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Grumman Bearcat

Because it did not see combat in World War 2, the F8F Bearcat never gained the popular acclaim of its predecessors, the Wildcat and Hellcat. Yet in many respects it was the greatest piston-engine fighter ever flown, and despite its bluff appearance it also did what no other aircraft had done for over 30 years: set a new piston-engine world airspeed record.

In the terrible first year of the war in the Pacific in 1942 there was never much doubt in the minds of the US Navy Bureau of Aeronautics that American technology, and American fighter designers, could and would gain command of the Pacific sky. Yet the range, agility, rate and angle of climb, firepower and (not least) morale-sapping reputation of the Imperial Japanese Navy's Mitsubishi A6M Zero fighter were a far greater challenge than anything that had been expected. There was even a vague fear that the A6M and its anticipated better successors (which in fact failed to appear) would not be conquered by Grumman's F6F Hellcat, then being designed, because of the US fighter's size and weight.

In about May or June 1943 a series of discussions between the BuAer Fighter Branch in Washington and Leroy R. Grumman, Bill Schwendler and Jake Swirbul of Grumman led to the decision to build the smallest fighter possible around the outstanding Pratt & Whitney R-2800 Double Wasp engine, the same as that used in the F6F Hellcat. As far as possible the small fighter would use existing technology and existing equipment items, and the wing profile adopted by Schwendler was the same as that for the F6F. Everything possible was to be done to hasten development and reduce risk; odd ideas were out.

Inevitably a small air-combat fighter could not carry as much fuel as the F6F, so despite higher speeds it would have shorter range. The BuAer was even prepared to accept reduced firepower, the six 'fifty calibre' (0.5-in/12.7-mm) guns of the F6F giving way to only four, and with only 300 rounds per gun instead of 400. There was strong pressure to reduce the weight of armour, but ways were found to achieve a slight reduction without degrading the protection. The final mass agreed was 29.3 lb (13.29 kg) in front of the cockpit and 49.4 lb (22.4 kg) behind it. In all other respects the smaller aircraft was expected to be dramatically superior. It had an important secondary advantage in being able to operate easily from the dozens of small escort carriers.

Two prototypes of the Grumman G-58 (BuAer nos 90460-1) were ordered on 27 November 1943. The US Navy designation was XF8F-1, and a year later the name Bearcat became official (according to Webster, the Bearcat is an obscure Malaysian prehensile-tailed civet). Design went fast, and the midnight-blue prototype was flown by Bob Hall from Bethpage on 31 August 1944. Features

Now a regular display aircraft at British and European air shows, this beautifully restored and maintained F8F-2P Bearcat is flown by Stefan Kawowski and owned by Stephen Grey.

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This F8F-1, BuAer no. 95494, was almost the last of the 770 built, the final F8F-1 being 95498. It is shown as the aircraft of US Navy Commander C. E. Clarke, CO of fighter squadron VF-72 embarked in 1949-50 aboard the carrier USS *Leyte*. The F8F had been designed to be capable of operation from ships of half *Leyte*'s size.

included a sliding bubble canopy giving near-perfect view, the cockpit being as high as possible amidships; hydraulically-operated plain flaps; hydraulically-actuated landing gear with very wide track and height both for deck stability and propeller clearance; an R-2800-22W engine with water injection and fed by large wing-root inlets which also served the twin oil coolers; a 12 ft 7 in (3.84 m) Aeroproducts propeller with four blades and no spinner; a retractable tailwheel with solid tyre; a sting-type arrester hook at the extreme tail; and small hinged outer wing panels folded manually by inserting a long bar into an internal diagonal tube from below.

There was just one strange feature. Sensors were installed to measure g pulled during tight turns or dive pull-outs, and if these indicated greater than a given limit (believed to be 9 g) they triggered explosive bolts which separated the outer 3 ft (0.91 m) of the wings, with the outer halves of the ailerons, thus preventing catastrophic failure of the whole wing. It is difficult to see how this idea got through, because an obvious design case, demonstrated during test flying, was one tip off and the other still on, from explosive-bolt failure, and this proved so difficult that, added to the obvious maintenance problems, the idea was quickly abandoned. More serious was a basic stability problem which led to the loss of 90460 in late 1944 after a work-out at NAS Patuxent River. The design, and the growing production line, was urgently modified with a dorsal fin, 5 in (127 mm) shorter fuselage and 4 in (102 mm) more span. The production engine was the R-2800-34W with greater combat ratings, and the bag tank under the cockpit floor was increased in size from 150 US gal (568 litres) to 185 US gal (700 litres). Hardpoints were added for a centreline tank of 150-US gal (568-litre) size, and underwing pylons permitted the carriage of two 1,000-lb (454-kg) bombs, or two 100-US gal (378.5-litre) tanks or four 5-in (127-mm) rockets.

