-8A Autocannon, 11 Hardpoints	+3	1152x30mm (Up to 1325 Overload)
A-10C	RWR, IFF, Gyrocompass, Transponder, GPS, Secure Radios (2 Very-Long Range, 6 Long Range, 3 Medium Range, 1 Short-Range), Laser Designator (12 km), Flare/Chaff (50/50), IR Suppression, HUD, Target ID, ECM 1, IRCM 1, Stealth 1	440/400m Primitive Runway	GAU-8A Autocannon, 11 Hardpoints	+4	1174x30mm (Up to 1350 Overload)
WA-10	Gyrocompass, Transponder, GPS, Secure Radios (1 Very-Long Range, 3 Long Range, 1 Medium Range), IR Suppression, HUD	440/400m Primitive Runway	Probe Launcher, 11 Hardpoints	+1	Up to 32 Weather Probes

*The cockpit is surrounded by a titanium shield and a high-strength Perspex canopy and has an AV of 13.

Cessna A-37 Dragonfly

Notes: This attack aircraft was developed from a trainer, the T-37 Tweet, in the late 1960s. It is not used by the US, but is used by Chile, Columbia, Dominican Republic, Ecuador, Guatemala, Honduras, South Korea, Peru, El Salvador, Thailand, Uruguay, and Vietnam. It did have limited service with US forces in the Vietnam War. The entry here will handle the A-37 but not the T-37 variant. The Dragonfly was also known in some circles as the “Super Tweet.” The A-37 platform was meant from the first to be useful in COIN, aircraft, light gunship, and trainer.

The history of the Dragonfly in combat began in mid-1967, when 25 were sent to Vietnam under the Combat Dragon program. For this role, they were outfitted with multi-use pylons capable of carrying bombs, (iron and cluster), rocket packs, napalm canisters, and as many as two SUU-11/A Minigun pods; this is in addition to an internal GAU-2B/A Minigun. An unusual type of MER used allowed the Dragonfly to carry a small external fuel tank and up to three 250-pound bombs on the same rack; however, if anything had to be ejected, everything on the pylon had to be ejected. Missions were to include Sandy flights, helicopter escort, CAS, FAC, and night interdiction. The second seat on FAS and CAS missions was normally occupied by an observer or a dedicated weapons officer; in practice, in all missions other than FAC, the second pilot/weapons officer seat was empty, allowing an increase of 200 kilograms in ordinance carriage. However, full controls were retained at both positions. The initial aircraft for this role was an A-37A, a heavily-modified Tweet initially designated YAT-37D Super Tweet, then AT-37D Super Tweet, with twin GE J85-J2/5 non-afterburning turbojets with 2400 pounds thrust each. Four hardpoints of surprising ability were carried under each wing and on the wingtips; however, the wingtip pylons were designed only for 1893-liter fuel tanks each.

Thousands of sorties were flown by the A-37A in the first year; in this year, numerous deficiencies were noted, enough that the pilots called the A-37A more often by the “Super Tweet” appellation, even though it was already designated the Dragonfly. Most complaints among pilots was range and endurance; speed was not as much as an issue to to the nature of its missions. Another complaint were the non-boosted controls, particularly in high-G or high-load situations. The A-37A was not armored, and the flight

controls were non-redundant.

In 1967, the first A-37Bs arrived in country; most went to the AFRVN, who by this time were flying most of the A-37As in country. They were all new-build aircraft, though based on the design of the T-37C. The A-37B included higher external stores limits, four wet hardpoints per wing, higher G-limits for the airframe (from 5G to 6G); flight surfaces were made redundant, self-sealing fuel tanks replaced the internal fuel tanks. The cockpit seats were armored and ballistic nylon curtains were added to the front of the cockpit behind the instruments and to the sides of the cockpit and the rear. The flight surfaces allowed for more maneuverability. Aerial refueling capability was added, and updated avionics were installed (including de-icing and a suite of indicators and controls designed for the FAC mission). Higher-thrust 2850-pounds-thrust GE J85-GE-17A replaced the A-37A's engines. These engines could be turned on and off in the air, as pilots found that a one-engine cruise configuration was effective. A midair refueling probe helped the situation. Like its predecessors, the A-37B was not pressurized, though it did have oxygen and masks.

These aircraft went to boneyards after use or went into civilian ownership. Eventually, all were replaced by the A-10 Warthog.

When Vietnam fell, 92 A-37Bs and As were recovered from the AFRVN before the NVA could capture them. These aircraft were at first redesignated OA-37D and were assigned to former TAC units that were now AFNG or AFRES units. They flew in combat as Operation Just Cause, primarily in CAS missions. Some 95 were captured and used by the Vietnamese as late as the early-1980s, used for missions over Cambodia and against Chinese forces. The A-37B and OA-37B are still used today in Central and South America.

