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-AF 1B - 1011

By Luiz Padilha and William Wiltgen



## The Modernization Program of the AF-1 fighters / 1A

On April 14, 2009, during LAAD - Latin America Aero & Defense, held in Rio de Janeiro, was signed the contract for the Modernization Program of the AF-1 fighters / 1A of the Navy of Brazil with Empresa Brasileira de Aeronáutica SA - EMBRAER.



Admiral-of-squad Julio Soares de Moura Neto with the president of Embraer, Frederico Fleury Curado

The contract (lasting about five years), Embraer will modernize 12 fighters the Navy, 9 AF-1 (single-seat) and three AF-1A (two-seater). The aim of this modernization is to upgrade these fighters because of avionics and sensor lag with respect to existing modern fighters today and so extend its operating life until 2028, when the aircraft carrier São Paulo has their estimated low.

In the same year, the Navy approved the inclusion of improvements in the program, further enhancing the capabilities of the new fighters henceforth called **AF-1B / C**.



The Navy sent to Embraer's facility in Gavião Peixoto, São Paulo, his first two AF-1 fighters (**1014** and **1023**) to start the program. However, the AF-1 fighter - **1011**, sent later, was chosen to be the prototype of the Modernization Program.

Importantly, the program that there are two lines:

### Modernization and Maintenance

It is up to Embraer, perform the modernization of cells, avionics, sensors and overhaul of 12 engines.

In the Navy, it is carrying out maintenance / update the items not modernized, such as the landing gear and hydraulic systems.

The Navy of Brazil signed an agreement with the US Navy for the modernization of AF-1 / 1A aircraft, through the provision of publications and technical assistance engineering.

### The modernization of fighters consists of:

\* Overhaul of aircraft (PMGA) \* Overhaul engine (IAI in Israel) \* New radar (Elta 2032) \* New HUD (Head Up Display);

\* Two tactical displays 5 "x7", Color Multi-Function Display (CMFD) \* HOTAS (Hands On Throttle and Stick);

\* Main computer that will run all navigation and ballistic calculation for the pilot is to employ the weapons (bombs, machine gun and other short- and medium-range missiles existing in the inventories of FAB and MB) \* New power generation system, replacing current generators and converters;

\* OBOGS system (On Board Oxygen Generation System), which will generate the oxygen from the atmosphere to the crew, without the need for supplying the current oxygen bottles;

\* New radio Rohde & Schwarz M3AR that have commonality with the FAB aircraft to perform automatically, and encrypted communication in the future that will allow the transmission of data via the data-link setup \* Radar Warning Receiver (RWR);

\* Installation of the 3rd VHF radio, capable of performing data transmission via data-link, while the aircraft remains with the listening of the ATC units (Air Traffic Controller);

\* Revitalization of Autopilot \* Integration of Radar Altimeter and TACAN \* Inertial System (EGI) \* Integration of the latest generation of engine instruments and

\* Briefing and debriefing stations installation, enabling the pilot position to better prepare the mission, thus ensuring a better use, saving use of avionics, better provision of information generated in flight training of crews and evaluation of missions.

\* Sending Pratt & Whitney J52-P-408 engines for the IAI company in Israel, where they undergo a complete overhaul (overhal), returning as new.



Pratt & Whitney J52-P-408

### DAN Embraer-Hawk Peixoto

In 2013 there was the "roll out" of the AF-1B prototype - **1011**. The fighter first flew from the Embraer unit in Gavião Peixoto. Although the same is not yet complete was to start the phase test flights, where systems already installed will be analyzed.



-AF 1B - 1011

Embraer, a visit to Gavião Peixoto in order to bring our readers the current status of the Modernization Program AF-1.



When we arrived at Embraer of Gavião Peixoto, a detail that stands out is its gigantic structure and the beautiful view of an A-29 in the colors of Smoke Squadron at the entrance. This unit later this year, will take place the first flight of the KC-390 prototype, the new freighter of FAB.



