In order to distinguish them from US-built aircraft, the CASA machines were designated SF-5A, SF-5B or SRF-5A, whereby the S stood for Spain. In EdA service they received the C.9, CE.9 and CR.9 designations, respectively, the C standing for *caza* (fighter), E for *enseñanza* (training, and R for *reconocimiento* (reconnaissance). The '9' indicated that this aircraft was the ninth fighter type to be operated since the Ejército del Aire became an independent service in July 1939. As a consequence of the variant change, the production series received the following serials: SF-5B CE.9-001 to CE.9-034, SF-5A C.9-035 to C.9-052, and SRF-5A CR.9-053 to CR.9-070. At a later stage, a switch of primary role from fighter to ground attack was accompanied by a change in designation by the Ejército del Aire, with the three versions becoming A.9, AE.9 and AR.9.

## SF-5B+ update programme

In 1989 the possible end for the SF-5 loomed when it was decided to temporarily ground all Freedom Fighters for rigorous airframe inspections. Several weeks later, the green light was given to restart operations, but under strict g-load restrictions. Availability of aircraft became ever more problematic, since every aircraft had to be submitted to a close inspection after every 25 flying hours.

To overcome these difficult times, in 1990 CASA instigated a limited structural and avionics upgrade programme to extend the life of the then 22 surviving SF-5Bs from Ala 23 de Instrucción de Caza y Ataque (fighter and attack training wing). CASA had intended to start this limited Maintenance and Life Extension Programme (MLEP) with a minor reinforcement of the wingroot and a limited avionics improvement. In order to modernise the obsolete avionics package, the existing navigation (TACAN AN/ARN-65), communication (UHF AN/ARC-54) and IFF-SIF (AN/APX-72) systems had to be replaced by a suite including VIR-31A VOR/ILS, AN/ARC-164 UHF radio, four-digit AN/APX-101 IFF and new TACAN equipment. In addition, the DME-40 navigation system was selected, along with an RWR and chaff /flare equipment.

Based on Northrop's Structural Life Extension Program (SLEP) study, continuing to operate the aircraft safely would require an increase in periodic depot-level inspections, thus removing the aircraft from service for extended periods. This had already resulted in Spanish pilots flying only 100/120 hours per year, far below the minimum as stipulated by NATO. Consequently, a decision was made to undertake a more comprehensive structural upgrade, a choice underlined by the fact that, in an accident in 1989, the wing roots of an SF-5B failed in mid-flight.

At a total cost of 18,000 million Pesetas, the new update programme was designed to have each aircraft coming off the line almost as new, integrating the installation of the new avionics package with the necessary structural improvements. At that time, Bristol Aerospace Ltd in Winnipeg, Manitoba, was already embarking upon a similar programme, updating a total of 46 Canadian CF-5s to convert them into Lead-in Fighters Trainers for future CF-18 pilots. Consequently, Bristol became the prime subcontractor for the structural improvements.

The most extensive structural improvement was carried out on the wing. The lower wing skin and several internal structural components were re-designed and manufactured from different materials in order to reduce localised fatigue, stress corrosion, exfoliation corrosion and other time-dependent effects. The dorsal longeron was another critical structural component identified in the SLEP study. Several flight stress surveys had determined that, due to a more severe operational flight regime, the

***Single-seat SF-5As and SRF-5As (illustrated) were phased out of the combat role with Ala 21 in 1992, six survivors being passed to Ala 23, mainly to be flown by instructors on tasks such as target-towing. The last airworthy aircraft was lost in a crash in 2003.***

***Ala 23 was formed at Talavera as the Escuela de Reactores (jet school) in 1953, initially with T-33s. F-86Fs followed in 1959, and the current SF-5Bs in 1970. It was initially allocated 28 of the 34 built, later acquiring four more when Ala 21 at Morón gave up F-5 operations.***