Milton Keynes Aviation Society Newsletter ***mkas.co.uk***

HAWKER SEA HAWK - Oct 2015

SUPERMARINE ATTACKER – Mar 2020

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THE HAWKER SEA HAWK

HAWKER SEA HAWK FGA.6 (~LTBOY2K / CCSA)

"The Hawker Sea Hawk, while not the first naval shipboard jet fighter, was an early example of its type that incorporated several ingenious engineering features and was an extremely clean design. It provided excellent service as a first-line fighter in several naval air arms for over a decade." Greg Goebel

SEA HAWK FGA.6 WITH FOLDED WINGS (ADRIAN PINGSTONE / PD)

HAWKER SEA HAWK FGA.6 (~FEGART / CCSA)


Sea Hawks of 801 Squadron fire their cartridge starters aboard HMS Bulwark in the Caribbean in 1958.

The Hawker Hurricane was sometimes referred to as a "Fury monoplane" when it followed the Fury biplane of the 1030's. I had not realised that the Sea Hawk (with the designation "P.1035") began its life as a jet version of the wartime Fury (which followed the Hurricane).

The following account is written by Greg Goebel in his website: http://www.airvectors.net/avsehawk.html which he generously makes freely available for all to copy. He writes:

"I had never really heard of the Sea Hawk until the 1990s. Certainly I must have seen it in books when I was younger, but never paid any attention to it. However, I've acquired a fascination with the first generation of jet fighters. A lot of ingenuity was applied with the development of the new jet technology, and many of the aircraft had certain cleanness and simplicity in design, thoroughly manifested in the elegant Sea Hawk, that would be lost as jet aircraft became more sophisticated.

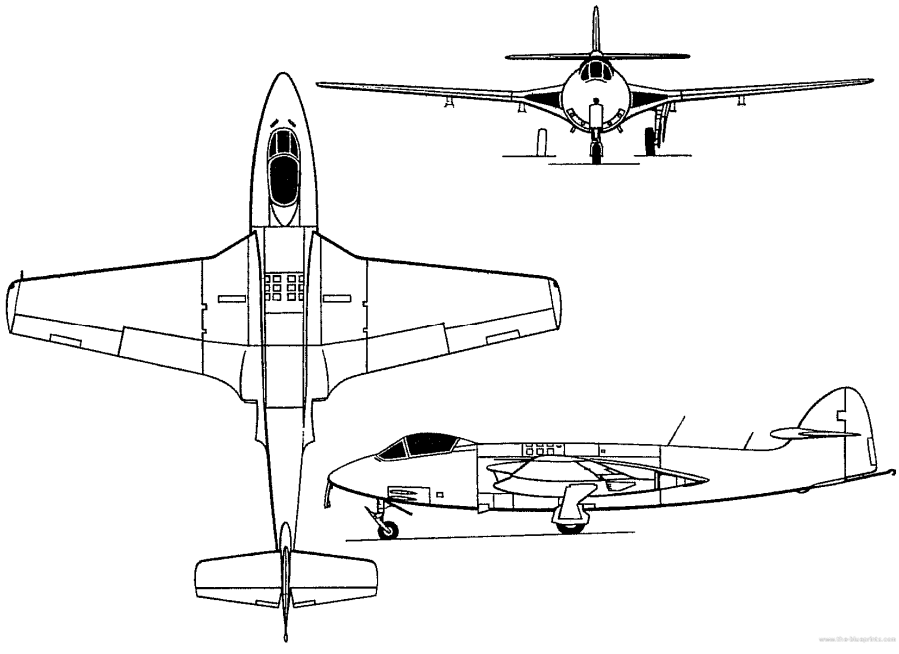
The Hawker Sea Hawk, while not the first naval shipboard jet fighter, was an early example of its type that incorporated several ingenious engineering features and was an extremely clean design. It provided excellent service as a first-line fighter in several air arms for over a decade.

