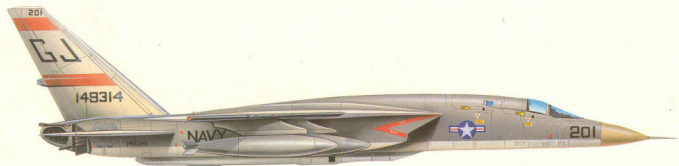


# RA-5C Vigilante



LINDSAY PEACOCK

With full  
colour artworks  
and photographs

COMBAT AIRCRAFT SERIES

# RA-5C Vigilante

LINDSAY PEACOCK

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**The Author**

LINDSAY PEACOCK is an aviation journalist and photographer who has written extensively on military aircraft subjects for books and magazines, especially in areas of specific interest to aircraft modellers. He has travelled widely in pursuit of his profession and hobbies, and spent much time at military aircraft establishments observing his subjects at close quarters. His other books in this series are F/A-18 Hornet, F-14 Tomcat, B-52 Stratofortress, AH-1 HueyCobra, and A3J/RA-5 Vigilante.

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# Design and Development

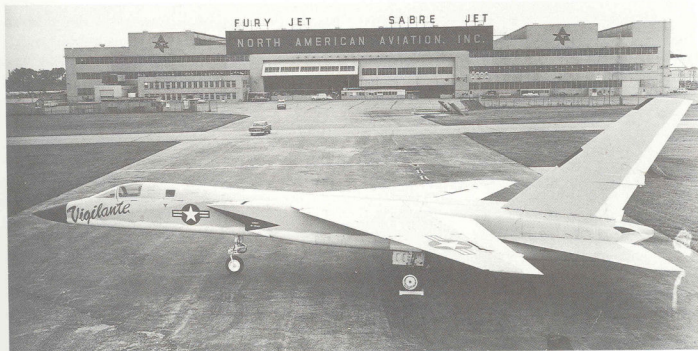
**O**F THE VARIOUS types of warplane which served aboard the US Navy's large fleet of aircraft carriers during the course of the 1960s and 1970s, few can have been as impressive as the North American Vigilante. The outcome of an ambitious concept calling for a jet-powered attack bomber to replace the Douglas A3D Skywarrior which had still to enter service when work on the Vigilante began, North American's design must surely rank as one of the most elegant aircraft ever to grace a flight deck with its presence, oozing "class" from the tip of its nose-mounted pitot tube to the top of its sharply-raked vertical fin.

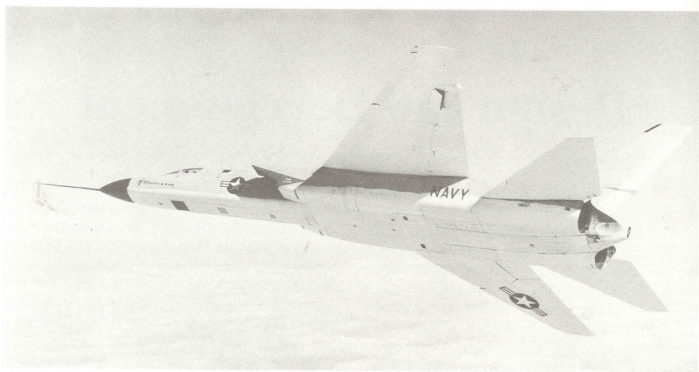
Aesthetic considerations understandably failed to impress the Navy and in its initial guise as a delivery system for nuclear weapons the Vigilante was little more than an expensive and embarrassing failure. Although as a bomber it was a flop, a fortunate accident of good timing saw the Vigilante eventually succeed in redeeming its own and North American's reputation in spectacular fashion by performing

sterling work in the reconnaissance role during the course of a career which spanned some 15 years. During that career, it also saw a considerable amount of combat action in South-East Asia where it shared responsibility for the Navy's reconnaissance workload with Chance Vought's RF-8 Crusader.

Evolution of what eventually emerged as the Vigilante dates back to the mid-1950s, as the brainchild – and, incidentally, the first major design initiative – of North American's Columbus, Ohio division. Acquired by North American in 1950, the Columbus facility had previously enjoyed rather limited status as purely a production and modification centre, concentrating on hardware for the US Navy. Projects undertaken included such types as the T-28B Trojan trainer, the AJ Savage heavy attack bomber and the FJ Fury fighter, Columbus personnel getting a taste of design experience with the ultimate FJ-4B

**Below: The first of two prototype YA3J-1 aircraft, BuNo 145157 is seen soon after roll-out at North American's Columbus factory. It was later modified to reconnaissance configuration as an RA-5C.**





variant of the latter type.

Having acquired a considerable amount of expertise in dealing with various Navy programmes, it was hardly surprising that the Columbus division design bureau – headed by Frank G. Compton – was anxious to move on to rather more ambitious projects and one of the first manifestations was the so-called North American General Purpose Attack Weapon (NAGPAW). Later referred to by the parent company as the NA-233, this concept was, in broad terms, an extremely advanced attack bomber possessing the ability to deliver conventional and/or nuclear weapons over long range at high subsonic speeds at low level.

#### Nuclear strike missile

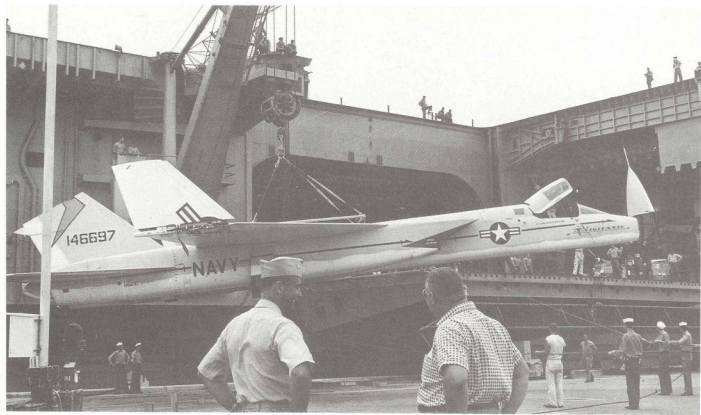
At that time, the Navy was still very much in the market for “heavy bombers” with the ability to undertake the strategic nuclear strike mission. Types like the AJ-1/2 Savage and the P2V-3C Neptune were the principal means of delivering nuclear weapons from the larger aircraft carriers of the *Midway* class. Both were, however, essentially of World War 2 vintage, being somewhat slow and outdated as well as potentially vulnerable to the new generation of Soviet fighters. Ultimately, the Savage and Neptune were replaced by the A3D Skywarrior but the Navy was determined to plan even further

Above: Seen during an early test flight, detail changes may be detected on the nose and tail cone of the first YA3J-1 prototype while the presentation of the aircraft's name has also changed.

ahead and it was against this background that the NAGPAW proposal was submitted to the Bureau of Aeronautics (BuAer) in late 1954.

Briefly, Compton's NAGPAW submission envisaged a relatively small single-seat pure jet powered by twin engines and capable of high subsonic speeds at low level. A moderately swept wing, low set horizontal tailplane and an aft-facing linear bomb bay were among the key features of a design which was also intended to utilise inertial navigation equipment and a small radar to assist in finding and attacking targets. NAGPAW was optimised for a variation of the still new and largely untried Low Altitude Bombing System (LABS) in which the aircraft would pull up into a vertical climb above the target, and eject the nuclear weapon rearwards from the linear bomb bay during the climb before rolling out and endeavouring to outrun the impending nuclear blast wave. Consideration was also given to fitting an auxiliary rocket motor to assist safe escape after weapon release by boosting maximum speed.

The Bureau of Aeronautics' response to NAGPAW was essentially favourable although it did make one or two stipulations which had far-reaching ramifications for what eventually evolved into the Vigilante. The first of these related to performance, the



Above: Displaying the chevron of the Naval Air Test Center's Flight Test Division on its fin, A3J-1 146697 is loaded aboard the USS *Saratoga* at the start of a series of suitability trials.

Navy being of the opinion that NAGPAW should be able to achieve high supersonic speed with a maximum capability of the order of Mach 2, if possible. At that time, performance gains were taking place almost daily and the Navy can be excused for wanting to take full advantage of this. In the light of subsequent events, their stance undoubtedly proved beneficial, the RA-5C's excellent performance standing in good stead when it entered combat in Vietnam.

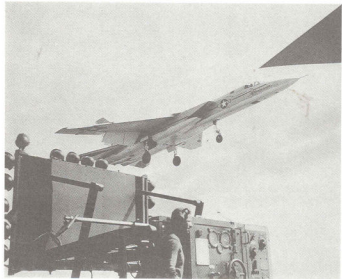
In addition, BuAer also specified that the resulting aircraft should be able to undertake a catapult-assisted take-off from the flight deck in nil-wind conditions with a full payload of fuel and weapons. It was this demanding requirement which proved to be the greatest stumbling block in the ensuing design effort.

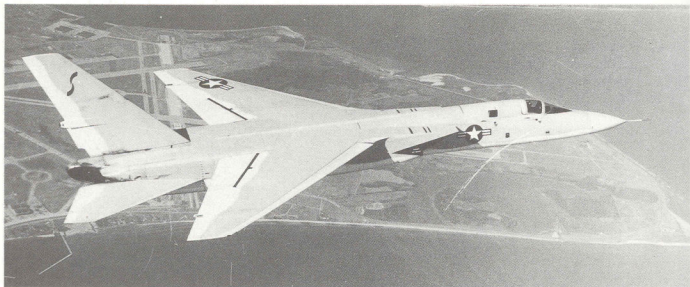
By themselves, these criteria were not insuperable. However, the marriage of both in a single airframe did ultimately prove to be irreconcilable, for the nil-wind launch parameters inevitably dictated the use of a large wing in order to generate sufficient lift. This, in turn, seriously compromised performance at the top end of the speed range and it is clear with

the wisdom of hindsight that variable geometry offered perhaps the only feasible solution.

Unfortunately, the Navy had only recently had a pretty rough ride down that particular road with Grumman's XF10F Jaguar and the service certainly was not anxious to enter another potential minefield in a hurry. As a result, Compton and his colleagues were essentially on a hiding to nothing and were forced to settle for a compromise, the resulting

Below: Watched by members of the USS *Saratoga*'s ship's company, A3J-1 146697 performs a missed approach as part of its initial series of sea trials with the Naval Air Test Center in July 1960.





Above: Another early production A3J-1 flies above NAS Patuxent River, Maryland, home of the Naval Air Test Center. On its fin, this machine displays the Service Test Division's stylised "S".

Vigilante being able to achieve a respectable Mach 0.95 at low altitude and Mach 2 at 40,000ft (12,200m).

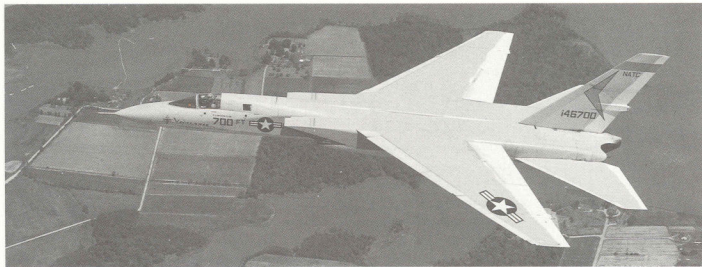
Although low altitude performance fell far short of that desired, the Navy nevertheless opted to press ahead with NAGPAW, notifying North American's Columbus division of its intentions in a formal instruction to proceed which reached the company on 29 June 1956. This permitted North American to go ahead with preparations for production, those responsible setting about ordering long lead-time items as well as preparing tooling and initiating detailed design engineering. Within the space of three months, the future of the NA-233 became even more secure, following the award of an \$86 million contract covering the manufacture of a pair of YA3J-1 prototypes. Roll-out of the first YA3J-1 (Bu.No. 145157) took place on 16 May 1958 and the name Vigilante was officially adopted at that time. Following the usual period of ground testing, this aircraft eventually got airborne for its maiden flight on the last day of August, North American's chief test pilot Dick Wenzel being at the controls for this auspicious occasion. Number 145157 seems to have performed satisfactorily, attaining an altitude of 35,000ft and a speed of Mach 0.92 while aloft.

Following initial company testing, the Vigilante was subjected to the usual gamut of Navy Preliminary Evaluations (NPE) and Board of Inspection and Survey (BIS) trials, these being a necessary prelude

to service entry and conducted at a time when the Navy was on the brink of introducing several new types to the operational inventory. In common with other outstanding warplanes such as the F4H Phantom and P3V Orion, both YA3J-1 prototypes and several early production examples of the A3J-1 duly found their way to Patuxent River, Maryland where they were put through the wringer by personnel of the Naval Air Test Center's Flight Test, Service Test and Weapons Systems Test Divisions. One notable highlight of this period was carrier suitability trials which were conducted aboard the USS *Saratoga* (CVA-60) in July 1960.

During the same period, the Vigilante also managed to find its way into the record books when Cdr Leroy Heath and Lt Larry Moore of the Navy employed a zoom climb to coax an early production A3J-1 to an altitude of no less than 91,451ft (27,892.6m) on 13 December 1960. Flying from Palmdale, California, this remarkable flight culminated in the establishment of a world altitude record for an aircraft carrying a 1,000-kg (2,204-lb) payload.

Other test agencies which played an important part in clearing the way for A3J service entry included the Naval Weapons Evaluation Facility at Kirtland AFB, New Mexico, an organisation more concerned with examining the type's potential as a strike aircraft with a variety of conventional and "special" (i.e. nuclear) weapons. Even as these tests were under way, it was fast becoming clear that the unique linear bomb bay was by no means satisfactory, numerous problems being encountered during trials of this innovation.



Above: Another A3J-1 assigned to Flight Test at Patuxent River, 146700 cruises serenely above the Maryland countryside in 1960. The massive wing planform is clearly evident in this fine study.

Indeed, despite persistent attempts to put things right, the linear bomb ejection method was never perfected and bomb bay space was eventually given over to additional fuel cells on the RA-5C model. Even then, problems still arose, as the stresses and strains involved in a catapult launch sometimes resulted in the RA-5C involuntarily leaving a few fuel tanks "behind" as it progressed down the catapult track. Consequences invariably seem to have included a brief but spectacular conflagration on the flight deck as the afterburner flame ignited the fuel. For the crew of the RA-5C such adventures sometimes ended in a hasty departure from the aircraft concerned and an unscheduled dip in the ocean but there were also instances of aircraft "dumping tanks" and making it back to the carrier in perfect safety once the fire was out and the debris had been cleared away.

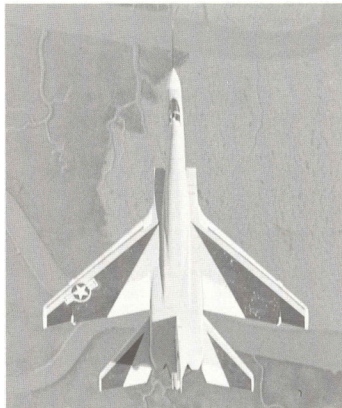
### Relinquished by the Navy

By the early 1960s, the strategic bombing role had been rather reluctantly relinquished by the Navy, the A3J surviving as a tactical aircraft primarily for the low-level strike mission and utilising either conventional or tactical nuclear weapons. Inevitably, the problems with the weapons delivery system provided ammunition for the critics – and there were quite a few of them around at this time – while cost considerations were not overlooked by those who were

of the opinion that the Vigilante was little more than a luxury – and an expensive one at that. When one considers that the unit cost at the start of production ran as high as \$9 million in 1961 dollars one can perhaps appreciate just why they were so concerned.