On 6 October 1944 massive orders were placed for 2,023 F8F-1s, supplemented four months later by 1,876 F3M-1s from the Eastern Aircraft division of General Motors, as a follow-on to the FM-2 Wildcat. This total of 4,000 was just for starters, output being set at 100 per month, but at VJ-Day in August 1945 the F3M contract was cancelled, and Grumman's F8F-1 order cut back to 770. Repeat orders resulted in Grumman's cancellations totalling 5,253 overnight. Some idea of the trauma resulting from the wholesale termination of contracts is gained from the fact that in the month of March 1945, from its two plants at Bethpage, Grumman delivered to the US Navy 664 aircraft. Quite a few were F8F-1s, but though deliveries had begun in February the first combat unit (VF-19) did not equip until 21 May. Based at NAS Santa Rosa, California, it received a mix of trials F8F-1s (90437-59) and regular F8F-1s numbered from 94752 (94753 being retained as a third XF8F-1 prototype).

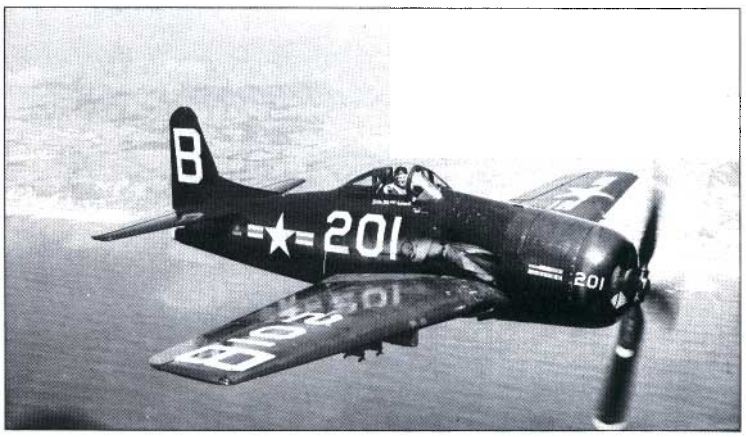
VF-19 suffered no more than normal running-in snags, though at one time the F8F was grounded because of persistent and dangerous fuel and hydraulic leaks. The squadron sailed aboard USS *Langley* in July 1945 in good time for the invasion of Japan, but the Japanese surrender came before this was necessary. By August two further squadrons had equipped, and by 1948, despite greatly reduced rate of deliveries, there were 24 Bearcat squadrons flying the F8F-1.

Tall fin trials

Though 5,253 F8F-1s were cancelled, Grumman still had F8F work to do. Yaw stability remained marginal, and the answer was either a taller fin or extra auxiliary fins. NACA recommended a 16-in (406-mm) increase in fin height, but Grumman calculated this would need a stiffened fuselage and eventually, in 1946, retained an F8F-1 (94873) as tall-fin trials aircraft. More immediate was the decision to accept a slight reduction in rate of climb in order to get greatly increased firepower, and from the 771st production airframe Grumman delivered 126 F8F-1Bs with four M-2 cannon, each with 205 rounds of 20-mm ammunition.

Despite far-sighted US Navy efforts to use gas-turbine engines in various jet, piston-plus-jet and turboprop-plus-jet fighters, the F8F remained the best bet for combat units and production continued with a greatly refined F8F-2 model in late 1947. The F8F-2 had the tall tail, as well as additional armour protection, improved systems and the R-2800-30W engine with variable-ratio supercharger and an improved cowling and installation features. Parts of the structure were strengthened, armament remaining four 20-mm cannon. Grumman built two modified F8F-1s (95049 and 95330) followed by 293 F8F-2s in five production blocks. The total of F8F-2s was brought up to 365 by 12 F8F-2N night-fighters and 60 F8F-2P photo-reconnaissance fighters with a long-focal-length camera behind the cockpit in an installation similar to that of the F6F-5P, and only two cannon.

The very first Bearcat was BuAer no. 90460, seen here over the Long Island shore in the hands of company pilot Bob Hall. Compared with every other F8F this XF8F-1 was shorter in span but longer in the body, and it also lacked a dorsal fin. It was current practice to write TEST as a warning to other air traffic nearby.



