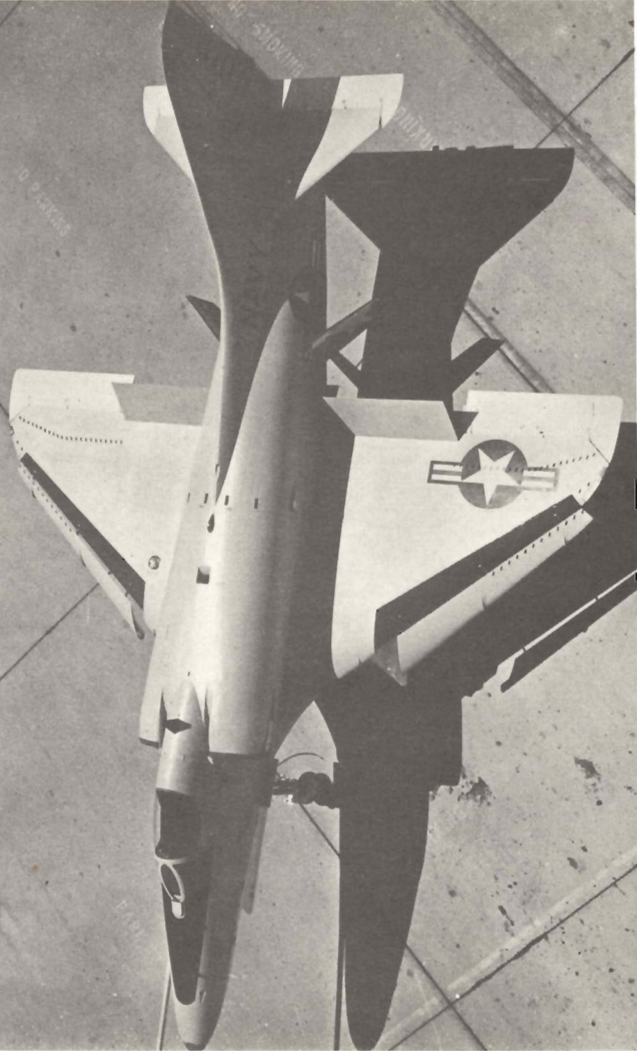
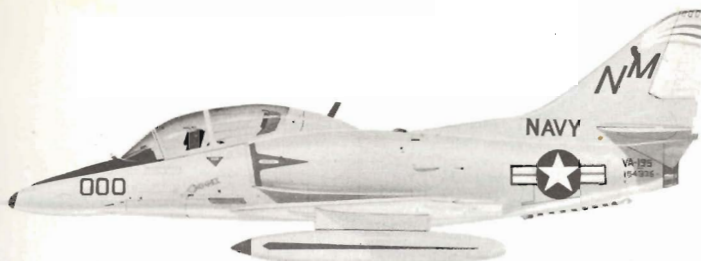


MCDONNELL-DOUGLAS A-4A/L SKYHAWK IN USN-US MARINE CORPS-ROYAL AUSTRALIAN NAVY & ROYAL NEW ZEALAND AIR FORCE SERVICE





Good plan-view shot of an unarmored A-4F, serial 152101; note white control surface areas. (McDonnell-Douglas)



A-4E, VA-215, USS *Hancock*. In standard Gull Grey and White scheme, Fuselage and rudder markings are black diamonds on white ground.

MCDONNELL-DOUGLAS A-4A/L SKYHAWK

IN USN-US MARINE CORPS-ROYAL AUSTRALIAN NAVY & ROYAL NEW ZEALAND AIR FORCE SERVICE

Illustrated and Compiled by
Richard Ward

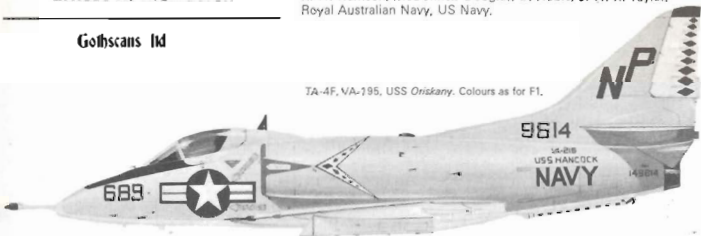
Text by
Ernest R. McDowell

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ACKNOWLEDGEMENTS

The A-4 Skyhawk, first post-war US Navy aircraft to be published in the AIRCAM series, first flew in 1954, seventeen years ago, and still going strong in first line attack units and as a trainer. Thanks are due to all who assisted with material and photographs whose names are listed below in alphabetical order:
Air Pictorial, Fred C. Dickey Jr., Joseph G. Handleman, R. W. Harrison, McDonnell-Douglas, D. Noble, J. W. R. Taylor, Royal Australian Navy, US Navy.

TA-4F, VA-195, USS *Oriskany*. Colours as for F1.



Published by: Osprey Publishing Limited, England

Editorial Office: P.O. Box 5, Canterbury, Kent, England

Subscription & Business Office: P.O. Box 25, 707 Oxford Road, Reading, Berkshire, England

The Berkshire Printing Co. Ltd, © Osprey Publishing Ltd, 1971 ISBN 85045 042 X Not for sale in U.S.A.



TA-4F flown by Colonel H. V. Huffstutter, Commander Marine Aircraft Group Thirty-two, note five miniature squadron insignia on rudder and code repeated on under-wing tanks. (R. Harrison)

Colourful TA-4F of VT-23 rolling along the taxi-track at Glenview NAS. Orange-red areas as for side-view illustration G1, nose flash, fuselage stripes and tank decor in dark blue. (F. C. Dickey Jr.)





An A-4C of VA-12 on the flight deck of the USS F. D. Roosevelt in the South China Sea. Note white edging to 413 on nose. (R. Harrison)

MCDONNELL-DOUGLAS A-4A/L SKYHAWK

The Korean conflict accelerated the development of the jet aircraft in much the same manner that World War I had advanced the development rate of the propeller driven airplane. While jets had appeared in combat very late in World War II, they saw such a limited service that there was very little opportunity to work out tactics or try very many new approaches.

In Korea, Douglas had a winner in their Skyraider, but jets began to push propeller driven aircraft out of the picture and soon led to the Navy asking that a successor to the slow attack aircraft be developed. Douglas had a successor on the way but it soon became obvious that the turbo-prop Skyshark was not going to be the answer as their engineers simply could not overcome the over-heating problems created by the engine.

While these events were taking place Douglas management had been looking to the future and had authorized a study that took into consideration the cost, weight, and complexity-growth factors which had begun to show up. Newer jet models were very rapidly becoming extremely expensive, heavy, and difficult to maintain. They had hopes of producing a new type of lightweight fighter based on the anticipated results of this investigation. The facts bore out the theory. Findings indicated that the addition of a single pound added a factor of ten to the design of a new aircraft so far as weight was concerned. That is each pound added required an increase of ten pounds overall either in structural or fuel weight simply to maintain the original performance specifications.

Douglas engineers working with this new approach turned out a design for a new lightweight fighter which was offered to the Navy in 1952. The idea interested and impressed the Navy but as they were more in need of the new attack aircraft than another fighter a suggestion was made that Douglas investigate the feasibility of using the concept in an attack airplane. The Navy wanted it to be a shipboard attack aircraft that could take over the assignments being handled so well by the Skyraider but with the increased performance of a jet. They wanted to cut

down mission length in time and thus reduce pilot fatigue.

A design team headed by Edward H. Heinemann, the chief engineer of the El Segundo Division, went to work on the new problem and after six months of preliminary work they presented the Navy with a pleasant surprise. Not only did they do the job but they bettered the requirements with ease. Their answer was an aircraft that was approximately 90 knots faster, with an increase in range of about 100 nautical miles and a plane that weighed less than half of the 30,000 pounds specified by the Navy. This was achieved by carefully re-examining each item in the airframe and wherever possible redesigning them to cut down weight yet still retaining the maximum strength. Simplicity was the keyword. Everything not needed to enable the airplane to accomplish the mission was eliminated. The mock-up was readied and the first mock-up board inspection took place in February of 1952.

The Navy was suitably impressed and after a bit of additional work a contract was signed on 12 June 1952. This called for two prototypes and ten pre-production aircraft.

These were designated the A-4D-1 and were to be used in service evaluation tests. Normally the Navy would have ordered two X-aircraft plus a static test airframe but this practice was not followed in this case. The political situation was such that it was imperative that new models be produced as fast as possible. The Navy contract specified, "a lightweight high performance, single engine, day attack land plane capable of performing dive-bombing, interdiction, and close support missions". In addition it also was envisaged as being able to deliver either nuclear or conventional weapon loads on land or sea targets with or without fighter escort if necessary and regardless of air control by either side.

Work on the XA-4D-1 proceeded well but problems arose that were unique at that time. The initial order had called for a production rate and this in turn had enabled Douglas to plan to use some of the production tooling on the prototypes. One machine which



Flying shot of an early A-4D-2N (designation subsequently changed to A-4C), serial 145062. (McDonnell-Douglas)

had been specifically designed to machine the wing spars in one piece from solid plate, had to be de-bugged and the problems this created set the programme back fifteen weeks. A speed up by Douglas in time made up for this lost time.

The mock-up board met again in October, evaluated the progress made, suggested some changes, and gave Douglas two new contracts for an additional 19 planes.

The first flight took place only four weeks behind schedule with test pilot Robert Rahn at the controls. This aircraft Bu/No. 137812, eventually had the X designation dropped and was later used as the mock-up vehicle for new versions. The flight was made on 22 June 1954. Only eighteen months had elapsed since the initiation of the detailed engineering work and the first flight. The second aircraft made its maiden flight on the date that originally had been scheduled for it and the third which had been turned out almost entirely on production tooling was sent aloft on 14 August 1954 two weeks ahead of schedule. A popular but unofficial nickname around the plant for the A-4D was "Heinemann's Hot-Rod" but the machine was now designated the Skyhawk. Later it would be dubbed the "Mighty-Mite", the "Tinker Toy Bomber" and several other lesser known names.

Construction

Construction of the airframe was pretty straightforward, there were few if any unconventional features thanks to the concept of design simplicity and the weight saving approach. The airframe was broken down into three major components so far as fabrication was concerned and each part was completely finished before being mated in the assembly area.

These components consisted of the wing, forward fuselage portion and aft fuselage portion. All equipment, control runs, electrical wiring, plumbing, etc. were installed in each section so that when the three met in the final stage assembly area the airframe was put together quickly and with a minimum of effort.

