

OV-10 Bronco

in action



Aircraft Number 154
squadron/signal publications

DON GREER

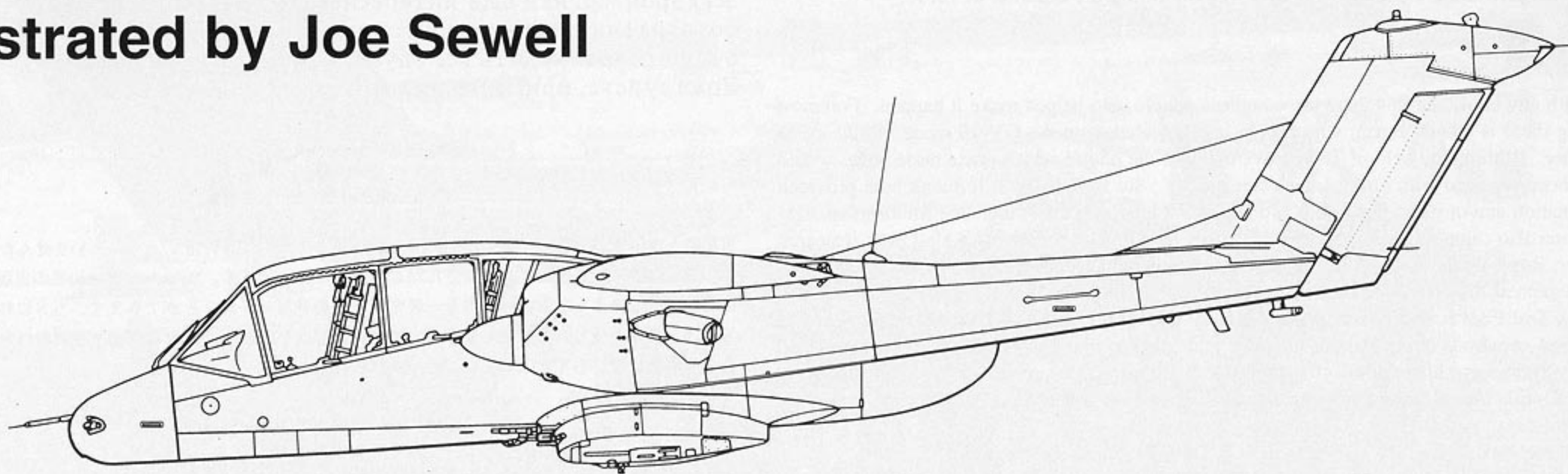
OV-10 Bronco

By Jim Mesko

Color by Don Greer

Illustrated by Joe Sewell

in action



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Two OV-10As of Light Attack Squadron Four (VAL-4), Bien Thuy Detachment, attack Viet Cong Targets in the Mekong River Delta region during the Summer of 1971.

Credits

As with any book like this there are countless people who helped make it happen. Foremost among these is Chuck Burin, whose help and knowledge on the OV-10 made all this come together. Without the help of Terry Love many of the photos which grace these pages would have been replaced with ones of far lesser quality. Stu Bailey and Bill Shenk both provided information and/or photos as did an old and true friend, Knox Bishop. Joe Michaels of JEM Aviation also came through in the photo area as did Len Lundh. At NASA's Lewis Research Center, Roy Coe put up with my barrage of questions and requests for a whole morning as I photographed the NASA Bronco fleet at Cleveland Hopkins Airport. His help and that of NASA Test Pilot Rich Ranaudo helped greatly with the NASA OV-10 story. Carl Altevogt provided numerous North American slides that filled in many gaps. Greg Stewart provided some outstanding photos of OV-10s from VMO-2 during an exercise at 29 Palms which were very helpful. To all these people and those listed below a heartfelt "Thank You" is so very appropriate.

Greg Gatewood
U.S. Marine Corps
U.S. Air Force
Roy Wiggs
Bob Cressman
U.S. Air Force Museum
Jon Miller
Cleveland National Airshow Committee
Bob Mikesh
Bud Colvin
Dick Cole
Nick Waters

Dave Boksanski (Deceased)
U.S. Navy
George Piter
North American Rockwell (NA)
Dave Menard
Joe Dodyk
DAVA
NASA
Squadron Signal
Jeff Clements
Dana Bell
California Department of Fire

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ISBN 0-89747-340-X

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Dedication

This book is dedicated to the many pilots who flew the Bronco in peace and war, but especially to the Marines who know that ground and air power are a team that must work together to win wars at the lowest possible cost. To all these men this book is humbly dedicated.