In flight and firing tests, the A-37B proved themselves able to carry GPU-2/A pods with M197 20mm cannons or AMD pods with 30mm ADEN guns could be carried on the centerline and used effectively; however, no combat use of these pods are in evidence. Minigun pods, on the other hand, were used quite often to increase machinegun firepower.

Experimental Dragonflies

The A-37E, also called the A-37E/STOL, had more powerful engines, thrust reversers, and larger flaps to decrease takeoff run and landing run. It has a centerline gun pod for easier aiming (in a time where such an installation was important for radar gunsights and even a minigun in a small aircraft). It had weather radar, mild ECM, and flare and chaff dispensers. The fuselage was longer and the A-37E had greater lifting capability. This version was never built.

The A-37F has reduced lifting capacity compared to the A-37E, but because it has rotatable wingtip VTOL pods which could also be used for VIFF flying. This would have made the A-37F a STOVL aircraft, with a very short landing run or takeoff run (when not operating as a VTOL aircraft). It had a more advanced gunsight and a bombing radar gunsight. As the wingtips could no longer be used for fuel tanks, two fuselage hardpoints were added; in addition, space in the fuselage formerly used for the engines could be used for fuel. This version too was never built.

The Tebuan was a proposed Canadian variant of the CL-41 Tutor, itself a version of the T-37 Tweet. It was a fully weaponized version, with an extended nose containing the radar of an F-104B, and capable of using heat-seeking missiles (primarily Falcons or Sidewinders) in addition to the normal armament. It had a pair of GE J85-J4 turbojets with 2950 pounds thrust each. It never made it past a few mockups.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
A-37A	$5,726,120	JP4	2.13 tons	5.44 tons	2	10	None	Enclosed
A-37B	$5,850,680	JP4	2.67 tons	6.8 tons	2	10	None	Enclosed
OA-37B	$20,604,540	JP4	2.64 tons	6.94 tons	2	12	FLIR (6 km)	Enclosed
A-37E	$25,287,570	JP4	2.64 tons	7.07 tons	2	14	FLIR (6 km), Weather Radar (50 km)	Enclosed
A-37F	$27,020,770	JP4	2.48 tons	7.21 tons	2	17	FLIR (6 km), Weather Radar (50 km)	Enclosed
Tebuan	$64,246,000	JP4	2.5 tons	7.45 tons	2	13	FLIR (6 km), Weather Radar (50 km), Radar (25 km)	Enclosed

Vehicle	Tr Mov	Com Mov	Mnvr/Acc Agl/Turn	Fuel Cap	Fuel Cons	Ceiling	Armor
A-37A	1242	248 (90)	NA 62 8/5 40/30	2000	1449	12730	FF3 CF3 RF2 W3 T2
A-37B	1448	290 (80)	NA 70 9/5 30/20	2000	1698	12700	FF3 CF3 RF2 W3 T2
OA-37B	1420	284 (75)	NA 69 9/5 30/20	2000	1733	12700	FF3 CF3 RF2 W3 T2
A-37E	1567	312 (65)	NA 76 9/5 30/20	2200	1919	13970	FF3 CF3

							RF2 W3 T2
A-37F	1567	312 (65)	NA 76 9/5 30/20	2500	2119	13970	FF3 CF3 RF2 W3 T2
Tebuan	1575	314 (90)	NA 77 9/5 30/20	2000	1929	13970	FF3 CF3 RF2 W3 T2

Vehicle	Combat Equipment	Minimum Landing/Takeoff Zone	RF	Armament	Ammo
A-37A	IFF, Secure Radios	550/495m Primitive Runway	+1	SUU-11/A Minigun, 8 Hardpoints	1600x7.62mm
A-37B	IFF, Secure Radios	550/495m Primitive Runway	+2	SUU-11/A Minigun, 8 Hardpoints	1600x7.62mm
OA-37B	IFF, Secure Radios, Laser Designator (6 km)	550/495m Primitive Runway	+2	SUU-11/A Minigun, 8 Hardpoints	1600x7.62mm
A-37E	IFF, Secure Radios, Laser Designator (6 km), Flare/Chaff (16 each), ECM 1	440/396m Primitive Runway	+2	SUU-11/A Minigun, 8 Hardpoints	1600x7.62mm
A-37F	IFF, Secure Radios, Laser Designator (6 km), Flare/Chaff (16 each), ECM 1	330/200m Primitive Runway (& STOVL Characteristics)	+3	SUU-11/A Minigun, 8 Hardpoints	1600x7.62mm
Tebuan	IFF, RWR, Secure Radios, Flares/Chaff (16 Each), ECM 1, Laser Designator (6 km)	550/495m Primitive Runway	+3	SUU-11/A Minigun, 8 Hardpoints	1600x7.62mm