This standard F8F-1, BuAer no. 95318, is seen flying with a post-war US Navy fighter squadron. Note the underwing pylons for two tanks or bombs and four HVARs (high-velocity aircraft rockets) and the scorching of fuselage paint downstream of the grouped exhaust outlet.

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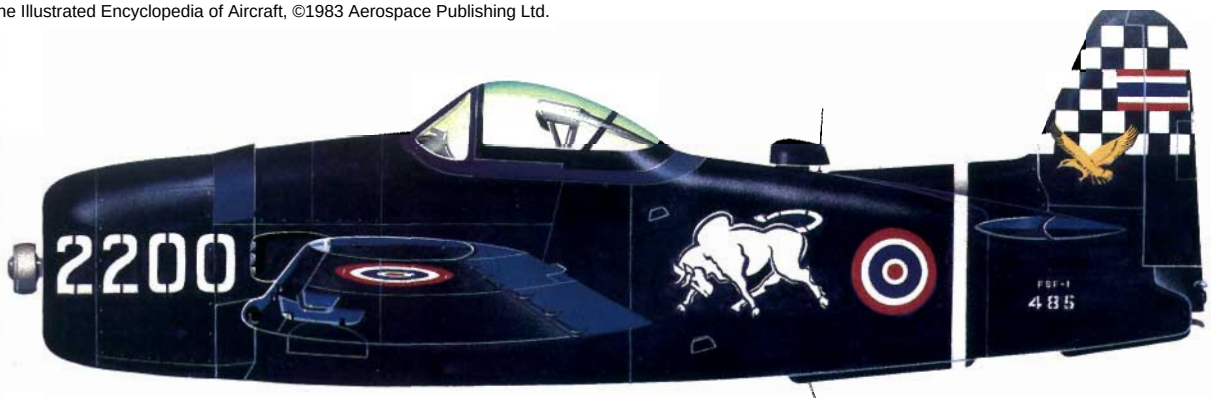


Whereas most Royal Thai air force Grumman Bearcats sported an overall natural aluminium finish, this F8F-1D Bearcat retains the midnight blue finish of its previous operator, the US Navy. Flown by the 23rd Squadron, 2nd Fighter-Bomber Wing, the aircraft bears the squadron's Golden Eagle motif on the fin.

The F8F-1D and F8F-1DB Bearcats of the Royal Thai air force were supplied ex-US Navy, and not passed on from the Armée de l'Air. This F8F-1D, whose US numbering has been erased, was serving in 1954 with the RTAF 2nd Fighter/ Bomber Wing's 23rd Squadron, based at Tan Son Nhut AB, later busy in the Vietnam war.

The first Bearcat night-fighters were the F8F-1N rebuilds of F8F-1 fighters converted from 1946. The first two (94812 and 94819) were trials aircraft to prove the installation of the APS-19 radar, operating at a 3-cm wavelength with the aerial assembly housed in a pod attached to the stores point under the right wing instead of being built into the fore-part of the wing as in the wartime F6F and F4U night-fighter conversions. The cockpit display was mounted centrally below the main panel, often with a rubber viewing visor, but the results were finally satisfactory. The F8F-2N had an identical installation.

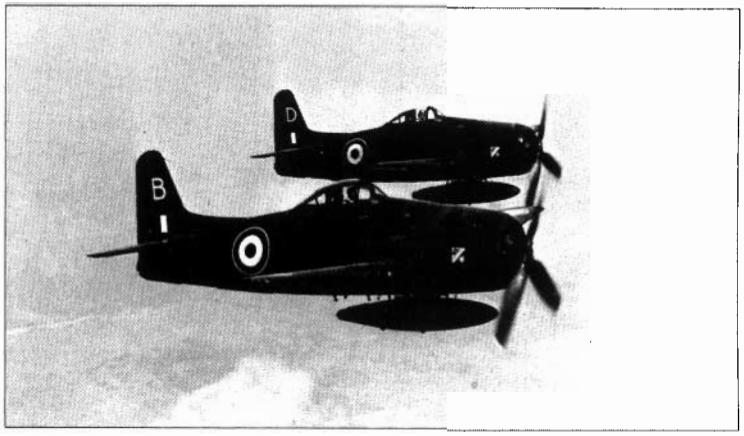
As the US Navy's last piston-engine fighter the F8F had much going for it, yet it emerged into a world already excited by jets. As soon as the US Navy had a jet fighter, the McDonnell XFD-1 (later XFH-1) Phantom, it ran a series of tests against an F8F at Patuxent River. In the standing start to 10,000 ft (3050 m) test the F8F left the new jet standing, and it scored well in most other areas; but the Phantom was hardly the most potent jet. In mid-1946 a mock combat against a USAAF Lockheed P-80 Shooting Star was so one-sided that the F8F pilot never once got the jet within firing parameters, and this was the more remarkable inasmuch as the agility of the F8F was superior to that of the heavy P-80. Yet later the same year Lieutenant Commander N. W. Davenport, strapped into an F8F, took off in 115 ft (35 m) and thundered up to 10,000-ft (3050-m) altitude in 1 minute 34 seconds, a feat which no jet at that time could equal.

