

F-111 AARDVARK (& EF-111/FB-111)

By Dimitris V. Dranidis



General

Users: United States, Australia

Roles & Mission: The F-111 was the result of the ill-fated joint TFX program in the early 60s, a major effort whose aim was to satisfy the requirements of both the USAF (for a low-level strike aircraft for the European theater) and the USN (for a long-range fleet-defence interceptor). The navy version proved an outright failure as a result of excessive weight figures, and the air force version entered service amidst a vast number of technical problems. Most of the technical headaches revolved around the unreliability of the extremely advanced avionics suite, problems with the variable geometry wing and its carry-through box, severe airflow problems on the complex air intakes (the Soviets wisely went for much simpler intakes on the Su-24 & MiG-23) and last but not least the weight of the aircraft itself. However, the giant leap that the new aircraft brought to the table in terms of deep, precision strike capabilities with unprecedented accuracy and survivability against Warsaw Pact air defences, persuaded the USAF that the Aardvark was worth having around, even as a hangar queen. Successive versions of the aircraft improved its already awesome strike capabilities and wide range of stores, if not easing the maintenance problems (the F-111D in particular was a horror story). The UK-based F-111E/Fs formed the backbone of USAFE's deep strike ability in the European theater for almost 2 decades, and together with NATO Tornados would undoubtedly be among the first units to cross the border if the war that never was did come. UK-based aircraft also participated in the famous El-Dorado Canyon operation in 1986 against Libya, in a feat of tactical airstrike never before accomplished. For the Desert Storm operations in 1991, aircraft from both European bases and from CONUS were moved into allied bases in Turkey and Saudi Arabia, and played an active role in the deep interdiction profile. The F-111 started being replaced by the F-15E Strike Eagle from 1988 onwards, and was eventually retired in the mid-to-late 1990s, mainly as a cost-saving measure.

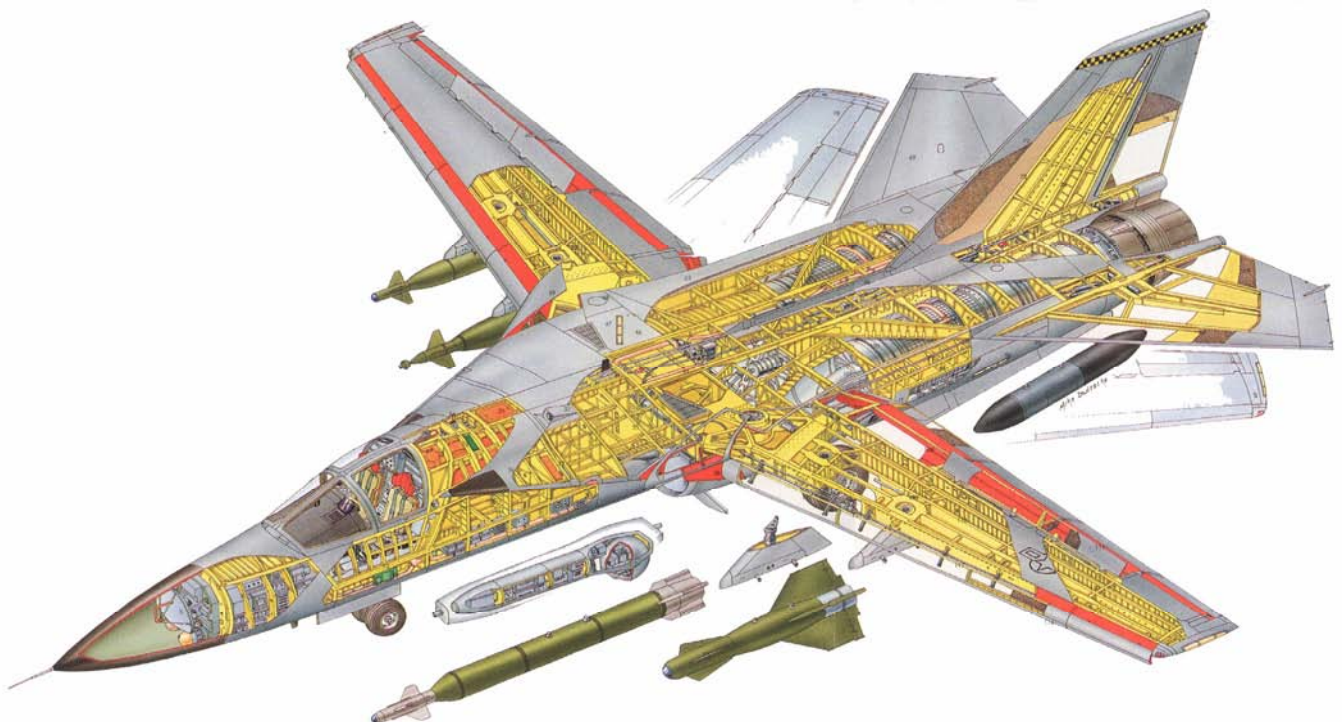
The EF-111 was a highly modified version with all the attack avionics removed and replaced by an extremely advanced electronic warfare suite, very similar to the one already fitted to the US Navy's EA-6B Prowler. The two-man crew was augmented by another 2 EW operators and even the canopy was gold-plated to reduce electronic interference from the aircraft's own systems. The aircraft thus modified were cross-attached as needed to normal F-111 squadrons to provide EW escort on deep-strike packages. The retirement of the aircraft in the late 90s was a severe blow to the USAF's independent escort-jamming capabilities; indeed since then the air force has to regularly rely on EA-6B detachments from the USN to cover its relevant needs.