ORIGEN: While Hawker Aircraft was introducing their Fury prop-driven fighter in 1944 Hawker engineers began to consider how to apply the new jet engine technology to the Fury design. Rolls Royce had just introduced a new centrifugal-flow turbojet engine, the B.41, to be named the "Nene" (photo below), that had adequate thrust to propel the big Fury airframe. In November 1944, Hawker submitted a preliminary concept for a B.41-powered Fury to the British government, with the designation "P.1035".

The design team, working under Hawker's Sydney Camm, removed the piston engine from the nose of the Fury, moved the bubble canopy as far forward as possible, and put the B.41 engine in the middle of the aircraft. The intakes were positioned alongside the fuselage and the tailpipe went straight out the back.

After a little more thought, the Hawker engineers came up with a follow-on proposal in December 1944. The new design, designated the "P.1040", had a significant change, the straight tailpipe being replaced with a split tailpipe, with an outlet in each wing root. This scheme meant the wing root had to be thickened, and so the intakes were placed in the wing roots as well. This new layout reduced the length of the ducting and allowed fuel to be stored both fore and aft of the engine, preserving the aircraft's centre of gravity as fuel was consumed. It also reduced the thrust losses that would be caused by longer exhaust pipes.

The Fury's distinctive elliptical wing was abandoned for one with straight edges to simplify manufacturing, and the tailplane was raised to allow it to clear the jet exhaust. The new design was the first Hawker aircraft with tricycle landing gear. With all the changes, the P.1040 no longer looked at all like a Fury.



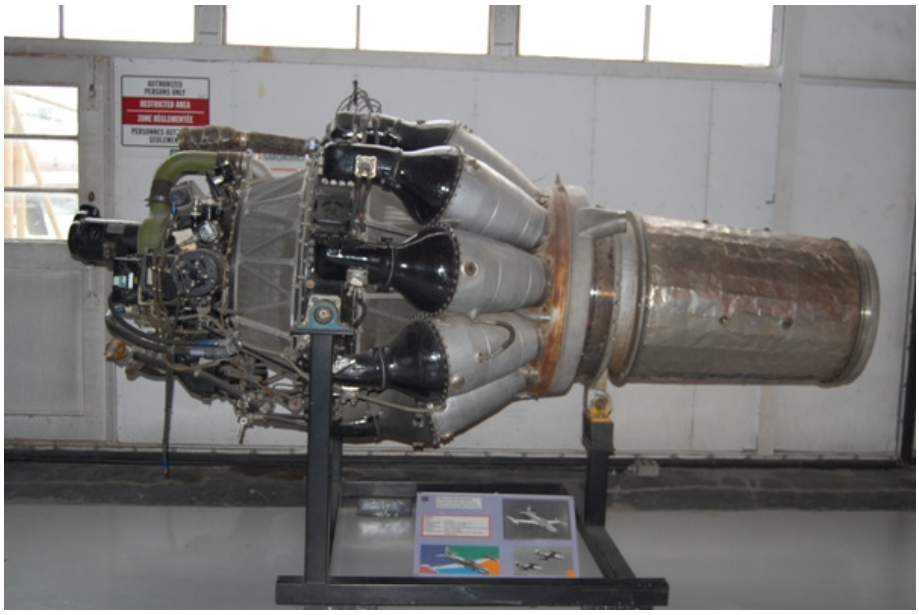
Armament was specified as four Hispano Mark-5 20 millimetre cannon. The P.1040 was intended for Royal Air Force use, but government interest was mild. The war would clearly be over before long and both the RAF and the Royal Navy had other jet fighter designs either flying or in the works. Nonetheless, in October 1945, months after the guns had gone silent Camm ordered the construction of a P.1040 prototype.

By that time the RAF interest had gone completely; RAF planners believed that their new 600 MPH Meteor would be the hottest thing in the air for the foreseeable future. Hawker Aircraft, faced with massive cancellations of orders for their piston fighters, hastily modified the P.1040 design for carrier operation, and submitted the proposal to the Royal Navy in January 1946.