Production ended in May 1949, by which time there were 12 squadrons on the F8F-1 and another 12 on the F8F-2 and variants. Withdrawals began only three months later, and were accelerated by the greater payload/range demands of the Korean War from June 1950. The last F8F-2Ps were withdrawn from the front-line units in late 1952, and the last fighter units (VF-859 and VF-921) re-equipped in 1953. Small numbers were converted into F8F-1D and F8F-2D drone directors, but there is no record of a drone (pilotless) version of the F8F. In the US Naval Reserve F8F-1s and F8F-2s continued to equip fighter squadrons until July 1955.

Bearcats abroad

The Bearcats were not scrapped, however. Almost 300 were to find fresh careers in some of the world's harshest climates on the other side of the world. Confusingly, they were given modified fuel systems resulting in a second lot of D suffixes (both F8F-1D and, modified from cannon-armed F8F-1Bs, the F8F-1DB), the D in this case signifying drop tank equipped. The first and most important customer was France, which was seeking tough combat aircraft in order to fight the Viet Minh guerrilla forces in its Far East colony of Indo-China. Though some sources put the number supplied to the Armée de l'Air at 120 there is evidence the actual figure was in excess of 160. The Bearcats flew more than 120,000 combat missions between July 1951 and the French capitulation in 1954, entirely on ground close-support and attack missions and with virtually no interference except from small-calibre AA fire, which was often heavy. The Bearcat flew with numerous *groupes*, often renumbered, as well as a reconnaissance squadron, Escadrille de Reconnaissance d'Outre-Mer 80, whose F8F-1DBs were fitted with French camera pods hung under the fuselage. Despite great adversities

Photographed while on manufacturer's test flying prior to US Navy acceptance, this is a cannon-armed F8F-1B, BuAer no. 122096. The larger guns much more than doubled the firepower and had little effect on any aspect of performance except rate of climb. Many F8Fs, including 122096, had two dorsal whip radio aerials.



French Armée de l'Air Bearcats retained midnight blue finish, and added their own yellow-bordered insignia, with unit badge on the cowling. These F8F-1Ds seen over Indo-China in the early part of 1953 were serving with GC II/9 (later renumbered GC II/21) 'Auvergne'. Bearcats served with eight Groupes de Chasse or Marche.

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the Bearcats did very well, and were highly popular, their only real shortcoming being limited mission radius and endurance when carrying attack ordnance.

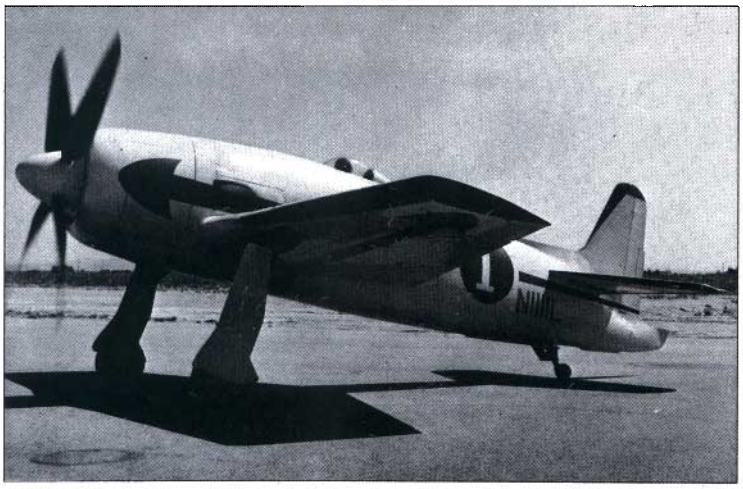
At the same time 129 Bearcats were supplied under the Mutual Defense Assistance Program to the newly resurrected air force of Thailand. Some were cannibalized for spares, and the main force of about 100 F8F-1Ds served with No. 13 Sqn (No. 1 Wing) and with Nos 22 and 23 Sqns (No. 2 Wing), again chiefly in the attack role. Whereas the Armée de l'Air had retained the US Navy midnight blue, the Royal Thai air force operated many of its Bearcats in natural metal. They continued flying until at least 1962.