The wing was a cantilever low wing with a modified delta planform with a 33° sweep at quarter chord of low aspect ratio. Wing spars, as mentioned, were machined in one piece from solid plate. They were continuous from wing tip to wing tip giving added strength to the design. A constant stress level was achieved by using a planview taper of the wing box coupled with proper stringer configuration which eliminated the need for a tapered skin. The wing skin was a non-tapered sheet of 75S aluminium alloy, .004 inch thick, 27 feet long and 8 feet wide, which at that time was one of the longest thin-gauged sheets ever to be rolled. The wing was made up of a three spar box stretching almost from wing tip to wing tip and this box formed an integral fuel tank as the over-all continuity of the design greatly simplified the tank sealing problem. Capacity of the wing tanks was 560 gallons. Ailerons were hydraulically powered and of all metal construction. A servo trim tab was fitted in the port aileron. Flaps were also all metal and were the split type. All control surfaces except the rudder were of constant chord. Automatic leading edge slats were installed that needed no actuating mechanism. They were designed to operate aerodynamically in response to flight conditions and extended over 70% of the wing. The trailing edge was almost equally divided between the flaps and ailerons. The ailerons

were aerodynamically balanced by horns inset at the wing tips.

Ten steel tension bolts attached the wing section to the major fuselage frames. Attachment points were located on the leading edge, front, intermediate, and rear spars and the trailing edge channel section.

Despite the thin section wing the main gear was accommodated in it. The tricycle gear was designed to retract forward. The main gear legs were pre-shortened for retraction and the wheels rotated through 90° to lie horizontally within the leading edge. The gear legs were housed in external fairings under the wing.

The leading edge root section ahead of the front spar carried the 20 mm. cannon, one on each side of the fuselage that made up the armament. This section also housed the rotating ammo drums which were used to prevent jamming and to facilitate feeding of the guns. Each drum carried 100 rounds.

Three hard points were incorporated in the wing to enable it to carry the external stores for the missions for which it was intended. These were at the centre-line and at points six feet three inches to each side of the C/L. Universal stores pylons were fitted at these points to handle a variety of weapons, tanks, etc. To enable the Skyhawk to carry these external stores the landing gear selected by Douglas was longer than most. The nose wheel retracted into the nose section of the fuselage. As no emergency hydraulic system was fitted the gear had been designed to drop aft in free fall and automatically lock in place under the pressure generated by the airstream. On later models the nose wheel was steerable.

The small size of the Skyhawk, which enabled it to be accommodated easily by the aircraft carrier elevators, eliminated the need of providing for any type of folding wing. This in turn saved added weight by eliminating the need for folding mechanism, cut maintenance time and problems on the wing, and gave it an added strength safety factor.

The fuselage was of a semi-monocoque construction built in two parts. It was all metal. The forward half included the nose cone, which was detachable, housing the avionic package of identification, navigation and communication equipment. The nose cone was attached to the forward bulkhead in such a manner as to eliminate about 50 pounds of weight when compared to standard attachments used on other aircraft of the period. In addition to the nose cone the forward section included the cockpit, a self-sealing fuel cell aft of the cockpit with a 210 gallon capacity, the Wright J65-W-2 axial turbojet plus attachments.

The J65-W-2 produced 7,200 pounds of static thrust and was installed in all pre-production aircraft but was replaced by the more powerful J65-W-4 which produced 7,800 pounds of static thrust, on the production aircraft.

The aft section of the fuselage was attached to the forward part, by just six bolts, the break point being at the intermediate spar. The rear section housed the turbo jet tail cone and tail pipe. This section consisted of three major frames. One was connected to the rear spar, a second carried the arresting hook vertical and side loads, and a third which connected to the fin spar and carried the connection upon which the variable incident tail plane pivoted. This being one of the very few forgings used on the Skyhawk. The dorsal fin and fairing were built as integral parts of the aft section. The outwardly hinged air brakes



An early Skyhawk carrying the designation YA4-D1, note absence of inflight refuelling probe. (McDonnell-Douglas)

were also attached to the aft fuselage.

The cockpit received considerable attention from the design team. Like everything else in the airframe it was both simple and functional in layout. Maximum emphasis was placed on pilot efficiency and comfort. Maximum internal space was achieved by using heavy skinning without internal stiffeners in this area. They were able to avoid altering the external shape of the fuselage by using this method. It also afforded the pilots a bit of additional protection against light flak. Wherever possible several instruments were combined into one easy-to-read gauge. Anything not considered as absolutely essential to the performance of the mission was eliminated.

The gunsight was reduced from the standard 120 mm. to 63 mm. yet retained the larger optical field of the 120 mm. sight.

Another area in which the weight saving programme was effective was the ejector seat. Douglas designed their own highly successful "Escapac" seat which cut 40 pounds of weight from the standard seat of the day. This was a 59% weight saving on this one item alone.

The fuel cell behind the cockpit plus the wing internal tanks gave the Skyhawk a fuel capacity of 770 gallons, two 250 gallon external tanks could be carried or one 300 gallon tank could be substituted for these two for ferrying range. Using only the internal fuel the A-4D-1 had an endurance of 2.75 hours. The cockpit fuel cell was separated from the engine bay by an elliptical bulkhead which took the tank hydrostatic pressures.

A wind-driven emergency generator was housed in the forward fuselage on the port side just ahead of the leading edge of the wing. Since the Skyhawk carried no emergency hydraulic system and no battery this generator had a manual release. It could be dropped into the airstream at any speed under 460 m.p.h. A two-bladed variable pitch propeller unfeathering and a fly weight type governor maintained the generator at a constant r.p.m. by mechanically changing the blade pitch.

The horizontal control surfaces were constant chord. The stabilizer was electrically operated and fully adjustable and was used for trim throughout the normal flight range. The ailerons, elevators and rudder were operated by dual hydraulic power systems. Failure of one system did not render the

controls inoperable and if both failed it was possible to mechanically disconnect the system thus permitting manual control.

Besides the arresting hook provided for carrier landings, a catapult hook was also provided, so that the Skyhawk was completely qualified for all carrier and land operations.

The Skyhawk series

The Department of Defence issued orders to use a new series of letter-number designations shortly after the series began so that all will be treated here under the new system versus the old. As an example the A-4D-1 became the A-4A under the new programme.

The A-4A was the first production run model powered by the Wright J65-W-4. A total of 166 were eventually built for the Navy. First flight was on 22 June 1954. During the test flight programme Lt. Gordon Grey of the Navy's test pilot team set a new five hundred kilometre closed course record while flying the third prototype Bu/No. 137814 at a speed of 695.163 m.p.h. The Skyhawk thus became the first attack aircraft ever to hold this record. The record was set at low altitude on 15 October 1955 and still stands. Delivery to the fleet started in September of 1956 and by the 26th of the month VA-72 had been completely equipped with the Skyhawk. VA-72 served as the service test unit to work up and test the plane under actual carrier operations. VA-72 used six A-4's in a 600 hour flight testing programme and achieved the best availability rating of any new design ever tested.

The A-4B was flown for the first time on 26 March 1956 and was an extensively modified aircraft. The Wright J65-W-16A of 7,700 pounds static thrust was installed. An improved bombing system and improved gunsight were installed. The rudder was a completely new idea, it consisted of a single surface of skin which was strengthened by external exposed stiffeners and was called a "tadpole rudder" by Douglas engineers. An in-flight refuelling boom plus tank gave the model capabilities of both in-flight refuelling and ability to serve as a "buddy-tanker". Other changes included a strengthened rear fuselage, a single point pressure fuelling system, Bullpup air-to-ground capability, a dual hydraulic system and automatic dead reckoning navigation computer system. The empty

weight increased from 8,400 to 9,140 pounds while maximum speed decreased just three miles an hour. A total of 542 were manufactured before the next model appeared. Later fifty of these were to be reconditioned and refurbished for the Argentine.

The A-4C (A-4D-2N) was first flown on 21 August 1958. This was a limited all-weather night-attack version. About 15% new structure and equipment went in the C model. The nose was lengthened to house the radome and other avionics. This added nine inches in length to the airplane. Terrain clearance, ground ranging, and navigational radar were added. Other new equipment installed included the TPQ-10 ground control bombing system, the AJB-3 all altitude reference and loft bombing system, the new Escapac low-level ejection system for the pilot, an auto-pilot, an improved oxygen system, a revised cockpit layout, and a new gun sight. All of these improvements naturally raised the empty weight to 9,559 pounds. The Escapac seat featured a solid propellant rocket which was fastened to the seat and operated inside a tube that was rigidly fastened to the airframe like a piston. Some 638 aircraft were produced.

There was no A-4D produced by Douglas. The next in the series was the A-4E which first flew on 12 July 1961. It was a completely re-engineered aircraft. The Pratt and Whitney J52-P-6 twin spool turbojet of 8,500 lb. S/T replaced the Wright engine. The changes incorporated amounted to almost a 30% redesign. The new lighter engine increased the range by 27% since it consumed less fuel and it permitted an increase in weight and load carrying ability. Two additional weapon carrying pylons were introduced on the strengthened wing, one under each wing. A TACAN, Doppler Navigation, MK 9 toss bombing system, radar altimeter, and an improved AJB-3A low altitude bombing system were provided to improve the mission capabilities of the A-4E. The forward portion of the fuselage had to be redesigned to accept the new engine. Range with a ton of ordnance now stood at 1,400 miles. The E model became operational in December of 1962 with the delivery of the bantam bomber to VA-23. Total production of the E was 500 aircraft.

The A-4F made its first flight on 31 August 1966. Delivery to the Navy commenced on 20 June 1967 and the last one reached the fleet in June of the following year. The F model featured the more powerful J52-P-8A which produced 9,300 lb. S/T. New lift spoilers on the wings shortened the landing run out by up to 1,000 yards and this coupled with nose wheel steering, low pressure tyres and a zero height, zero speed ejector seat practically gave the F a short field capability. The pilot got added bullet-flak protection as new resistant materials were used in the cockpit area. The avionics package was up-dated to keep it abreast of any new features in this field. The nose wheel featured hydraulic steering and Menasco shocks were put on the gear.

The A-4G was simply an E model that had been ordered by the Royal Australian Navy for its carrier HMS *Melbourne*. A total of eight aircraft to be used as attack-interceptors were ordered. The first delivery was made on 26 July 1967. These were assigned to No. 805 Squadron RAN. Later a flight of three aircraft were attached to 724 Squadron. The standard USN camouflage was retained. This was the gull grey and white scheme. The rudder was red and white checkered. USN Bu/Nos. were used but the

prefix N-13 was added by the RAN.

The A-4H was the designation assigned to the Skyhawks ordered by the Israeli Air Force. There were 48 in the first batch which were delivered during 1967-68. Camouflage was the standard Israeli Air Force with upper surfaces of brown, sand and green, and pale blue under surfaces. No A-4J was produced.

The A-4K was similar to the A-4F but was the designation that was given to a batch of ten ordered by the Royal New Zealand Air Force. These had different radios and tail parachutes. The first delivery was made to the RNZAF on 16 January 1970.

The A-4L was simply a modified A-4C with an up-rated engine and with bombing computing system and avionics located aft of the cockpit as in the A-4F. Delivery of this model to the U.S. Naval Reserve Carrier Air Wing began in December of 1969.