Nevertheless, despite the best efforts of the critics, the Navy was clearly determined to continue with the Vigilante; procurement of production examples of the A3J-1 got under way in 1959 when an initial

Below: The A3J-1 Vigilante's distinctive planform is displayed to advantage in this unusual view of a test aircraft in flight. Vast expanses of dayglo paint can be seen on wing and tail surfaces.



batch of nine aircraft (Bu.Nos. 146694–146702) was ordered with FY1960 funds. Further contracts followed in quite quick succession although the quantities involved were generally fairly modest, 14 being ordered in FY1961, 10 in FY1962 and 24 in FY1963.

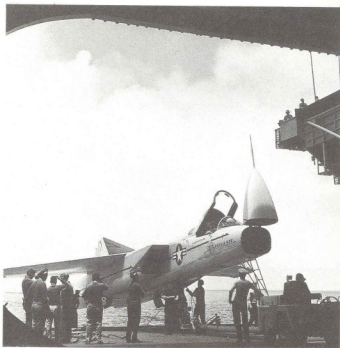
Production was then due to switch to the A3J-2 which was also intended to serve as a strike aircraft but it should be noted that the initial batch of 18 had actually been ordered as A3J-1s. Making its first flight on 29 April 1962, the A3J-2 appeared on the scene in the very same month that Secretary of Defense Robert S. McNamara announced that the Vigilante would henceforth fulfil the reconnaissance role.

As it turned out, production of the 18 A3J-2s was too far advanced for modification to A3J-3 (later RA-5C) reconnaissance configuration to be undertaken on the line and all 18 were eventually completed to A3J-2 (A-5B) standard although only two were actually delivered to the Navy in this guise. Of the remainder, four more also entered the inventory, this time with the designation YA-5C and these aircraft – lacking reconnaissance equipment – were employed as interim trainers by VAH-3 pending the availability of full-system RA-5Cs. Eventually, both A-5Bs, all four YA-5Cs and the 12 aircraft that remained undelivered were retrospectively modified to RA-5C configuration before being handed over to the Navy and it was some of these aircraft which were assigned to RVAH-5 when it made its combat debut in WestPac in the summer of 1964.

Deliveries of the “*recce Vigi*” did not cease, however, as 43 more RA-5Cs were built from the ground up with FY1963 funding. The decision to store tooling once manufacture terminated ultimately proved a wise one for it permitted the type to achieve the rare distinction of being reinstated in production in 1968. It was originally anticipated that 46 more RA-5Cs would be purchased at that time but production was actually curtailed with the 36th example (Bu.No. 156643) which emerged from the factory on 10 August 1970, bringing total procurement of new-build RA-5Cs to 79.

In the intervening period, modification of most of the surviving A-5As had added 43 more airframes to the RA-5C fleet and no fewer than 140 of the 156 Vigilantes that were built between 1958 and 1970 eventually saw service in the reconnaissance role.

A few other variations on the Vigilante theme do



Above: Framed in the hangar deck door, the sixth A3J-1 Vigilante is clearly a centre of attention as personnel prepare to tow it from the elevator to the USS *Saratoga*'s hangar in July 1960.

deserve brief mention even though they failed to come to fruition. All were intended for service with the US Air Force – and, to be more specific, with that agency's Aerospace Defense Command (ADC) – which was always on the look-out for new and improved interceptors.

Over a period of more than 10 years, starting in 1959, North American Columbus submitted a number of proposals to ADC for an interceptor based on the Vigilante airframe. Among the more startling was one incorporating a Rocketdyne XLR46-NA-2 liquid-fuelled rocket motor to provide enhanced high altitude performance. Collectively known as “*Retaliator*”, studies examined a variety of armament concepts and configurations but no firm order was ever forthcoming.

More than a decade later, Columbus evolved a three-engined variant in response to ADC's Improved Manned Interceptor requirement, this featuring a third J79 engine in the space originally occupied by the linear weapons bay. Air for this engine would be provided by bifurcated dorsal intakes while sketches of the design depict an aircraft carrying half-a-dozen missiles bearing a strong resemblance to the Hughes AIM-54 Phoenix. Once again, though, the project progressed no further than the drawing board.

# The Vigilante Described

WITH REGARD TO technical merits, the Vigilante was certainly a daring venture in that it incorporated a bewildering array of new and previously untried features. Perhaps even more remarkable was the fact that it came from a division of North American which had acquired little direct experience of design work up to that point, personnel at Columbus, Ohio being mainly concerned with modification and improvement of existing projects. In some ways, however, that may well have been to the ultimate advantage of the Vigilante, for had those responsible had more design experience behind them, they might well have adopted a rather more conservative approach when it came to conceiving a new bomber for the Navy.

As it turned out, an honest appraisal would almost certainly result in the conclusion that the Columbus team failed in their original objective for the North American design enjoyed a less than earth-shattering career as an attack aircraft. However, it is fair to say that this failure cannot wholly be attributed to the parent company, for the Navy itself must accept some responsibility.

Admittedly, there were daunting technical challenges, most notably with the innovative linear

weapons bay—but the Vigilante was as much a victim of circumstance as anything else, for it should not be forgotten that the A3J-1/A-5A made its debut at around the same time as the Navy effectively got out of the carrier-borne strategic nuclear strike role. The service thereafter invested its deterrent capability in Polaris-armed, nuclear-powered strategic submarines and left responsibility for aerial delivery of nuclear weapons to Strategic Air Command.

## Conventional strike

Initially, the Vigilante was switched to low-level conventional strike, a mission for which it was by no means ideally suited, rather ironically largely as a result of earlier Navy strictures relating to launch capability. These had, in turn, seriously compromised performance at low level and, while the A3J was capable of a fairly healthy turn of speed, it could have been even better had the Navy been prepared to take a more flexible line a few years earlier.

With the switch to tactical reconnaissance, the

**Below:** The Vigilante's first overseas visit was made in summer 1961 when an early production A3J-1 from the NATC at Patuxent River was one of the highlights of that year's Paris Air Show.



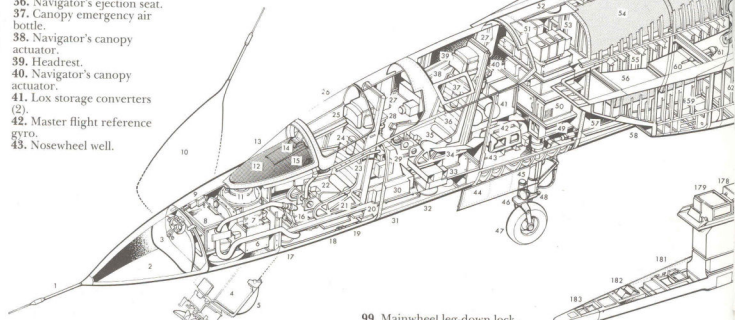
# NORTH AMERICAN (ROCKWELL) RA-5C VIGILANTE CUTAWAY KEY

1. Pitot static boom.
2. Hinged radome.
3. Search radar antenna.
4. Hinged radar and AN/ASB-12 forward package (servicing position).
5. TV optical scanner.
6. In-flight refuelling line.
7. In-flight refuelling probe (stowed).
8. AN/ASB-12 bomb directing set.
9. Radome actuator.
10. Radome (folded).
11. LQX converter.
12. Instrument panel shroud.
13. One-piece Acrylic windscreen.
14. Radar-flight projected display indicator.
15. Control column.
16. Rudder controls.
17. TACAN antenna.
18. ADF antenna.
19. AN/APR-27 antenna.
20. Viewfinder.
21. Pilot's ejection seat.
22. Underseat high-pressure emergency oxygen bottle.
23. Cockpit supply air.
24. Canopy emergency air bottle.
25. Headrest.
26. Pilot's canopy.
27. Emergency escape system ballistic charges.
28. Pilot's canopy actuator.
29. Indicator power supply.
30. Bombing computer.
31. UHF antenna.
32. Radar altimeter.
33. AN/ALQ-100 antenna.
34. Navigator's side console.
35. Underseat high-pressure emergency oxygen bottle.
36. Navigator's ejection seat.
37. Canopy emergency air bottle.
38. Navigator's canopy actuator.
39. Headrest.
40. Navigator's canopy actuator.
41. Lox storage converters (2).
42. Master flight reference gyro.
43. Nosewheel well.

44. Pre-closing nosewheel doors.
45. Nosewheel gear steering unit.
46. Taxiing light.
47. Forward-retracting nosewheel.
48. Nosewheel centering unit.
49. Nosewheel gear actuator.
50. Flight control main electronics bay.
51. Flight control relays.
52. IFF antenna.
53. Bulkhead.
54. Forward fuselage fuel cell (455 US gal/1722 l).
55. Inlet sidewall structure.
56. Forward variable ramp.
57. Nacelle inlet assembly.
58. Port intake.
59. Nacelle structure.
60. Aft variable ramp.
61. Ramp actuator.
62. Intake duct.
63. (Ventral) launch-catapult looks (2).
64. Main wing/fuselage frame forging.
65. Wing forward attachment pick-up point.
66. BLC ducting.
67. Fuselage sump fuel cell (490 US gal/1855 l).
68. Starboard wing-foot filter.
69. Starboard auxiliary drop-tanks (400 US gal/1514 l each).
70. AN/ALQ-41 and -100 forward transmit antennae.
71. AN/APR-25 and AN/ALQ-41 and -100 forward receive antennae.
72. Leading-edge wing-droop (inner section).

73. Droop actuator and torque rod.
74. Conduit to wing fold (hydraulic and electrical).
75. Wing structure.
76. Starboard wing integral fuel (715 US gal/2705 l).
77. Span-wise corrugated stiffeners.
78. Wing-fold line.
79. Leading-edge wing-droop (outer section).
80. Starboard navigation lights.
81. Starboard formation light.
82. Wing outer section (folded).
83. Outboard spoiler deflector (downward airflow).
84. AN/ALQ-41 and -100 aft receive antennae.
85. Central (closed) and inboard spoiler deflectors (upward airflow).
86. Starboard flaps.
87. BLC flap-blowing duct.
88. Wing aft attachment pick-up point.
89. Dorsal fairing.
90. Overwing saddle tank (210 US gal/795 l).
91. Wing centre-line splice assembly.
92. Starboard intake ducting.
93. Bomb-bay forward fuel cell.
94. Hydraulic reservoir air storage tank.
95. Port intake ducting.
96. Port mainwheel well.
97. Retraction jack.
98. Universal jack.

104. Bomb-bay central fuel cell.
105. No 1 hydraulic system reservoir.
106. No 2 hydraulic system reservoir.
107. Aft fuselage saddle tank (130 US gal/492 l).
108. Anti-collision beacon.
109. Starboard engine oil tank (6.1 US gal/23 l).
110. Fuselage aft structure.
111. Horizontal stabilizer.
112. Horizontal stabilizer attachment frame.
113. Horizontal stabilizer actuator.
114. Vertical stabilizer actuator.



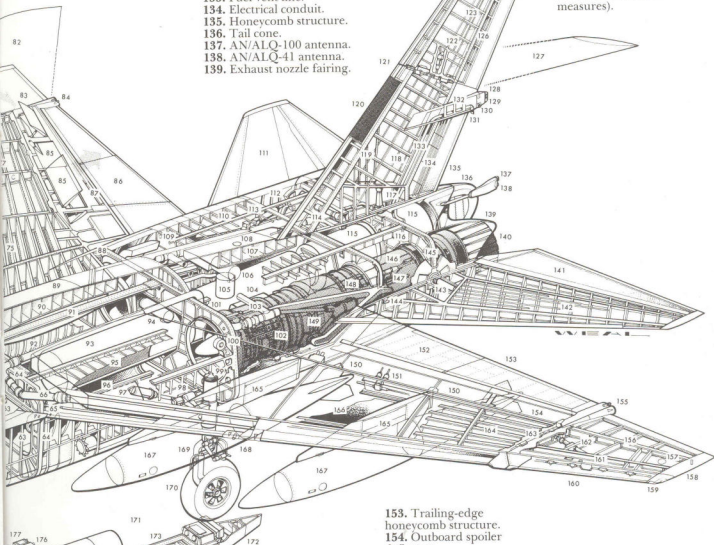
99. Mainwheel leg-down lock.
100. Wing aft attachment pick-up point.
101. Steel mainframe and firewall (canted).
102. [79-GE-10 turbojet.
103. BLC cross-over ducting.

115. Bomb-bay aft fuel cell (total internal capacity: 885 US gal/3350 l).  
 116. Fuselage aft frame.  
 117. Vertical stabilizer pivot.  
 118. Vertical stabilizer lower-section structure.  
 119. Conduits (front to rear: electrical, hydraulic, tail-fold cable).  
 120. Leading-edge dielectric panel.

121. Tail-fold hinge line.  
 122. Tail-fold actuator.  
 123. Vertical stabilizer upper-section structure.  
 124. Front spar.  
 125. Scimitar antenna.  
 126. Electrical conduit.  
 127. Vertical stabilizer (folded).  
 128. Rear formation light.  
 129. AN/APR-25 aft antenna.  
 130. Buddy tanker lights.  
 131. Fuel vent.  
 132. AN/APR-25 amp detectors.  
 133. Fuel vent line.  
 134. Electrical conduit.  
 135. Honeycomb structure.  
 136. Tail cone.  
 137. AN/ALQ-100 antenna.  
 138. AN/ALQ-41 antenna.  
 139. Exhaust nozzle fairing.

147. Exhaust nozzle cable pulley feedback system.  
 148. Arresting hook.  
 149. Launch catapult holdback yoke.  
 150. Central and inboard spoiler deflectors.  
 151. Wing spoiler actuators.  
 152. Port flaps.

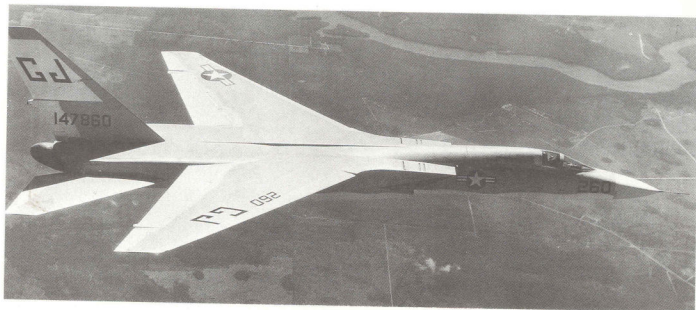
167. Port auxiliary drop-tanks (400 US gal/1514 l each).  
 168. AN/APR-25 and AN/ALQ-41 and -100 forward receive antennae.  
 169. High-strength alloy Bendix mainwheel gear.  
 170. Port mainwheel.  
 171. Modularized multi-sensor ventral reconnaissance pod.  
 172. PECM antenna.  
 173. Side-looking radar (SLR).  
 174. PECM (Passive electronics counter-measures).