Much to Hawker's relief the Royal Navy was impressed and ordered three prototypes, plus a static test item. Hawker completed the prototype already in progress to provide the initial aircraft, and quickly constructed the others. Camm's engineers then proceeded to refine the P.1040's design as a carrier-based interceptor. They also considered what could be done to get the RAF interested again, an effort that eventually led to the extremely successful Hawker Hunter.

The first prototype of the P.1040 flew on 2 September 1947, powered by a Nene 1 engine with 4,500 lb thrust. The project was announced to the public a month later, disguised for some forgotten reason as a purely company-financed effort. This pretence was dropped when the second prototype flew a year later, on 3 September 1948. The second prototype had folding wings, a stinger-type arresting hook, and was fully armed. The second prototype was used in carrier trials that indicated a need for a slightly wider wingspan and longer arresting hook.

The third prototype took to the air on 17 October 1949. This aircraft was essentially a fully functional production prototype, with longer arresting hook, provisions for "Rocket Assisted Take-Off Gear (RATOG)", and attachment points for drop tanks. The powerplant was the production-standard Rolls-Royce Nene 2 / RN.4 Nene 101, (right), with 5,000 lb thrust. Service trials proved successful and on 22 November 1949 the Royal Navy ordered 151 examples of the new aircraft, now formally known as the "Sea Hawk".



IN SERVICE: The initial batch of 35 Sea Hawk "Fighter Mark 1s (F.1)" was partly used for further service trials, one of which ended disastrously when the aircraft's folding wings unlocked on take-off, and to provide the first examples actually delivered to Royal Navy Fleet Air Arm (FAA) squadrons in March 1953.

When Winston Churchill became prime minister again in 1951 he initiated a "Super-Priority" scheme to speed the production of certain critical aircraft, including the Sea Hawk. The end result was that manufacturing was transferred to Armstrong Whitworth Aircraft (AWA), another member of the Hawker Siddeley group. AWA built 60 more F.1s. Pilots had noticed a tendency for the ailerons to oscillate, and to fix this problem the Sea Hawk "F.2" was produced by AWA, providing power-actuated ailerons and a few other small improvements. 40 were built.

The next variant, the Sea Hawk "Fighter-Bomber Mark 3 (FB.3)", first flew in March 1954. It incorporated a strengthened wing that could be adapted to carry a variety of stores. Test configurations included two 225 kilogram (500 pound) bombs and dual drop tanks; 20 "sixty pounder" rocket projectiles (RPs), which were 7.62 centimetre (3 inch) rockets, each with a 27 kilogram (60 pound) warhead; and other combinations of bombs, rockets, or mines.

116 Mark 3s were built, but the Royal Navy was so overloaded with Korean War commitments that the service was unable to qualify most of these aircraft for full use of stores. Despite the hold-ups with the FB.3, an improved strike variant, the Sea Hawk "Fighter Ground-Attack Mark 4 (FGA.4)", was developed, being first flown in August 1954, with 97 were built in all.

By 1954, however, other nations were beginning to field aircraft that could break the sound barrier in level flight, and the performance of the Sea Hawk was becoming inadequate. The Rolls-Royce Nene was a centrifugal flow engine, and it had become obvious by that time that this was a technological dead end for high-performance aircraft. The axial flow engine was clearly the way of the future.

Some improvements were still possible. When the 5,200 lb thrust RN.4 Nene 103 became available about 50 FB.3s were re-engined with the Nene 103, becoming known as Sea Hawk "FB.5s" (referred to in some sources as "F.5s", though that seems inconsistent). The increase in thrust was too small to significantly increase the aircraft's top speed, but it did provide an additional margin of safety for flight-deck operations.