The A-4M was similar to the A-4F but had the J52P-408A engine which produced 11,200 lb. S/T installed. A braking parachute was added to make combat operations possible from a 4,000 foot runway which gave it a 30% increase in effectiveness. A larger windscreen and canopy was fitted to increase pilot vision and a greater ammo capacity was provided for the 20 mm. guns. A more powerful generator and a self contained engine starter were other new items on the M. The first of the two prototypes flew on 10 April 1970 and 50 were ordered for the US Marine Corps with delivery scheduled to begin in late 1970.

The A-4N is a projected version basically similar to the M model and was offered for consideration by the Navy in mid-1970, whether this is the end of the line for the Skyhawk remains to be seen.

Trainer versions

The Navy issued a requirement for a two-seat trainer version which resulted in the TA-4E. This trainer went into production in April of 1966. Initial order called for 139 aircraft. The TA-4G was the Australian version of the trainer and a total of two were ordered. The TA-4H was the designation assigned to those produced for Israel's Air Force. The TA-4K was ordered for the New Zealand Air Force with the RNZAF getting four aircraft, the first was turned over to them on 16 January 1970.

The TA-4E made its first flight on 30 June 1965 and it was shortly thereafter redesignated as the TA-4F by the Navy. The TA-4F was a dual control trainer powered by a Pratt and Whitney J52-P8A turbojet engine. It was fitted with two Douglas Escapac ejection seats. Delivery to the Navy started in May of 1966. Spoilers were added to the top surface of the edge of the wing to destroy the lift and securely place the aircraft on the ground when landing in a cross-wind or other unfavourable condition. The electronics carried in duplicate in both cockpits where necessary included an APG-53A terrain clearance radar, ASN-41 dead reckoning navigation set, and APX-64 IFF radar beacon all carried only in the front cockpit. An AJB-3A low altitude bombing system was carried in front while the all-altitude reference component was repeated in the rear seat. The ARC-51 UHF communication set, ARR-69 auxiliary receiver, ARA-50 ADF, ARN-52 and APN-141 radar altimeter were installed in duplicate in both cockpits. The TA-4F fuel capacity was cut by 140 gallons. To overcome this Douglas designed a saddle tank which could be mounted over the engine in the rear to make up for the lost fuel capacity created by



Neat formation by A-4D-2N Skyhawks of VA-112, see colour illustration D1. (US Navy)

the addition of the second cockpit. A blind flying hood was available for use in the second cockpit. The TA-4F was carrier qualified.

The final version of the TA series seems to be the TA-4J which was ordered for the US Naval Air Advanced Training Command under a \$26,834,000.00 contract. First flight took place in May of 1969 and the first four of this series were delivered to the Navy on 6 June 1969. It is still in production. Some of the tactical systems were deleted, such as air-to-air, and air-to-ground missile launch equipment. Certain instruments were added while others were relocated or deleted. The J25-P-6 engine was fitted but provisions were made for the airframe to accept the J52-P-8A. A certain amount of combat avionics were carried and the rest could be installed should the occasion ever arise where these would be needed.

Operational life

On 24 January 1959 Major J. P. Flynn and Capt. C. D. Warfield of the Second Marine Air Wing took off in their Skyhawks from El Toro Marine Air Field, California, and four hours and twenty-five minutes later touched down at Cherry Point, North Carolina, 2,082 miles from El Toro. The non-stop flight had been made entirely without in-flight refuelling to demonstrate the range capacity of the aircraft.

Capt. J. K. Beling of VA-72 flew a 2,250 mile non-stop strike using the buddy system of in-flight refuelling to deliver a full scale inert bomb on target by loft bombing. Flying an A-4D the course was out over the Atlantic Ocean and originated as NAS Oceana. Flown entirely without the use of navigational aids or frequent electronic position checks "operation longhaul" came out right on the "money". Many flights such as these were to demonstrate the ability of the aircraft.

A favourite designation for modern carrier pilots is "Centurion", the title being bestowed on those who complete 100 carrier landings successfully. The number of Centurions among the Mighty-Mites Squadrons are legion. In March of 1960 five of VA-153's pilots hit the mark on the USS *Hancock*. VA-113 turned out four more aboard the USS *Shangri-La* while flying the A-4D-2. They were joined by the CO of CAG 11 during the cruise. The Marine pilots of VMA-225 aboard the USS *Essex* set a record when all 17 pilots became Centurions on the same day during a Mediterranean cruise. VA-34's Lt. George Ball became the first Skyhawk jockey to become a double Centurion when he chalked up his 200th landing on the USS *Saratoga* during operations with the 6th Fleet.

VA-34 "The Blue Blasters" fired the first operational Bullpup missile during manoeuvres in the Atlantic. VA-34 had their Skyhawks equipped to carry three of these missiles for close support work.

Work sometimes is tempered with play and some practical jokers aboard the USS *Franklyn D. Roosevelt* got up early one morning to get operation "Tinkertoy" under way. When the hard working pilots of VA-172 and VA-46 arose and went to their Skyhawks they were surprised to see that they had been modified overnight. Members of VA-15 working like beavers had put a wind-up key on the nose of each A-4D. Instructions on how to double the range with "in-flight rewinding" had been prepared and were passed out to the Hawk pilots. Despite offers of big promotions all members of VA-15 declined to act as "in-flight key winders".

Another unusual use of the Skyhawk, this one practical, was carried out by members of VA-44 and VA-12 operating from Cecil Field. Their Skyhawks were equipped to spray insecticide to test the effectiveness of spraying at high speeds. The Navy wished to see if this could be used to suppress insects in close support of tactical military operations. The Skyhawks could carry the fluid and disperse it at the rate of 300 gallons per minute while flying at an altitude of 150 feet and a speed of 500 m.p.h. Ground-to-air communications made this an effective and quick method and also proved it would be too expensive to use on a commercial basis.

Combat operations

The Skyhawk has been used quite extensively in combat over both North and South Vietnam operating from carriers on Yankee and Dixie Stations. The entire story of their operations has not been released as yet.

Marine Squadron VMAS-211 operated its A-4E's from ground strips at Chu Lai. One incident which demonstrated the ability of the Bantam Bomber occurred when 1st Lt. Richard Bloomberg's aircraft was badly hit by anti-aircraft fire. He managed to make it back to Danang and made a dead stick landing with all instruments out as the engine began to overheat on the final approach. The plane had been holed in a number of places.

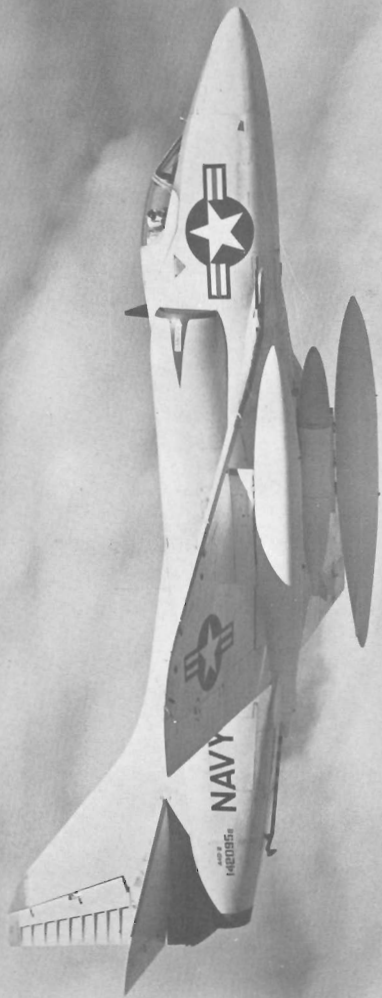
The Skyhawks operating over North Vietnam flew from the carriers on Yankee Station. They were called upon to perform against a large variety of targets. A favourite tactic was to go in at treetop level, pull up, sight their target, roll in and then zoom and loft their weapon load on the target with devastating effect. Against lightly defended or moving targets they went in simply as dive-bombers and plastered their objective. Hopefully some Navy or Marine pilot will tell the story of the Skyhawk as effectively as the story of the F-105 has been told in "Thudridge". Just about every one of the Naval and Marine Skyhawk squadrons has been in action in Vietnam so the story should be an interesting one.

Last gasp?

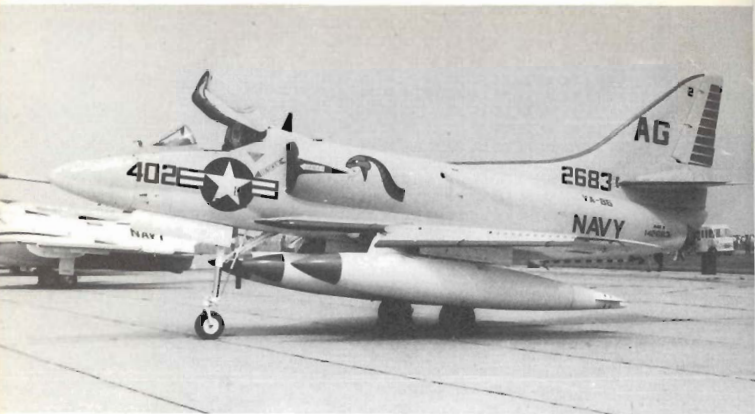
Douglas made a mighty attempt to extend the production life of the series by coming up with an export version to be powered with the Rolls Royce Spey engine. They hoped to interest Canada in the CA-4E single-seat version and the CA-4F two-seater. This proposed aircraft was beaten out by the F-5/T-38 duo. So Douglas turned hopefully to Europe with the Spey-powered A-4 and got the Netherlands and Belgium to evaluate the airplane. They hope to see it fulfil the reconnaissance, strike and close support rôles in the NATO forces. Proposals were made to Italy, Holland and Belgium to co-produce the Spey A-4, with costs and production being shared. Douglas looked upon their new aircraft as a good replacement for the NATO F-84's, F-86's and other planes that were becoming obsolescent. Despite the greatly improved performances offered by the Spey and the fact that the plane was among the lowest priced and could be delivered in quantity in less than two years from the go-ahead it failed to score. Whether the project will be dusted off and offered again in the future is doubtful but one thing is certain the Skyhawks already produced, to the amount of 2,400 by the spring of 1970, assure that one will still be flying a long time from now.