140. Variable-area convergent-divergent expansion nozzle.  
 141. Honeycomb structure.  
 142. Horizontal stabilizer structure.  
 143. Horizontal stabilizer pivot.  
 144. Machined end rib.  
 145. Pivot attachment frame.  
 146. Afterburner.

153. Trailing-edge honeycomb structure.  
 154. Outboard spoiler deflector.  
 155. AN/ALQ-41 and -100 aft receive antennae.  
 156. Outer section wing structure.  
 157. Compass.  
 158. Port formation light.  
 159. Port navigation lights.  
 160. Outer section leading-edge droop.  
 161. Droop actuator and torque rod.  
 162. Wing-fold actuator.  
 163. Wing-fold hinge line.  
 164. Span-wise stiffeners.  
 165. Stores pylons.  
 166. Port wing integral fuel (715 US gal/2705 l).

175. Equipment shelf.  
 176. IMC and camera control unit.  
 177. Recorder amplifier.  
 178. Data converter.  
 179. Band 11 and 12 receivers.  
 180. Interchangeable camera module (2 side oblique serial frame cameras, 2 panoramic cameras, or 2 vertical serial frame cameras).  
 181. PECM components.  
 182. Vertical serial frame camera (KA-50 or -51).  
 183. Forward oblique serial frame camera (KA-51A).



Above: The distinction of introducing the Vigilante to the Fleet fell to VAH-3 at Sanford, Florida. This A3J-1 was one of the first aircraft to be handed over to this dedicated training unit.

Vigilante at last succeeded in finding its true meter and it was more or less unparalleled at this task for many years. Employing a mixture of optical and electronic sensors in its intelligence-gathering activities, the RA-5C was without doubt the definitive Vigilante, redeeming the reputation of the Columbus design team and vindicating in a rather round-about fashion the Navy's decision to stay with the project 'through the rough times.'

As far as the airframe was concerned, the Navy's initial insistence on nil-wind take-off capability and Mach 2 performance had a profound effect on the physical appearance of the Vigilante even though, as noted elsewhere, it failed to meet these demands. What resulted was a relatively large and extremely handsome machine, which, in its original A3J-1 version, possessed rakish lines, its angular appearance being somewhat softened on the succeeding A3J-2 and A3J-3 models which both featured a hump-backed forward fuselage section.

### Extremely sophisticated

The Vigilante was also extremely sophisticated for its day, featuring a number of innovations, not least of which was the unique linear weapons bay. Essentially, this took the form of a tunnel located between the engines, long enough to accommodate not only a nuclear weapons, but also a pair of fuel tanks. Loading was accomplished from the rear, the weapon and tanks being inserted as a single unit with the fuel tanks aft. Fuel contained in these tanks would

be consumed during the flight to the target area.

Weapons release was relatively simple, in theory. The bomb and tanks were ejected rearwards in toto, with the fuel tanks thereafter acting as stabilising devices during the weapon's brief fall to earth under the influence of gravity. It was originally intended to fit two hydraulically-actuated clam-shell doors at the after end of the Vigilante bomb bay but this idea was eventually abandoned in favour of a more simple arrangement whereby a cone-shaped fairing was fitted. This was effectively a "throw-away" device, being jettisoned moments before the weapon/fuel package was ejected by means of a solid-fuel cartridge. Electrical connections, fusing actions and routine maintenance operations relating to the nuclear device were accomplished via a non-structural panel situated in the aircraft's belly.

In reality this concept proved to be very difficult to perfect. All kinds of problems were encountered with weapons separation or, as was apparently often the case, failure to separate. In the end, despite extensive testing, the system was never perfected and it was certainly not used operationally. On the RA-5C, the now redundant bomb bay area was used to house three fuel cells with a total capacity of 885 US gal (3,350 l) as well as some of the reconnaissance-related equipment.

In the tactical role, weapons carrying capability was thus confined to a pair of underwing stores

stations on the A3J-1 which was able to operate with a variety of ordnance, including tactical nuclear weapons, conventional iron bombs, Bullpup air-to-surface missiles and practice bomb dispensers. On the later A3J-2 and A3J-3—both of which made their respective debuts after the Navy relaxed its, nil-wind take-off requirement which in turn permitted operations at rather greater gross weights—the number of stores stations rose to four. Each was able to carry either bombs or, if additional range was required, 400 US gal (1,514 l) auxiliary fuel tanks. Indeed, it is not generally realised that the RA-5C retained strike capability until the end of its days.

### Never employed

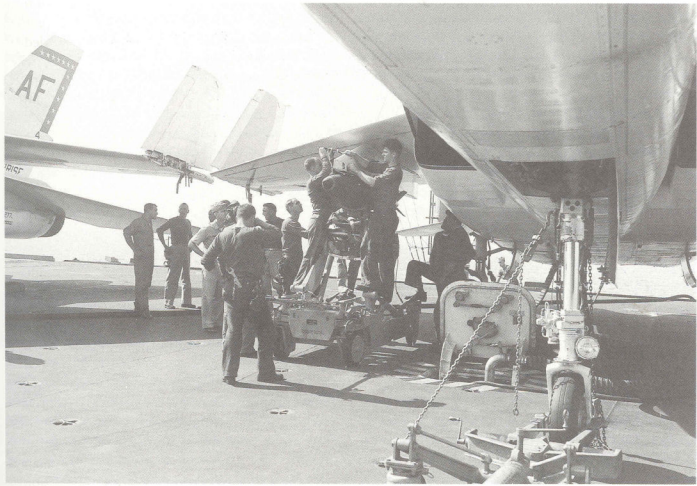
As far as is known, the Vigilante's strike potential was never employed in Vietnam but had the need arisen there is no doubt that the RA-5C could have been pressed into service to deliver "special" or nuclear weapons. For the most part, the aircraft seems to have operated in "clean" condition for optimum performance and its fairly impressive speed of 620

kts (1,149 km/h) at sea level was of great value in South-East Asia, where it was generally acknowledged that post-strike reconnaissance ranked high among the more difficult ways of earning combat pay. For Vigilante crews, the old adage "speed is life" was most certainly true . . .

In addition to the bomb bay, the fuselage also housed the engine installation, a pair of General Electric J79 afterburning turbojets buried side-by-side in the aft section. Although the engines themselves failed to break much new ground, air intake design certainly did, the Vigilante being one of the first types to benefit from variable geometry ramps.

These ramps were employed in conjunction with a sensing system to provide a smooth flow of air to the engines. Hydraulically-actuated, they were situated in the roof of each intake; forward and aft variable sections were adjustable through a range of angles from zero to 23 degrees with programming accom-

**Below:** VAH-7 was the first operational unit to take the Vigilante to sea, deploying on the USS *Enterprise* for a short Mediterranean cruise in summer 1962. Here, deck crew load bombs on to an A3J-1.





Above: RA-5C Vigilante 150823 of the NATC's Flight Test Division snags the wire during the course of arrestment trials at Patuxent River. This aircraft spent its entire service life with the NATC.

plished automatically to eliminate the formation of shock waves.

On the initial prototype, development YJ79-GE-2 engines—rated at 10,350lbst (4,700kg) dry and 15,150lbst (6,880 kg) with thrust augmentation were used, while production J79-GE-2s were fitted to the early A3J-1s. Further development of the engine led to the J79-GE-4 which, although possessing identical ratings, was an improvement by virtue of the use of steel rather than magnesium alloy for the stator cases and front frames. Yet another change was made before A3J-1 production terminated, the slightly more powerful J79-GE-8 being adopted and this was also fitted to the A3J-2 and the A3J-3. Wet and dry ratings were 16,500lbst (7,490kg) and 10,450lbst (4,744kg) respectively for the 'dash 4' and 'dash 8' engines.

Ultimately, the J79-GE-10 evolved. This variant of the General Electric powerplant was installed in the 36 RA-5Cs that were manufactured in response to the 1968 re-order. Dry rating of the 'dash 10' version was 11,870lbst (8,110kg) at sea level. However, some modification to the air intakes was necessary in order to cope with increased mass air flow and the opportunity was also taken to add wing root fillets to enhance longitudinal control when on final approach. Today, such additions are known as LERX (Leading Edge Root Extensions), the F/A-18 Hornet being one modern type which possesses this feature.

### Use of titanium

Much of the structure in and around the Vigilante's engine bays embodied titanium; approximately 2,400lbs (1,090kg) of this material was used in the construction of each aircraft while the inner surface

"hot spots" incorporated heat-reflective gold film which was sprayed on before being literally baked into place. Such refinements contributed towards making the Vigilante a somewhat expensive beast. Other materials like the Alcoa 2020-T6 aluminium-lithium alloy which was used as skinning for wings and tailplane were, if anything, even more costly.

The forward fuselage section was considerably more slender and at certain angles of attack resulted in the Vigilante taking on the appearance of a cobra about to strike. This section housed the two-man crew with separate cockpits provided for the pilot and the bombardier/navigator (reconnaissance/attack navigator or RAN on the A3J-3/RA-5C). Access was gained by rearward-hinging canopies and this was, according to some accounts, not always easy to achieve when at sea, the Vigilante's long nose section tending to make life difficult in certain deck parking areas.

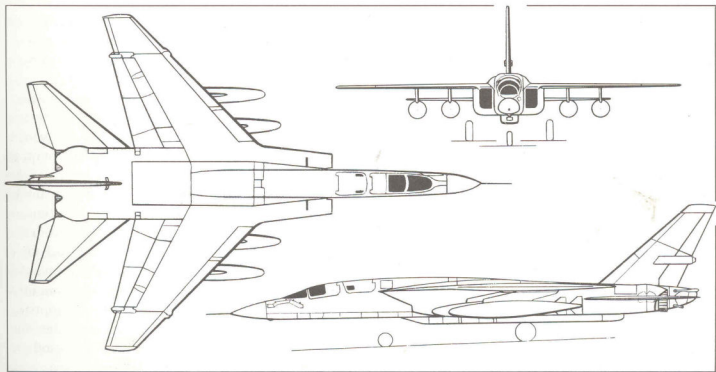
As far as the pilot was concerned, he was quite fortunate in having a fairly good field of view, the forward cockpit featuring a conventional windscreen and canopy. For the navigator, things were not quite so good—but they could have been worse. The initially-proposed fully transparent second canopy was at one time likely to be replaced by an entirely solid unit. While this would have been best from the point of view of tasking in that it offered ideal conditions for monitoring the radar display and also providing a greater degree of protection from nuclear blast effect, it did not exactly meet with approval from those who would have to work in the rear cockpit. The main objection arose from nothing more than good old-fashioned claustrophobia...



Eventually, a compromise solution was found in which small glazed areas were provided on each side. These overcame the claustrophobia problem but physiological monitoring of Vigilante BNs/RANs later revealed that heart-beat rates during final approach to an aircraft carrier were often higher than those of the early astronauts. This condition was eventually attributed to the fact that forward vision was non-existent, which basically meant that the poor "GIB" (guy in back) had no way of knowing whether his pilot was flying a good approach or not.

**Above: Modified with a ventral canoe to assess the aerodynamic qualities of the RA-5C derivative of the Vigilante, 146699 was never actually updated to full reconnaissance configuration.**

Fear of the dreaded "ramp strike" was obviously still quite well entrenched when the Vigilante entered service and probably remained high throughout the type's operational career. But the lack of vision almost certainly worked both ways for it seems that RANs were generally more relaxed than pilots when engaged in combat, presumably for the simple





Above: Typical upper surface markings can be seen on this RA-5C from RVAH-5 aboard the USS *America* in summer 1966. Below: Four RA-5Cs from RVAH-11 maintain good formation as they overfly Albany on the occasion of the squadron's transfer from Sanford.



reason that they were unable to see all the flak that was being aimed their way by North Vietnamese gunners.

Both cockpits were fitted with Columbus-designed North American HS-1 ejection seats which were initially effective at all altitudes throughout the 90-kt (167 km/h) to supersonic speed range. Later modification resulted in genuine zero-zero seat capability.

Ergonomic factors were taken into account when designing the cockpit layout with controls and displays grouped together as far as possible in line with both function and frequency of use. Broadly speaking, on the RA-5C at least, this resulted in reconnaissance-related controls being positioned to

port; those for the radar to front and forward and nav/comm equipment to starboard.

In the extreme nose section, ahead of the pilot's cockpit, were the antenna for the search radar, and elements of the AN/ASB-12 bombing system package together with plumbing related to the fully retractable in-flight refuelling probe which was situated to port.

If the fuselage contained its fair share of innovations, the same claim could also be made of the wing which possessed a number of radical new features. Perhaps the most notable—and certainly the most visible—of these was the flight control system, which eliminated the need for ailerons to provide roll control but also embodied a primitive form of “fly-by-wire”, something which has generally been perceived as a development of the 1970s.

Performance stipulations laid down by the Navy were instrumental in dictating the use of a large wing with 37.5 degrees of sweep at the quarter-chord line while at the same time possessing a surprisingly low thickness-chord ratio of just 3.5%. The Navy's nil-wind take-off requirement also necessitated the adoption of a complex high-lift system, based initially at least, on the use of leading edge droop and blown flaps. On the later A3J-2/3 models, this arrangement was reversed, blowing being provided for the drooping leading edge and eliminated from the flaps which were slightly larger. To facilitate stowage aboard carriers, the outermost wing sections folded upwards, reducing span from 53 ft (16.17 m) to 42 ft 4 in (12.90 m).

### Unique spoiler

In place of conventional ailerons, North American opted for a unique spoiler/deflector arrangement to provide roll control. Situated at about the mid-span position on each wing, paired spoilers and deflectors provided a flow of air through the wing when both were open, the twin inboard sections on each wing featuring spoilers on the upper surface and deflectors on the under surface. On the third, outboard, section, this arrangement was reversed, with the spoiler (which could also be used for yaw compensation) below and the deflector above.

The Vigilante's horizontal tail surfaces were rather more conventional, of the “all-flying” type and providing pitch control and trim when used in concert.



Above: Another view of the RA-5C aerodynamic test bed. The sensor canoe is clearly visible beneath the aircraft's belly as are the four underwing 400 US gallon jettisonable auxiliary fuel tanks.

Differential movement, which was fairly restricted, was used for roll trimming. The vertical tail was also of the "all-flying" type to meet control and directional trim requirements. Initially, North American had intended to use a twin-fin layout, similar to that of the F-14, F-15 and F-18, and this was present on the mock-up. By the time the Vigilante made its first flight, the design had been revised in favour of a single fin. This incorporated a folding section which reduced the height of the aircraft from 19 ft 4 in (5.91 m) to 15 ft 6 in (4.73 m).

In normal operation, longitudinal and lateral control inputs were relayed to the respective moving surfaces by means of electrical signals or "fly-by-wire", the Vigilante pioneering developments in this field. In the event of electrical failure, mechanical back-up systems were available. By way of a contrast, directional control inputs relied on the use of a mechanical system but all of the moving surfaces were hydraulically-powered, irreversible systems.

At one stage, North American envisaged using compressed nitrogen rather than hydraulic fluid for the main power system, eventually shelving this idea in favour of dual 3,000 psi (211 kg/cm<sup>3</sup>) hydraulic systems driven by variable displacement pumps. Early production aircraft had one pump on each engine but this was later increased to two per engine, these providing power for independent flight control systems. The utility system was actually combined with the flight controls to satisfy other hydraulic requirements, and was isolated from the flight control system once the aircraft had been "cleaned-up" after launch.