Yet a third South East Asian operator was the successor to the Armée de l'Air in the new state of South Vietnam, the country formed by the partitioning of Indo-China after the 1954 ceasefire. The RVAF (Royal Vietnam air force) took over all the F8Fs left after the French withdrawal, and despite severe shortages of spares, skilled personnel and everything else, did at least have some measure of US support and, by cannibalizing half the force, kept the other half flying until about 1960.

There was one civil Bearcat, purchased privately from Grumman. In the company's first six years it was often visited by Major Alford (Al) Williams, one-time speed-record holder and perhaps the most famed exhibition pilot of the inter-war years, who, as he flew for Gulf Oil, named his Grumman-built aircraft Gulfhawks. To replace his pre-war biplane Gulfhawk III Williams ordered a demilitarized F8F-1 which was duly built as the G-58A. It had an R-2800 with water/methanol injection giving 2,800 hp (2088 kW) for short periods, and as it was 1,300 lb (590 kg) lighter than carrier-equipped Bearcats it had a fantastic aerobatic performance. It was unofficially timed at a true airspeed of 500 mph (805 km/h) at 19,000 ft (5790 m) soon after Williams took delivery in June 1947. But by this time the great stunt flier was slower in his reactions, and after several close shaves he wrecked the trim Gulfhawk IV during a landing at Elizabeth City, North Carolina. He retired from flying 'hot ships' soon afterwards.

Grumman itself also built a civil Bearcat, but this was assembled from spares, without cost either to the company or the US Navy. It was basically an F8F-1, but had the tall-finned tail, and registered N700A it was fully equipped with Airways avionics and was used by Field Service Representative Rodger Kahn to tour US Navy F8F units.

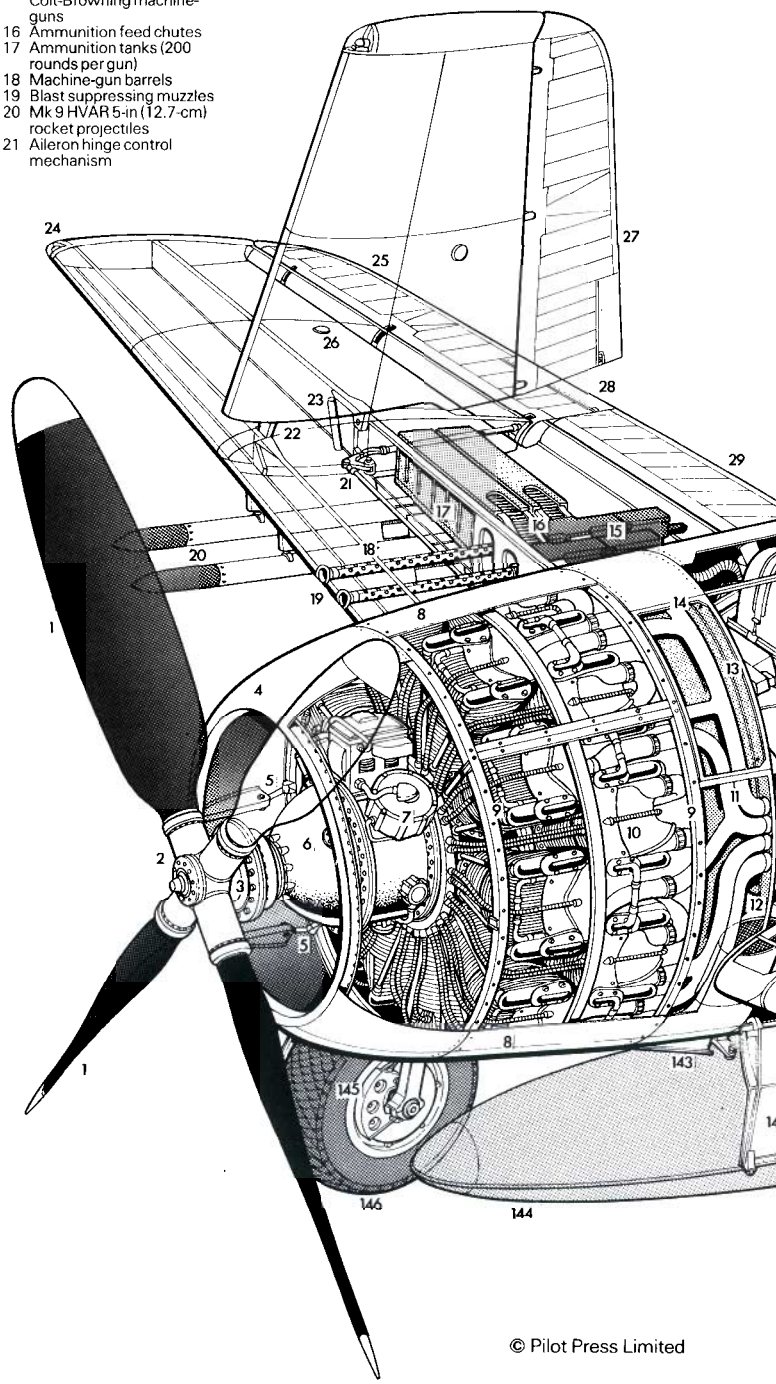
After their withdrawal from US Navy service many Bearcats were snapped up by civilian racing pilots, while others have been preserved in combat trim. By far the most famous is Darryl F. Greenamyer's much-modified F8F-2, registered N1111L, which passed through various stages of boosting and streamlining, with clipped wings, a tiny canopy and numerous other changes. On 16 August 1969, over an instrumented course at Edwards AFB, Greenamyer flew it to a new world speed record for piston-engine aircraft of 482.463 mph (776.449 km/h), beating the Messerschmitt Me 209 figure set just over 30 years previously.