Textron AT-6 Wolverine

Notes: The AT-6 Wolverine is pumped-up version of the AT-6 Texan, which itself is an attack-capable variant of the T-6 Texan trainer. (The T-6A is used by the US Air Force for basic flight training, and the US Navy and Marines' T-6B does the same thing for their pilots.) The Wolverine is Textron's entry into the US Air Force's OA-X program (a program meant to partially replace the A-10 in the ground support and Sandy role. Like the other entries into the OA-X program, none can match the A-10, and that's the opinion of dozens of air combat experts, not just me.) On the whole, the OA-X program is proceeding slowly, and may never actually produce a new ground support aircraft, let alone use the AT-6 Wolverine. The Wolverine is also known as the AT-6 LAAR (Light Attack and Armed Reconnaissance aircraft). The Wolverine, however, does have a leg up on other OA-X entrants, because it's base airframe is already used by the Air Force; and the OA-X program may produce as many as three aircraft of differing capabilities. In addition to current and past operational tests, the AT-6 (along with the other entrants) proved its NATO interoperability during Exercise Ample Strike in 2015. The Wolverine is designed for use in "Permissive" environments – one where the US basically has air superiority and there is little to no AAA or MANPADS activity.

The Wolverine has greatly-strengthened wings and fuselage, allowing for a multiplicity of hardpoints, both wet and dry. It has proven itself capable of utilizing most smaller ground-attack-type weapons in the USAF inventory. The Wolverine uses most of the cockpit displays and architecture as the A-10C Warthog; however, these instruments are split up between the pilot and WSO, and the entire A-10C suite could not be fitted into the Wolverine. The Wolverine also uses the HOTAS system of the F-16, allowing the pilot less movement to fire ordnance,

The Wolverine has been tested successfully with a variety of laser-guided, and JDAMs up to 500 pounds. It is also capable of using most of the rocket pods in the NATO inventory, including the APKWS and other laser-guided rockets. It can also carry Hellfire and Brimstone ASM. As part of the ongoing tests, the Wolverine has been armed with Small-Diameter Bombs, and more weapons capabilities are being tested. One or two hardpoints are usually taken by FN-Herstal HM400 .50-caliber gun pods, or 20mm autocannon pods. The Wolverine carries communications equipment allowing it to communicate with troops on the ground as well as other aircraft and helicopters, via secure radios.

The engine has been replaced with a 1600-horsepower turboprop engine; this high horsepower is primarily to increase lifting capability and maneuverability, as the top speed is not great compared to most modern military aircraft. The aircraft is able to operate in light inclement weather. Construction of the skin of the Wolverine is of carbon composites. The large bubble canopy gives the crew an ample view of what's around them, and the canopy is bulged to allow the crew to see partially below the aircraft.

Promising tests have been conducted with Wolverines taking off and landing on aircraft carriers. Officially though, the US Navy and Marines have no interest in the Wolverine, though they appear to be watching the Air Force's tests closely.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
$30,807,500	JP4	1.86 tons	4.54 tons	2	34	Radar (45 km), All-Around Day/Night Advanced CCTV (30 km), FLIR (23km)	Shielded

Tr Mov	Com Mov	Mnvr/Acc Agl/Turn	Fuel Cap	Fuel Cons	Ceiling	Armor
1003	279 (25)	NA 116 3/2 20/15	1432	356	9449	FF3 CF3 RF2 W2 T2

Combat Equipment	Minimum Landing/Takeoff Zone	RF	Armament	Ammo
Laser Designator (6 km), IR Suppression, Secure Radios, HUD, GPS, RWR, LWR, IFF, Flare/Chaff (30/30)	900/600 Primitive Runway	+3	7 Hardpoints	None

F-15E Strike Eagle

Notes: This version of the F-15 air superiority fighter was adopted by the USAF in 1984, and gave a stellar performance in the 1991 Gulf War, Iraq, Afghanistan, and in Israeli use. The Strike Eagle features new engines, navigation/attack pods under the intakes, and new skin for less radar observability. The Strike Eagle also has standard fit conformal FAST (Fuel and Sensor Tactical) pods fitted beside each intake that can carry up to 1000 kg (2800 liters) of fuel and/or sensors, designators, or ECM/IRCM devices. The crewmembers have ejection seats, and the aircraft is capable of in-flight refueling. In addition to the US Air Force, the Strike Eagle is used by Israel and Saudi Arabia. The Strike Eagle retains its air-to-air capability, and is capable of delivering nuclear weapons.