Emergency power was provided by a Garrett AiResearch ram-air turbine situated in the fuselage

just ahead of the main undercarriage bay—this dropped out automatically in the event of electrical failure and was intended to provide emergency power for the primary flight control system as well as emergency electrical power. In the more normal course of events, the latter was furnished by two engine-driven 42 kVA generators, transformer-rectifiers supplying either 115 Volt AC or 28 Volt DC power.

Since it was conceived for the strategic strike role, it follows that the Vigilante would need good range characteristics, although, on the A3J-1 at least, these were to some extent compromised. Nevertheless, the initial variant carried a fairly respectable amount of fuel, total internal capacity being some 2,805 US gal (8,383 l). Integral tanks situated in each wing each had a capacity of 715 US gal (2,706 l). In the fuselage, two bag tanks located just a little way aft of the cockpit were able to take 655 US gal (2,479 l) between them. Finally, a saddle tank above the bomb bay adjacent to the leading edge of the fin held a further 130 US gal (492 l).

In addition, the linear weapons bay tanks had a capacity of 590 US gal (2,234 l). Suitably-configured Vigilantes were sometimes pressed into service as "tankers", with a hose reel and drogue assembly inserted into the weapons bay along with an extra fuel tank of 290 US gal (1,100 l) capacity.

### Carriage of fuel

Later, following the decision to abandon further development, the weapons bay was given over entirely to the carriage of fuel, the definitive RA-5C accommodating three fuel cans in this location with a combined capacity of 885 US gal (3,350 l). An additional saddle tank—of 210 US gal (795 l) capacity—was installed overwing on the A3J-2/3 models which introduced the deeper fuselage, this new feature permitting the forward fuselage tanks to be enlarged and they were now able to take 945 US gal (3,577 l) between them.

Internal fuel capacity of the RA-5C was, therefore, a respectable 3,600 US gal (13,633 l). In this configuration, subsonic high altitude combat radius rose to an impressive 1,310 nautical miles (2,428 km). Comparable figures for a "clean" aircraft, including some supersonic flight, were still quite respectable, at 475 nautical miles (880 km).

# Sensors and Systems

**I**F THE BASIC Vigilante airframe was itself impressive, what lay hidden beneath the surface was no less so, North American's design featuring a sophisticated and highly complex array of "goodies" to assist in the performance of its mission. At the heart of these was the AN/ASB-12 bombing system, a package in part based upon earlier work by North American's Autonetics Division for the B-64 Navajo strategic missile, a weapon system which failed to enter production.

**Below:** Following the completion of a sortie, a technician removes exposed film cassettes from the oblique camera of an RA-5C of RVAH-6 "Fleurs" on board the USS *Forrestal* in the summer of 1974.



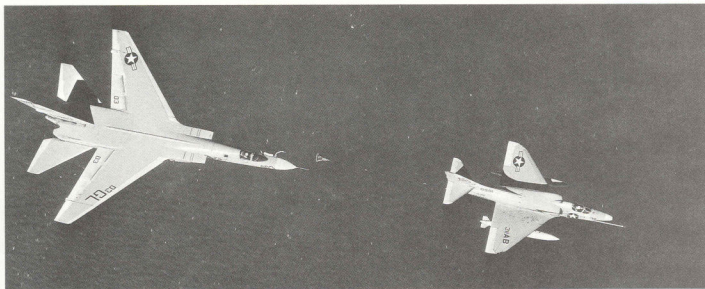
Application to the Vigilante resulted in what was arguably the most advanced Automatic Flight Control System (AFCS) thus far installed in a production aircraft. Elements of the package included an advanced autopilot, a General Dynamics Electronics multi-mode radar, North American's own NASARR radar computer to furnish terrain avoidance and weapons delivery data via a Pilot's Projected Display Indicator (PPDI) set, a closed-circuit television system, a Radar-Equipped Inertial Navigation System (REINS) and, last but not least, a Versatile Digital Analyser (Verdan).

Collectively, this was the AN/ASB-12. It permitted bombing and reconnaissance operations to be accomplished in virtually all kinds of weather, although the latter was to some extent dependent on VFR conditions if the objective was primarily of a photographic nature.

Data generated by AN/ASB-12 components was presented to the crew via radar display screens. The PPDI permitted heads-up operation with cues pertaining to terrain avoidance, ground or contour map, altitude, heading and weapon delivery being notified to the pilot on a diachroic mirrored surface which protruded above the instrument panel shroud. In the rear cockpit, the bombardier-navigator/reconnaissance-attack navigator had conventional radar displays to assist him in his tasks.

## System complexity

System complexity was such that it took some considerable time—and quite a bit of hard cash—to “get it right”. Indeed, research and development related to the Vigilante's system swallowed up many millions of dollars prior to and after entry into service. Reliability levels were not all that they might have been at the start; an example was provided by the fact that Verdan mean time between failure (MTBF) was still rated in minutes more than a year after the type's



Above: With its refuelling probe extended, an A3J-1 Vigilante of VAH-7 prepares to take a "drink" from an A4D-2N Skyhawk of VA-172 in April 1962, shortly before VAH-7's maiden 6th Fleet visit.

maiden flight. Ultimately, "tweaking" of the package greatly improved matters, Verdant eventually attaining reliability levels of around the 500-hour mark. Similar gains were achieved with other key elements of the system but the early years of the Vigilante's career must have been quite frustrating, especially when viewed in conjunction with the difficulties then being experienced with weapons release.

### Unmatched intelligence-gathering

By the time that the change was made to the reconnaissance task, many of these failings had been largely overcome and the Vigilante thereafter settled in to its new role with increasing confidence being expressed by all of those associated with it. Secretary of Defense Robert S. McNamara remarked in the spring of 1962 that the RA-5C's intelligence-gathering potential could not be matched by "any other device in the Navy inventory".

McNamara's confidence was well placed and the Vigilante very quickly became the Navy's principal reconnaissance tool, employing a variety of sensors and cameras in the execution of its daily tasks. For the most part, the equipment was accommodated in a long fairing or "canoe" beneath the aircraft's belly although some items encroached into the fuselage.

Technically, the 'canoe' was removable so as to permit the RA-5C to perform the attack mission—in

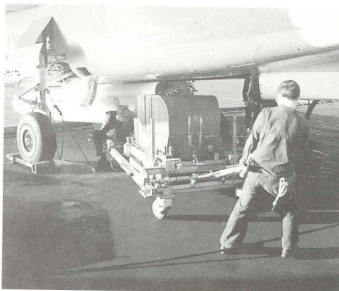
practice, removal had little impact on performance or handling qualities and it seems generally to have been left *in situ* throughout the Vigilante's 15-year career as a reconnaissance system.

A mixture of optical and electronic devices were allotted to "stations" located in the canoe, in the fuselage and beneath the wing. Nine different modular packages were available, configurations varying according to mission requirements.

Ten stations existed, generally numbered in strict sequence from the front of the canoe. Three of them were set aside for optical equipment. Station 1, in the nose, housed a forward oblique KA-51A or KA-51B serial frame camera for daylight use only while just to the rear was station 2 which contained an azimuth/vertical serial frame camera, the type varying according to whether it was intended for use by day or night—the KA-51A/B type was effective in either case whereas the KA-50A or KA-62A could only be used by day.

### Passive ECM

Station 3 contained AN/ALQ-61 passive electronic countermeasures equipment (PECM) as did station 3A at the rear end of the canoe. Station 4—in the centre of the fairing—was also dedicated to optical equipment, and intended for occupation by any one of three identically-shaped modules. Thus, for instance, it could employ right and left oblique serial frame cameras for daytime work; a pair of panoramic cameras; two stabilised serial frame cameras for use by day or night or two serial frame cameras



Above: Two of "Heavy Six's" maintenance troops wheel a panoramic camera module away from an RA-5C Vigilante after removing it from the ventral canoe which houses most of the reconnaissance gear.

in split-vertical configuration. Equipment associated with photographic reconnaissance was located at station 9, this referring to the inboard wing pylons which were "wired" to take flasher pods for use at night.

Other electronic equipment was to be found in stations 5 and 6. The former occupied fuselage space directly above station 4 and consisted of electronics associated with the reconnaissance equipment, which included a camera control unit, a recorder amplifier and a data converter as well as a couple of receivers. Also buried in the fuselage just to the rear of station 5 was station 6 which comprised PECM canisters.

Finally, there were the radar sensors of stations 7 and 8. The former essentially was a small "blister" on the base of the canoe to house AN/AAS-21 infra-red mapping radar. The main body of the rear half of the canoe constituted station 8 which contained an AN/APD-7 side-looking airborne radar (SLAR).

### Generation of data

This array of equipment was capable of generating a considerable amount of data and a variety of processing techniques were required to satisfy the unique characteristics of each. Close co-operation between the manufacturer and the service resulted in the appearance of the Integrated Operational Intelligence Center (IOIC)—later renamed the Carrier Intelligence Center (CVIC)—and it was this which

was in many ways the heart of the system. Basically, it comprised a collection of trucks and trailers which housed specialised processing equipment as well as interpretation facilities and it was equally at home on a shore base or at sea aboard an aircraft carrier. In conjunction with the RA-5C itself, the IOIC/CVIC constituted the Integrated Operational Intelligence System (IOIS).

### Single supersonic recon pass

In practice, to gain maximum advantage from the IOIS, the RA-5C was only required to make a single pass over the target area at supersonic speed at high or low level with all sensors running in order to acquire continuous full-spectrum PECM, IR, SLR and optical intelligence. Associated equipment automatically added a matrix block displaying data pertaining to geographic location and time correlation—it was this matrix which played a vital part in subsequent correlation and analysis by CVIC technicians and intelligence specialists for it enabled material to be accurately and promptly recalled for detailed study. Targets detected by one sensor or another could be isolated for further study and, if necessary, it was always possible to cross-refer to other data generated by the sortie to obtain a clearer "picture". Comparison with earlier or later material relating to the same area could often be enlightening in that this enabled intelligence specialists to monitor the developing scene.

Below: For much of its life, the Vigilante was what can only be described as maintenance intensive. Here, technicians of RVAH-11 examine an RA-5C aboard the USS *Kitty Hawk* in WestPac in 1969.





Above: The Naval Air Test Centre was involved in all phases of Vigilante trials. RA-5C 150824 is from the Flight Test Division.



Above: Featuring bicentennial trim, an RVAH-12 RA-5C is prepared for launch from USS *Enterprise* in March 1975.



Above: Lacking Air Wing code letters and a carrier name, this RA-5C is from RVAH-7 and was probably photographed in 1966.

Location of national insignia and three-digit modex number can be clearly seen in this upper surface plan view of RVAH-3 RA-5C 149314/GJ-201.



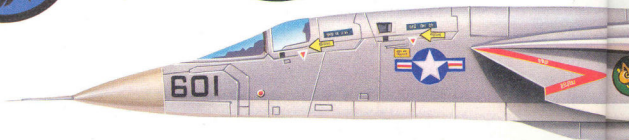
Insignia of RVAH-7 "Peacemakers".



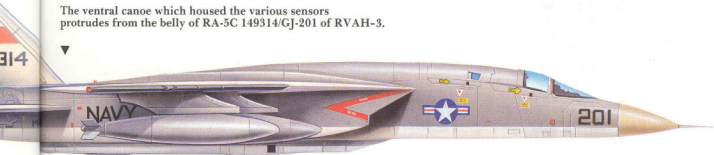
Insignia of RVAH-5 "Savage Sons".



Insignia of RVAH-11 "Checkertails".



The ventral canoe which housed the various sensors protrudes from the belly of RA-5C 149314/GJ-201 of RVAH-3.



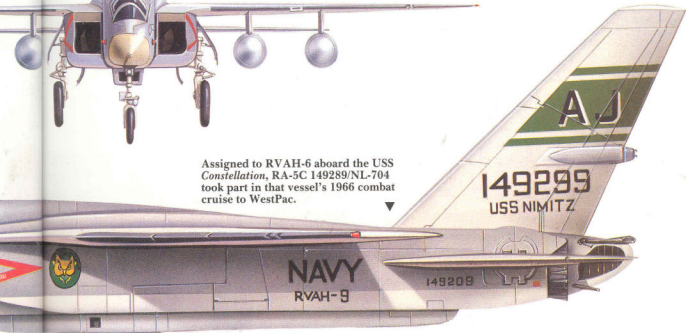
Insignia of RVAH-1 "Smokin' Tigers".

Insignia of RVAH-3 "Sea Dragons".

Four auxiliary fuel tanks are carried underwing in this head-on view of an RA-5C of RVAH-3.



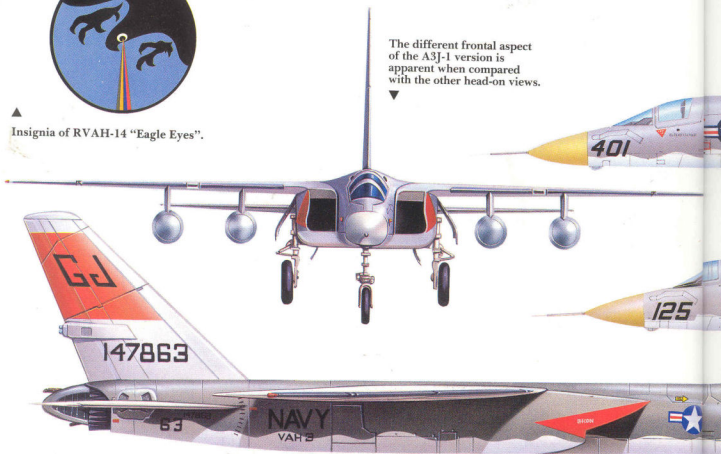
Assigned to RVAH-6 aboard the USS *Constellation*, RA-5C 149289/NL-704 took part in that vessel's 1966 combat cruise to WestPac.





▲ Insignia of RVAH-14 "Eagle Eyes".

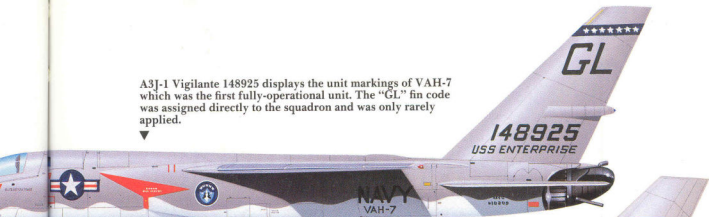
The different frontal aspect of the A3J-1 version is apparent when compared with the other head-on views.



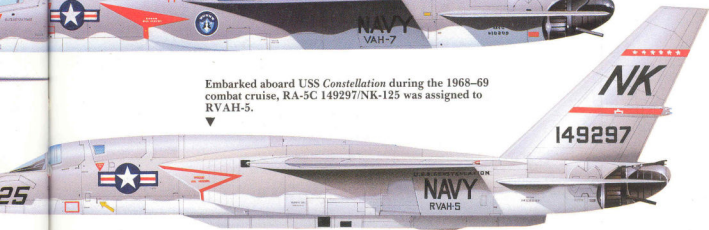
▲ VAH-3 at Sanford, Florida was the first squadron to receive the A3J-1 version and served as a training unit for the Vigilante community between 1961 and 1979.