This early OV-10A was used as a backdrop for a group photograph to show the Marine ground/air team and support personnel during late 1969 at the Marble Mountain airstrip. The Broncos were combined with other Marine aviation detachments under the control of VMO-2. Later this aircraft was one of six aircraft sold to Morocco. (USMC via Cressam)



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MARINES



DANGER
EXHAUST

Introduction

During the Second World War the U.S. Marine Corps developed the most effective air-ground support team then in existence based upon the pioneer work the aviators had done in the Central American region during the 1920s and 1930s. This team refined close air-ground support to such an extent that Marines on the ground were able to call in air strikes within incredibly short distances to their most forward troops, helping to reduce casualties against the fanatically dug-in Japanese defenders on numerous islands on the road to Tokyo. Similar tactics were also developed by the Army Air Force in Europe and while differences existed between the two services, a common thread which each shared was the use of light single engined aircraft to locate targets and direct strike aircraft attacks against these targets. These light aircraft were a vital link in effectively using air power to facilitate the advance of ground forces, and without them the effectiveness of air power in this role would have been severely handicapped.

Following the end of the war, the Marines continued to work on these tactics, the only service to do so, and this work proved invaluable in the Summer of 1950 when the Korean War broke out. In the early days of the war, air support was the key weapon in holding back the North Korean Army from overwhelming U.S. and South Korean ground forces. The new Air Force, while providing vital support, had not worked on close air-ground support to the extent the Marines had done since the end of the Second World War, and needed to hone its skills in this role. It eventually developed an effective structure to provide support to the ground forces.

Again the common thread that ran through both the Marine and Air Force tactics was the use of light aircraft to spot targets and direct air strikes. A variety of aircraft, including Stinson L-4s and L-5s, Cessna O-1s and North American LT-6s were used in this role, although they had not been specifically designed for this role. Following the end of the war, **This factory mock-up of the OV-10A reveals some of the original features of the design which were later deleted on the production aircraft. These included the shorter wing and the horizontally mounted fuselage sponsons.** (NA via Altevogt)

the lessons of the war were studied regarding the use of air power to support ground forces, but little was forthcoming regarding new equipment.

In 1959, the Marines conducted a study concerning a new aircraft which could serve as both an observation and light attack aircraft. This study, designated LLVMA (Light, Light Marine Attack Aircraft), aimed at developing a relatively cheap aircraft which could operate from forward airfields with a minimum of maintenance and facilities. A key proposal in this study was the ability of the aircraft to carry a variety of ordnance to support Marine helicopters during air assaults. This requirement was unique at the time, since aircraft used for spotting and control had never been called on to provide direct support before.

While this study was under consideration, the U.S. began to realize that rather than all out nuclear or conventional warfare on a global scale, the most serious threat to the U.S. and its allies was low-level intensity guerrilla wars, which were being conducted in a number of areas, most notable in the former French colonies of Laos and Vietnam in Southeast Asia. In line with the re-thinking of U.S. strategic goals, the Air Force began voicing interest in a relatively cheap attack aircraft which could be used in such a conflict in place of more sophisticated and expensive jet aircraft which were not suited for such conflicts. In addition, such an aircraft could also be supplied to nations under the Military Assistance Program (MAP), many of which had only limited maintenance and support facilities.

At the same time, the Army was also looking for a new aircraft to replace its Grumman OV-1 Mohawk. This aircraft would be used to support the concept of Airmobility then under development. The Army wanted an aircraft that could carry a relatively heavy armament at fairly high speeds to provide flexible support during airmobile operations.

The broad similarities in requirements fit right in with the new Secretary of Defense, Robert McNamara, and his concept of "commonalty," by which one weapons system would be able to fill a number of roles for all services, rather than having different aircraft tailor made for **The first prototype took to the air on 16 July 1965 from the North American plant at Columbus, Ohio under the control of chief test pilot Ed Gillespe. The aircraft carried the Tri-Service markings which were used on the aircraft while it was evaluated by pilots from the Army, Navy, Air Force and Marines. The aircraft carries a special test probe on the wingtip and does not have the fuselage sponsons fitted.** (NA via Altevogt)