The F-15E accent is on air-to-ground performance; it is a strikefighter. The WSO in the back seat has controls for piloting the aircraft; this is normally done to allow the pilot to rest on the way to the target and on the way back. The WSO's instruments are very different however, having the accent on air-to-ground warfare. He also does not have good visibility from the back seat. The F-15E also has an autopilot which can perform functions such as hands off navigation and even hands off terrain following flight. The cockpit is a partially glass cockpit; while it still has a large number of analog instruments, most functions are controlled via hand controllers on three multifunction displays (per cockpit). The original engines for the Strike Eagle were the Pratt & Whitney F100-PW-220 turbofans, providing 14590 pounds thrust dry and 23770 pounds thrust in afterburner. However, as the weight that the F-15E would be called upon to tote grew, it became obvious that new, more powerful engines were needed. The Strike Eagle was re-equipped with F100-PW-229 engines, with 17900 pounds thrust dry and 29160 pounds of thrust in afterburner. Several foreign air forces, such as Saudi Arabia and Singapore, chose F110-GE-129 engines for their Strike Eagles for commonality purposes with their F-15C/Ds; these engines produce less dry thrust at 17155 pounds thrust, but more afterburning thrust at 29500 pounds.

Israeli F-15Is differ primarily in their avionics and EW suites, being equipped largely by homegrown Israeli-made avionics and EW components. For game purposes, however, they are the same as standard F-15Es with F100-PW-229 engines. The South Korean F-15K Slam Eagle has a number of features that set it apart from the F-15E, such as an IRST system, EW suite which is lighter in weight then the F-15E's TEWS (Tactical Electronic Warfare System), and an additional U/VHF radio compatible with Link 16. In addition, the F-15K's crew have a Joint Helmet Mounted Cueing System, and can carry weapons such as the AGM84 SLAMER, AGM84H Harpoon Block II, and European KEPD 350. The Saudi F-15SA is almost identical to the standard F-15E with F110-GE-129 engines, but its radar is able to operate in Synthetic Aperture mode, useful for reconnaissance.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
F-15E (F100-PW-220 Engines)	$99,274,273	JP5	10.4 tons	36.74 tons	2	23	Radar (280 km), FLIR (90 km), Image Intensification (90 km)	Shielded
F-15E (F100-PW-229 Engines)	$101,174,233	JP5	10.4 tons	36.74 tons	2	23	Radar (280 km), FLIR (90 km), Image Intensification (90 km)	Shielded
F-15SA	$101,319,073	JP5	10.4 tons	36.74 tons	2	23	Radar (280 km), FLIR (90 km), Image Intensification (90 km)	Shielded
F-15K	$103,433,993	JP5	10.4 tons	36.54 tons	2	23	Radar (280 km), FLIR (90 km), Image Intensification (90 km), IRST (70 km)	Shielded

Vehicle	Tr Mov	Com Mov	Mnvr/Acc Agl/Turn	Fuel Cap	Fuel Cons	Ceiling	Armor
F-15E (F100-PW-220 Engines)	2066	574 (130)	NA 155 10/7 100/70	16400	5936	18290	FF6 CF6 RF6 W5 T5
F-15E (F100-PW-229 Engines)	2525	701 (130)	NA 189 10/7 100/70	16400	7274	18290	FF6 CF6 RF6 W5 T5
F-15SA	2422	673 (130)	NA 192 10/7 100/70	16400	6794	18290	FF6 CF6 RF6 W5 T5
F-15K	2539	705 (130)	NA 190 10/7 100/70	16400	7274	18290	FF6 CF6 RF6 W5 T5

Vehicle	Combat Equipment	Minimum Landing/Takeoff Zone	RF	Armament	Ammo
F-15E	Secure Radios, Chaff/Flare (80/80), RWR, INS, IFF, ECM 3, Deception Jamming (50 km), EW Suite, Auto Track, HUD, HUD Interface, IR Uncage, Look-Down Radar, TFR (30 km), Track While Scan, All Weather Flight, Target ID, Multitarget (6)	2800/1055m Hardened Runway	+4	20mm M61A1 Vulcan Autocannon, 13 Hardpoints	500x20mmM61
F-15SA	Secure Radios, Chaff/Flare (80/80), RWR, INS, IFF, ECM 3, Deception Jamming (50 km), EW Suite, Auto Track, HUD, HUD Interface, IR Uncage, Look-Down Radar, TFR (30 km), Track While Scan, All Weather Flight, Target ID, Multitarget (6), SAR (20 km)	2800/1055m Hardened Runway	+4	20mm M61A1 Vulcan Autocannon, 13 Hardpoints	500x20mmM61
F-15K	Secure Radios, Chaff/Flare (80/80), RWR, GPS/INS, IFF, ECM 3, Deception Jamming (50 km), EW Suite, Auto Track, HUD, HUD Interface, IR Uncage, Look-Down Radar, TFR (30 km), Track While Scan, All Weather Flight, Target ID, Multitarget (6), Helmet/Sight Interface	2800/1055m Hardened Runway	+4	20mm M61A1 Vulcan Autocannon, 13 Hardpoints	500x20mmM61