Nose and under-cart detail shot of an early A-4D-5. (McDonnell-Douglas)

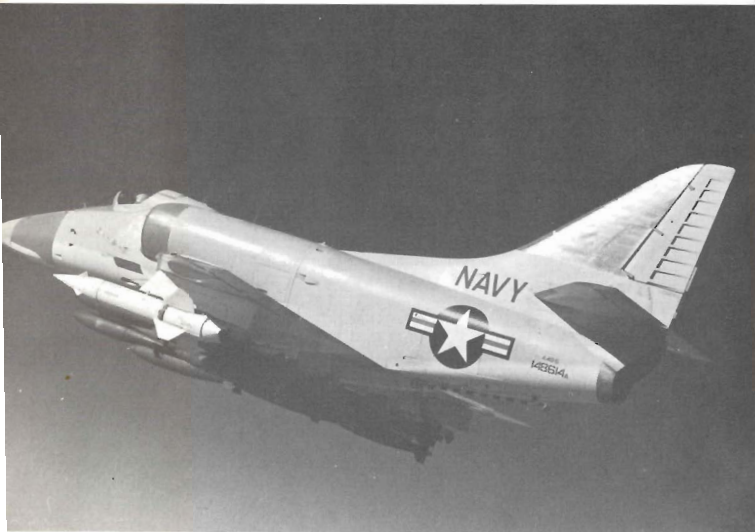


Flying shot showing the clean lines of the Skyhawk, note grey leading edges and anti-glare panel. (McDonnell-Douglas via J. W. R. Taylor)



An A-4D-2 of VA-86, see side-view illustration B4 for colour details. (R. Harrison)

Fully loaded A-4D-5 (A-4E) showing off its paces; this version was fitted with the 8,500 lb thrust J52-P-6A engine and could carry an external load of 8,200 lbs. (McDonnell-Douglas via J. W. R. Taylor)





A-4B of VA-155, USS *Coral Sea*, Australia, summer 1968. (R. Harrison)

An A-4B of an unknown unit at Quonset Point NAS, May 1966. (R. Harrison)





Above: A-4B, NATF Lakehurst at Brunswick, Maine, August 1968. See side-view illustration G2 for colour details. (R. Harrison)



Left & below: Port and starboard shots of an A-4B of the Glenview NAS Demonstration Team, "The Air Barrows". See cover illustration for colour details. (R. Harrison)



An A-4B of the Naval Air Reserves, Jacksonville NAS, 1967. (R. Harrison)

A-4C of VSF-1, USS *Independence*, 1969. Note 513 staggered on upper surface of starboard wing, repeated in white on flap face. (R. Harrison)





A-4C of VA-44, USS Saratoga, 1967. Photo taken at Sandford, Florida. (R. Harrison)

A-4C of VA-83, photo taken at Pease AFB, N.H., 1968. See side-view illustration B3 for colour details. (R. Harrison)

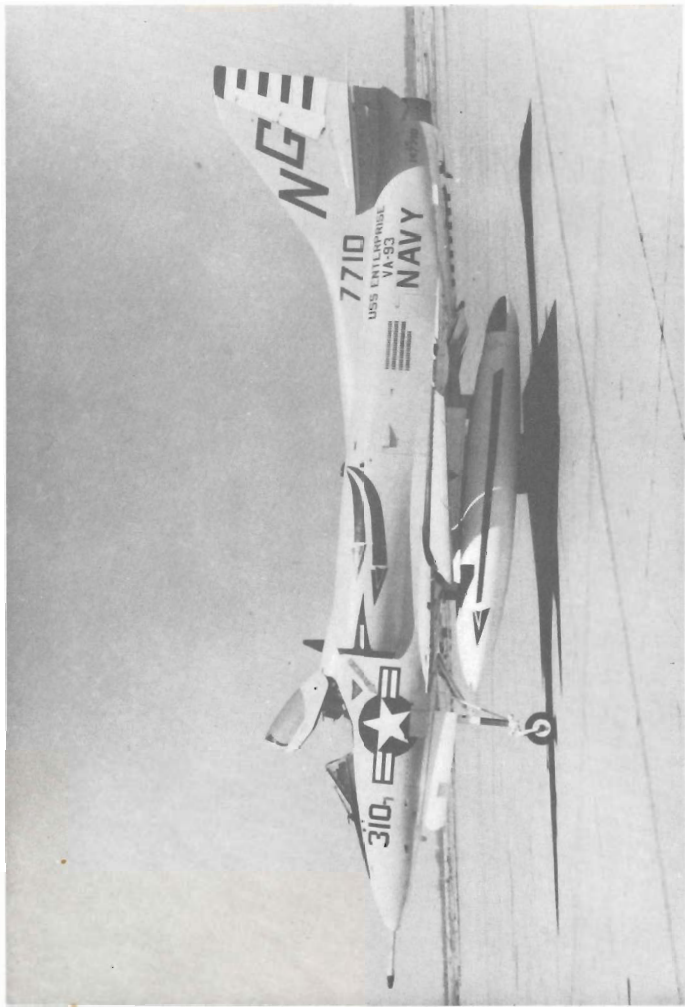




A-4C of VA-112, USS *Kittyhawk*, South China Sea, 1967. Note rocket pods under centre-section. See side-view D1 for colour details. (R. Harrison)

Line-up of A-4C's of VA-113 on the flight deck of the USS *Kittyhawk*, July 1965. See side-view D2 for colour details. (R. Harrison)





An A-4C of VA-93, USS Enterprise, with 80 missions over Vietnam recorded on the aft fuselage. (R. Harrison)



With 39 missions over Vietnam recorded on the nose, an A-4C of VA-216 flown by Cdr. Tex Birdwell. Photographed at Lemoore, California, 1988. (R. Harrison)



An A-4C of VA-144 back from a mission over Vietnam landing on the USS *Kittyhawk* in the South China Sea, 1967. (R. Harrison)

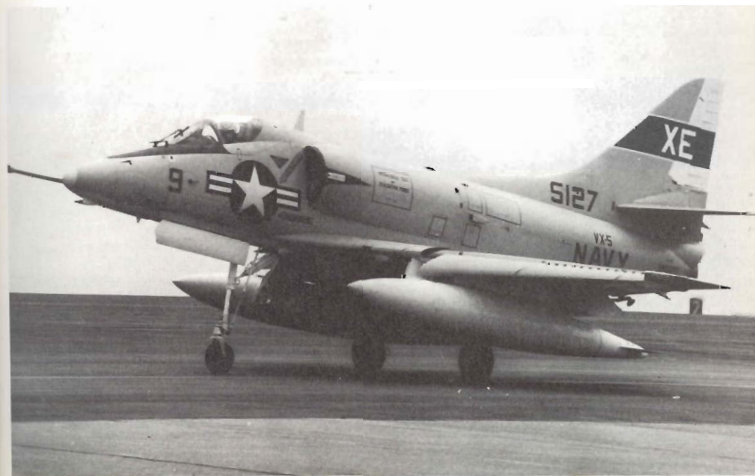
A-4C's of VA-153 on the flight deck of the USS *Coral Sea*, South China Sea, summer 1967. See side-view D5 for colour details. (R. Harrison)

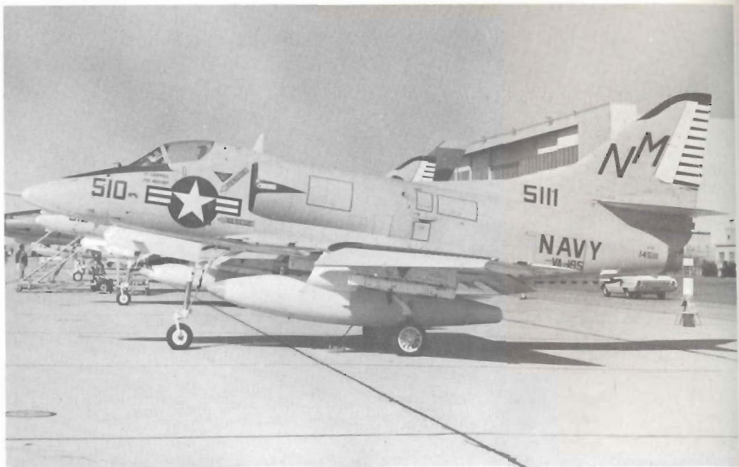




An A-4C of VC-7, tail colour unknown. (R. Harrison)

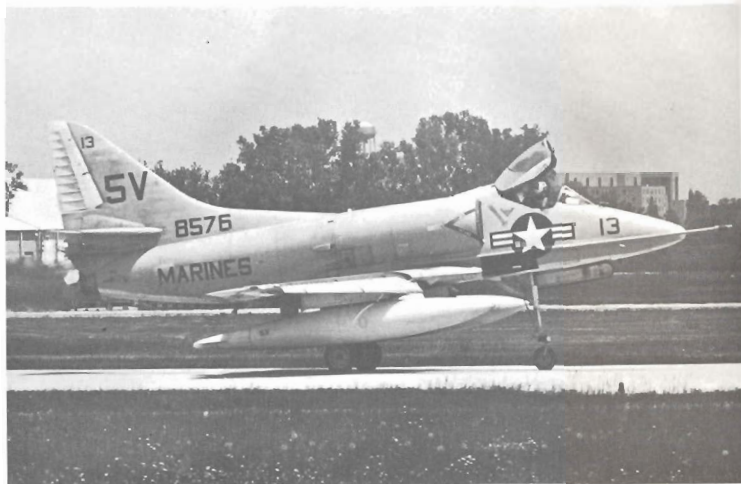
A-4C of VX-5, Operational Test and Evaluation Force. (R. Harrison)

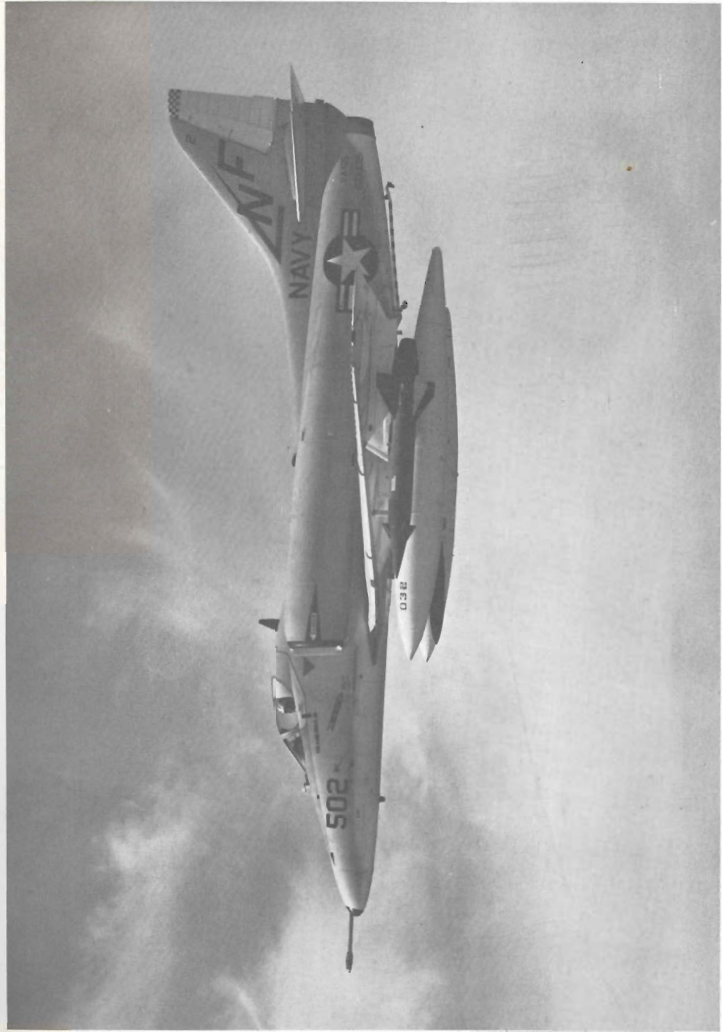




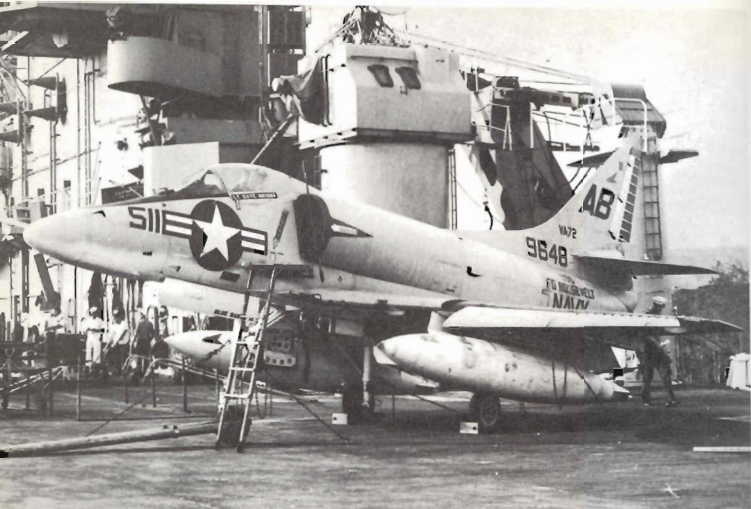
A spick and span A-4C of VA-195 at Edwards AFB, May 1967. NM was the carrier code of the USS *Onskany*. (R. Harrison)