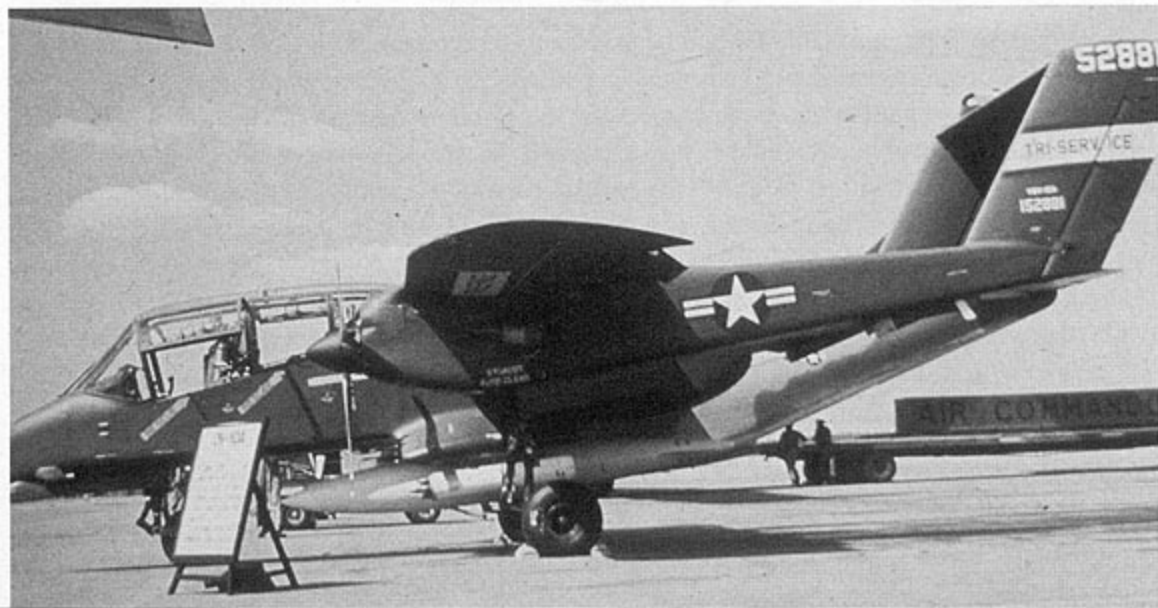


each service. It was envisioned that this would cut down on overall cost and duplication of effort. With this in mind, he formed a Tri Service Committee, comprised of representatives from the Army, Navy, Air Force, Marine Corps and Defense Department during early 1963 to formulate requirements for one aircraft which would be able to fulfill the needs of each service with only minor modifications to the basic design.

The end result of this was a requirement for a Light Armed Reconnaissance Aircraft (LARA) which was formulated by the end of 1963. These requirements were sent out to various aircraft companies, who were asked to prepare proposals for the new aircraft within the parameters of the committees requirements, which were quite stringent. The requirements called for a twin engined aircraft with a two man crew, capable of carrying 2,400 pounds of ordnance, able to operate out of small unprepared airstrips, and loiter over a target fifty miles from its base for one hour. In addition, it would have to be able to carry upwards of 2,000 pounds of cargo, six paratroopers, or several wounded troops, on stretchers, in its fuselage. In terms of performance, the aircraft was expected to be able to take stress loads of between plus 8 Gs and minus 3 Gs, operate from aircraft carriers, fly on one engine, have a speed of at least 350 mph, be able to be converted to an amphibian and have an 800 foot takeoff run. Armament was specified as four 7.62MM machine guns with 2,000 rounds of ammunition. Hardpoints were to be provided for a variety of different ordnance, including Sidewinder air-to-air missiles (AAMs) and the ability to carry a 20MM gun pod.

In response to the committees invitation, eleven companies submitted proposals and from these, seven were chosen for closer examination. These were the Beech PD 183, Douglas D.855, General Dynamics/Convair Model 48 Charger, Helio 1320, Lockheed CL-760, Martin and the North American Rockwell NA 300. After a detailed examination and computer study of each proposal, the Tri Service Committee selected the North American design over the others in August of 1964. In October the company received a contract for seven prototypes. Several of the firms involved in the bidding protested this selection, but only General Dynamics/Convair decided to build a prototype to compete against the NA-300 in the hopes of winning a "fly-off" competition. Despite this effort; however, the Defense Department did not change its mind and the decision to give the contract to North American was not changed.

