2025 Study Submission

RFX - A Near Term Stealth Strike Recce Fighter

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The retirement of the F-111 fleet and the cancellation of the A-12A Avenger II has produced a shortfall in the USAF's deep strike capability. At this time the gap in capability is being filled with the multirole F-15E Beagle strike fighter, which has lesser payload radius performance to the F-111 and A-12, while also lacking the low observables capability of the latter.

The RFX concept is an attempt to conceptualise a near term Stealth technology replacement for the F-111, F-15E and F-117A, utilising the existing Stealth and systems technology base and thus minimising the R&D overhead to develop the aircraft. The design exploits B-2 aerodynamics and stealth airframe and materials technology, F-22 propulsion and off the shelf avionics.

The RFX is slightly larger than an F-15E but smaller than the F-111 family of aircraft. The aircraft is a flying wing in general configuration similar to a B-2A, but with a wing sweep angle of 45 degrees designed to optimise the airframe for transonic cruise. It is fitted with two unreheated turbofans, prototypes to be flown with the F-110 but with production aircraft to be fitted with a pair of unreheated ATF common F-119 fans. The aircraft carries 25,000 lb of internal fuel which provides a nominal combat radius of 1,200 NM with 6,000 lb of internal weapon load. Empty weight is cca 30,000 lb, with an MTOW in the vicinity of 65,000 lb. The aircraft has a span just over 72 ft and a length of about 46 ft.

The crew are seated side by side, as in the F-111, on a pair of Escapac ejection seats. A two piece aft hinged bubble canopy is used. The cockpit uses flat panel active matrix LCD multifunction displays, but with a pair of raster scan HUDs which are common to the F-15E. Conventional centre mounted controls are fitted, and the RH station provides full command capability by virtue of software driven displays. The RH station will be crewed with WSOs, the controls being provided to save the expense of a specialised combat rated trainer version.

The aircraft uses a full authority quadruplex digital fly-by-wire flight control system using algorithms developed for the B-2A, but using different computer hardware. The high pressure hydraulic system uses B-2 technology. While the optical Mil-Std-1773 could be used for the dual bussed main avionic system, cost pressures result in a conventional 1553B bus which supports the dual mission computers as well as the pair of display management processors. The complex integrated avionic system designed for the ATF is not used, due uncertainties in funding and hence production schedules.

Avionics are conventional. The primary navigation and attack sensors are a nose mounted steerable navigation FLIR, derived from LANTIRN, in a blended nose fairing and the first generation Texas Instruments DLIR ventral turret as fitted to the existing F-117A. The laser equipped DLIR turret provides target designation and rangefinding for laser guided bomb delivery. The dual field of view navigation Flir projects on the HUDs and is equipped with video tracking facilities for engagements against airborne targets. The nav attack system uses dual Honeywell H523 Ring Laser Gyros and production aircraft would be fitted with D/GPS and possibly a covert Terrain Contour Matching navigation system similar to the UK Terprom system.

The aircraft uses a conventional electronic warfare system, built around the ALR-56R super-heterodyne warning receiver/ESM subsystem, derived from the mature high density ALR-56M. The newer subtype is to have substantially better sensitivity and additional forward facing interferometric antennas used for precision direction finding of emitters. The aircraft also carries a Phase-Rate-of-Change passive rangefinding subsystem for defence suppression and silent attack on airborne radiating targets. No active DECM is carried, given favourable experience with the F-117 over Baghdad.

Three ventral weapon bays are used. The central, No.2 bay is the largest and will accommodate three GBU-24 2,000 lb laser guided weapons, AGM-88 HARM anti-radiation missiles, or (planned) specialised pallets with either reconnaissance cameras, or high powered jammers used for the escort jamming role. An additional fuel cell may be fitted above the recce pallet. The smaller outboard No.1 and No.3 bays carry pairs of either AIM-120 or AIM-9X missiles on a telescoping extendable dual launch rail. All weapon stations use Mil-Std-1760 weapon control bus interfaces. The AAMs as well as the HARM may be cued to targets using the ESM subsystem, which has improved detection range and DF accuracy for this specific purpose.