Fastest of all piston-engined aircraft, save only Steve Hinton's 'Red Baron' Griffon-Mustang (since destroyed), the Greenamyer Bearcat is seen here in world speed record trim with modifications to almost every part. The canopy came from a diminutive Cosmic Wind formula-1 racer and the tailcone was specially built.

Grumman F8F-1 Bearcat cutaway drawing key

1 Aeroproducts constant-speed propeller
2 Propeller hub pitch change mechanism
3 Propeller fixing bolts
4 Engine cowling ring
5 Cowling ring fasteners
6 Reduction gear casing
7 Engine magnetos
8 Detachable engine cowlings
9 Cowling frames
10 Pratt & Whitney R-2800-34W Double Wasp 18-cylinder two-row radial engine
11 Exhaust collector pipes
12 Oil cooler
13 Stainless steel fireproof bulkhead
14 Cowling air flap
15 Starboard 0.5-in (12.7-mm) Colt-Browning machine-guns
16 Ammunition feed chutes
17 Ammunition tanks (200 rounds per gun)
18 Machine-gun barrels
19 Blast suppressing muzzles
20 Mk 9 HVAR 5-in (12.7-cm) rocket projectiles
21 Aileron hinge control mechanism
22 Wing fold hinge joint
23 Wing folding bar socket fitting
24 Starboard navigation light
25 Starboard aileron
26 Formation light
27 Outer wing panel folded position
28 Aileron tab
29 Starboard flap
30 Oil tank (17 US gal/64 litre capacity)
31 Induction air duct
32 Water injection tank (16 US gal/60 litre capacity)
33 Hydraulic distribution unit
34 Engine bearer struts
35 Armoured cockpit bulkhead (29.3 lb/13.3 kg weight)
36 Engine control runs
37 Access plate
38 Instrument panel
39 Rudder pedals
40 Fuel feed pipe
41 Trim controls
42 Pilot's side console panel
43 Engine throttle and propeller controls
44 Control column
45 Oxygen regulator
46 Mk 8 Mod 6 illuminated reflector gunsight
47 Windscreen panels
48 Rearward-sliding cockpit canopy
49 Headrest
50 Head and back armour (49.4-lb/22.4-kg weight) see 54
51 Safety harness
52 Canopy sliding rail
53 Pilot's seat
54 Back armour (see 50)