F-105 Thunderchief

Notes: This aircraft was designed from the outset for tactical bombing missions, including nuclear bombing. It was not designed for maneuverability, just speed, range, and the ability to carry a nuclear weapon. This led to a great many nicknames, such as Lead Sled, Ultra Hog, Flying Speedbrake, and the favorite, Thud. The Thunderchief was a star in the bombing campaign against North Vietnam during the late 1960s and early 1970s. Flown only by the US Air Force and Air National Guard, the Thunderchiefs were retired in 1984. The Thunderchief has in its belly an internal bomb bay; this bay can carry 1.36 tons of weapons, but this was much more likely in operational use to carry a 1300-liter fuel tank. If the fuel tank is carried, a centerline hardpoint may be used. (EF-105s do not have this option; the bomb bay space is taken up with an extra crewmember and electronics.) The internal bomb bay can carry all of the Thunderchief's ordinance load, allowing it to attack in the clean configuration; this configuration was primarily to be used when attacking with a nuclear weapon. The F-105 was designed for a short nuclear war, so some deficiencies of the aircraft did not become apparent until a long conventional bombing campaign, such a poor hydraulics layout and fuel tanks that were not self-sealing. Some were corrected in later marks of the Thunderchief, but the F-105 remains the only American aircraft to be pulled out of a war due to heavy losses. On the other hand, the F-105 was known for its spacious cockpit and excellent instrument layout.

The F-105A was only a prototype; soon after testing was complete, a new, more powerful engine was available, and the new F-105B became the first production aircraft. The F-105B had numerous changes from the YF-105A, including a switch to a more powerful engine, application of the area rule to the waist of the aircraft, and forward-swept, variable-geometry air intakes. The F-105B was powered by a powerful J75 turbojet which, along with the design changes, led to a clean speed of Mach 2.15 in afterburner. The J75-PW-19 engine supplied 14300 pounds thrust dry and 26500 pounds thrust in afterburner and with water injection. The F-105B, optimized for nuclear weapon attack, had only basic bombing controls which could be used for conventional missions, and no self-

defense features. The F-105B had a fire control system allowing for toss bombing of nuclear weapons.

The F-105D was the configuration that most in which most Thunderchiefs were built; this version had an RWR added in 1966 and flare/chaff dispensers added in 1969. The D model was designed in response to the USAF's request for an updated all-weather attack variant of the Thunderchief. It had an attack avionics system more suited for conventional bombing called the Thunderstick system, and additional armor. The F-105D could carry a 1500-liter fuel tank in the bomb bay, increasing the fuel load. The F-105D Thunderstick II (or T-Stick II) model improved the bombing sights and accuracy, but these were not deployed to Vietnam, though 30 were so modified. A Thunderstick II-modified Thud may be identified by the long dorsal spine housing additional avionics.

The F-105F was at first conceived as a trainer variant of the F-105D, with the nose lengthened by 79 centimeters to house the second crewmember. However, a number of F-105Fs were converted under the Commando Nail modifications to have a rear seat with a high-resolution radar set to enable it to conduct all-weather and night low-level attacks against dangerous targets. Several of these modified F-105Fs were later further modified, becoming EF-105Fs and becoming the first F-105-based Wild Weasel aircraft.

The EF-105F and F-105G were the some of the first Wild Weasel electronic warfare aircraft built; their job was to act as "SAM bait," and then knock out the SAM and radar sites with antiradiation missiles. The stories and decorations of the Wild Weasel pilots are legion. (The "EF"-105F was never an official designation, but was an oft-used designation to differentiate them from "regular" F-105Fs.) The EF-105F was an F-105F jammed with EW gear, including long blisters on the underside of the forward fuselage housing jammers and other EW equipment. They were at first optimized for detecting and jamming gun radar and the radars of the S-75 (SA-2) SAM, with other jammers being added later. Starting in 1967, some EF-105Fs were modified into the improved F-105G Wild Weasel III standard.

The AF-105C was a proposed two-seat trainer, which was never put into production. The F-105E was a two-seat trainer variant of the F-105D that was, as with the F-105C, never put into production.