The airframe design is similar to the B-2, and the general configuration is very close to that of the B-2A. The dorsal exhausts employ shark tooth trailing edges used to scatter impinging radiation to either side of the aircraft. The configuration bears much resemblance to the YF-23 ATF prototype, and a similar active cooling system is used to reduce secondary infrared radiation from the exhaust channels. A moving fuselage beavertail surface is used for active pitch trim, and split outboard ailerons / speedbrakes provide for low speed roll and yaw control as with the B-2. The engine inlets are mounted ventrally to ensure clean airflow at increased AoA, the aircraft is expected to sustain a respectable turn rate.

The fuselage centre section houses a forward avionic bay, the cockpit, an avionic bay in the hump behind the cockpit, and the central weapon bay, about which is wrapped the centresection fuel cell, which carries 10,000 lb of JP-5. An inflight refuelling receptacle is directly behind the cockpit, and a single point refuelling attachment is inside the main weapon bay. The engines are situated immediately outboard of the central weapon bay area, with the outboard weapon bays to either side inboard of the engine bays. The main undercarriage legs retract outboard, pivoting off the central structural box which mounts the weapon bays and engines, the main wheel well doors are hinged outboard. The nosewheel is a conventional dual arrangement pivoting aft, with a single left hinging door which mounts the ground support diagnostics panel.

Engine accessory drives on both powerplants provide electrical and hydraulic power. A Garret GTC36 series APU is embedded in the fuselage, exhausting into the RHS exhaust channel and drawing air from a retractable scoop in the RHS inlet duct. The APU provides compressed air for unassisted engine start, hydraulic pressure capable of sustaining the flight controls, and electrical power to drive the core avionics. An OBOGS oxygen system is also carried. The fitting of the APU and OBOGS is intended to provide for operational deployments with a minimum of ground support equipment.

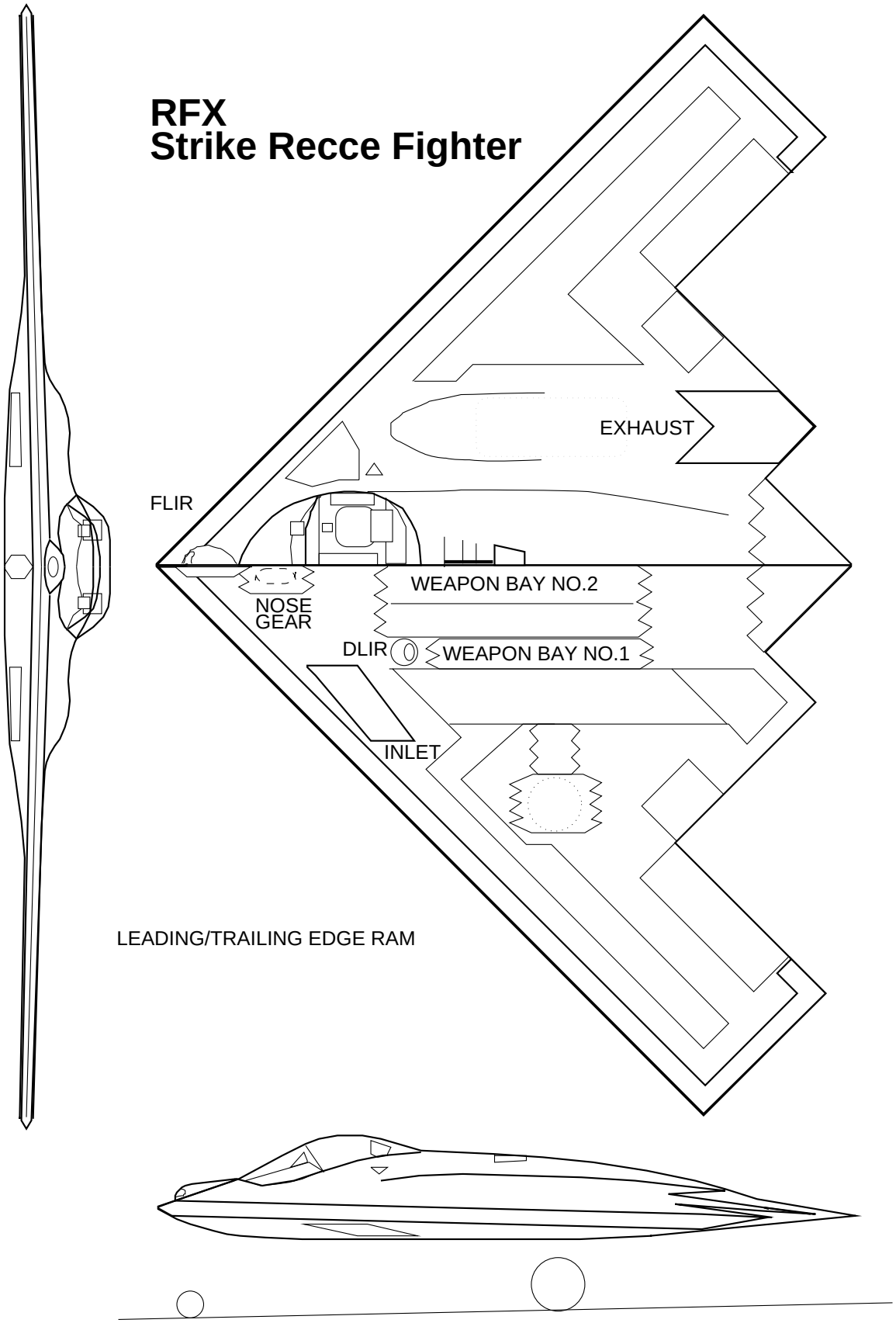
Dual main spars attach to the central box forward of the engines, and are reinforced by an aft load carrying member which attaches at the rear of the central box. The design is to be structurally rated at 7.5 G, although the aircraft is unlikely to pull this load frequently given its mission profile. Fuel is split into five main cells, the central saddle tank and two outboard integral tanks in the wings.