HAWKER SEA HAWK FGA.6:

wingspan	39 feet
wing area	278 sq_feet
length	39 feet 8 inches
height	8 feet 8 inches
empty weight	9,728 pounds
max loaded weight	16,153 pounds
maximum speed	560 MPH / 487 KT
service ceiling	44,500 feet
range (drop tanks)	790 MI / 685 NMI
range (no drop tanks)	480 MI / 420 NMI

The new Nene 103 was also engineered into new-build Sea Hawks. These new machines being designated the "FGA.6", and 87 were built for the FAA. A number of FGA.4s were upgraded to FGA.6 standard as well. The FGA.6 was the first variant of the Sea Hawk to see combat action, providing close air support for the Anglo-Israeli-French seizure of the Suez Canal, Operation Musketeer, in November 1956. The aircraft flew from the carriers HMS Albion, Bulwark, and Eagle.

The Sea Hawks acquitted themselves well, but two were lost due to Egyptian ground fire and several others were damaged. Overall Musketeer was a military success but a political disaster, with the USA intervening to demand that the invaders (Britain, France and Israel) withdraw from Egypt.

By that time, the Sea Hawk was on the verge of obsolescence, and phasing-out of the type began in 1958. By 1960, it was completely out of FAA first-line service.

FOREIGN SERVICE: The FGA.6 was the basis for minor variants supplied to the Netherlands and to West Germany. In 1956, 30 "Mark 50" Sea Hawks were ordered by the Dutch, to be paid for with NATO funds. These machines were almost identical to FGA.6 aircraft, but had a Philips UHF radio, with a large blade antenna on the top of the aircraft. Most of these machines were later modified to carry a pair of Philco-Ford Sidewinder 1A heat-seeking air-to-air missiles. These aircraft remained in service until 1964.

At about the same time, the West German Navy air arm, the "MarineFlieger", placed an order for 64 Sea Hawks with the order evenly split between 32 day fighters and 32 foul-weather fighters. The machines delivered were also basically FGA.6 aircraft, but with a tailfin about 38 centimetres (15 inches) taller. The day fighters were designated "Mark 100". The foul-weather fighters were designated "Mark 101", and carried a large pod with an Ekco Type 34 search radar on one of the underwing pylons.

The last production Sea Hawks were 14 FGA.6 aircraft, delivered in 1961 to the Indian Navy, along with 10 refurbished ex-FAA machines. (Sources tend to vary on the relative numbers of used versus refurbished machines in this batch). Along with the initial purchase batch India also obtained 12 ex-FAA Sea Hawks from Britain and 28 used machines from Germany, with the last Sea Hawks delivered to India in 1965 giving a total of 74 aircraft.

Indian Sea Hawks saw combat during the 1971 Indo-Pakistan war, performing strikes off the carrier INS Vikrant on the Pakistani port of Chittagong and other coastal targets. The Sea Hawks inflicted substantial damage and suffered no losses to themselves. That was the second and final time the Sea Hawk was used in anger.

An Indian Navy pilot, Commander Peter Debras, accomplished an extraordinary feat on 4 March 1976, when the Vikrant 's catapult malfunctioned and his Sea Hawk splashed down and sank in front of the carrier. The vessel then steamed directly over the top of the aircraft; Debras coolly waited until it had passed over before punching out and being rescued. It was the world's deepest successful ejection.