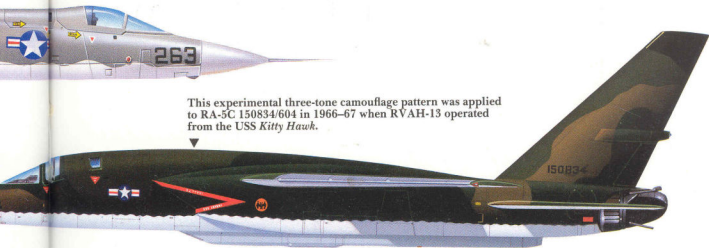
A3J-1 Vigilante 148925 displays the unit markings of VAH-7 which was the first fully-operational unit. The "GL" fin code was assigned directly to the squadron and was only rarely applied.



Embarked aboard USS *Constellation* during the 1968-69 combat cruise, RA-5C 149297/NK-125 was assigned to RVAH-5.



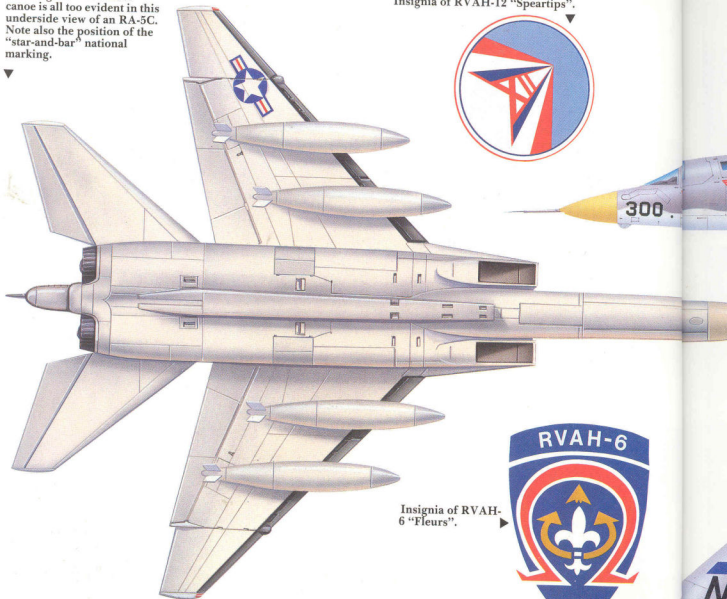
This experimental three-tone camouflage pattern was applied to RA-5C 150834/604 in 1966-67 when RVAH-13 operated from the USS *Kitty Hawk*.



Also from RVAH-13 "Bats", RA-5C 156613/AG-601 featured standard colours while assigned to the USS *Independence* in 1975-76.

The length of the sensor canoe is all too evident in this underside view of an RA-5C. Note also the position of the "star-and-bar" national marking.

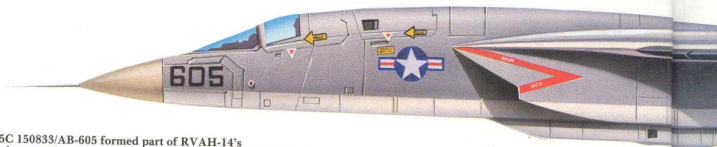
Insignia of RVAH-12 "Spartans".



Insignia of RVAH-6 "Fleurs".

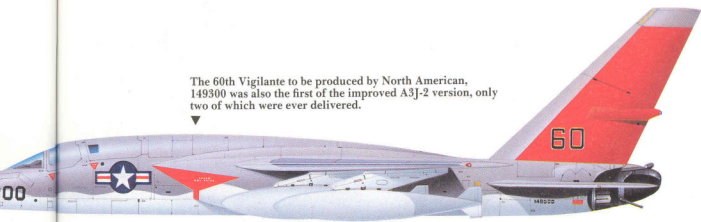


▲ RVAH-9 took its RA-5Cs aboard the USS *Nimitz* for that carrier's maiden deployment to the Mediterranean in 1976-77.

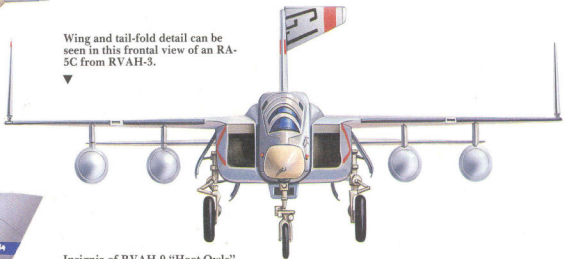


▲ RA-5C 150833/AB-605 formed part of RVAH-14's complement when this unit visited the 6th Fleet on the USS *John F. Kennedy* in 1972.

The 60th Vigilante to be produced by North American, 149300 was also the first of the improved A3J-2 version, only two of which were ever delivered.



Wing and tail-fold detail can be seen in this frontal view of an RA-5C from RVAH-3.



Insignia of RVAH-9 "Hoot Owls".



Insignia of RVAH-13 "Bats".



Above: Three A-5As of VAH-7 overfly the shore base at Sanford, Florida in February 1963. Below: An RA-5C of training squadron RVAH-3 gets airborne during a carrier qualification period.



Above: Seen during routine operations with the 6th Fleet in the Mediterranean in 1967, an RA-5C of RVAH-5 aboard the USS America is well set for an arrested landing at the end of another sortie.

Below: The first example of the follow-on production batch, BuNo 156608, was assigned to RVAH-7 when this picture was taken somewhere over the Philippines in May 1979 during the type's last development.



Above: Displaying the rarely used "GM" tail code combination and unusual single-digit nose numbers, these two late production RA-5Cs were assigned to RVAH-9 when photographed near Albany in May 1970.

# The Vigilante in Service

**E**VEN THOUGH THE Vigilante was somewhat less than successful as a heavy attack aircraft, attack-dedicated examples of North American's heavyweight did ultimately succeed in completing a few deployments aboard a couple of Navy carriers during the early 1960s before the switch to the reconnaissance mission came about.

Before the first major deployment was made, however, a considerable amount of time was spent in preparation. In some respects, this process could be considered as having begun as early as July 1960, for it was in that month that the first sea trials were accomplished on the USS *Saratoga* (CVA-60). Although those tests proved that the Vigilante could both launch from and recover aboard a carrier at sea, they also showed that it was still quite a long way from being an operational system. Delivery of production-configured aircraft still lay almost a year away and that milestone would inevitably be only the precursor of a fairly lengthy period of training aimed at familiarising air and ground crew with the vices and virtues of the North American machine.

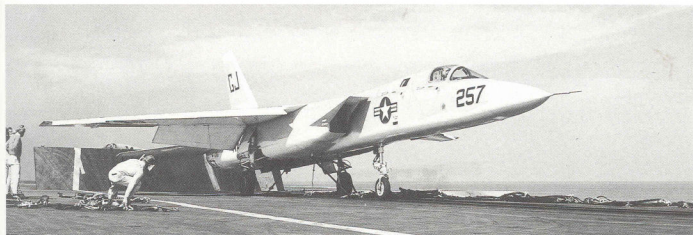
At the time that the Vigilante made its debut, the Navy had only recently implemented a drastic revision of policy with regard to crew training, establishing a number of specialist RAG (Replacement Air Group) squadrons to support the various "communi-

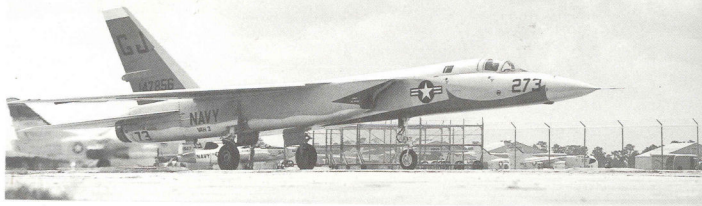
ties" which then existed within the service. For instance, pilots and maintenance personnel of the Atlantic Fleet who were destined to be associated with the F8U Crusader initially reported to fighter squadron VF-174 at Cecil Field, Florida for training prior to joining an operational sea-going billet. In much the same way, their Pacific Fleet counterparts went first to VF-124 at Miramar, California.

Similar arrangements existed for the A4D Skyhawk 'community' and these would, presumably, have been introduced for the Vigilante had it fulfilled its original role of heavy attack. When the A3J was switched to the reconnaissance role, this change of mission also had quite an impact on training policy. One factor which influenced training arrangements was undoubtedly the number of aircraft involved, as the typical strength of a Heavy Attack Squadron (VAH) was 12 aircraft when at sea.

With each major fleet having several VAH units, it clearly made sense to provide separate RAGs within the Atlantic and Pacific Fleet organisations, if only to limit the probability of overcrowding. Units employed in the RAG capacity for the heavy attack community were VAH-3 (Atlantic) and VAH-123

**Below:** With the bridle attached and the hold-back link secure, an A-5A of VAH-3 awaits launch from USS *Independence* in late 1962 when training of personnel for Fleet units was well under way.





Above: Featuring a rather distinctive paint job, A3J-1 147856 of VAH-3 threads its way past a number of A3D Skywarriors as it taxis for take-off for another training mission from Sanford.

(Pacific). Both operated variants of the A3D Skywarrior and furnished a steady flow of aircrew and technicians to the deployable front-line units of Heavy Attack Wing One (HAtWingOne) at Sanford and Commander, Fleet Air Whidbey (ComFAirWhid) at Whidbey Island, the latter agency exercising control of Pacific Fleet VAH units following the disestablishment of HAtWingTwo on 30 June 1959. Once at sea aboard a carrier, VAH squadrons and detachments followed standard Navy practice and reported to the Commander of the embarked Carrier Air Group for operational control.

Production examples of the initial A3J-1 variant actually began to reach "Heavy Three" at Sanford on 16 June 1961 when the first four aircraft were handed over and, after a fairly brief period of familiarisation, it very quickly set about training personnel for the first operational squadron. This was VAH-7 which entered the transition phase in the summer of 1961, spending several months at 'school' with VAH-3 before taking delivery of the first of a fleet of 12 aircraft in late January 1962.

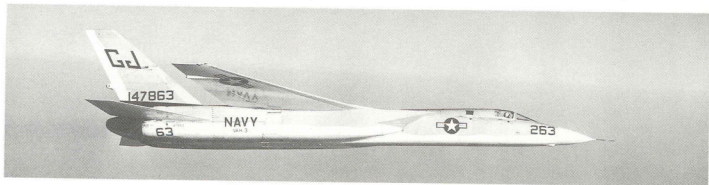
Despite the fact that the Vigilante was arguably the most sophisticated and complex type yet to enter Navy service, within a matter of months the A3J-1 had embarked for its maiden operational deployment. A dozen aircraft of VAH-7 went to sea at the beginning of August on a cruise which, although of only relatively brief duration, was nonetheless significant on several counts.

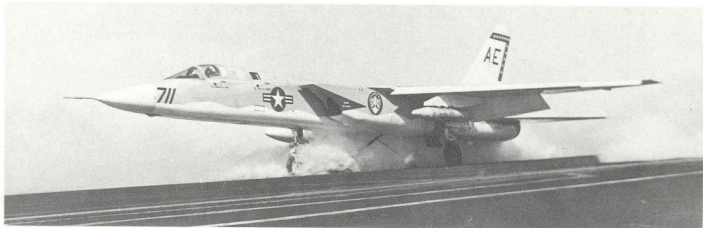
With the switch to the reconnaissance task occurring at about the time that the Vigilante entered service and with the number of aircraft assigned to Reconnaissance Attack Squadrons (RVAH) at sea being initially exactly half that of the VAH units (i.e. six instead of 12), it was possible to concentrate the RVAH 'community' at a single shore base and simultaneously limit training resources to a single RAG. Sanford Naval Air Station (NAS) in Florida was the site selected and HatWingOne's RAG, VAH-3 (often referred to simply as "Heavy Three"), duly picked up responsibility for Vigilante training in 1961.

Below: Something of the aesthetic appeal of North American's bomber can be seen in this in-flight study of an A3J-1 from VAH-3 at Sanford. Presentation of markings was typical for 1961-62.

### Operational debut

Perhaps most importantly, it marked the operational debut of the nuclear-powered USS *Enterprise* (CVAN-65), the carrier spending a couple of months





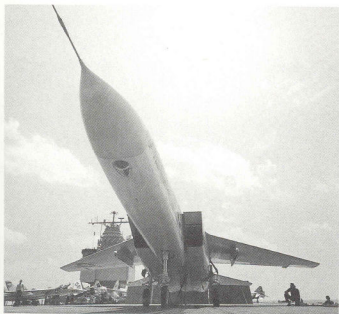
Above: With a practice bomb dispenser beneath the port wing and a fuel tank to starboard and partly shrouded by steam, an A-5A of VAH-7 accelerates rapidly on launch from the USS *Enterprise*.

with the 6th Fleet in the Mediterranean during which time it participated in a succession of NATO exercises. At the same time it witnessed the operational debut of the *Vigilante*, but yet another important debutante was the McDonnell F4H-1 Phantom, VF-102 claiming the distinction of being the first Navy fighter squadron to take this type into 6th Fleet waters by just a matter of hours, since VF-74 sailed on the USS *Forrestal* on the very same day as the "Big E" left Norfolk.

Operating as part of Carrier Air Group Six (CVG-6), VAH-7 spent little more than two months at sea on this occasion. It returned to the USA with the *Enterprise* on 11 October and spent the Christmas and New Year season at home in Florida in the aftermath of the Cuban missile crisis.

The shock waves of that period of tension had

Below: The long and slender nose section of the *Vigilante* is perhaps slightly distorted in this unusual wide-angle view of an A3J-1 about to launch from one of the *Enterprise* bow catapults.

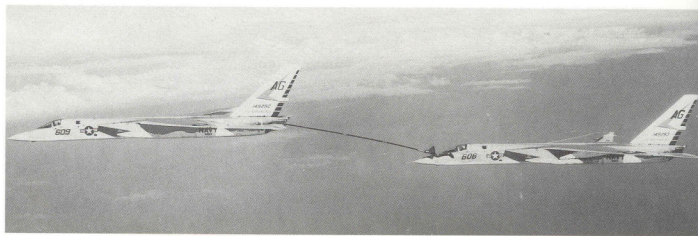


barely died away when "Heavy Seven" went back to sea, again joining CVG-6 on the *Enterprise* which sailed for its second Mediterranean visit on 6 February 1963. This time, however, it was a full-length cruise, the carrier and its embarked squadrons spending the next seven months at sea before they were relieved by the USS *Independence* (CVA-62) and CVG-7 in late August.

Amongst the units aboard the latter carrier was VAH-1 which had entered transition in September 1962, at more or less the same time as the various *Vigilante* models were redesignated following the introduction of the unified nomenclature system on 18 September. By the time that VAH-1 accepted its first aircraft on 22 January 1963, the original A3J-1 designation had given way to A-5A while the A3J-2 was now known as the A-5B and the A3J-3 had become the RA-5C, both of these two variants having flown for the first time in 1962.