The FB-111 was a Strategic Air Command (SAC) modification of the basic Aardvark. The airframe was elongated and structurally strengthened, larger wings were installed and the undercarriage was even further reinforced. The main purpose of the modifications was to increase the aircraft's fuel tankage and its maximum take-off weight (MTOW) so that it could carry six AGM-69 SRAM missiles or six free-fall strategic nuclear weapons. The aircraft was intended as a SEAD-optimised consort to the existing B-52G/H strategic bomber fleet. The range of the aircraft was still inadequate for true penetration of the Soviet mainland even with extensive AAR. Instead it would be tasked with the elimination of PVO nodes (airfields, SAM sites, EW/GCI radars, C3I centers etc.) along the periphery of the Soviet Union, thus enabling trailing B-52s to penetrate Soviet airspace with increased survivability. Seventy-six were built and saw service with the SAC until 1990, when they were converted to F-111Gs and assigned to Tactical Air Command. The F-111Gs were assigned to the 27th Fighter Wing at Cannon AFB and were used in a training role only, until their complete retirement in 1997. 18 of them were transferred to the Royal Australian Air Force (RAAF) in 1993 to augment its F-111C fleet.



The F-111C was a special version for the needs of the RAAF. In many respects it represented a cross between the F-111A and the FB-111. It was equipped with eight underwing pylons mounted on an FB-111-type larger span wing (span of 70 feet when fully extended), and fitted with the FB-111's reinforced undercarriage. Twenty four such airframes were delivered to the RAAF between 1968-1969, but the wing problems that had caused a number of accidents with USAF Aardvarks forced a revision of the aircraft that delayed their IOC until late 1973. Four of the aircraft were converted as RF-111C for the reconnaissance role, fully retaining their strike capability. The RAAF aircraft can carry the Pave Tack pod (as USAF's F-111Fs) as well as some unique weapons such as the Harpoon AshM. All of the remaining F-111Cs have been refurbished and upgraded under the AUP program, which should prolong their operational service until at least 2020. These aircraft were further augmented by 18 ex-USAF F-111Gs from 1993 onwards¹.



Strengths: The Aardvark is fast at low level. **Really** fast. In fact, very few aircraft (and even fewer interceptors) can catch up with it at treetop height when in full afterburner. With a reasonable hi-lo-hi profile and with tanker support, it has also an exceptional range for a non-strategic aircraft, courtesy of its efficient (if unreliable and stall-prone) TF30 turbfans and huge fuel fraction. To this, one should add a very wide range of offensive munitions & stores (including tactical and even strategic nuclear weapons), advanced offensive avionics, extensive PGM capability (particularly the PaveTack-fitted F-111Fs at Lakenheath), a full terrain-hugging ability, and a comprehensive self-protection suite (in addition to the regular escort presence of dedicated jammers like the EF-111 or EA-6B) and what emerges is an asset

¹ This is, by necessity, a summary account of the service of the F-111 with the RAAF. Those interested in knowing about every single nut & bolt of the aircraft could do well to contact Dr. Karlo Copp, arguably the most passionate person about the F-111 in the known universe ☺

that the Soviet representatives, realizing its potential, insisted that it (the FB-111 version) should be included on the negotiating table in the late-70s SALT II talks, classifying it as a global-strategic rather than theater/operational weapon.