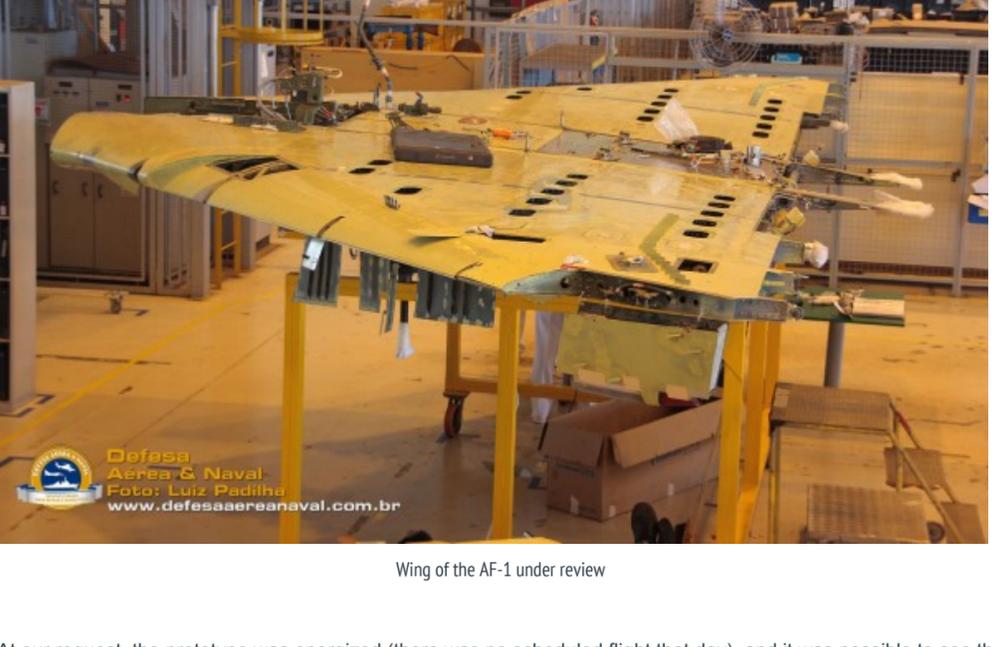
Captain-de-Fragata Fabricio Fernando Duarte Nazareth, Nelson Jabour representative of Embraer and the Captain-of-Sea-and-War Augusto José Da Silva Fonseca Jr.

We were greeted by AF-1 Modernization Program Manager, **Captain-de-Mar-e-War Fonseca Jr**, by his successor, **Captain-de-Fragata Fabricio** and the representative of Embraer in the program, **Nelson Jabour** engineer, who accompanied us to the building where it develops the program.

After a brief presentation by the representative of the communications area of Embraer Defense and Security, Mr. Valtécio Alencar, headed for the hangar where they were aircraft of the Navy of Brazil.

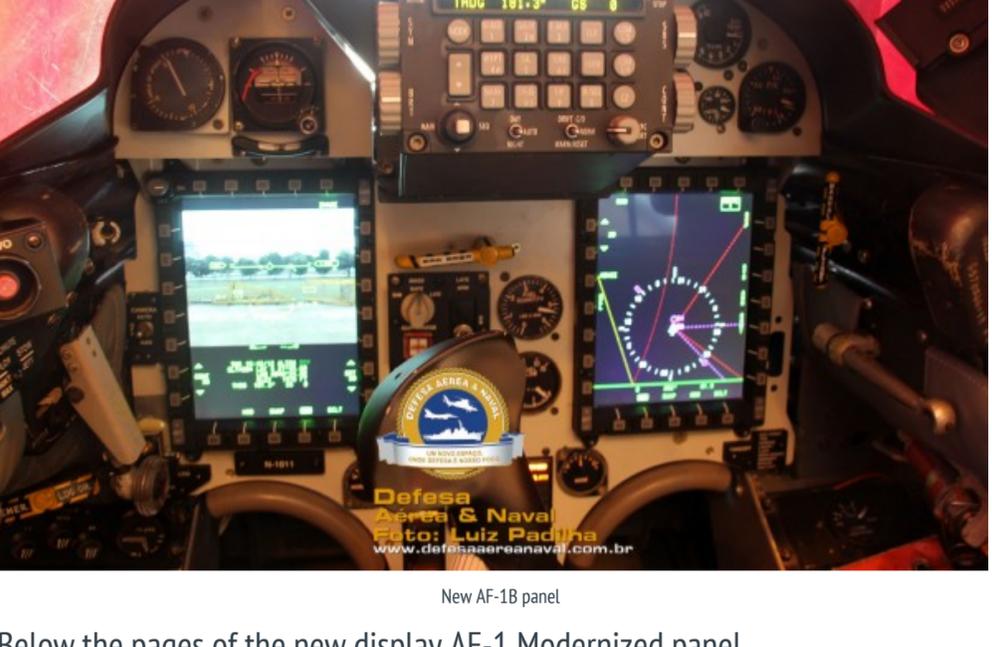


It was observed 6 AF-1 / A fighters (1001-1008 - 1011-1014 - 1022-1023), the hangar where modernization is being performed. The prototype single-seat AF-1B - 1011 is conducting the test flights with Embraer test pilot and test pilot of Brazil's Navy following the whole evolution of the program.