### Intensive training

Following an intensive period of training, carrier qualification and shakedown operations, VAH-1 was considered ready to begin its first (and, indeed, only) major A-5A deployment with the rest of CVG-7. Sailing for the Mediterranean on 6 August, the "Indy" was also present for exactly seven months before she was in turn relieved by the *Enterprise* in February 1964. While ashore, the Navy had again indulged in a redesignation exercise which resulted in the Carrier Air Groups (CVGs) being retitled as Carrier Air Wings (CVWs) with effect from 20 December 1963. Thus, CVG-6 was now known as



Above: The second operational squadron to receive the A-5A was VAH-1 on the USS *Independence*. Here, a pair of Vigilantes from "Heavy One" indulge in a session of in-flight "buddy" refuelling.

CVW-6 but otherwise it was pretty much the mixture as before; VAH-7's A-5As were on board for what proved to be the last full-length tour of operations by this Vigilante sub-type.

It was also the most far-ranging. *Enterprise* and CVW-6 entered the Mediterranean in late February 1964 and remained on station as part of 6th Fleet resources until 29 July when they turned over their operational commitment to the USS *Forrestal* and CVW-8. In the normal course of events, the carrier would then have headed for its home port on the US East Coast—but this cruise was far from normal. *Enterprise* and CVW-6 instead turned southwards after passing Gibraltar on the first leg of a voyage which would take them around the World.

Forming the spearhead of Task Force One (TF1), *Enterprise* was accompanied by two other nuclear-powered and missile-armed warships—the cruiser USS *Long Beach* (CGN-9) and frigate USS *Bainbridge* (DLGN-25)—on "Operation Sea Orbit", a cruise which effectively signalled the Navy's ability to conduct prolonged operations on a global basis. Moving south down the Atlantic Ocean, TF1 rounded Africa's southern tip and then crossed the Indian and Pacific Oceans, before returning to Atlantic waters via Cape Horn.

Once back in the 2nd Fleet's area of responsibility, the three ships swung north and headed for home, reaching Norfolk, Virginia on 3 October 1964 at the end of a voyage which was made all the more remarkable by virtue of the fact that external support was kept to the bare minimum. Since all three warships relied on nuclear power, there was no need

to take on fuel, but neither did they have to pick up provisions with which to feed ship's company. Indeed, about the only item which was regularly required was fuel for the Air Wing's complement of aircraft since flight operations were conducted throughout the circumnavigation of the globe.

As far as the A3J-1/A-5A was concerned, it appears to have been viewed with a certain amount of ambivalence. For the most part, the Vigilante seems to have been fun to fly with the result that pilots and navigators were generally quite enthusiastic. For the support troops though, the picture was much less favourable, as the general inadequacy of the supply system was matched by shortages of certain critical items with the result that maintaining an acceptable number of aircraft in an "up" status, was, at best, difficult and, at worst, near impossible. The command view was more sobering—as general consensus was that the best thing that could have been done with the A-5A was to leave it behind or, failing that, consign it to the status of a "hangar queen".

TABLE ONE

Carrier Air Wing Code Letter Combinations 1962-79

Atlantic Fleet		
Code	Air Wing	Squadrons Assigned
AA	CVW-17	RVAH-6/7/9/11/12/13
AB	CVW-1	RVAH-11/14
AC	CVW-3	RVAH-1/9/11/12
AE	CVW-6	VAH-7, RVAH-5/13
AF	CVW-6	VAH-7 (1962 only)
AG	CVW-7	VAH-1, RVAH-1/7/9/11/12/13/14
AJ	CVW-8	RVAH-1/6/9/13

# The Vigilante in Service—II

**I**F THE PURE BOMBER version of the Vigilante failed to live up to expectations—and with just two operational squadrons making only four deployments between August 1962 and October 1964, that has to be a reasonable conclusion—the same accusation most certainly could not be levelled at the dedicated reconnaissance variant which went on to enjoy a long and highly successful career. In the period leading up to the service entry of the RA-5C, however, two other sub-types also joined the Fleet but the number of aircraft involved was minimal. Neither ever went to sea in squadron strength although they probably did spend some time aboard Navy aircraft carriers as part of the on-going training programme.

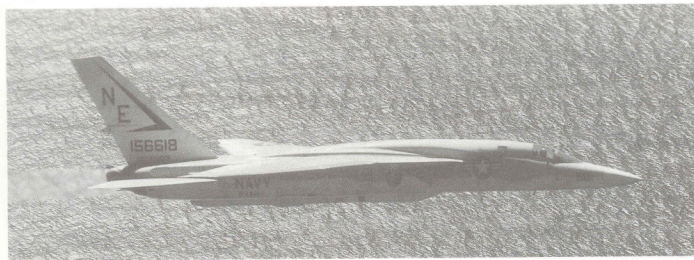
The first of these was the A3J-2 (A-5B post September 1962) and 18 examples of this version (Bu.Nos. 149300–149317) were eventually completed, although only two were ever delivered to the Navy as A-5Bs. Both of the aircraft concerned (Bu.Nos. 149300 and 149302) reached the Fleet in 1963, joining “Heavy Three” at Sanford and being employed solely in the training role for a fairly short interlude before being returned to North American for retrospective modification to RA-5C standard and subsequent re-issue.

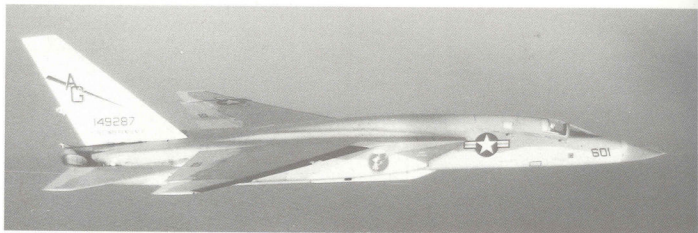
The A-5B also served as the basis for the second sub-type, this being the YA-5C which was operated by VAH-3 as an interim trainer for a short while in the 1963–64 period. Lacking the specialised reconnaissance equipment of the later RA-5C, the four aircraft involved (Bu.Nos. 149301, 149303, 149304 and 149305) were also subjected to post-production modification which brought them up to full RA-5C configuration whilst the 12 A-5Bs which were not delivered (Bu.Nos. 194306–149317) also met with the same fate. Indeed, it fell to some aircraft from the latter batch to make the RA-5C’s operational and combat debut from the USS *Ranger* in 1964–65.

## Summer of '63

Delivery of the RA-5C to the Fleet kicked-off in the summer of 1963 when the first example was ferried to Sanford, Florida where the “Savage Sons” of VAH-5 had been selected to introduce this new reconnaissance platform to full operational service. As was usual, initial deliveries were made to the training unit (VAH-3) and it was not until later in the

**Below:** Almost certainly taken in 1971, RA-5C 156618 carries the insignia of RVAH-1 which completed just one cruise to the Western Pacific as part of Carrier Air Wing Two aboard the USS *Ranger*.



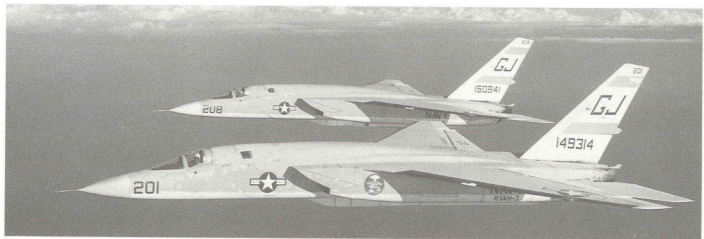


Above: The characteristic hump-backed physical appearance of the A-5B and RA-5C versions of the Vigilante may be clearly seen in this view of an RA-5C from RVAH-1 "Smokin' Tigers".

year that VAH-5 began to acquire its own aircraft. Interestingly, VAH-5 also picked up a few A-5As at this time, using these to speed the training process. They had, however, been relinquished by the late summer of 1964 when "Heavy Five" headed west to meet up with other elements of CVW-9 aboard the USS *Ranger*.

In the intervening period, VAH-5's designation had been changed in recognition of the revised role and, with effect from 1 May 1964, it had been known as Reconnaissance Attack Squadron Five (RVAH-5), the forerunner of an eventual total of ten such units which were created by early 1968. In the early stages at least, transition was accomplished quite quickly. Other squadrons which were subject to redesignation during the course of 1964 comprised VAH-1 (1 September), VAH-3, (1 July), VAH-7 (1 December), VAH-9 (3 June) and VAH-13 (1 November), the change of identity generally taking place as the unit concerned neared the end of the transition phase.

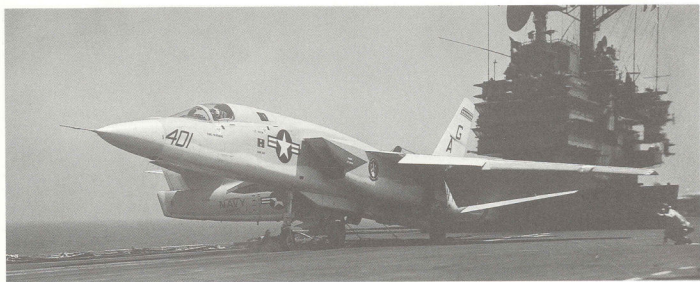
Below: Dating back to about 1966-67, this picture depicts a pair of RA-5C Vigilantes from training squadron RVAH-3 shortly before this and other elements of CRAW-1 moved from Sanford to Albany.



As well as redesignating the squadrons which actually operated the RA-5C, the Navy also elected to change the title of the organisation which acted as a "parent" for the various units during their often quite lengthy shore-based interludes. As noted earlier, the entire Vigilante force was initially concentrated at NAS Sanford, Florida as part of ComNavAirLant's Heavy Attack Wing One and this agency continued to exercise control until August 1964. Then, with heavy attack no longer the primary mission, it was duly retitled as Reconnaissance Attack Wing One (RAWingOne).

### Skywarriors before

Apart from VAH-1 and VAH-7, all of the units which acquired Vigilantes in 1964 had previously operated the Douglas A-3B Skywarrior, a type that was also used by VAH-6 which was redesignated as a Reconnaissance Attack Squadron on 23 September



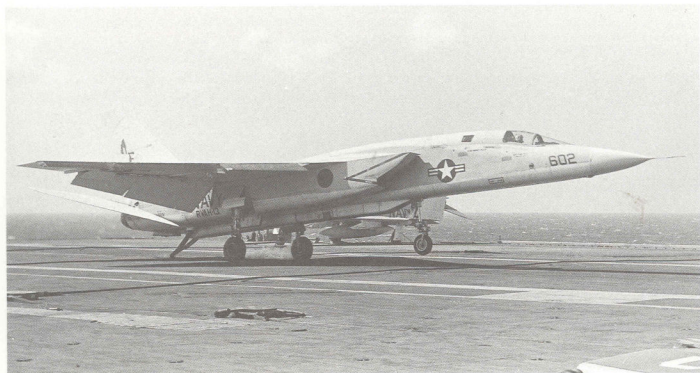
1965 and by VAH-11 which assumed its new identity on 1 July 1966. Two other squadrons were also destined to operate the RA-5C but these were both established specifically for the North American type. These units were RVAH-12 which came into being on 1 July 1965 and RVAH-14, which brought the Vigilante equipment programme to a close when it formed on 1 February 1968.

All of these units took delivery of the RA-5C at Sanford but the last to form had been in existence for just a few months when the Vigilante community

**Below:** With the horizontal tail deflected leading-edge down and with the slats and flaps at maximum extension, an RVAH-13 RA-5C returns to the USS *America* at the end of a combat sortie in 1968.

**Above:** Embarked aboard the USS *Independence* as part of CVW-7 in 1968-69, this RVAH-1 RA-5C displays the personal marking of a two-star Admiral just ahead of the fuselage national insignia.

moved in its entirety to NAS Albany, Georgia. Although the official date of the change is generally acknowledged as being 1 May 1968, the transfer process actually took some time to complete for several squadrons were embarked on that date. As a consequence, these did not reach their new quarters until they returned from sea duty. Similar circumstances prevailed in 1974 when RATWingOne and the various squadrons which made up the Vigilante community moved again, this time in a southerly





Above: The "Savage Sons" of RVAH-5 were first to use the RA-5C in combat. This picture was taken much later, however, when the squadron was assigned to the USS *Constellation* in August 1974.

direction, to NAS Key West at the extreme tip of Florida.

Although the number of active squadrons remained unchanged until May 1974, the steadily diminishing size of the Vigilante fleet did have some considerable impact on the number of aircraft assigned to each of the nine deployable units. This is best illustrated by quoting a few figures. In 1964, when the RA-5C embarked for its first operational cruise, the usual complement at sea was six aircraft and this level was held until about 1971, largely as a result of the follow-on batch of 36 examples that were ordered in 1968 and delivered in 1969-70.

Thereafter, a steady decline set in, units usually taking four or five aircraft to sea during 1971 with the figure stabilising at four in 1972. As it transpired, even this lower level was to prove short-lived, as the

Below: The characteristic nose high Vigilante landing attitude is evident in this view of an RVAH-7 RA-5C returning to the USS *Enterprise* after a mission over North Vietnam in April 1966.



typical complement was cut to just three aircraft in 1973.

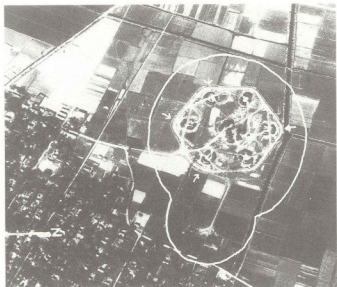
Subsequent reductions in the number of active squadrons permitted this level to be held for the remainder of the Vigilante's front-line career but during the final two or three years, the RA-5C was by no means as commonplace as it had once been. Indeed, in the late 1970s, it was not unknown for Navy aircraft carriers to deploy without any reconnaissance element at all, since the gradual phase-out of the Vigilante was to some extent matched by a similar decline in the size of the RF-8G photo-Crusader force.

However, all that lay some considerable way off in the future when, in the summer of 1964, RVAH-5 was in the final stages of preparation for its first tour with the RA-5C. Assigned to CVW-9 aboard the USS *Ranger* (CVA-61), "Heavy Five" was bound for the Western Pacific (WestPac) for what was originally expected to be a fairly routine peacetime cruise. Final preparations had, in fact, been conducted in

TABLE TWO

Pacific Fleet

Code	Air Wing	Squadrons Assigned
NE	CVW-2	RVAH-1/5/6/7/9/13
NG	CVW-9	RVAH-1/5/6/7/11/12
NH	CVW-11	RVAH-6/7/11/13
NK	CVW-14	RVAH-1/5/7/9/12/13
NL	CVW-15	RVAH-6



Above: Taken by an RA-5C from RVAH-12 on the USS *Constellation* in June 1967, this depicts an SA-2 Guideline SAM site near Haiphong, North Vietnam. The four missiles visible are marked by arrows.

the vicinity of Hawaii in June and July and the *Ranger* was one of the first carriers to be directed to WestPac as part of the US build-up which came about in the wake of the Tonkin Gulf incident of 2 August 1964.