A-4C of the Marine Air Group, Glenview NAS. (Fred C. Dickey Jr.)





An A-4E of VA-55 armed with Bulldog missiles and multiple bomb racks, see side-view B1 for colour details. (McDonnell-Douglas)

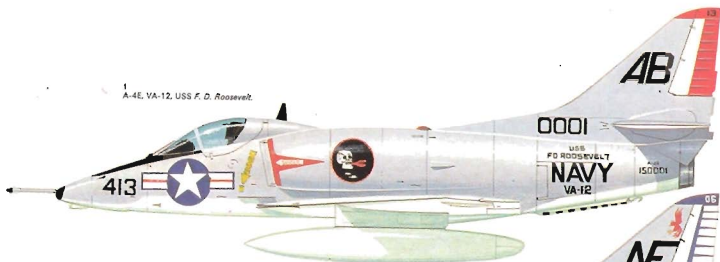


A-4E of VA-72, USS *F. D. Roosevelt*, South China Sea. 1967. Note white outline to 511 on nose. See side-view D2 for colour details. (R. Harrison)

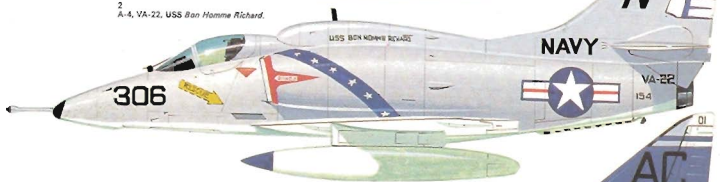
Unusually marked A-4E of VA-81, USS *Forrestal*; photo taken on Bradley Field, Conn., May 1965. (R. Harrison)



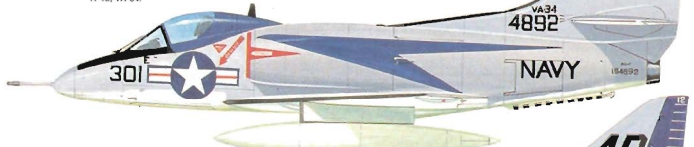
1 A-4E, VA-12, USS *F. D. Roosevelt*.



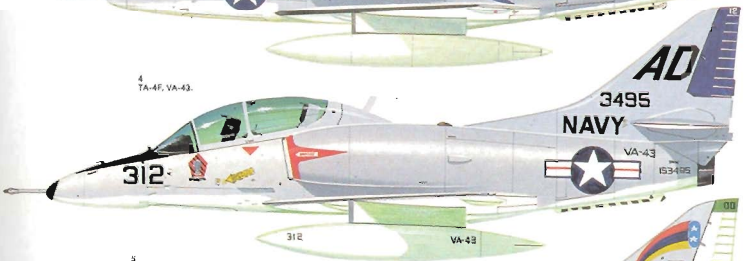
2 A-4, VA-22, USS *Ban Hammé Richard*.



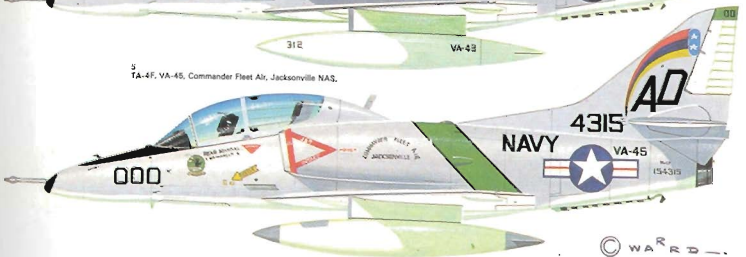
3 A-4B, VA-34.

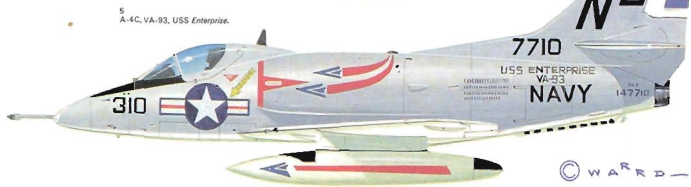
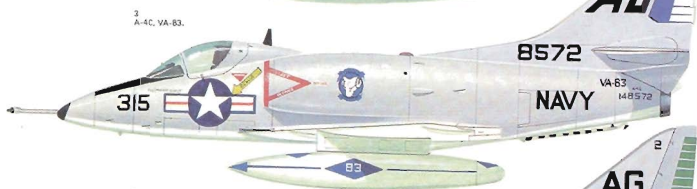
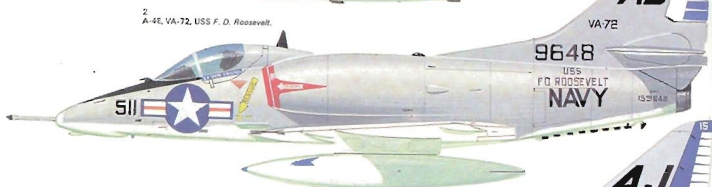
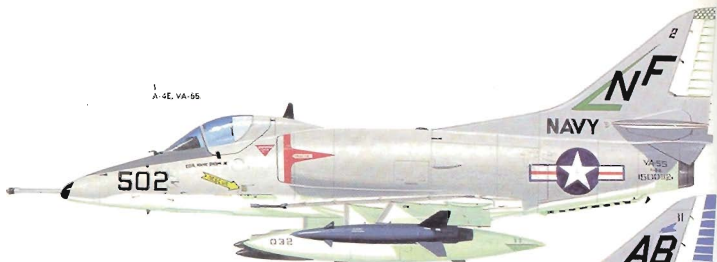


4 TA-4F, VA-43.



5 TA-4F, VA-45, Commander Fleet Air, Jacksonville NAS.

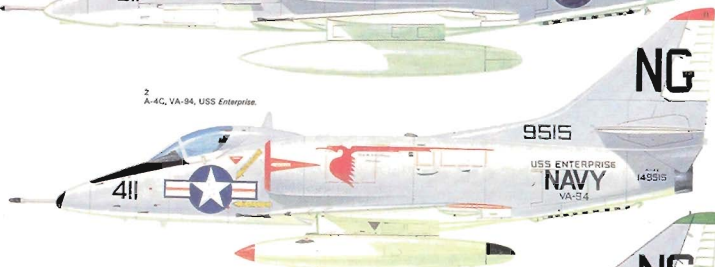




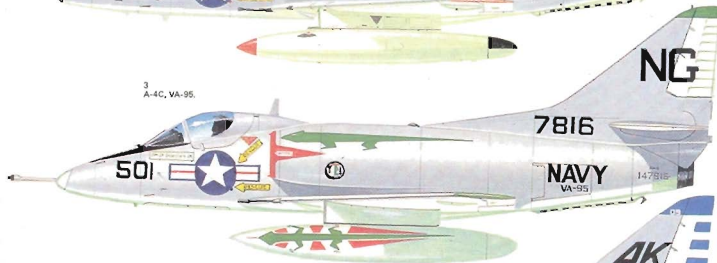
1 A-4F, VA-93, USS Bon Homme Richard.



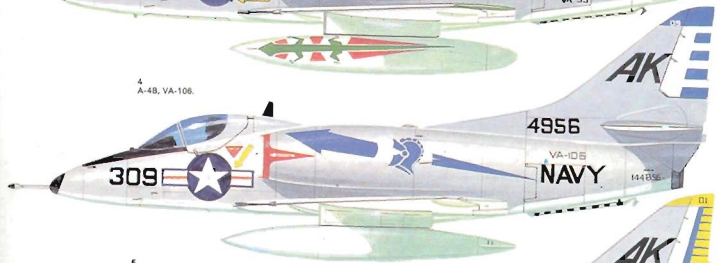
2 A-4C, VA-94, USS Enterprise.



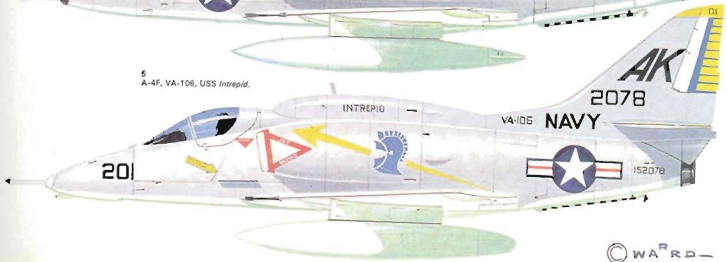
3 A-4C, VA-95.

