T-38/F-5

By Hal Andrews

Among the aircraft used by the Navy for special purposes are three members of Northrop's widely used family of lightweight, supersonic trainers and fighters: the T-38A *Talon* and F-5E and F *Tiger II*. They are unusual supersonic Navy aircraft because they are not carrier-suitable. Their appearance in the inventory was dictated by training needs for test pilots at the U.S. Naval Test Pilot School, Naval Air Test Center (NATC), Patuxent River, Md., and as aggressor aircraft for honing the skills of fighter pilots and pilot/radar intercept officer teams. Thus, while Northrop's original design objective — a lightweight fighter for both carrier and Air Force use — never materialized, at least the Navy did finally become a customer.

Back in the fifties, Northrop's fighter production centered on a large, subsonic, all-weather fighter, the F-89 *Scorpion*. The company's competitors were already involved in the development and/or production of supersonic fighters for various missions, including the Air Force "Century series" and its Navy equivalents. Based on assessment of its own F-89 and the characteristics of most current competitive designs, Northrop management felt that fighters had become too large, complex, heavy and costly — and that the real challenge and opportunity was to build a simple, lightweight, supersonic fighter.

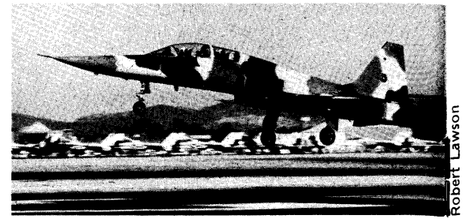
In 1955, a new generation of Air Force-sponsored smaller jet engines for missile applications promised engines which, if equipped with afterburners, would provide the basis for a small twin-engine fighter which was capable of supersonic speeds. General Electric was particularly interested in seeing the new 2,000-pound-thrust class J85 developed for manned aircraft applications, and Northrop's evolving design centered around twin A/B equipped J85 propulsion. While early designs concentrated on a day fighter, either carrier or land-based, by late 1955 efforts shifted to two verions of a land-based design — a fighter and a trainer. The rapidly growing aerodynamic and structural knowledge gathered from supersonic flight experience and research was utilized and efforts directed to keeping the aircraft small and simple.

Interest in the two-place trainer grew in the Air Force. The single-seat fighter gave promise of replacing the many subsonic and transonic fighters used by foreign air forces, which would find it difficult to effectively operate the complex supersonic types that met U.S. needs.

In 1956, the Air Force selected the N156T trainer design for its first supersonic advanced trainer, and YT-38 prototypes were ordered. Initial flight of the first YT-38 was in April 1959, using non-afterburner J85 engines. The basic lines of the T-38/F-5 family have changed little since that first flight. The major changes in the production T-38As were those associated with the afterburner engines. Without armament, the low-wing trainer displayed extremely clean lines and, with afterburners, reached 1.3 Mach number (MN) at altitude. Production of the T-38A reached 1,189 when completed in January 1972. The aircraft continues to serve as the Air Force's advanced trainer.

While T-38 development was underway, Northrop continued to work on the N156F single-place fighter as a company project. A Department of Defense decision followed to order three prototypes for possible Military Assistance Program (MAP) fighters.

F-5F



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The first flew less than four months after the initial YT-38 flight. After flight tests and evaluation using the first and second prototypes, the third was shelved when interest for MAP waned. However, in 1962, an improved fighter was selected for MAP procurement in F-5A single-place fighter and F-5B two-place fighter/trainer versions. The third N156F became the first YF-5A and the F-5 *Freedom Fighter* went on to even greater success than the T-38, equipping many of the world's air forces — either under MAP, by direct purchase or through licensed coproduction.

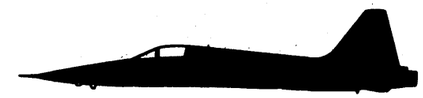
Improvements in the initial F-5s included uprated engines, wing leading edge fillets and flaps and increased store stations. Subsequent improvements included a maneuvering flap system involving both leading and trailing edge flaps. Maximum speed of the single-place fighter increased to 1.4 MN at altitude. The two-place version had the external store stations of the single seater, but the nose guns were eliminated in the two-place nose section.

While initial F-5 production was underway, GE came out with the considerably improved J85-21 engine, delivering 5,000 pounds thrust with afterburner. The first flight of a test installation was in March 1969 with larger inlets and fuselage modifications to accommodate the higher-powered engines. Planning proceeded for incorporation in F-5 production, along with some changes to take advantage of the increased power.

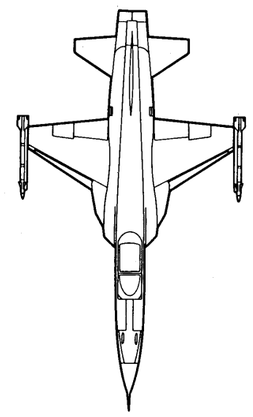
In 1970, when the Air Force undertook an international fighter competition to select the next MAP fighter, the updated F-5 with 5,000-pound thrust J85s formed the basis for Northrop's winning proposal. F-5Es, and companion two-place F-5Fs, were then ordered to replace the earlier F-5s on Northrop's production lines as the *Tiger II*. (Grumman's F11F/F-11A had been the official *Tiger*, while a squadron of Air Force F-5As deployed to Vietnam had used the unofficial *Skoshi Tiger* appellation.) Increased internal fuel and continued wing aerodynamic development resulted in further performance improvements and the F-5E and F followed the success of their predecessors. The single-seat F-5E achieves 1.6 MN in its clean fighter configuration, and the *Tiger IIs* remain major components of current worldwide air forces.