Thus, more or less overnight, the whole emphasis of the deployment changed and it was, perhaps, not totally unsurprising that the Navy elected to confine Vigilante operations by RVAH-5 to South Vietnam where there was less likelihood of losing an aircraft and its sophisticated array of reconnaissance systems and sensors. Missions over the high threat regions of

North Vietnam therefore fell to the RF-8A Crusader pilots of VFP-63's Detachment Mike who probably felt justifiably aggrieved at drawing the "short straw". It is likely that RVAH-5 personnel were not too happy about this decision either, especially in view of the fact that the squadron rejoiced in the, on this occasion, rather inappropriate nickname of "Savage Sons". Nevertheless, it was RVAH-5 which claimed the dual distinction of introducing the RA-5C to full operational service and to combat, this tour ending with a return to the USA in May 1965.

#### Four more squadrons

By the end of 1965, four more squadrons had followed the "Savage Sons" to the combat zone. RVAH-1 was first, spending several months in WestPac aboard the USS *Independence* (CVA-62) as part of CVW-7. Even as RVAH-1's tour was nearing its end, so two more RA-5C squadrons were heading for action, both RVAH-13 and RVAH-7 sailing from the West Coast in October. "Heavy Thirteen" was first to leave, departing with other elements of CVW-11 on the USS *Kitty Hawk* (CVA-63) on the 19th, to be followed exactly one week later by "Heavy Seven" on the USS *Enterprise* (CVAN-65) as part of CVW-9. Finally, "Heavy Nine" also made it to WestPac just as the year was ending, having left the USA in early

Below: With its afterburners glowing, an RVAH-7 RA-5C accelerates down *Enterprise*'s port bow catapult track at the start of another combat mission over hostile North Vietnam in April 1966.



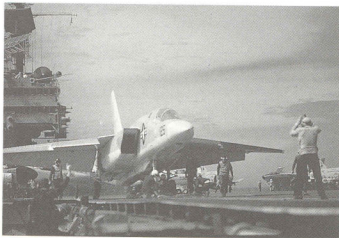
December with CVW-14 on the USS *Ranger* (CVA-61).

Operations were now conducted over both North and South Vietnam, the earlier restriction imposed on RVAH-5 having been lifted. One of the first major tasks of the Vigilante force was that of mapping virtually the whole of North Vietnam. This arose largely in response to a puzzling sequence of bombing errors which were eventually attributed to inaccurate maps—in some cases the degree of error was of the order of four miles (6.4 km). With many targets lying close to one another this clearly made life difficult for those responsible for taking the war to the North.

With regard to combat use, Vigilante squadrons completed a grand total of 31 deployments between the start of US Navy participation in the Vietnam War in August 1964 and the ceasefire in 1973. Top honours were claimed by RVAH-5 and RVAH-6 which both visited the war zone on five occasions. Four squadrons—RVAH-1, RVAH-7, RVAH-11 and RVAH-13—all undertook four tours while RVAH-12 went to South-East Asia three times, leaving RVAH-9 to bring up the rear with two periods of duty. Of the two squadrons which played no part in the war effort, RVAH-3 never made it to WestPac for reasons which are fairly obvious (it was the training unit and never deployed in an operational capacity) while RVAH-14's four cruises were all made with the 6th Fleet in the Mediterranean.

The RA-5C's maiden cruise in the latter area was in fact undertaken by the "Hoot Owls" of RVAH-9 between December 1964 and June 1965 as part of

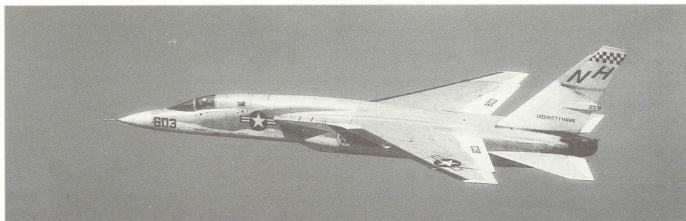
**Below:** Responsible for introducing the RA-5C to combat from the USS *Ranger* in the summer of 1964, RVAH-5 was again in action in summer 1968, this time flying from the USS *Constellation*.



**Above:** Maintenance personnel cluster round an RVAH-9 RA-5C aboard the USS *Ranger* in the Tonkin Gulf in December 1968. Scenes like this were commonplace during the course of the war in Vietnam.

CVW-3 aboard the USS *Saratoga* (CVA-60) but the reconnaissance Vigilante was generally a much rarer sight in this part of the world as a brief study of the deployment figures soon reveals. Between RVAH-5's maiden cruise of August 1964 and the return of RVAH-7 from its final tour to WestPac on the USS *Ranger* in September 1979, RA-5C units completed 73 deployments in all. Of these, 41 were to WestPac with the remaining 32 to the Mediterranean, the destination for all of the four cruises that were made by the original A-5A derivative.

Over Vietnam, the very nature of the Vigilante's mission and the methods employed in its execution inevitably meant that losses would be sustained as a result of enemy action. In the early phase at least, RA-5Cs were called upon to perform pre- and post-strike reconnaissance and it did not take long for the North Vietnamese gunners and missile crews to rumble the fact that, following a raid, a Vigilante (or a Crusader) would soon be along to take pictures of the damage inflicted. All they had to do was wait for



the hapless reconnaissance aircraft, which became the target for a concentrated AAA (anti-aircraft artillery) and SAM (surface-to-air missile) barrage. Inevitably, this succeeded in claiming a number of victims.

At least 23 RA-5Cs are known to have been lost during the course of the Vietnam War, 18 of which were directly attributable to combat action. AAA took the heaviest toll, with 11 confirmed losses to this cause. Although hyped as the major threat, the SAM was rather less successful, with just two aircraft definitely falling victim to the SA-2 Guideline. Two more Vigilantes are known to have been brought down by ground defences but it is not clear whether it was SAM activity or AAA which administered the *coup de grace*.

#### Successful search and rescue

A further RA-5C fell foul of a different type of missile, having the misfortune to tangle with an Atoll-armed MiG-21, and the remaining two casualties were to unknown causes. Operational losses accounted for a further five aircraft, two of which could conceivably have been combat-related. The loss of an aircraft did not necessarily result in the loss of a crew, however, for the various elements of the US armed forces active in South-East Asia had organised an impressive search and rescue organisation which achieved a considerable amount of success during the course of the war. The Navy contributed a fair amount of resources to the SAR network, including armed and armoured helicopters operating from a number of ships in the Tonkin Gulf. Assuming that pilots could succeed in nursing their battle-damaged aircraft as far as the coast before ejecting, they stood every chance of rescue.

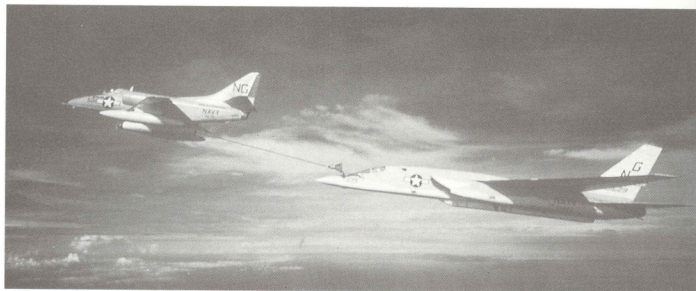
Above: Rather unusually lacking the bureau number on the vertical tail, this RA-5C Vigilante is from RVAH-11 which completed a combat tour to WestPac on the USS *Kitty Hawk* and CVW-11 in 1969.

By 1974, attrition as a result of combat and other causes and the retirement of most of the original Vigilante production aircraft marked the beginning of the end for the 10 squadrons which used the type. RVAH-14 was the first to disappear on 1 May of that year. As far as operational resources were concerned, with the exception of about 10 early examples—all of which had been withdrawn by 1978—it was the final production batch (Bu.Nos. 156608–156643) which saw the Vigilante era out. Frequent trading of aircraft between units was necessary to ensure that reconnaissance commitments were met between 1974 and 1979.

Single squadrons also faded from the scene in 1975 (RVAH-11) and 1976 (RVAH-13) while 1977

Below: The size of the belly-mounted sensor canoe carried by the RA-5C variant is clearly evident in this view of an aircraft from RVAH-12 which operated from the USS *Constellation* in 1967.





Above: In-flight "buddy" refuelling was a routine aspect of combat throughout the Vietnam War. Here, an RA-5C from RVAH-7 on the USS *Enterprise* receives fuel from a VA-76 A-4C in May 1966.

saw the final bow of two more squadrons (RVAH-5 and RVAH-9), before, in the space of just over nine months, the remaining five squadrons were all disestablished. First to go was RVAH-6 in late October 1978 and this was soon followed by RVAH-1 in January 1979. There was then a slight lull before, on 2 July 1979, RVAH-12 was also consigned to limbo, leaving just the training unit RVAH-3 and RVAH-7 to soldier on for few more months. As it turned out, "Heavy Three" survived for barely six weeks, standing down on 17 August while RVAH-7 was still at sea aboard the USS *Ranger*.

Returning from its last cruise on 22 September, RVAH-7 scarcely had time to settle in at Key West

Below: End of the line. Displaying RVAH-14 insignia and partly protected by Spraylat, a now redundant RA-5C soaks up the Arizona sunshine at the Military Aircraft Storage and Disposition Center.



before it too was disestablished, on 28 September. For Key West, this did not quite mark the end of the Vigilante era and it was not until 20 November 1979 that the last example departed, the final nail in the coffin being hammered in on 7 January 1980 when Reconnaissance Attack Wing One disbanded. Of the aircraft which saw out the last years of service, only four were committed to storage at Davis-Monthan, others joining museum collections or being scrapped at Key West, where one example was allocated for as a 'gate guardian' reminder of the type's association with this Florida base.

### To Davis-Monthan

Of the three dozen Vigilantes which found their way to Davis-Monthan between July 1970 and June 1979, most were still present quite recently although a few had been transferred to the New Mexico Institute of Mining and Technology at Socorro for use in the testing of explosives. A handful of aircraft also went to the Naval Weapons Center at China Lake, it at one time being mooted that some Vigilantes would be modified to serve as high-speed drones for weapons testing. This proposal does not seem to have come to fruition, however, and the few aircraft involved will probably end their days as targets on some of the many ranges which may be found within the boundaries of the massive China Lake complex.

# Colours and Markings

SINCE IT HAD BEEN retired from the front-line inventory by the time that the current tactical paint schemes had begun to find wider acceptance, Vigilante colours and markings were by no means as diverse as those employed by some of its contemporaries such as the McDonnell Douglas F-4 Phantom and Grumman A-6 Intruder.

Indeed, with one or two notable exceptions, only one basic colour scheme was ever applied to service aircraft—the standard US Navy finish of non-specular Light Gull Gray (FS36440) upper surfaces with Gloss Insignia White (FS17875) undersides and movable control surfaces such as the fin and flaps. Demarcation lines tended to vary from aircraft to aircraft as study of the accompanying illustrations will soon reveal but the colours used did not change. It should be noted that all aircraft appear to have had natural metal wing leading edges.

Application of national insignia also seems to have changed little from variant to variant, with all Vigilantes displaying the familiar “star-and-bar” marking on both sides of the fuselage ahead of the air intakes as well as above the port wing and below the starboard wing. Black “Navy” inscriptions were located on the aft fuselage sides just behind the main wheel

wells and the squadron number was usually displayed directly below this, again in black. Aircraft designation data was carried beneath the horizontal tail surfaces in conjunction with the Bureau Number which was repeated in full at the base of the fin in conjunction with the name of the carrier to which the squadron was assigned. In virtually all instances, such lettering was also in black.

## Warning arrows

Yellow warning arrows and red intake warning triangles were also usually present but other markings varied according to squadron and air wing assignment. Code letter combinations indicating CVW assignment generally appeared on the upper part of the fin with the individual three-digit modex (side number) being displayed on the extreme nose section, with black generally being employed although there were some variations. In addition, it should be noted that the modex could be repeated in entirety or in abbreviated form at any one of a

**Below:** Typical colours and markings of the early service period are displayed by these A-5As from VAH-7. The lead aircraft, 147854/AE-700, features multi-coloured “CAG” stars on the fin.





Above: One of several Vigilantes involved in camouflage tests in 1966, 150830/705 of RVAH-6 is seen in landing configuration as it returns to the USS *Constellation* at the end of another mission.

number of locations on the airframe. Among those most commonly used were the fin tip, the upper surfaces of the flaps and the aft fuselage beneath the horizontal tail, the latter location being a speciality of VAH-3 in 1961-62. Nose radome colours also varied, with cream most commonly used although black was by no means unknown.

As far as fin code letter combinations are concerned, it is worth mentioning that all RVAH and VAH squadrons possessed unique identification letters, invariably starting with 'G'. However, with the exception of the training unit RVAH-3, which used the 'GJ' combination, these were seldom applied. Instead, it was usual to display the code of the Carrier Air Wing to which the squadron was assigned. A listing of these codes accompanies this chapter.

For the record, details of the individual code combinations are also provided but these were generally only displayed when a particular unit was not assigned to a CVW, such as occurred with RVAH-5 and RVAH-9 in 1977 shortly before these two squadrons were disestablished. In both cases, these were used in conjunction with a three-digit modex for identification of individual aircraft.

Squadron badges were also displayed by most units, often on the sides of the intake wall while other trim was for the most part confined to the vertical tail which provided an admirable "canvas" for a variety of adornments. As is often the case, such markings tended to change throughout the life of the squadron concerned but some of the schemes were particularly handsome, RVAH-9 for instance making extensive use of green while RVAH-11

aircraft carried an eye-catching black and white checkerboard pattern in 1971-72.

No review of Vigilante colours would be complete without some reference to the camouflage schemes that were applied to a few aircraft during the course of 1966 when the war against Vietnam was at its peak. Two squadrons—RVAH-6 aboard the USS *Constellation* with CVW-15 and RVAH-13 aboard the USS *Kitty Hawk* with CVW-11—were involved in this project which was basically aimed at evaluating the advantages and disadvantages inherent in tactical camouflage similar to that which was being introduced by the US Air Force at the same time.

Full details of all of the colour schemes conceived at this time are not readily available but at least one RVAH-6 RA-5C (Bu.No. 149313/702) featured

**TABLE THREE**

**Squadron Code Letter Combinations**

RVAH-1	GH
RVAH-3	GJ
RVAH-5	GK
RVAH-6	GS
RVAH-7	GL
RVAH-9	GM
RVAH-11	GN
RVAH-12	GP
RVAH-13	GR
RVAH-14	GQ

**Note:** Instances of use of these code combinations are rare, apart from RVAH-3. However, RVAH-5, RVAH-6 and RVAH-9 are known to have employed them and it is possible that some of the others did too.

camouflaged upper surfaces of Dark Green FS34079 and Olive Drab FS34102 in conjunction with gloss white undersides and reduced size full-colour "star-and-bar" national insignia on the fuselage sides and wings. Individual markings appear to have been confined to black Navy titles on the aft fuselage, black modex on the extreme nose and black bureau number at the base of the fin.

RVAH-13, on the other hand, opted for a slightly more ambitious upper surface camouflage on RA-5C Bu.No. 150834/604. This involved the use of matt Dark Green FS34079, Olive Drab FS34102 and Tan FS30219. Once again, undersides were gloss white but there were one or two other differences when compared with the RVAH-6 machine.