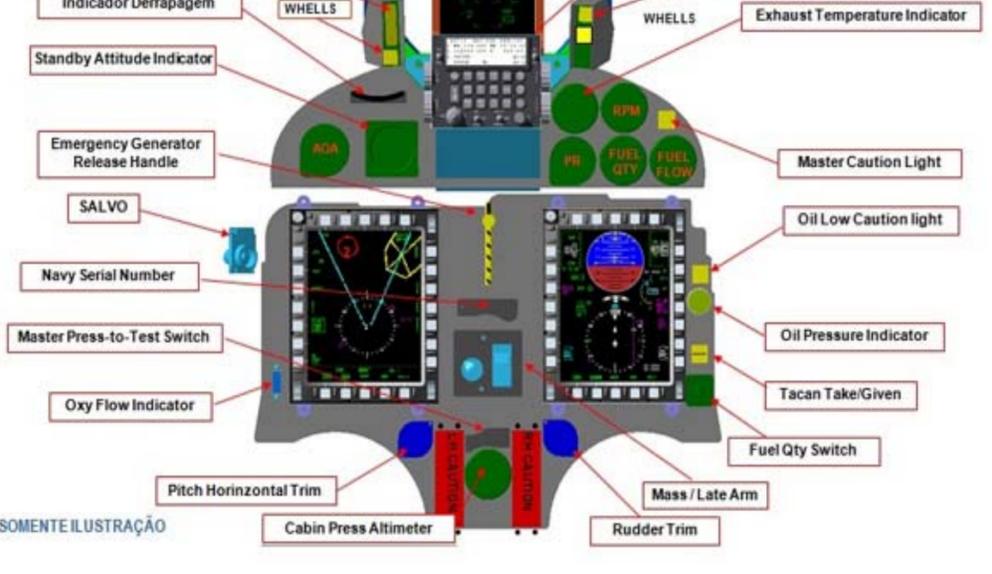
Wing of the AF-1 under review

At our request, the prototype was energized (there was no scheduled flight that day), and it was possible to see the new lit panel with all available pages. Unfortunately, regulatory issues (International Traffic in Arms Regulations (ITAR)), we could not shoot some items that make up the modernization.



New AF-1B panel

Below the pages of the new display AF-1 Modernized panel



But it was possible to see the new refrigeration equipment for electronic systems being installed, observe the care the recovery of cells that there are, find out where the RWR will be installed on hunting the nose, where the dispensers of Chaff-Flare will be installed Finally, be sure that the modernization strides, with expected delivery of the first aircraft to the squadron VF-1 (AF-1B - 1001) already in 2014.



Although it is not yet installed, the RWR sensors were placed in the prototype for the photo shoot.

The fighters when they Embraer, are disassembled and subjected to rigorous inspection, with a meticulous and thorough work of regeneration of cells. For the installation of some equipment were needed some structural changes to better adapt the same, but always keeping the CG of the aircraft, without altering the flight characteristics of the game.



The first prototype of the two-place version, AF-1C, will be the **1022**, which is already being prepared to receive the new avionics and new sensors. By owning 2 cockpits, we found some differences in the sensors of the cooling system in the hunt nose.

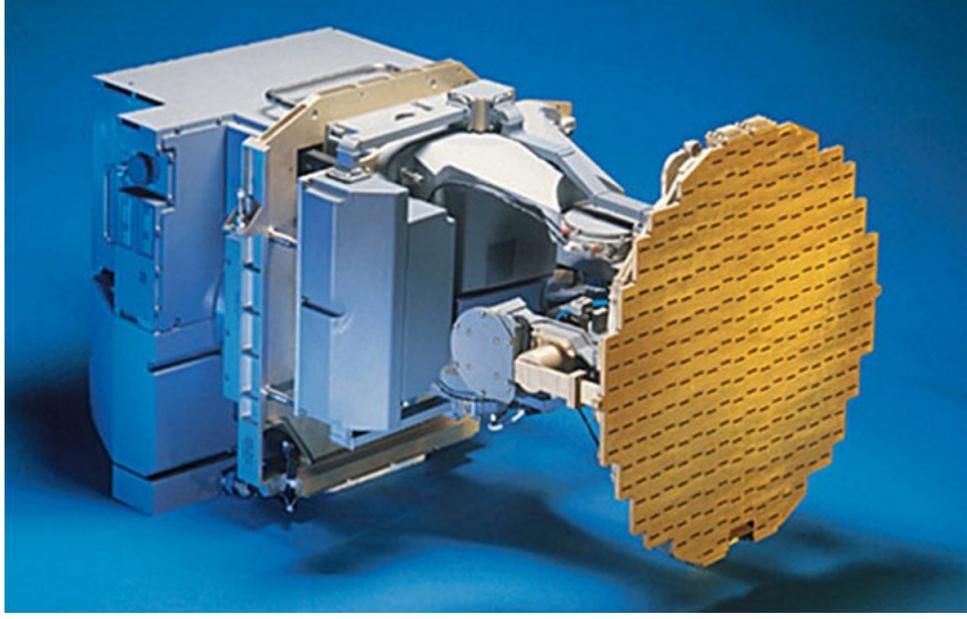


AF-1B in 1022 the nose

The AF-1C- **1022** prototype will perform the same tests made by AF-1B - **1011**, and once approved, the AF-1C - **1023** will be assembled and delivered to the VF-1 squadron.