In 1968, when the various early afterburner-equipped jets were out of the Navy inventory, and no longer supportable at NATC, the Test Pilot School turned to the T-38A for a replacement in its syllabus. Five were acquired from T-38A production and the aircraft continue their service there.

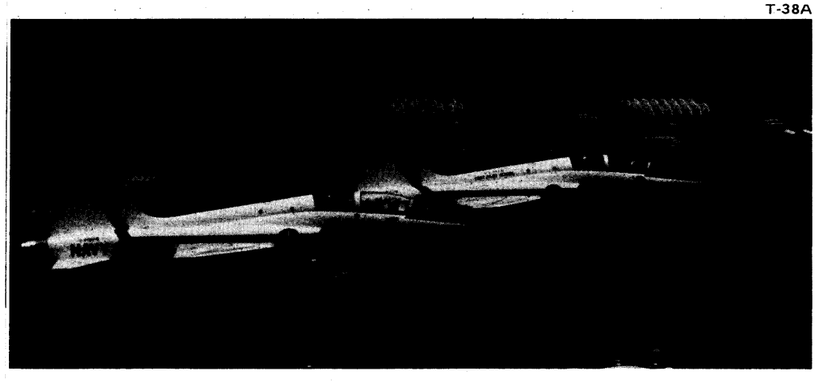
Subsequently, the introduction of air combat maneuvering training and the establishment of the Navy Fighter Weapons School at NAS Miramar, Calif., highlighted the need for "aggressor" aircraft which were capable of simulating the characteristics of current threat aircraft in fighter combat. "Top Gun," as the school quickly became known, met this need with borrowed T-38As, followed by Navy acquisition of F-5Es and then Fs. VF-43 acquired similar aircraft for East Coast training and these aircraft, while not using any fighter weapons, continue to play a major role in maintaining the effectiveness of our carrier fighter squadrons — even if not in the manner that Northrop originally envisioned. ■



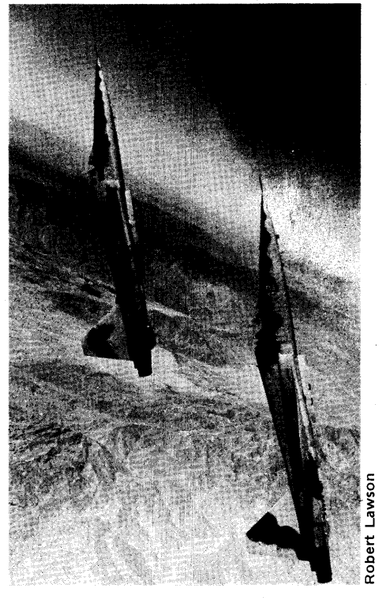
	T-38A	F-5E
Span	25'4"	26'8"
Length	46'4"	48'2"
Height	12'10"	13'4"
Engines (2)	GE J85-5	GE J85-21
Thrust (A/B)	3,850 lbs.	5,000 lbs.
Maximum speed	1.3 MN	1.6 MN
Service ceiling	55,000'	53,800'
Range	1,000 mi.	1,350 mi.
Crew	2	1



T-38A



F-5E



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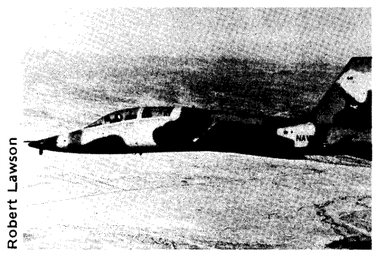
T-38A



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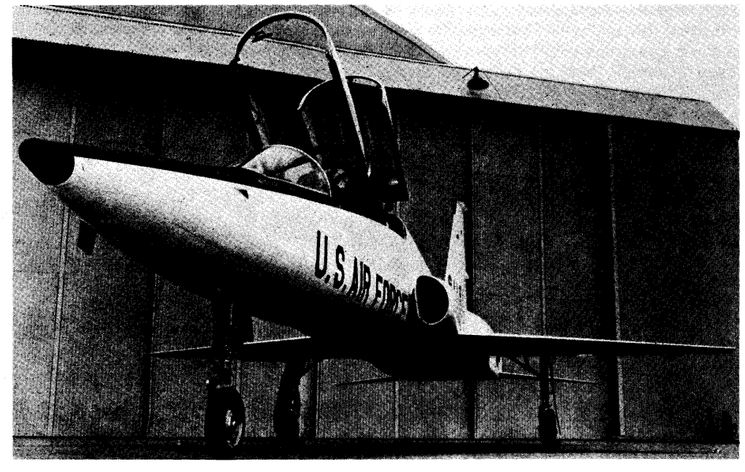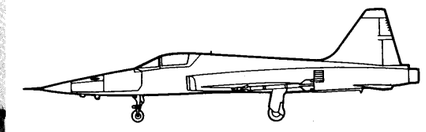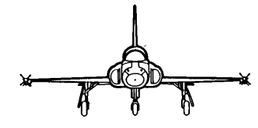
YT-38