Weaknesses: Extracting this awesome performance out of what was essentially an early-60s design had to take its toll somehow. In the case of the F-111, maintainability was the primary head that rolled. The Aardvark is one of the classic cases to come to mind when one refers to “hangar queens”. This was particularly the case with the F-111D and its ultra-complex offensive avionics suite. When it worked, this was the finest Aardvark ever – but it rarely did (small wonder then, that this version was permanently based on Cannon AFB rather than forward-deployed in Europe). Downtime became such a headache with the early variants that the USAF decided to procure successive versions with much simpler avionics (F-111E/F) in the meantime. Even the most mature E & F versions did not solve these problems completely². Furthermore, like the vast majority of dedicated strike aircraft, the F-111 has only basic self-defense armament and should be protected either by close escorts or by distant fighter screens.



The FB-111 could carry six SRAMs or thermonuclear bombs; four under the wings and, as this test flight demonstrates, another two in the fuselage weapons bay

Another drawback is the runway & basing requirements of the aircraft. Despite the presence of the swing-wings (which were devised mainly to make it possible for such a heavy aircraft and its payload to get airborne at all, rather than shorten the take-off run) and the powerful turbofans, the Aardvark is still “delicate” and demanding when it comes to runway length & condition (particularly when contrasted to the mudstrip capabilities of its Eastern sibling, the Su-24). This means that only a relatively limited number of bases (except its permanent ones) would be able to practically host it as alternate deployment sites in wartime. Put from another perspective, the Warsaw Pact counter-air planners would have to wreck only a limited number of bases to ensure that the F-111 threat drastically diminishes.

Deployment & Scenario Use: The F-111s are prime actors for any 70s/80s “WW3 Central Front” type scenario, as their importance in executing NATO’s planned interdiction plan against a WP onslaught would have been vital. The two permanent bases in Europe were both in the UK: RAF Lakenheath (3 F-111F squadrons) and RAF Upper Heyford (3 F-111E squadrons, 1 EF-111 squadron). The primary tasking for these aircraft would be the logistical & second-echelon interdiction of the Warsaw Pact forces, with targets including bridges, ammunition & fuel depots, divisional & army headquarters, supply truck convoys etc.



Precision strikes would be best handled by the -F model because of their capability to carry the Pave Tack pod (comprising a FLIR and a laser designator). For the same reason, the Upper Heyford F-111Es would be more likely to have a number of their inventory held back as a nuclear reserve (the -F would be too valuable as a PGM-hauler to have it sitting on the ground with a nuke). Typical mission profiles would probably dictate using UK basing (with AAR over Germany on the way in and possibly on the way out as well) continuously throughout the conflict, as

diverting to continental European strips would entail the risks of succumbing to the WP counter-air operations. The Lakenheath birds are of course also the stars of any recreation of El-Dorado Canyon (in fact such a scenario is already available at the HHQ).

Bases in the CONUS were hosting priority TAC reinforcements for Europe and included Cannon AFB (3 F-111D squadrons) and Mountain Home AFB (3 F-111A squadrons, 1 EF-111 squadron).

In Australian service, the Aardvarks exploit their vast range to form the long arm of the RAAF against a wide range of targets in the western Pacific, as well as the first line of defence against a potential seaborne threat (using both Harpoon AShMs as well as PGMs and free-fall munitions).

Game Stats:

Max Speed: 900kts
Length: 23 Meters

² The effect of downtime as a result of maintenance had not been simulated well in any version of Harpoon until recently. However, with the advent of realistic ready-times in H3 v3.5.9 with the DB2000 v6.4 database, such factors have become of primary concern when planning & executing air ops. You’ve been warned ☺

Span: 19.2 meters
 Weight: 21540 kg
 Crew: 2
 Climb Rate: 60 m/s at SL

Equipment: F-111D Aardvark (USAF 1980) – DB2000 v6.4

Radars:

| Name | Max Range | Abilities | Notes |
|----------------|-----------|--|-------------------------|
| AN/APQ-130 | 60nm | Surface Search Air Intercept Range Information Bearing Information IFF Information | Main attack radar |
| AN/APQ-128 TFR | 2nm | Surface Search Range Information Bearing Information | Terrain-following radar |