Twilight 2000 Notes: Some 100 F-105s were pulled from boneyards starting in 1997, refurbished, and sent back into combat. An unknown F-105 was responsible for at one nuclear bomb attack.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
F-105B	$14,629,881	JP5	6.35 tons	23.97 tons	1	17	None	Shielded
F-105D (Early)	$19,731,551	JP5	6.35 tons	23.85 tons	1	21	Radar (50 km)	Shielded
F-105D (Late)	$33,075,999	JP5	6.35 tons	23.97 tons	1	22	Radar (75 km)	Shielded
F-105D (T-Stick II)	$43,454,351	JP5	6.35 tons	23.97 tons	1	23	Radar (80 km)	Shielded
EF-105F	$53,068,933	JP5	5.68 tons	25.09 tons	2	24	Radar (90 km)	Shielded
EF-105G	$78,987,333	JP5	5.68 tons	25.09 tons	2	26	Radar (100 km)	Shielded
F-105F	$34,413,893	JP5	6.35 tons	24.41 tons	2	22	Radar (75 km)	Shielded

Vehicle	Tr Mov	Com Mov	Mnvr/Acc Agl/Turn	Fuel Cap	Fuel Cons	Ceiling	Armor
F-105B	1552	431 (150)	NA 116 4/2 40/20	2900	4342	14800	FF6 CF6 RF5 W4 T4*
F-105D (Early)	1566	435 (150)	NA 117 4/2 40/20	2900	4342	14800	FF7 CF7 RF6 W5 T4
F-105D (Late/T-Stick II)	1552	431 (150)	NA 116 4/2 40/20	2900	4342	14800	FF7 CF7 RF6 W5 T4
EF-105F/F-105G	1490	414 (150)	NA 112 4/2 40/20	2900	4342	14800	FF7 CF7 RF6 W5 T4
F-105F	1530	425 (150)	NA 115 4/2 40/20	2900	4342	14800	FF7 CF7 RF6 W5 T4

Vehicle	Combat Equipment	Minimum Landing/Takeoff Zone	RF	Armament	Ammo
F-105B	None	1400/950m Hardened Runway	+1	20mm Vulcan, 5 Hardpoints, Internal Weapons Bay	1028x20mm
F-105D	None	1400/950m Hardened	+2	20mm Vulcan, 5	1028x20mm

(Early)		Runway		Hardpoints, Internal Weapons Bay	
F-105D (Late)/F-105F	RWR, Flare/Chaff (60/50), TFR (20 km)	1400/950m Hardened Runway	+2	20mm Vulcan, 5 Hardpoints, Internal Weapons Bay	1028x20mm
F-105D (T-Stick II)	RWR, INS, Flare/Chaff (75/75), ECM 1, TFR (20 km)	1400/950m Hardened Runway	+3	20mm Vulcan, 5 Hardpoints, Internal Weapons Bay	1028x20mm
EF-105F	RWR, INS, Flare/Chaff (80/80), ECM 2, TFR (20 km)	1400/950m Hardened Runway	+2	20mm Vulcan, 5 Hardpoints	1028x20mm
F-105G	RWR, INS, Flare/Chaff (80/80), ECM 3, IRCM 1, Deception Jamming (30 km), Active Jamming, TFR (20 km)	1400/950m Hardened Runway	+3	20mm Vulcan, 5 Hardpoints	1028x20mm

*The F-105B was originally meant to be a tactical nuclear bomber. Because of this, it received extra shielding around its cockpit, giving the cockpit AV 7.

F-117A Nighthawk

Notes: Known more commonly to the public as the Stealth Fighter (despite actually being an attack aircraft), the Nighthawk is the first operational aircraft to exploit low observable stealth characteristics. The F-117A is known for its faceted outer surface, done to reflect virtually all radar energy away from the interrogating radar site, therefore transmitting little information back to the site. The faceted surface was also adopted because the computers and instruments of the time (mid-1970s) were not able to render a stealth shape with curves. In addition, the exhaust is passed through a flat tailpipe, and some sources state that the exhaust is mixed with cool outdoor air and passed over thermal-absorbing “bricks” of a still-classified composite material. The air intakes are covered by a conductive grill. The cockpit is described as spacious, but with poor visibility, including a large blind spot to the rear. The F-117A is definitely not a fighter, and is not rated to carry air-to-air missiles, nor does it have a cannon; it is designed to crack heavily defended airspace and take out targets that need precision weapons to destroy. (I have heard rumors that the F-117A was tested with AIM9 Sidewinder air-to-air missiles, but I have not heard what the results of these experiments were, or if they definitively occurred.) As radar use by the F-117A would give it away, it is not equipped with radar, being instead equipped with an imaging IR system, laser designator, and laser rangefinder. The F-117A is unstable in all three flight axes and is dependent upon fly-by-wire technology to keep the aircraft flyable, with computers making dozens of tiny corrections to the flight profile per second. The F-117A is powered by a pair of non-afterburning versions of the GE F404, the F404-F1D2, which have 9040 pounds of thrust each.