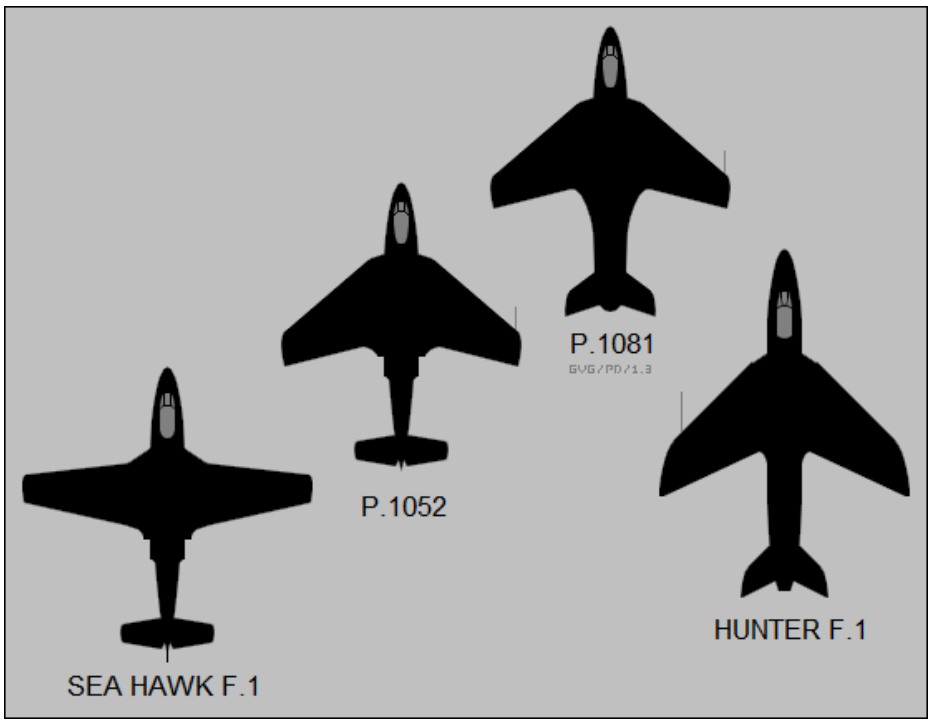
The Indians would continue to operate their Sea Hawks until the early 1980s, when these aircraft were replaced by Hawker Sea Harriers. Several of the Indian aircraft survive as static museum displays and gate guards. One FGA.6, tailcode WV908, was restored to flight status in 1998; it has flown intermittently since then, sometimes being grounded due to damage or lack of funds."

Those of us who visited the Royal Navy Historic Flight at Yeovilton last summer (2014) may remember not seeing their Sea Hawk FGA.6 WV908, which served initially with 807 Squadron in 1955. All work was concentrated on a Swordfish and Sea Fury to get them airborne. I await a status report on the Sea Hawk but last year I do not think it was airworthy, which it certainly has been before in the RNHF. There was also a problem of a dwindling stock of starter cartridges (see photo on page 1, bottom right) which they unable to source. As of then they had no alternative means of starting the engine.

In a later article I plan to trace the design and development steps which led from the Sea Hawk to the Hawker Hunter, as outlined in the diagram below.

ANDY CORNWELL

FOOTNOTE (March 2020): The Royal Navy Historic Flight, which has flown the flag for the Royal Navy at air shows and public events around the country for nearly 50 years, stood down on 31 March 2019. Responsibility for their aircraft (including the Sea Hawk) appears to have been taken on by https://navywings.org.uk/home/about-us/


P.1081
BVG/PD/1.3
P.1052
HUNTER F.1
SEA HAWK F.1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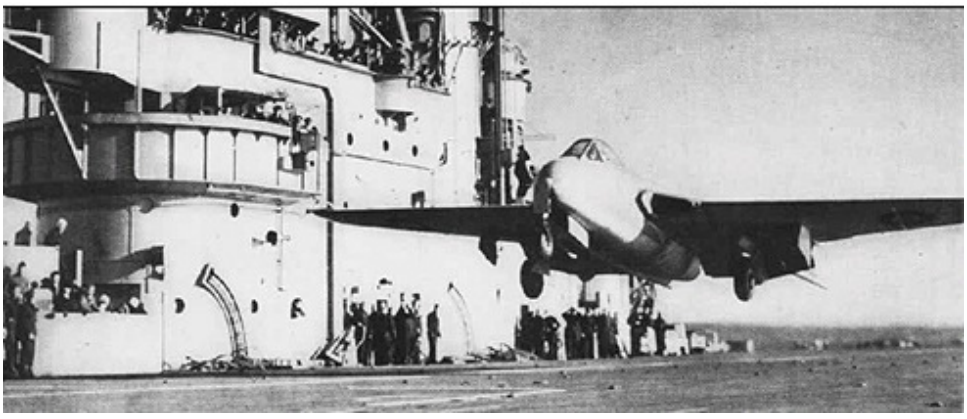
SUPERMARINE ATTACKER