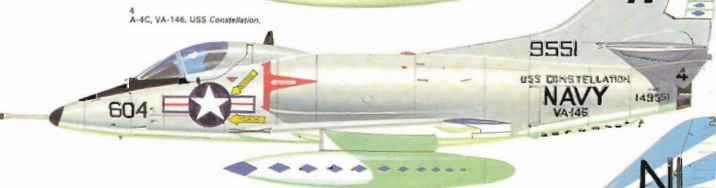
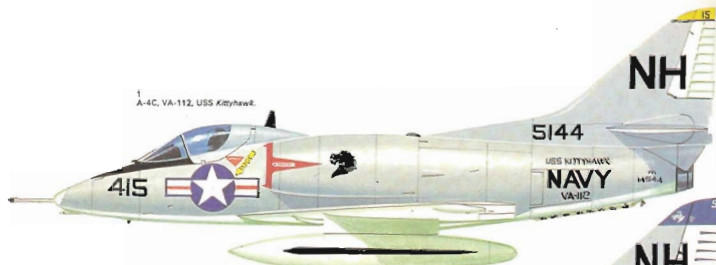


4 A-4B, VA-106.



5 A-4F, VA-106, USS Intrepid.

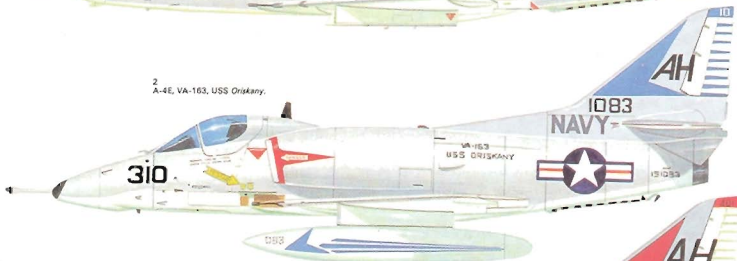




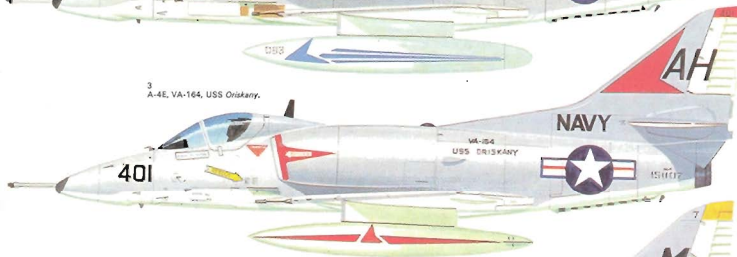
1
A-4E, VA-155, USS Constellation.



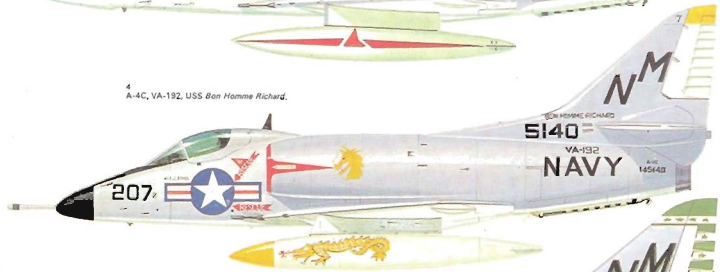
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A-4E, VA-163, USS Oriskany.



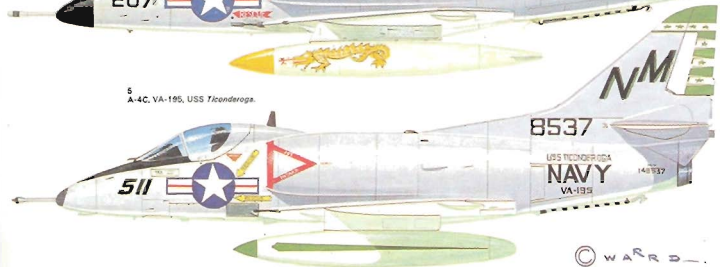
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A-4E, VA-164, USS Oriskany.



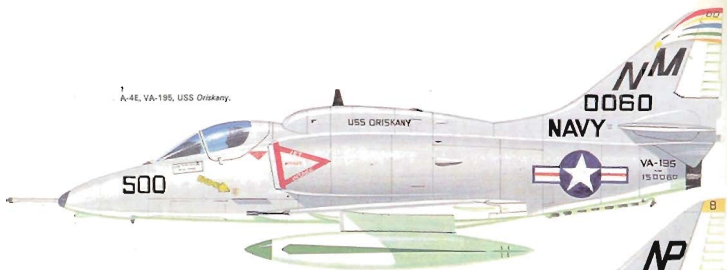
4
A-4C, VA-192, USS Bon Homme Richard.



5
A-4C, VA-195, USS Ticonderoga.



1 A-4E, VA-195, USS Oriskany.



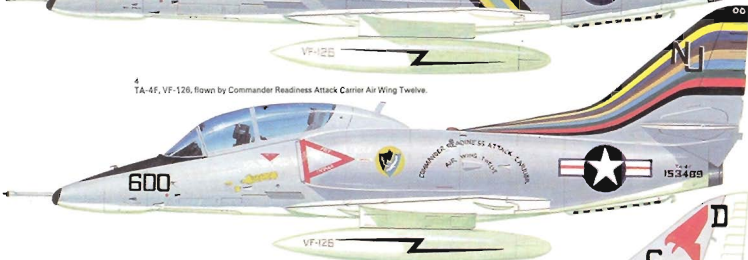
2 A-4E, VA-212, USS Hancock.



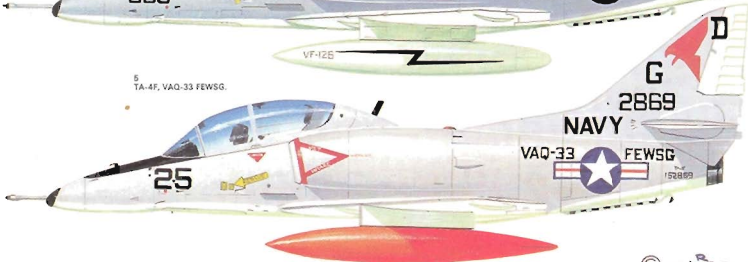
3 TA-4F, VF-126.



4 TA-4F, VF-126, flown by Commander Readiness Attack Carrier Air Wing Twelve.



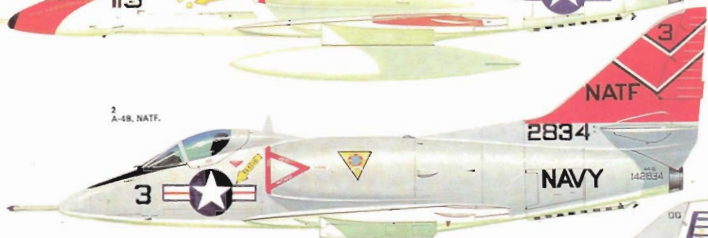
5 TA-4F, VAQ-33 FEWSG.



1
TA-4J, VT-21.



2
A-4B, NATF.



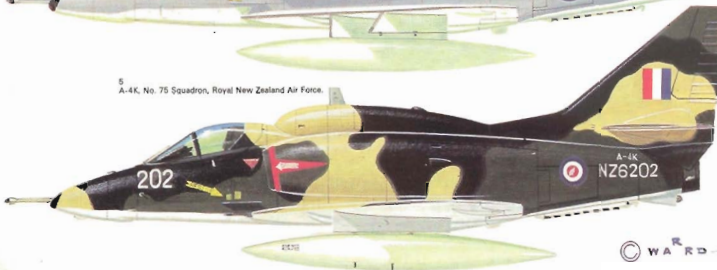
3
TA-4F, Commander Marine Aircraft Group Thirty-two (MAG-32).













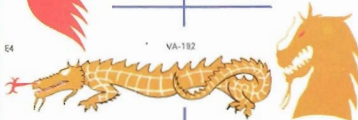


4
A-4G, No. 805 Squadron, HMAS Melbourne, Royal Australian Navy.

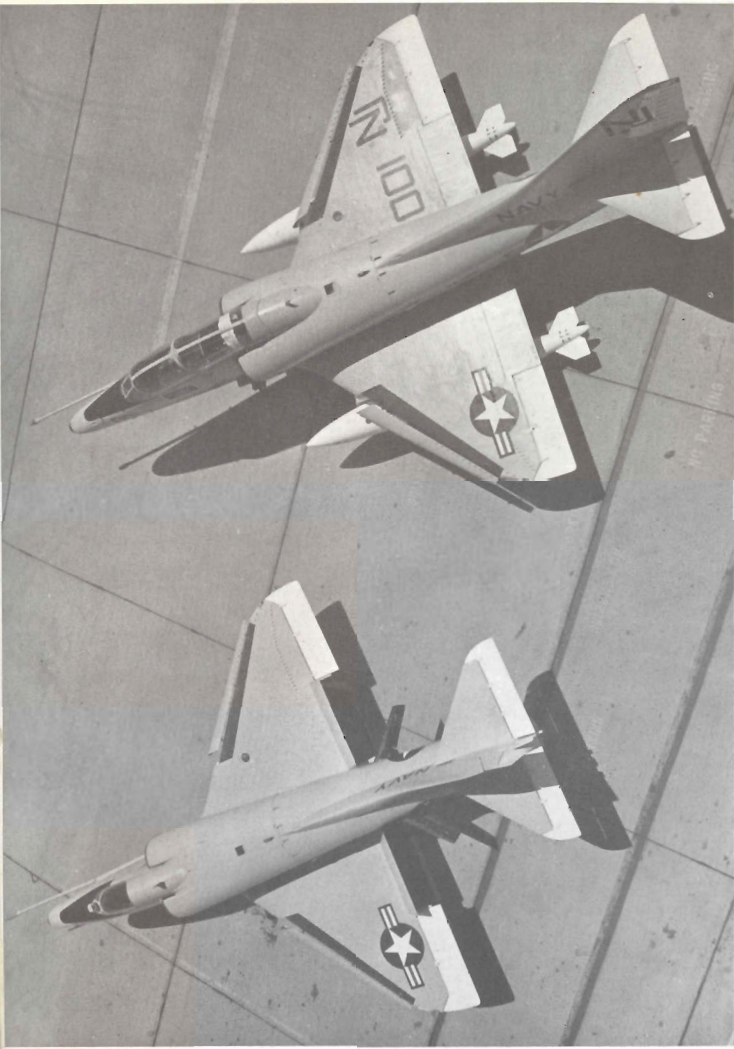


5
A-4K, No. 75 Squadron, Royal New Zealand Air Force.



INSIGNIA

<p>A1</p>  <p>VA-12</p>	<p>A4</p>  <p>VA-43</p>	<p>(nil)</p>  <p>VA-84</p>	<p>B3</p>  <p>VA-83</p>
<p>B4</p>  <p>VA-85</p>	<p>C3</p>  <p>VA-95</p>	<p>C4</p>  <p>VA-106</p>	<p>C5</p>  <p>VA-106</p>
<p>D1</p>  <p>VA-112</p>	<p>D2</p>  <p>STINGERS</p> <p>VA-113</p>	<p>D3</p>  <p>VA-144</p>	<p>D5</p>  <p>VA-153</p>
<p>E1</p>  <p>ATTACK SQUADRON 155</p> <p>VA-155</p>	<p>F1</p>  <p>VA-195</p>	<p>F2</p>  <p>VA-212</p>	<p>TP1</p>  <p>VA-216</p>
<p>C2</p>  <p>VA-94</p> <p>E4</p>  <p>VA-192</p>	<p>F3/4</p>  <p>VF-126</p>	<p>(nil)</p>  <p>VSP-1</p>	



