



damage tolerance life of the dorsal longeron was significantly less than the specified 4,000 hours. The existing aluminium longeron was reinforced with a steel structure and engineering studies indicated that the modified longeron should be inspection-free for at least 3,000 flying hours. Special attention was given to the F-5325 bulkhead, which sits in a critical location (behind the cockpit), directly affecting the safety of the aircraft. Other F-5 users at that time detected stress corrosion cracks in different areas of this bulkhead and, since the appearance and development of such cracks was unpredictable, it was decided to design and manufacture a new bulkhead using steel instead of aluminium.

Engines and ejection seats were overhauled to zero hours and the avionics improvements from the original CASA upgrade were incorporated. Additionally, a new windshield was installed with improved resistance to bird-strikes. Other areas modified during the structural modernisation were the vertical stabiliser (reinforcement by attaching angles), change of many magnesium parts to aluminium, new flight control wires, and the replacement of some air intake ducts by redesigned units. Finally, the original undercarriage was removed and replaced by a new one, again using stress-resistant materials.

Once received at Getafe, the aircraft were taken apart, after which the wings and front fuselages were sent to Canada. When all inspections and modifications were completed, the front and aft fuselages were connected once again and wings re-attached. After the installation of new cabling and avionics the engines were installed and the complete aircraft statically tested. Finally, the aircraft received a new low-visibility paint scheme, although the first two updated aircraft (AE-9-017/018) retained their original silver painting. Before final delivery to Talavera la Real air base, all aircraft were then extensively test flown by CASA and the Air Force. The first SF-5B to be updated arrived at Getafe in March 1991, and

was handed over to Ala 23 in May 1993.

By December 1995, the CASA/Bristol Aerospace SF-5B+ upgrade programme was completed (except for AE-9-029, which after an accident was reconstructed during a period of nearly three years). On the basis of this initial update, the extended lifetime allowed the aircraft and the training unit to continue its role up to 2005.

At the end of the programme CASA also investigated an alternative way ahead by converting one F-5A airframe into an F-5B, for which a repaired front part of a scrapped F-5B was mated to the rear of an F-5A. The following table lists the status and upgrade programme for all 34 SF-5Bs:

c/n	serial	last tact.	to CASA	redelivery to Ala 23
2001	AE-9-001	23-23	13/11/92	27/6/94
2002	AE-9-002	-	written off 4/4/74	
2003	AE-9-003	23-24	4/12/92	29/7/94
2004	AE-9-004	-	written off 26/7/72	
2005	AE-9-005	23-25	12/8/92	21/12/94
2006	AE-9-006	-	written off 8/4/73	
2007	AE-9-007	23-01	7/7/93	22/12/94
2008	AE-9-008	23-02	12/8/91	21/6/93
2009	AE-9-009	23-03	7/11/92	10/2/94
2010	AE-9-010	23-04	24/4/92	21/1/94
2011	AE-9-011	23-05	12/8/94	2/3/95
2012	AE-9-012	23-06	4/7/94	19/10/95
2013	CE-9-013	-	written off 3/7/74	
2014	AE-9-014	23-07	10/6/92	23/3/94
2015	AE-9-015	23-08	written off 7/10/91	
2016	AE-9-016	23-09	10/2/94	16/6/95
2017	AE-9-017	23-10	21/3/91	6/5/93
2018	AE-9-018	23-26	30/4/91	8/7/93
2019	CE-9-019	-	written off 19/12/72	
2020	AE-9-020	-	written off 4/4/89	
2021	AE-9-021	-	written off 7/5/75	
2022	AE-9-022	23-12	1/7/92	4/7/94
2023	AE-9-023	23-13	10/8/93	10/11/94
2024	AE-9-024	23-14	21/1/94	3/5/95
2025	AE-9-025	23-15	9/11/93	24/4/95
2026	AE-9-026	-	written off 11/2/62	
2027	AE-9-027	23-16	4/5/94	21/11/95
2028	AE-9-028	23-17	11/8/94	5/12/95
2029	AE-9-029	23-18	18/10/93	4/6/96
2030	AE-9-030	23-19	18/2/92	16/12/93
2031	AE-9-031	23-20	27/8/94	21/7/96
2032	CE-9-032	-	written off 25/05/76	
2033	AE-9-033	23-21	written off 28/4/89	
2034	AE-9-034	23-22	written off 1/8/88	

Base Aérea Talavera la Real, home of Ala 23, is located near Badajoz, close to the Portuguese border. The southern Extremadura region provides large tracts of sparsely populated terrain, much of it mountainous. As well as its training commitments, Ala 23 also provides aircraft for DACT exercises with front-line EdA fighters.

F-5M for the 21st century

Since this update programme was completed, the technology level of the EdA's F-18+ Hornet fleet has been constantly improved, while the service is receiving its first Eurofighter C.16 Tifón. The avionics package of its current lead-in-fighters has gradually become obsolete and no longer represents the working environment to be found in an operational fighter unit. For some time several options to fill this increasing gap have been studied, but due to various other programmes (Eurofighter, A400M, P-3 upgrade, Hornet upgrade, EC 120 etc) the EdA budget does not allow the procurement of a new advanced jet trainer. The only viable alternative was to search for a comprehensive avionics update package to provide a reliable, cost-effective training environment similar to its current and future generation fighters. This meant keeping the fleet of SF-5Bs operational well into the 21st century. Consequently, the EdA opened an international competition in the last quarter of 1999 for the upgrade of its remaining 22 SF-5Bs.

In the original budget, some 23,400 million Pesetas was envisaged for the five-year update programme, but this amount was significantly reduced after the defence cuts announced in September 1999. The Ministerial Council would only approve the allocation of some 1,250 million Pesetas in 2000, and 2,250 million in 2001. In the year 2000 budget, an additional allocation was made for 3,501 million for the year 2002. The bid, therefore, would only cover the production of four prototype aircraft and the option to modernise the remaining 18. Complete offers were received from Boeing, IAI, Elbit Systems and SAGEM, while Northrop sent in a partial offer. On 27 June 2000, a