INTRODUCTION

In December 1945 the indomitable Captain Eric Brown carried out landing and take-off trials aboard HMS Oceon in a modified de Havilland Vampire prototype. This was the first jet aircraft landing on a carrier anywhere and brought the Royal Navy into the jet age.



The Admiralty took great interest in the Vampire following these trials. However, at some later point their Lordships decided not to pursue the Vampire as their front line fighter but to put their trust in the Attacker instead. The RAF decided the opposite.

Delays in the Attacker development eventually led the Admiralty to conclude the Vampire seemed a cost effective training and evaluation machine for bringing the Royal Navy up to speed in jet carrier operations. A batch of 18 "Sea Vampire F.20" machines was ordered; these were a 'navalised' version of the Vampire F.5.

The Sea Vampire had several key differences from their land-based counterparts. It could be easily distinguished by the presence of a V-shaped arrester hook that retracted to a high-mounted position above the jet pipe. The Sea Vampire was fitted with enlarged air brakes and landing flaps for superior low-speed control during landing approaches, along with construction to higher load factors to account for the greater stresses involved in carrier landings.

This Sea Vampire F.20 was initially delivered to 700 and 702 Naval Air Squadrons to replace their piston-engine powered de Havilland Sea Hornets.

In the meantime other manufacturers were developing aircraft to meet (1944) Specification E.1/44, later modified to E.10/44, for a single seat jet fighter with a laminar- flow wing and a single jet engine.

Until these came along the magnificent Hawker Sea Fury served on RN carriers from 1945 to 1953. It was the last propeller-driven fighter to serve with the Royal Navy, and one of the fastest production single reciprocating engine aircraft ever built. *[But look at the length of that nose for landing!]*

THE ATTACKER

One of the Specification E.10/44 proposals was for the Supermarine Attacker. 'If it looks right – it probably is right'; so goes the old saying among engineers. When it comes to post-war naval jet aircraft and you look at the Supermarine Attacker alongside the later Hawker Sea Hawk there is no doubt which 'looks right' – and it was. The Sea Hawk was a clever and novel design and a favourite of Captain Brown; what more can one say?

The Attacker, below, immediately looks wrong as it is a jet with a tail-wheel (well, two actually). It looks better in the air but the undercarriage created problems with both landing and deck handling. The reason for that unfortunate configuration was a matter of expediency arising from its origins, as we shall see. Still, the Attacker has its place in history as the first Fleet Air Arm jet fighter to go into service.

Vickers Supermarine Attacker F.1 WA497 (right)