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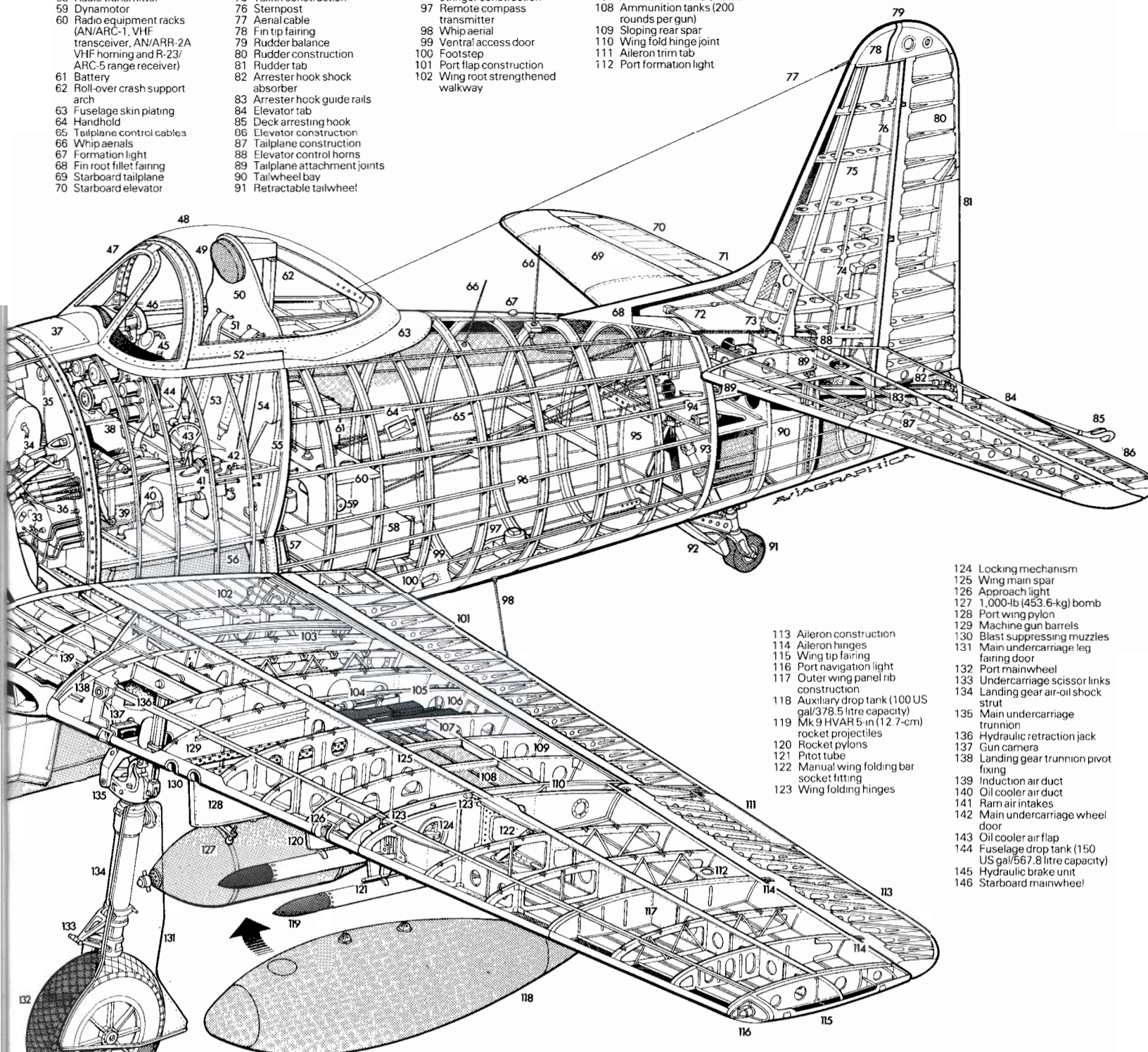
Cannon-armed F8F-1DB no. 121510 is shown serving with No. 514 Fighter Squadron (Escadron de Chasse) of the newly formed Royal Vietnam air force based at Saigon in 1956. The markings of this force were to survive to the end of the Vietnam war, though the F8Fs were withdrawn from front-line service in the 1960s.

55 Cockpit rear bulkhead
56 Bag type main fuel tank (185 US gal/700 litre capacity)
57 Fire extinguisher
58 Radio transmitter
59 Dynamotor
60 Radio equipment racks (AN/ARC-1, VHF transceiver, AN/ARR-2A VHF homing and R-23/ ARC-5 range receiver)
61 Battery
62 Roll-over crash support arch
63 Fuselage skin plating
64 Handhold
65 Tailplane control cables
66 Whip aerials
67 Formation light
68 Fin root fillet fairing
69 Starboard tailplane
70 Starboard elevator
71 Elevator tab
72 Torque shaft trim tab control
73 Fin front spar attachment
74 Rudder trim control
75 Tailfin construction
76 Sternpost
77 Aerial cable
78 Fin tip fairing
79 Rudder balance
80 Rudder construction
81 Rudder tab
82 Arrester hook shock absorber
83 Arrester hook guide rails
84 Elevator tab
85 Deck arresting hook
86 Elevator construction
87 Tailplane construction
88 Elevator control horns
89 Tailplane attachment joints
90 Tailwheel bay
91 Retractable tailwheel
92 Tailwheel leg fairings
93 Shock absorber strut
94 Retraction jack
95 Rear fuselage bulkhead
96 Fuselage frame-and-stringer construction
97 Remote compass transmitter
98 Whip aerial
99 Ventral access door
100 Footstep
101 Port flap construction
102 Wing root strengthened walkway
103 Wing rib construction
104 Hydraulic flap jack
105 Port gun bay
106 Twin 0.5-in (12.7-mm) Colt-Browning machine guns
107 Ammunition feed chutes
108 Ammunition tanks (200 rounds per gun)
109 Sloping rear spar
110 Wing fold hinge joint
111 Aileron trim tab
112 Port formation light