Electronic Warfare

| Name | Max Range | Abilities | Notes |
|----------------|-----------|---|-----------------------|
| AN/ALQ-94 DECM | N/A | | Active jammer |
| AN/ALR-41 | 150nm | Surface Search Air Search Bearing Information | Passive RWR/ESM/ELINT |

Stores:

- M-61 Vulcan 20mm cannon (fitted on internal weapons bay)
- Mk82 500lb LDGP/Snakeye
- Mk84 2000lb LDGP/Ballute
- B-61 nuclear bomb
- 600 USG Drop Tank



Versions (H3-DB2000 v6.4)

- **F-111C Aardvark (Australia 1980):** Offensive avionics & EW suite as F-111D. Weapons only Mk82 & Mk84 LDGP.
- **F-111C Aardvark (Australia 1986):** Based on F-111C (RAAF 1980), with significant improvements:
 - New attack radar (APQ-165) and RWR (ALR-62).
 - AAR-44 IR warning sensor added.
 - Pave Tack targeting pod now available (PGM capability).
 - Additional stores:
 - AGM-84D Harpoon IC
 - GBU-10 Paveway II LGB [Mk84]
 - GBU-12 Paveway II LGB [Mk82]
- **F-111C Aardvark AUP (Australia 1996):** New attack radar (APQ-169) and TFR (APQ-171).

- **F-111C Aardvark AUP (Australia 2003):** New stores:
 - EI-8222 ECM Pod
 - AGM-142A Raptor (Have Nap)
- **F-111G Aardvark (Australia 1993):** As FB-111 with all nuclear weapons removed. Avionics as F-111C AUP. Stores are only Mk82, Mk84, 600 USG tanks.
- **F-111D Aardvark (USAF 1980):** As described.
- **F-111D Aardvark (USAF 1985):** As F-111D (1980), with new store: AN/ALQ-131 ECM Pod.
- **F-111E Aardvark (USAF 1980):** As F-111D but with simpler avionics (much reduced ready-times). APQ-113 attack radar with APQ-110 TFR.
- **F-111E Aardvark (USAF 1991):** As F-111E (1980) with new store: BLU-107 Durandal.
- **F-111F Aardvark (USAF 1980):** As F-111E, with significant improvements.
 - More powerful engines (higher MTOW, increased payload, extended range).
 - New avionics
 - Offensive: APQ-144 attack radar, APQ-146 TFR.
 - Defensive: ALQ-137 ECM, ALR-62 RWR/ESM, AAR-44 IR warning sensor added.
 - New stores
 - ALQ-131 ECM pod
 - AN/AVQ-26 Pave Tack Pod (LGB capability!)
 - GBU-10 Paveway II LGB [Mk84]
 - GBU-12 Paveway II LGB [Mk82]
- **F-111F Aardvark (USAF 1983):** New stores:
 - AN/AXQ-14 Datalink Pod
 - GBU-15(V)1/B CWW guided bomb
- **F-111F Aardvark (USAF 1986):** New stores:
 - GBU-15(V)2/B CWW
 - GBU-24 Paveway III LGB [Mk84]
 - GBU-24 Paveway III LGB [BLU-109] (hard-target penetration capability for the first time)
- **F-111F Aardvark (USAF 1991):** New store: GBU-28 "Deep Throat" LGB [BLU-113]
- **F-111F Aardvark[USAF/1994]:** New avionics: APQ-161 attack radar, APQ-171 TFR
- **EF-111A Raven:** No weapons. Only external store is AN/ALQ-131 ECM Pod. APQ-160 radar, APQ-110 TFR. Radically revised EW suite :
 - ALR-23 ESM/ELINT
 - ALQ-99 Offensive ECM
 - ALQ-137 Defensive ECM
 - ALR-62 RWR/ESM
- **FB-111 Aardvark:** Larger dimensions, higher MTOW. APQ-114 attack radar, APQ-134 TFR. ALQ-137 ECM, ALR-62 RWR/ESM. AAR-44 from 1980's. Primarily nuclear tasked with specific stores:
 - AGM-69 SRAM
 - B-61 nuclear bomb

Current Service

Royal Australian Air Force

RAAF Amberley, Queensland

- 82nd Wing
 - 1 squadron: F-111C, RF-111C
 - 6 squadron: F-111C, F-111G

This article first appeared on the 3rd issue of the Waypoint magazine, February 2003. All original author rights reserved. No replication of any part of this article is allowed without the author's explicit consent.