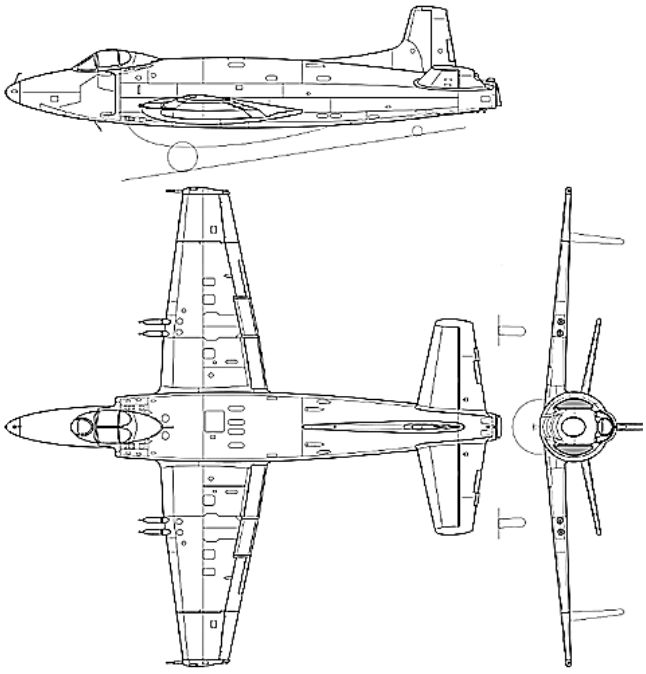
Design: The first production aircraft, WA469 was not flown until 5 May 1950. The type entered service with 800 Squadron at Ford in August 1951. It had a relatively brief service life, being progressively replaced by the Hawker Sea Hawk from 1954 onward.

Supermarine began the basic design work on this jet aircraft in June 1944 in response to Specification E.10/44 for a land based RAF fighter. This design was submitted to the Ministry Aircraft Production (as the Supermarine Specification 477) at the end of June.

Supermarine had originally been asked to use the new Rolls Royce RB40 turbojet, which could produce 4,000lb static thrust. This was to be matched with the Type 371 laminar-flow wing that had been developed for the Supermarine Spiteful, a proposed piston engined replacement to the Spitfire which was not pursued. Supermarine's chief designer, Joe Smith, preferred a smaller engine, and in response Rolls Royce produced the 3,000lb thrust RB41. This engine developed into the Rolls Royce Nene, and after some early problems was able to produce 4,500lb of static thrust.

Supermarine submitted a design that was in some ways a jet version of the Spiteful. It had Type 371 laminar flow wings, a new fuselage with a forward mounted pressurised cockpit (not initially), air intakes on the sides of the fuselage by the cockpit, and the exhaust pipe at the tip of the tail.

Like almost all single piston-engined fighters the Spiteful had its engine in the nose and thus needed the wings well foreword to achieve balance. This caused a tail-wheel undercarriage configuration. Jet engines are placed further back which usually causes the wings to be further back, allowing a tricycle undercarriage layout. The Attacker wings were not moved back relative to the Spiteful design, hence the tail-wheel.



Unusually for a jet the four 20mm canon were located in the wings rather than the nose; a further hangover of the Spiteful configuration. Having guns in the nose would have shifted more weight forward (and avoided asymmetric recoil problems if one gun jammed).

Development: On 5 August 1944 the Ministry of Aircraft Production gave Supermarine an order for three prototypes, described as 'Jet machines of the Spiteful type'. These were allocated the serial numbers TS409, TS413 and TS416. The latter two were to be suitable for naval use.

On 21 November 1945 Supermarine were awarded a new contract for 24 aircraft, six to the E.10/44 (RAF) specification and eighteen to a new naval specification, E.1/45. Work on the new aircraft was delayed by problems with the wings, which didn't perform as well as expected above 400mph. In February 1946 the Admiralty asked for work on the naval version to be suspended. The entire order for 24 the pre-production Supermarine aircraft (including 6 for the RAF) was suspended, but work on the prototypes continued.

The first prototype, TS409, made its maiden flight on 27 July 1946 at Boscombe Down, with Supermarine's chief test pilot Jeffry Quill at the controls. This was the first test flight of a Nene powered engine, and power was limited to 4,300lb thrust. With this engine the aircraft reached 542mph. It was later given a more powerful Nene engine with 5,000lb thrust, and reached 580mph.

The second prototype, TS413, was completed to a modified design. It was given a long stroke undercarriage to allow for the greater stresses of deck landings, lift spoilers and an arrestor hook. The tail fin was reduced in size, and the tailplane made larger. Balanced aileron tabs were installed, plus extra fuel tanks and the air intakes were modified. A Martin-Baker ejection seat was installed.