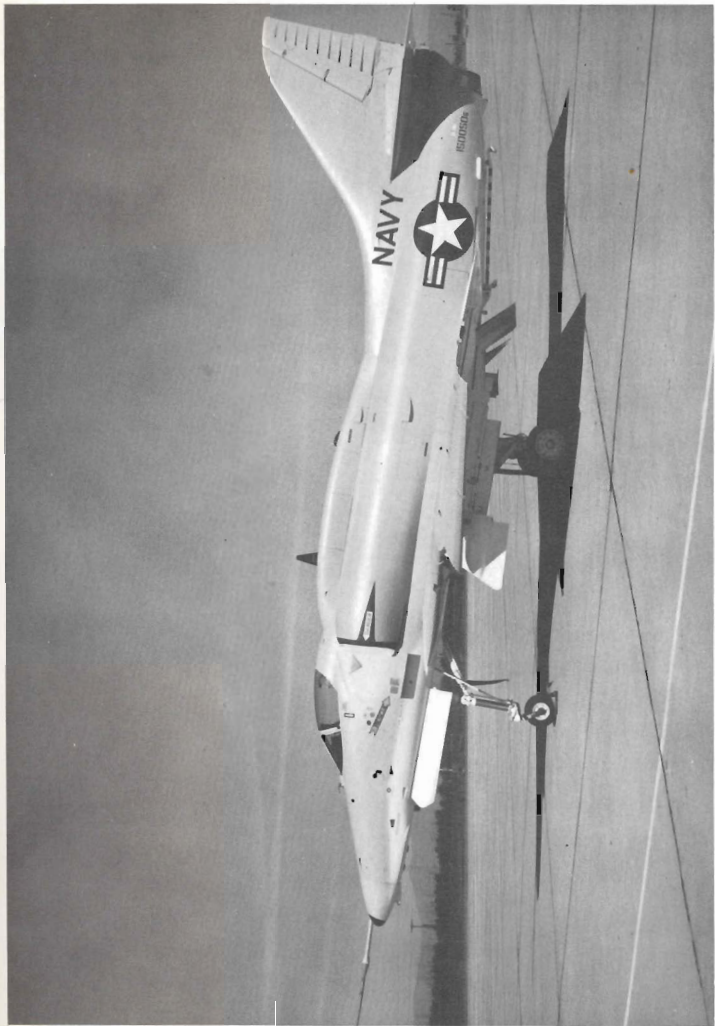
Comparative plain views of an A-4E and YA-4F, the latter belonging to VA-126. (McDonnell: Douglas vs. J. W. R. "swivel")



Colourful A-4E of VMA-324. (R. Harrison)

A-4E of VA-195, USS *Oriskany*, see side-view F1 for colour details. Note white edging to 500. (R. Harrison)





Manufacturer's shot of an A-4E which clearly shows all gizmo and external structural details. (McDonnell-Douglas via J. W. B. Taylor)



Above: Smart A-4F of VA-22, USS *Bog Homme Richard*, 1968. (R. Harrison)



Left, two pictures: Another pair of A-4F's similarly marked to 307 above. See side-view A2 for colour details. Serials, top 155000, centre 154970, bottom 154183.



Left: 000, an A-4F flown by the Commanding General of the 4th Marine Air Wing, Glenview NAS, 1971. (Fred C. Dickey Jr.)



Above: Late model A-4E of VX-5, Operational Test and Evaluation Force, Edwards AFB, California, May 1970. (R. Harrison)



Above & below: A pair of A-4L's of the Marine Air Group Squadron at Glenview NAS, VMA-543, note the A-4L below, 00, carries the legend MARTO on the hump which stands for Marine Reserve Training Officer. Photographs taken in 1971. (Fred C. Dickey Jr.)





A-4L's in the new Reserve Group markings. Each station which has a squadron attached has a different coloured striping, those illustrated are from Glenview NAS and have dark blue stripes. (Fred C. Dickey Jr.)



Right & below: TA-4B's of an unknown Navy Reserve unit photographed at S. Weymouth, Mass., September 1969. (R. Harrison)



Below: TA-4F of VF-126 photographed at Otis AFB, Mass., May 1969. See side-view F3/4 for general colour details. (R. Harrison)





Above: TA-4F of VA-44, red tip to rudder with black 63 otherwise standard scheme. (R. Harrison)



Above: TA-4F of VA-144 "Roadrunners", see side-view D3 for colour details. (R. Harrison)

Below: Colourful TA-4F of VAQ-33, Quonset Point NAS, R.I., June 1970. See side-view F5 for colour details. (R. Harrison)





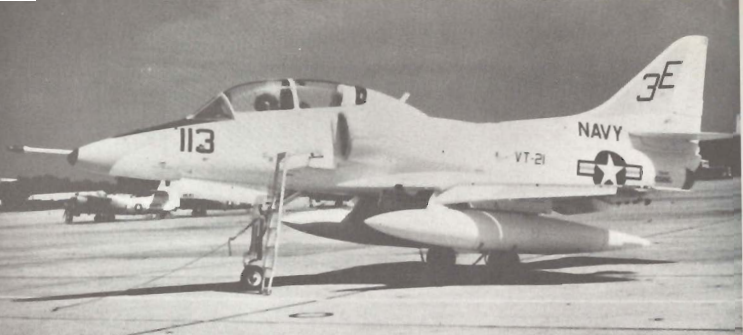
Above: Another shot of the TA-4F of VT-23 rolling along the taxi-track at Glenview NAS. (Fred C. Dickey Jr.)

Below: TA-4F 000, mount of Rear Admiral L. Heyworth Jr., VA-45, Commander Fleet Air, Jacksonville, see side-view A5 for colour details. (Joseph G. Handleman)



Below: Marine Corps TA-4F of H & MS-31. (R. Harrison)





Above: TA-4J of VT-21 photographed at Andrews AFB, September 1989. See side-view G1 for colour details. (Joseph G. Handleman)



Left: TA-4F of the Commander Readiness Attack Carrier Air Wing Twelve; in the background is 617. See side-views F3/4 for colour details of both aircraft. (R. Harrison)

Below: TA-4F of VA-43 photographed at Oceana NAS, Va., July 1968. See side-view A4 for colour details. (Joseph G. Handleman)





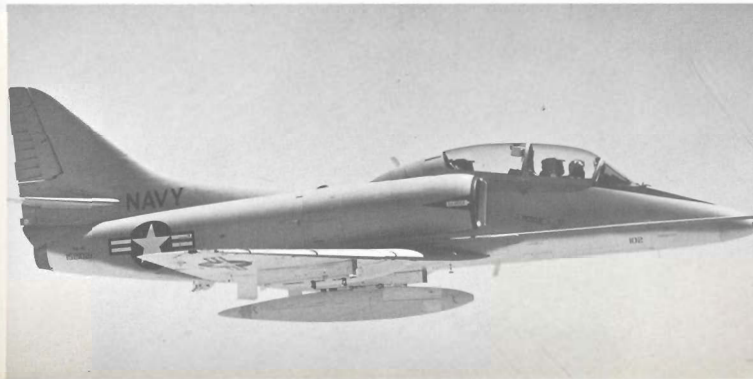
Above & right: Two shots of TA-4F 617 of VF-126 taken at Andrews AFB, November 1969. See side-view F3 for colour details. (Joseph G. Handleman)



Right: 604, another TA-4F of VF-126 but with dark blue rudder details. (Joseph G. Handleman)



Below: Good detail shot of a TA-4E showing the modified and lengthened nose. (McDonnell-Douglas via J. W. R. Taylor)

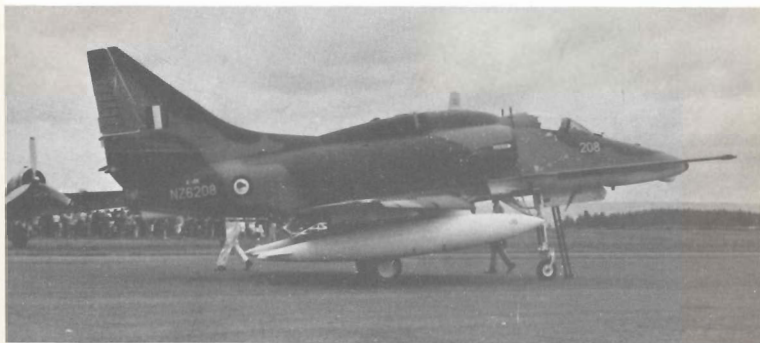
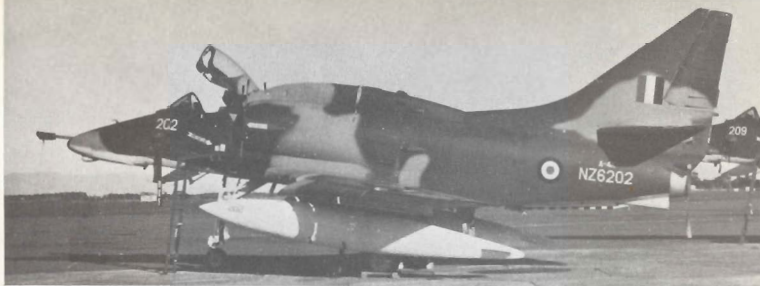




A pair of A-4G's of the Royal Australian Navy; scheme is standard US Navy gull grey and white.

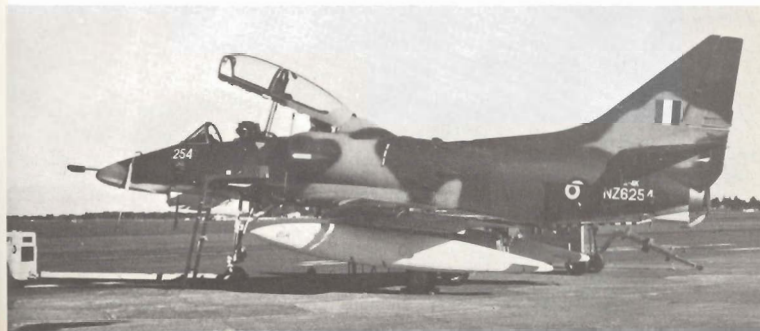
An A-4G of No. 850 Squadron on the steam catapult on board HMS *Hermes*, November 1968. See side-view G4 for colour details. (RAN via Air Pictorial)



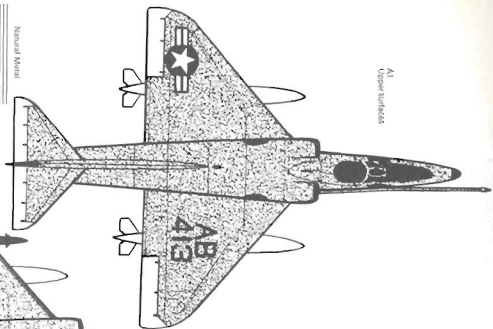


Above: A pair of A-4K Skyhawks of No. 75 Squadron, Royal New Zealand Air Force; note 208 has the Kiwi in the roundel centre. See side-view G5 for colour details. (D. Noble)