Low observable performance is similar to that of the B-2A, given that the aircraft uses much the same configuration, materials and blended contours. The leading edge employs embedded RAM (Radar Absorbent Material), with a compressed air deicing system. The air, bled from the compressors, is cycled through leading edge (linked) cavities to the wingtips, from where it is returned via plumbing to the exhaust bay cooling system, where it is dumped into the airflow used to blanket the titanium exhaust bay liners.

The aircraft is capable of achieving low supersonic dash speed, at about Mach 1.2. Sustained cruise speed is high subsonic and constrained by the wing profile. The aircraft is very efficient aerodynamically, as is the B-2, and will have an excellent climb rate and "fighter-like" handling. The structural G rating will result, as with the B-2, in a very rigid aeroplane with high roll rate performance and given the short length, high pitch rate performance. The very low wing loading at combat weight translates into excellent climb, acceleration and turn performance. The unreheated combat thrust to weight ratio of about 1:1 is by any standards excellent. The flight control system envelope is constrained to 22 degrees AoA max. High AoA handling is a potential problem area given the absence of vertical stabiliser surfaces, and the aircraft is not intended to be a dogfighter.

The mission for the aircraft is all-weather precision theatre strike, SEAD (Wild Weasel), theatre imagery and electronic recce and covert air-air intruder missions primarily against high value assets such as AEW aircraft, airborne command posts, tankers and transports in rear areas. With its very low signature and respectable aerodynamic performance it can stealthily penetrate deep, engage its target and egress equally stealthily. As it has been equipped with very accurate passive sensors, under non-visual conditions it is a serious threat to conventional air superiority fighters.

The RFX represents a quantum leap in the evolution of tactical strike aircraft, and would provide the USAF with an excellent replacement for the F-117A, F-111 and F-15E, should sufficient numbers be acquired. The aircraft has substantial potential to perform in a number of tactical roles as well as replacing the EF-111A with a credible new technology airframe. The airframe also has significant export potential, with possible long term customers being NATO Tornado users, and Australian F-111C/G users.


RFX
Strike Recce Fighter
EXHAUST
FLIR
WEAPON BAY NO.2
NOSE
GEAR
DLIR
WEAPON BAY NO.1
INLET
LEADING/TRAILING EDGE RAM