After an extensive set of dummy deck landings on land the aircraft's carrier trials began on HMS Illustrious on 28 October, with Lt-Cdr M.J Lithgow, Cdr E.M. 'Winkle' Brown and Lt S. Orr all taking part. These trials went well, and Lithgow reported that the average pilot would have no problem landing the Attacker. *[Though on early jets the lag between opening the throttle and the engine 'spooling-up' was quite a challenge when landing].* TS413 was lost in June 1948, and TS409 was brought up to naval standards to all the trials to continue.

On 26 February 1948 Lithgow set a new 100km closed circuit world speed record of 560.6 mph in the prototype TS409. This replaced a record that had been set in a Meteor F.4 only 20 days earlier. Lithgow broke his own record in the same aircraft (TS409) on the following day, reaching 564.8. The Attacker wasn't ordered by the RAF, but in September 1948 the Admiralty ordered 60 Attacker Mk Is, with deliveries to be completed by March 1951.

The third prototype (TS416) didn't make its maiden flight until 24 January 1950. It was the first to use the pressurized cabin, and introduced a number of minor changes suggested by the test flights. These weren't introduced on the Attacker F.1 as the aim was to produce as quickly as possible.

The first production F.1 (WA 469) made its maiden flight on 5 April 1950, with Mike Lithgow at the controls. A total of 145 Attackers were built for the Fleet Air Air, made up of 55 F.1s, 6 FB.1s and 84 FB.2s. The last, WZ302, was delivered in 1953.

Service:The Attacker F.1 entered service with 800 Squadron at RNAS Ford in August 1951, making it the first jet fighter to enter front line service with the Fleet Air Arm. At first the squadron operated eight aircraft, but this was increased to twelve late in 1952.
800 Squadron used all three models of the Attacker, and split its time between Ford and the carrier HMS Eagle. It was briefly based on Malta in April 1954, but was disbanded on 1 June 1954 and reformed with the Sea Hawk.

The Attacker was also used by 803 Squadron who received the F.1 in November 1951 and operated alongside 800 Squadron at Ford and on HMS Eagle. 803 served on HMS Albion and HMS Centaur, before disbanding on 4 November 1955. The Attacker also saw service in a number of other FAA squadrons for trials, training and for the RNVR.

A swept-wing variant of the Attacker was later developed as the 'Type 510'. This evolved into the Supermarine Swift for the RAF, which was supplanted by the Hawker Hunter. But that is another story.

Overseas; In 1953 the newly-formed and cash-strapped Pakistan Air Force reluctantly acquired 36 Attackers of a 'de-navalised' variant, Type 538. In January 1956 they converted to the the North American F-86F Sabre; perhaps to the joint relief of the pilots and those who maintained the runway surfaces. BAE say the Attacker stayed in service there until 1964.

Data:

Engine: Rolls-Royce Nene 3 Power: 5,100lb
Span: 36ft 11in Length: 37ft 6in Height: 9ft 11in
Empty weight: 8,434lb Loaded weight: 12,211lb
Max speed: 590mph at sea level, 583mph at 10,000ft, 561mph at 20,000ft, 538mpt at 30,000ft
Cruising Speed: 355mph
Climb Rate: 6,350ft/min at sea level, 6.6 min to 30,000ft. Service ceiling: 45,000ft
Range: 590 miles (1,190 miles with belly tank)
Armament: Four 20mm guns in wings
Bomb load: Eight 60lb rockets or two 1,000lb bombs below wings (FB.1 and FB.2 only)

Sources:

historyofwar.org baesystems.com Wikipedia

FOOTNOTE

My partiality for the Sea Hawk is ill concealed. I believe it is one of the most beautiful aircraft through its clever design and elegant simplicity. I put together an article on the Sea Hawk in the October 2015 edition of the Newsletter, a copy of which precedes this article.

ANDY CORNWELL