113 Aileron construction
114 Aileron hinges
115 Wing tip fairing
116 Port navigation light
117 Outer wing panel rib construction
118 Auxiliary drop tank (100 US gal/378.5 litre capacity)
119 Mk 9 HVAR 5-in (12.7-cm) rocket projectiles
120 Rocket pylons
121 Pitot tube
122 Manual wing folding bar socket fitting
123 Wing folding hinges
124 Locking mechanism
125 Wing main spar
126 Approach light
127 1,000-lb (453.6-kg) bomb
128 Port wing pylon
129 Machine gun barrels
130 Blast suppressing muzzles
131 Main undercarriage leg fairing door
132 Port mainwheel
133 Undercarriage scissor links
134 Landing gear air-oil shock strut
135 Main undercarriage trunnion
136 Hydraulic retraction jack
137 Gun camera
138 Landing gear trunnion pivot fixing
139 Induction air duct
140 Oil cooler air duct
141 Ram air intakes
142 Main undercarriage wheel door
143 Oil cooler air flap
144 Fuselage drop tank (150 US gal/567.8 litre capacity)
145 Hydraulic brake unit
146 Starboard mainwheel

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Grumman Bearcat

Grumman F8F variants

XF8F-1: prototypes of **G-58** design; two built followed by a third
F8F-1: first production version, with R-2800-22W or -34W engine, four 0.5-in (12.7-mm) guns; total 770
F8F-1B: as F8F-1 but four 20-mm guns; total 126
F8F-1D: small number of F8F-1s converted as drone directors
F8F-1D: *same designation used for post-war* modification with tropical three-drop-tank fuel system for South East Asia
F8F-1DB: conversions of F8F-1B for South East Asia
F8F-1N: night-fighter conversions; total 38
XF8F-2: two conversions with tall fin, revised cowling and other refinements
F8F-2: as XF8F-2 but four 20-mm guns and extra armour; 365 built
F8F-2D: small number converted as drone directors
F8F-2N: night-fighter conversions; total 12
F8F-2P: photographic conversions with only two guns; total 60
G-58A Gulfhawk IV: civil aircraft for Major Al Williams

A standard F8F-1 Bearcat, BuAer no. 94951, this aircraft is depicted in the 1953 markings in which it served with the US Navy Reserve at NAS Glenview, Illinois, just north of Chicago. Note the three whip aerials (one ventral) and HF wire aerial. At all times the F8F was very exciting to fly, and more agile than anything it was likely to meet, but its all-round speed and firepower were looking deficient by the 1950s.

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Specification

Grumman F8F-1 Bearcat

Type: single-seat carrier-based fighter/bomber

Powerplant: one 2,100-hp (1566-kW) Pratt & Whitney R-2800-22W, R-2800-30W or R-2800-34W 18-cylinder piston engir

Performance: maximum speed 428 mph (689 km/h) at medium altitudes; typical cruising speed 250 mph (402 km/h); initial climb 3,230 ft (985 m) per minute; service ceiling 34,700 ft (10575 m); range 1,416 miles (2279 km) (note: all these figures are with centreline drop tank, without which initial climb is 4,570 ft (1393 m) per minute and ceiling 39,450 ft (12024 m)

Weights: empty 7,070 lb (3207 kg); maximum (combat) 9,672 lb (4387 kg), (with external stores) 12,947 lb (5873 kg)

Dimensions: span 35 ft 6 in (10.82 m); length 27 ft 8 in (8.43 m); height 13 ft 10 in (4.23 m); wing area 244 sq ft (22.67 m

Armament four 0.5-in (12.7-mm) Colt-Browning machine-guns, each with 300 rounds, plus one 1,600-lb (725.8-kg) or two 1,000-lb (454-kg) bombs and four 5-in (127-mm) HVAR rockets

Keith Fretwell