The F-117A first saw combat service in Panama in 1988; depending upon who you ask, the results of its strikes ranged from inconclusive to effective. It was a standout in Desert Storm, striking targets deep inside of Iraq, flying 1300 sorties and achieving the destruction of 1600 high-value targets. It also participated in the bombing of Yugoslavia, where one was shot down by an SA-3 SAM in 1999; rumors also state that one F-117A was heavily damaged over Yugoslavia by unknown causes and had to be scrapped, though the pilot did return the aircraft to base. It also saw combat in Iraq and Afghanistan, though the F-117A was officially retired from combat service in 2008. Nonetheless, there have been persistent rumors that F-117As have flown combat missions in the fight against ISIS after 2008, until F-35s and F-22s became available in numbers. It has also been used as a low-observable Aggressor aircraft and cruise missile surrogate in Red Flag and Top Gun exercises. Part of the F-117A fleet is kept in service condition at Tonopah Test Range Airfield.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
$92,802,603	JP5	2.27 tons	23.81 tons	1	36	FLIR (100 km)	Shielded

Tr Mov	Com Mov	Mnvr/Acc Agl/Turn	Fuel Cap	Fuel Cons	Ceiling	Armor
1580	439 (150)	NA 119 4/2 40/20	4000	3674	14000	FF3 CF4 RF3 W4 T2

Combat Equipment	Minimum Landing/Takeoff Zone	RF	Armament	Ammo
RWR, IFF, INS, Flare/Chaff (50/40), ECM 3, IRCM 4, Stealth 4, IR Stealth 3, IR Suppression, HUD, HUD Interface, TFIIR (15 km), Target ID, Laser Designator (30 km)	1200/1500m Hardened Runway	+5	2 Weapons Bays	None

OV-10 Bronco

Notes: This aircraft was designed for forward air controllers, helicopter escort, and light ground attack and counterinsurgency work. The OV-10 was originally used by the US Marines, Navy, and Air Force, but by the mid-1990s was used in the active duty role only by Thailand, Venezuela, Morocco, Philippines, Indonesia, and Oman. The OV-10 was retired by US forces in 1994, and by other air forces in the 2000s, except for Filipino OV-10Ms, which continue to operate in a counterinsurgency role.

The OV-10A has a central fuselage with the cockpit and a small cargo area at the rear, accessed by clamshell doors at the rear of

the central fuselage. There are a further two nacelles containing the two engines, and continuing on to the rear to the tail. The tail is raised up from those nacelles, and the two are joined by a horizontal stabilizer. The center fuselage's cockpit has a large canopy, and it is bulged at the sides to be wider than the fuselage, enabling the crew to look down and under the fuselage. The rear seat can be removed to allow for the carrying of more cargo; with the rear seat removed, the OV-10A can carry 1.5 tons of cargo in the fuselage, or five paratroopers with light gear, or two litter patients and an attendant. At the bottom of the center fuselage are sponsons armed with four M60C machineguns, along with five hardpoints below the machineguns. The wings have an additional four hardpoints. Normal loadout for the hardpoints were usually seven-shot 70mm air-to-ground rockets for the wings, with 500-pound bombs for the fuselage hardpoints, but many other types of ordnance or fuel tanks could be carried. The OV-10A was, unfortunately, underpowered, limiting its maneuverability in the hills and valleys of Vietnam; there were several crashes when pilots found they did not have enough engine power to clear hills and ridges when climbing out of valleys. For various reasons, no OV-10 crew survived ditching the aircraft. The OV-10A is powered by a pair of 715 horsepower Garrett T76-G-10/12 turboprop engines.

The OV-10D NOGS (Night Observation GunShip) version of the Bronco was used by the US as late as the Gulf War. It has night vision gear and a 20mm gun turret in the belly, as well as uprated Garrett T76-G-420/421 1040-horsepower turboprop engines to cope with the added weight. The OV-10D can be distinguished by its extended nose, housing its observation equipment. They also have the belly-mounted gun turret and chaff dispensers in the engine tail extensions.

The OV-10F is an Indonesian modification of the OV-10A. The primary modification is the replacement of the four M60C machineguns with two M2HB heavy machineguns. They were replaced by Embraer Super Tucanos in 2012.

The OV-10M is an OV-10A modified with larger engine fuselage extensions to house Garrett T76-G-420 1040-horsepower engines. They also have four-bladed propellers instead of the three blades of OV-10As, and their wings are strengthened for higher G-rated flight. Their hardpoints are modified to allow them to carry Paveway I and II smart bombs.