For instance, the nose modex was in white while the aircraft concerned also displayed a small squadron badge on the intake wall. Presentation of national insignia seems to have been more or less identical to that of RVAH-6's Vigilante but Bu.No. 150834 did possess a black nose radome and also had a black-painted area at the top of the fin covering the duplex UHF communications/ALQ-55 antenna, features which were not shared with Bu.No. 149313.

As it turned out, the Navy eventually concluded that camouflage battledress raised more problems than it solved at this time and these early experiments failed to bring about any major changes, the aircraft involved soon reverting to standard Vigilante colour schemes.

## US NAVY VIGILANTE SQUADRONS

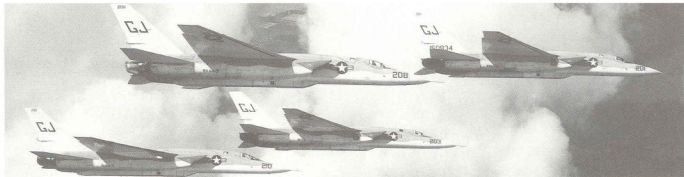
### A-5A VARIANT

**VAH-1 "Smokin' Tigers"** Transition from A-3B to A-5A began 9/62 with first aircraft being accepted on 22/1/63 at NAS Sanford, F1. Transition to RA-5C began in spring 1964 at Sanford and squadron was redesignated RVAH-1 on 1/9/64. Completed one Mediterranean deployment with A-5A model aboard the USS *Independence* with CVW-7 between 8/63 and 3/64.



Above: Four A-5As of VAH-1 in typical 1963-64 colour scheme.

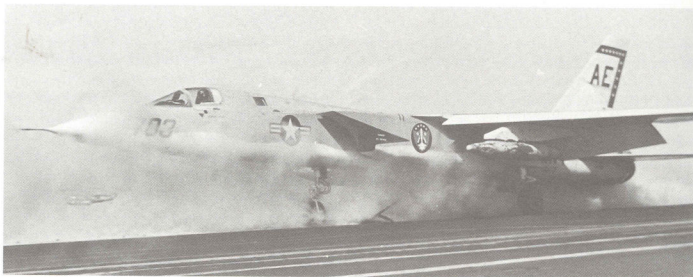
**VAH-3 "Sea Dragons"** Fleet Replacement Squadron or RAG. Took delivery of first Fleet A3J-1 on 16/6/61 at Sanford, operating this type alongside A3D-1/2/2T Skywarrior, F9F-8T Cougar and R4D-6 Skytrain. Also used A-5B and YA-5C models briefly and received first RA-5C in 1/64, being redesignated as RVAH-3 on 1/7/64.



Above: Markings variations are evident on these RA-5Cs of RVAH-3.

**VAH-5 "Savage Sons"** Converted from A-3B to RA-5C in mid-1963 at Sanford and also used a few A-5As at this time, before redesignated as RVAH-5 on 1/5/64. Never deployed with A-5A which was operated only briefly.

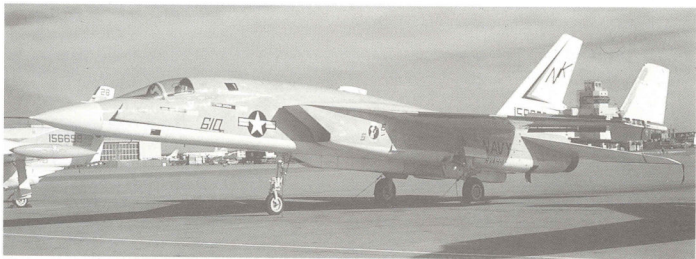
**VAH-7 "Pacemakers of the Fleet"** Transition from A3D-2 to A3J-1 began in summer 1961 but first aircraft not received at Sanford until 25/1/62. Re-equipped with RA-5C in late 1964 and redesignated as RVAH-7 on 1/12/64. Made three operational deployments to the Mediterranean with A-5A aboard USS *Enterprise* as part of CVW-6 between 8-10/62, 2-9/63 and 2-10/64.



Above: A VAH-7 A-5A accelerates down *Enterprise's* catapult track.

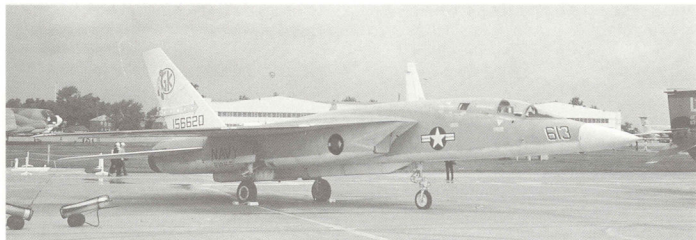
#### RA-5C VARIANT

**RVAH-1** Re-equipped from A-5A to RA-5C in 1964 and thereafter completed six Western Pacific (WestPac) cruises, four of which were combat deployments, and two Mediterranean (Med) cruises. Moved from Sanford to Albany, Georgia on 1/2/68 although did not physically take up new quarters until 7/68 since it was at sea at time of relocation. Moved again to Key West, Florida in 8/74 and eventually disestablished there on 29/1/79.



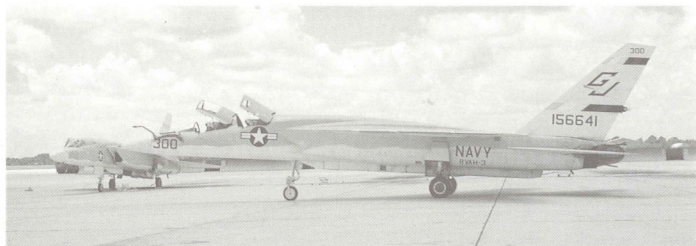
Above: RVAH-1's last cruise was made aboard *Enterprise* in 1978.

**RVAH-3** Operated RA-5C and served as Vigilante community RAG until disestablished on 17/8/79, having moved from Sanford to Albany on 1/5/68 and from Albany to Key West on 15/1/74.



Above: RVAH-3's "CAG-bird" returns to Albany in August 1972.

**RVAH-5** First squadron to deploy operationally with RA-5C model, making its first cruise to WestPac (and combat) between 8/64–5/65. Moved from Sanford to Albany 1/5/68 and to Key West on 16/1/74. Completed six more WestPac cruises (including four combat) and two tours of Med before being disestablished on 30/9/77.

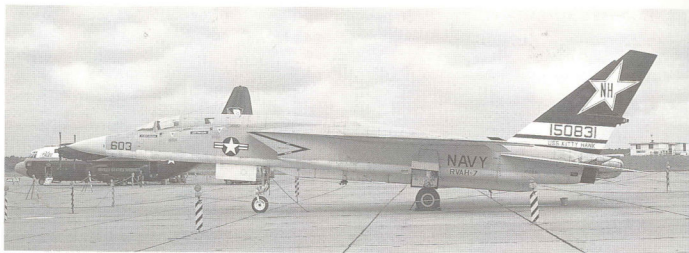


Above: This RA-5C of RVAH-5 is seen just before disbandment.

**RVAH-6 "Fleurs"** Moved from Whidbey Island, Washington to Sanford during 1965 as VAH-6 with A-3B and began transition to RA-5C, receiving first aircraft on 16/9/65. Was redesignated as RVAH-6 on 23/9/65 and subsequently completed two Med cruises and six WestPac cruises (including five combat) before being disestablished on 20/10/78. In between, it moved from Sanford to Albany on 1/12/67 and again to Key West in 1974.

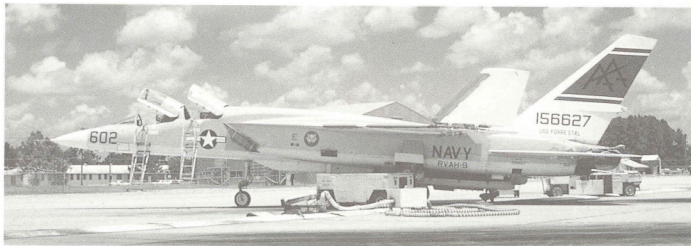


Above: RVAH-6 made two WestPac tours aboard the USS *Kitty Hawk*.



Above: Black trim was applied to RVAH-7's RA-5Cs in 1973-74.

**RVAH-7** Following re-equipment with RA-5C at Sanford, this unit completed seven WestPac (including four combat) and three Med tours between 1965 and 1979, with the final WestPac visit (2-9/79) also being the last operational cruise to be made by a Vigilante squadron. Moved from Sanford to Albany on 1/5/68 and to Key West 7/74. Disestablished 28/9/79.



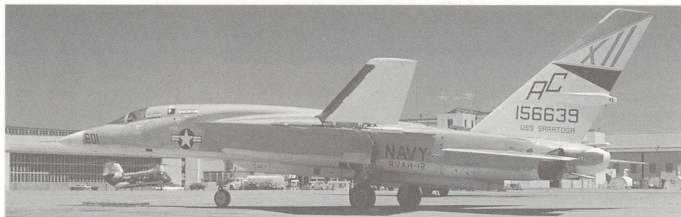
Above: RVAH-9 Vigilantes featured attractive green markings.

**RVAH-9 "Hoot Owls"** VAH-9's transition from the A-3B to the RA-5C began at Sanford in 4/64 and led to redesignation as RVAH-9 on 3/6/64. Unit subsequently completed two WestPac tours (both combat) and seven Med tours between 11/64 and 30/9/77 when it was disestablished. Had moved to Albany on 1/5/68 and again to Key West in 1/74.



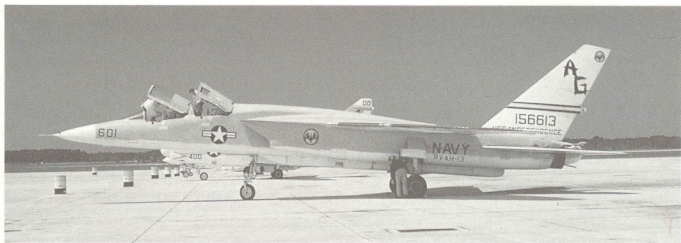
Above: This fairly nondescript RA-5C Vigilante is from RVAH-11.

**RVAH-11 "Checkertails"** VAH-11 began transition from the A-3B to the RA-5C at Sanford in spring 1966, receiving its first aircraft in July and being redesignated RVAH-11 on the 1st of that month. Completed four WestPac tours (all to combat) and two Med cruises before being disestablished 1/6/75. Had moved from Sanford to Albany 1/12/67 but did not take up residence until 6/68. Moved on to Key West in 1974.



Above: RVAH-12's last cruise was made aboard *Saratoga* in 1978-79.

**RVAH-12 "Speartips"** Commissioned as RVAH-12 at Sanford on 1/7/65 to operate RA-5C and subsequently completed four WestPac (including three combat) and five Med cruises before being disestablished on 2/7/79. In the meantime, it had moved to Albany on 1/5/68 and to Key West in 1/74.



Above: This scheme was applied by RVAH-13 "Bats" during 1975.

**RVAH-13 "Bats"** Moved from Whidbey Island to Sanford as VAH-13 with the A-3B in 8/64 and began transition to the RA-5C, taking delivery of its first aircraft on 5/10/64. Redesignated as RVAH-13 on 1/11/64 and eventually made five WestPac cruises (including four combat) and three Med cruises-before being disestablished on 30/6/76.



Above: RVAH-14's RA-5Cs featured light blue markings in 1969.

**RVAH-14 "Eagle Eyes"** Commissioned as RVAH-14 at Sanford on 1/2/68 to operate the RA-5C and subsequently completed four Med tours. Moved from Sanford to Albany on 1/5/68 and was still there when it was disestablished on 1/5/74, being the only RA-5C unit which was not transferred to Key West.

## SPECIFICATION DATA

### RA-5C VARIANT

**Type:** Carrier-based reconnaissance/attack aircraft.

**Powerplant:** Two General Electric J79-GE-8 turbojet engines, each rated at 10,800 lbt (4,903 kg) dry or 17,000 lbt (7,711 kg) in afterburner.

**Performance:** Maximum speed Mach 2.1 or 1,386 mph (2,231 km/h) at 40,000 ft (12,190 m); economical cruise speed 560 mph (901 km/h) at 40,000 ft (12,190 m); normal range 2,650 miles (4,265 km).

**Weights:** Empty 37,498 lbs (17,024 kg); normal take-off with full internal fuel 65,589 lbs (29,777 kg); maximum take-off 79,588 lbs (36,133 kg); maximum landing 65,988 lbs (29,960 kg); maximum landing (arrested) 47,000 lbs (21,338 kg).

**Dimensions:** Span 53 ft 0 in (16.17m); span (folded) 42 ft 4 in (12.90 m); length 76 ft 6 in (23.35); length (nose folded) 65 ft 4.5 in (19.94 m); height 19 ft 4 in (5.91 m); height (tail folded) 15 ft 6 in (4.73 m); wing area 753.3 sq ft (70.02 m<sup>2</sup>).

**Armament:** Generally nil, but four underwing hardpoints could have carried one Mk.28 or one Mk.43 nuclear weapon each. Alternative options comprised Mk.82 500-lb (227 kg); Mk.83 1,000-lb (454 kg) or Mk.84 2,000-lb (908 kg) conventional bombs or Aero 8A-1 practice bomb dispensers with 16 Mk.76, Mk.89 or Mk.106 practice bombs.

## VIGILANTE PRODUCTION DETAILS

Variant	Bu.Nos.	Qty	Con. Nos.
YA3J-1/YA-5A	145157-158	2	247-1/2
A3J-1/A-5A	146694-702	9	247-3/11
	147850-863	14	263-1/14
	148924-933	10	269-1/10
A3J-2/A-5B	149276-299	24	269-11/34
	149300-317	18	269-35/52
A3J-3/RA-5C	150823-842	20	279-1/20
	151615-634	20	283-21/40
	151726-728	3	283-41/43
	156608-643	36	316-1/36
<b>Total production</b>	<b>156</b>		

## CONVERSIONS

**A-5A to RA-5C:** 43 aircraft modified, viz: 145157, 146695, 146696, 146698, 146701, 146702, 147850, 147852, 147853, 147854, 147856, 147857, 147858, 147859, 147860, 147861, 148925, 148926, 148928, 148929, 148932, 148933, 149276, 149277, 149278, 149279, 149280, 149281, 149283, 149284, 149285, 149286, 149287, 149288, 149289, 149291, 149293, 149294, 149295, 149296, 149297, 149298, 149299.

**A-5B to RA-5C:** 14 aircraft modified, viz: 149300, 149302, 149306, 149307, 149308, 149309, 149310, 149311, 149312, 149313, 149314, 149315, 149316, 149317.

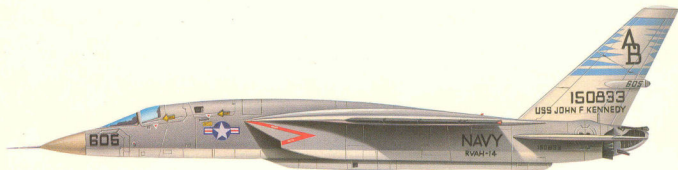
**A-5B to YA-5C:** 4 aircraft modified, viz: 149301, 149303, 149304, 149305.

**YA-5C to RA-5C:** 4 aircraft modified, viz: 149301, 149303, 149304, 149305.

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