**RADAR**

The radar chosen by the Navy to equip the AF-1B fighter / C is the IAI ELTA ELM-2032. Being a multifunction radar with an estimated range of 120 km in air-to-air mode, it allows the realization of various types of missions such as intercepting missiles with short-range air-to-air or BVR (Beyond Visual Range or beyond visual range) .



IAI Elta radar ELM-2032

In maritime transport, in naval attack missions, the estimated range of 250 miles gives the pilot the ability to identify targets, determine distances and launch anti-ship missiles safely.

The radar IAI Elta- 2032, can also be used for ground attack missions using smart weapons.

**WEAPONS**

Currently the Navy has only the Sidewinder AIM-9 missiles received upon acquisition of 23 fighters close to Kuwait. The Navy is studying what will be the new missile to be used in AF-1B / C fighters.



Sidewinder-9

The choice could be the Sidewinder AIM-9X Block I, the MAA-1B Piranha or the A-Darter, the FAB is developing with Denel of South Africa.



Already the BVR version is still unknown, but the radar allows the integration of the Derby missile, already used by the FAB.



For ASuW war (Anti-surface warfare), the natural choice would be the anti-ship missile American AGM-84 Harpoon because it has already been tested in the model by the US Navy. Another possibility would be the AM 39 missile of French origin in which MB has extensive experience, having been used by the HS-1 squad in the old SH-3 Sea King helicopters.



A-4 Skyhawk-Harpoon-on-Test-Center-Pacific-Missile

With the development of national anti-ship missile MAN-1 (surface-to-surface) by the Navy, in partnership with Mectron, Avibras and MBDA, evolving rapidly, the air-surface variant should soon be a reality. What weighs in this case is the deadline for the entry into service of the national version.



Anti-Ship Missile MAN-1

For the use of smart bombs like the Lizard or Spice it will require the Navy to acquire modern guidance systems.



### Maintenance

In the Navy of Brazil up to maintenance-update of the parties where there is the option to upgrade.

For example, we have the main landing gear that is crucial to support the embedded landing, and is being remanufactured by US company UAC, which is located in Los Angeles, CA.

The company has expertise in maintenance, remanufacturing of various equipment of A-4 and is ready to work together with the MB to the success of this program.



Main landing gear reviewed by UAC

The Navy has not set up will change the starting turbine (JSF) by another air. For other systems, the Navy is, along with Embraer, enabling domestic companies to provide logistical support and maintain the fighters in operation.

When all AF-1B / C fighters are ready, the Navy of Brazil will have a game in the state of the art avionics and embedded systems, greatly increasing the operational capability of Naval Aviation Navy undoubtedly a quality giant leap in employment in operations naval and air and in the future in international operations.

With the program making strides, remains hope for the return to operating industry aircraft carrier São Paulo (A 12), so that the objectives outlined, can be put into practice.



### List of AF-1 fighters, their status and Construction Number (1):

- CN 160 180 - Falcon 1001 - In modernization at Embraer
- CN 160181 - Falcon 1002 - \*
- CN 160 183 - Falcon 1003 - Monument at Naval Base San Pedro D'Aldeia
- CN 160 186 - Falcon 1004 - Active in Squadron VF-1
- CN 160 188 - Falcon 1005 - Waiting for shipment to Embraer
- CN 160189 - Falcon 1006 - \*
- CN 160190 - Falcon 1007 - \*
- CN 160 192 - Falcon 1008 - In modernization at Embraer
- CN 160 193 - Falcon 1009 - Waiting for shipment to Embraer
- CN 160195 - Falcon 1010 - Embedded in NAE SãoPaulo as mock-up
- CN 160 196 - Falcon 1011 - In modernization at Embraer
- CN 160 197 - Falcon 1012 - Waiting for shipment to Embraer
- CN 160 198 - Falcon 1013 - Active in Squadron VF-1

CN 160 202 - Falcon 1016 - \*

CN 160 203 - Falcon 1017 - \*

CN 160 204 - Falcon 1018 - Waiting for shipment to Embraer

CN 160 205 - Falcon 1019 - \*

CN 160 206 - Falcon 1020 - \*

CN 160 212 - Falcon 1021 - Active in Squadron VF-1

CN 160 213 - Falcon 1022 - In modernization at Embraer

CN 160215 - Falcon 1023 - In modernization at Embraer

\* Cells awaiting definition

(1) - Source: <http://a4skyhawk.org/2e/brazil/brazil-vf1.htm>

\* Our thanks to Embraer Defense and Security, the welcome at the Gavião Peixoto unit and the Embraer team in the program that met all our requests.



Engineer Julian Samson and the mechanical head of the Program