The US Department of State operates former USAF OV-10As and US Marine OV-10Ds in a drug interdiction role, and deploys them sometimes in South America. These have no official designations, but differ from the standard OV-10As and OV-10Ds in having no sponsons, merely a centerline hardpoint normally used to carry an extra fuel tank. They also had sprayer bars for herbicide installed under the rear tail in a large V-shape extending from the cargo bay to the tails. These were connected to a 1900-liter tank in the cargo bay. Additional external Kevlar armor panels around the cockpit. These aircraft carry civilian registration numbers on their tails instead of military markings.

The OV-10B was an OV-10A without weapons and only one hardpoint (to furl and unfurl the towed target), and a third crewmember in the rear cargo section facing to the rear and looking through the clear rear end. The Germans used these aircraft as target tugs. They were replaced in 1990 by Pilatus PC-9s. They will not be further detailed here.

The California Department of Forestry and Fire Protection operates 19 OV-10As, and uses them as fire spotting platforms which are also equipped with additional communications equipment in their role as coordinators of water drops by tankers. They are also equipped with FLIR viewers. They will not be further detailed here.

Twilight 2000 Notes: The Bronco returned late in the Twilight War as an attack aircraft when no other aircraft was available.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
OV-10A	$5,868,360	AvG, JP5, JP8	1.63 tons	6.55 tons	2+4	12	None	Enclosed
OV-10A (Pave Nail Mods)	$7,159,860	AvG, JP5, JP8	1.63 tons	6.56 tons	2+4	13	Image Intensification (20 km)	Enclosed
OV-10D	$10,892,340	AvG, JP5, JP8	2.4 tons	6.9 tons	2	13	FLIR (30 km), Passive IR (10 km)	Enclosed
OV-10F	$5,880,555	AvG, JP5, JP8	1.63 tons	6.59 tons	2+4	12	None	Enclosed
OV-10M	$6,084,360	AvG, JP5, JP8	2.4 tons	6.7 tons	2+4	12	None	Enclosed
OV-10A (State Dept)	$9,202,950	AvG, JP5, JP8	630 kg	7 tons	2	12	None	Enclosed
OV-10D (State Dept)	$16,677,765	AvG, JP5, JP8	1 ton	7.2 tons	2	13	FLIR (30 km), Passive IR (10 km)	Enclosed

Vehicle	Tr Mov	Com Mov	Mnvr/Acc Agl/Turn	Fuel Cap	Fuel Cons	Ceiling	Armor
OV-10A	944	263 (90)	NA 71 9/6 60/45	955	620	5500	FF3 CF3 RF3 W4 T4
OV-10A (Pave Nail Mods)	942	262 (90)	NA 71 9/6 60/45	955	620	5500	FF3 CF3 RF3 W4 T4
OV-10D	1291	358 (90)	NA 97 9/6 60/45	955	926	9100	FF3 CF3

							RF3 W4 T4
OV-10F	938	260 (90)	NA 70 9/6 60/45	955	620	5500	FF3 CF3 RF3 W4 T4
OV-10M	1329	369 (90)	NA 100 9/6 60/45	955	926	9100	FF3 CF3 RF3 W5 T4
OV-10A (State Dept)	884	246 (90)	NA 66 9/6 60/45	955	620	5500	FF4 CF4 RF3 W4 T4
OV-10D (State Dept)	1238	344 (90)	NA 93 9/6 60/45	955	926	9100	FF4 CF4 RF3 W4 T4

Vehicle	Combat Equipment	Minimum Landing/Takeoff Zone	RF	Armament	Ammo
OV-10A/M	Flares (40), Secure Radios	600/500m Primitive Runway	+2	4xM60C Machineguns, 9 Hardpoints	2000x7.62mm
OV-10A (Pave Nail Mods)	Flares (40), Secure Radios, Laser Designator (9 km)	600/500m Primitive Runway	+2	4xM60C Machineguns, 8 Hardpoints	2000x7.62mm
OV-10D	IR Suppression, Flare/Chaff (49/30), Secure Radios, Laser Designator (9 km)	600/500m Primitive Runway	+3	20mm M197 Autocannon, 4 Hardpoints	1000x20mm
OV-10F	Flares (40), Secure Radios	600/500m Primitive Runway	+2	2xM2HB Machineguns, 9 Hardpoints	2000x.50
OV-10A (State Dept)	Flares (40), Secure Radios, GPS	600/500m Primitive Runway	+2	5 Hardpoints	None
OV-10D (State Dept)	IR Suppression, Flare/Chaff (49/30), Secure Radios, GPS, Laser Designator (9 km)	600/500m Primitive Runway	+3	5 Hardpoints	None