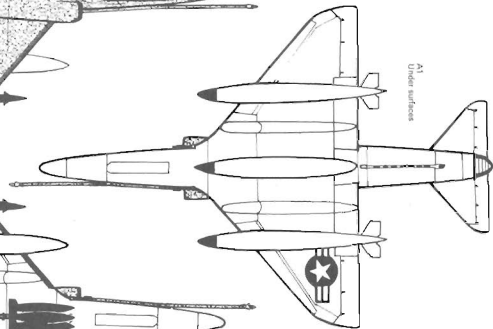
Below: A TA-4K of No. 75 Squadron in exactly the same scheme as the A-4K's above. All photos taken at Ohaheka on 9 July 1970. (D. Noble)



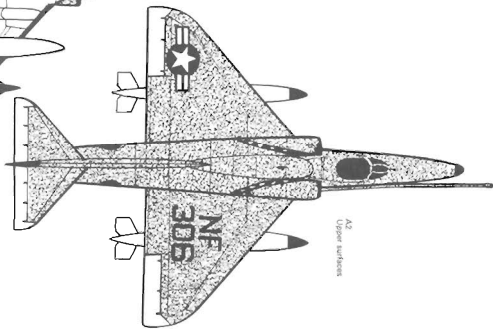
A1
Upper surfaces



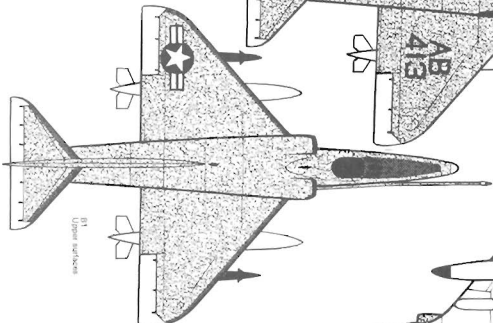
A1
Under surfaces



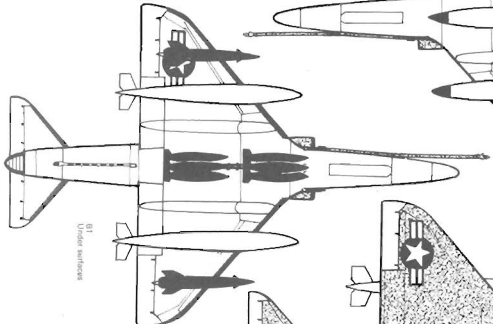
A2
Upper surfaces



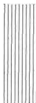
B1
Upper surfaces



B1
Under surfaces



Natural Metal



Dark Grey

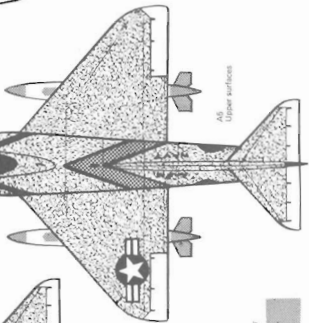
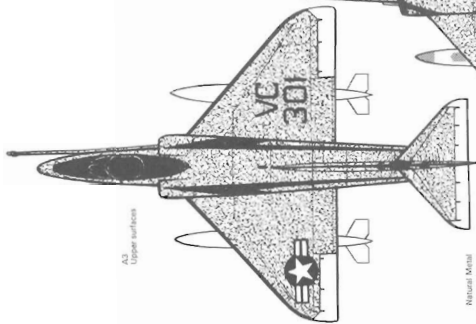
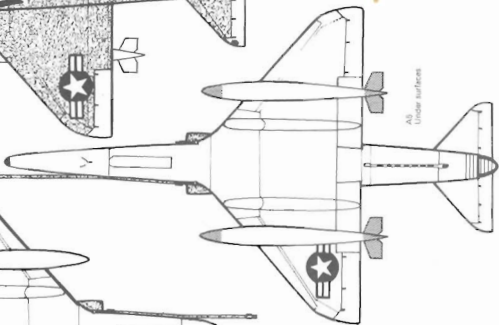
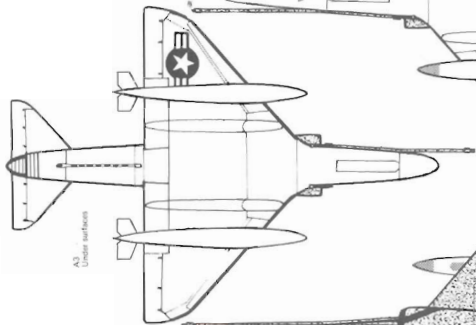
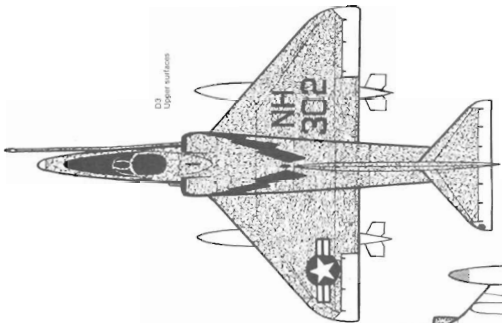


White



Dark Grey
(Leading edges and
air glider panels)





Natural Metal



Gull Gray



White



Green

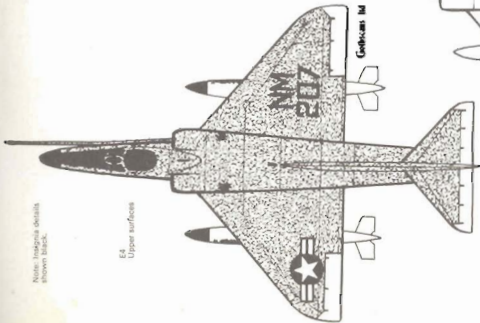


Medium Gray



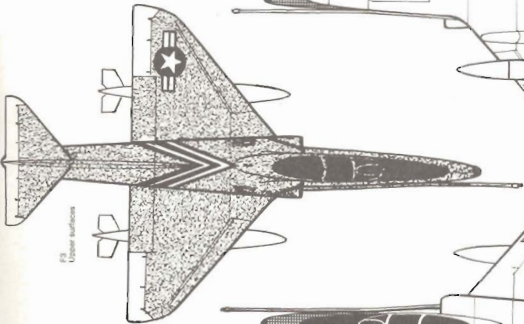
Note: Insignificant details shown black.

E4 Upper surfaces

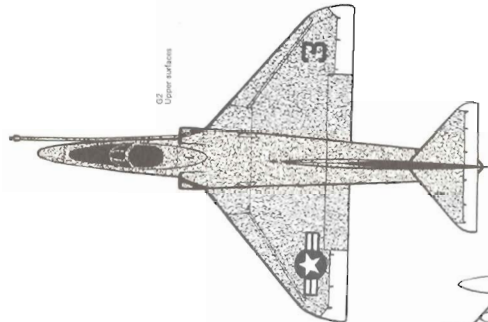


Gulfstream IV

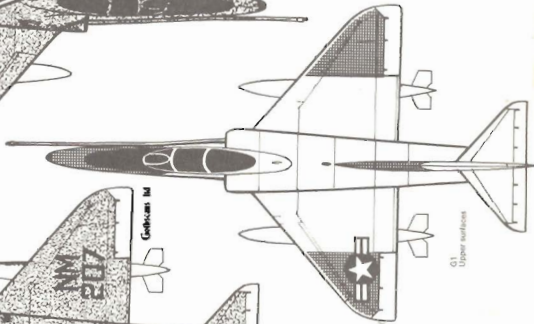
F9 Upper surfaces



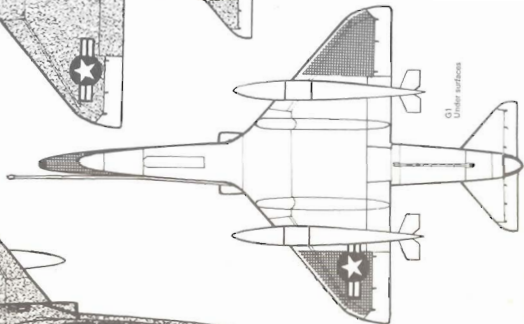
G2 Upper surfaces



G1 Upper surfaces



G1 Under surfaces



Natural Metal



Gull Grey

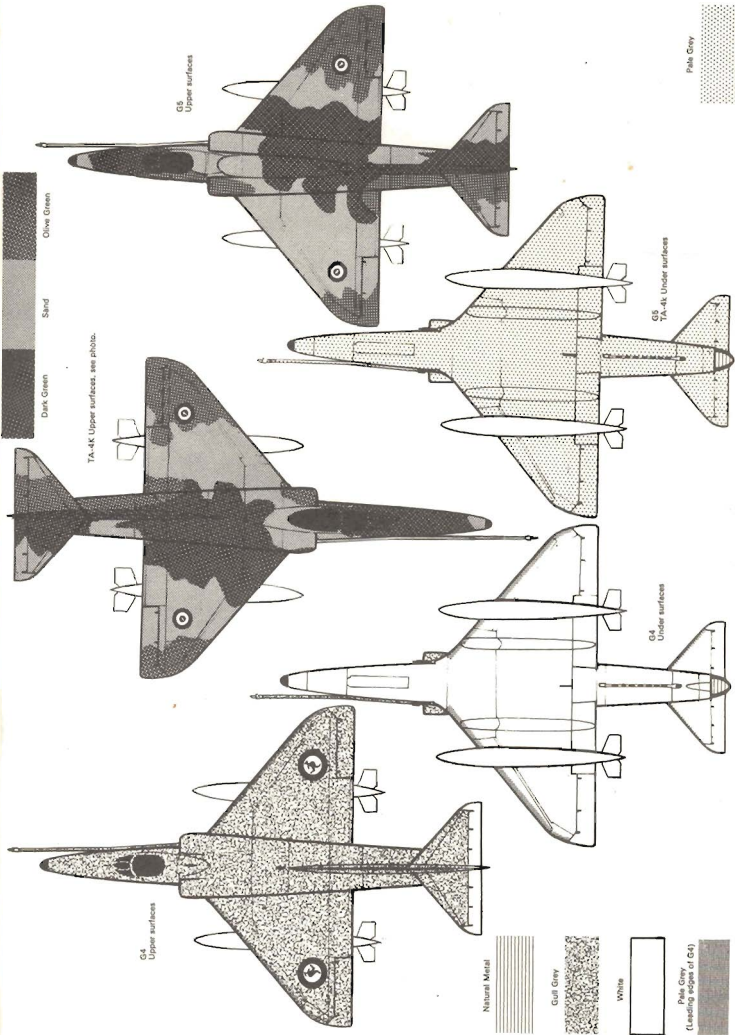


White



Orange Red





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Regia Aeronautica:
Colour Schemes & Markings, Vol. 2, Bombers, Reconnaissance, Maritime, Training and Liaison types.
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Bombardment Group Identification Markings and Codes 1941-1945.
Aerobatic Teams 1950-1970 Vol. 2.
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A-4F, VA-192, USS *Ticonderoga*.
A-4B, "Air Barrows", Glenview NAS Demonstration Team.
A-4F, VSF-1, USS *Independence*.