One of the YOYV-10s on display at an open house at the Eglin Air Force Base complex during an Air Commando presentation. At this time the increasing tempo of the war in Vietnam placed added emphasis on counter-insurgency warfare which the Air Commandos were developed to handle. The Bronco design had been formulated with this type of warfare in mind. (Boksanski via Dodyk)



Work on the aircraft, now designated the YOYV-10A, went smoothly and on 16 July 1965, the aircraft made its first flight, only nine months, almost to the day, from contract approval. The basic design was a twin-boomed configuration with the fuselage pod suspended under the wing with the pilot and observer seated in tandem under a large, segmented canopy which made for excellent visibility. To avoid undue complications or problems, the aircraft was of conventional aluminum monocoque construction. Power was provided by two 660 shp Garrett AirResearch T76-G6/8 turboprop engines with each engine turning its propeller in the opposite direction in order to cancel out torque. These propellers were also reversible in pitch to aid in short field operations. This was tied into the oleo legs of the landing gear by means of a scissors switch to forestall its use until the aircraft was firmly on the runway. To help increase aileron control in lateral movement, four quarter circular plates were incorporated into each upper wing which rotated upward with aileron movement, giving the aircraft a very good rate of roll with light stick movement.

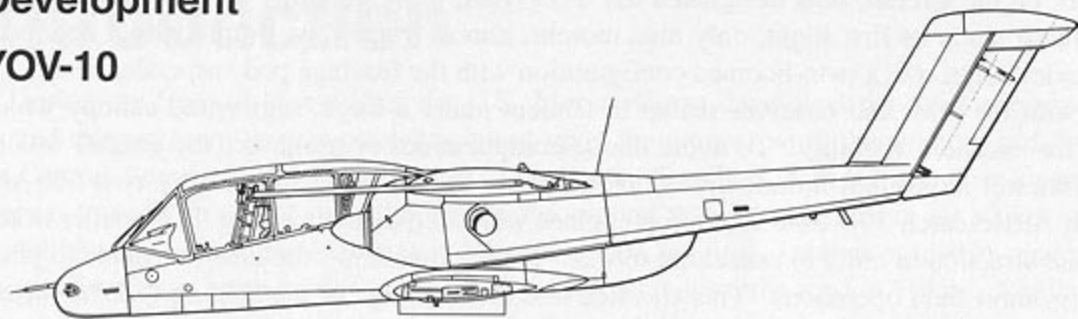
Following the initial test flight, the remaining six prototypes were delivered up through 7 October 1966. During this period the various aircraft were put through a vigorous test program, both by North American and pilots from all four services. In addition, information from combat reports out of Southeast Asia was also factored in, resulting in some serious changes in the criteria for the OV-10. These included the addition of more communications equipment, self-sealing fuel tanks, 300 pounds of armor protection from small arms fire, and the ability to operate in a high heat/humidity environment. As a result, the aircraft design could no longer meet the performance specifications, resulting in major modifications to the basic design. The most noticeable was the increase of the wingspan by some ten feet and the movement outward of the engine nacelle boom by six inches. More power was needed and modified versions of the 715 shp T76-G10/12 engine was fitted in place of the original T76-G6/8 engine. The horizontal fuselage weapons sponsons were angled downward to increase the probability of a "clean" ordnance separation. All these changes took time to incorporate into the design and evaluate and correct for problems. Problems with lateral stability in both the original and modified design were discovered which led to the addition of a dorsal fillet at the base of each vertical fin. The various bugs; however, were wrung out by early 1968 and the aircraft was cleared for production under the designation OV-10A Bronco.

The sixth prototype shows off the classic lines of the Bronco design as it banks to the starboard. The basic outline of the production aircraft would change very little from the prototype except for the length of the wing, the angle of the sponsons and the addition of a fillet at the base of the tail assembly. (NA via Altevogt)

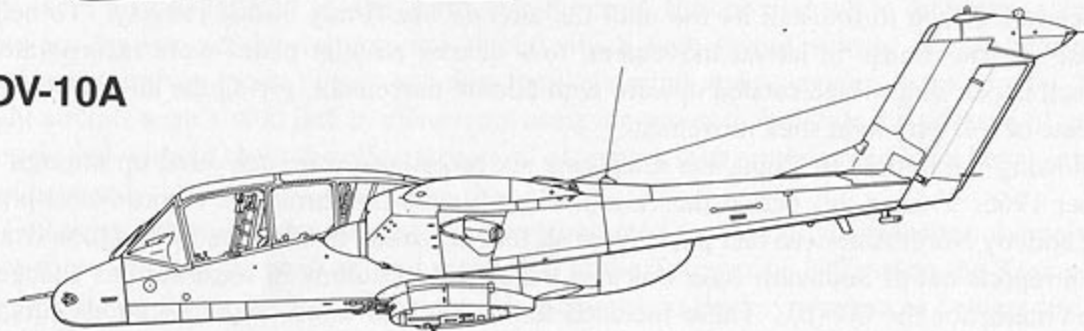


Development

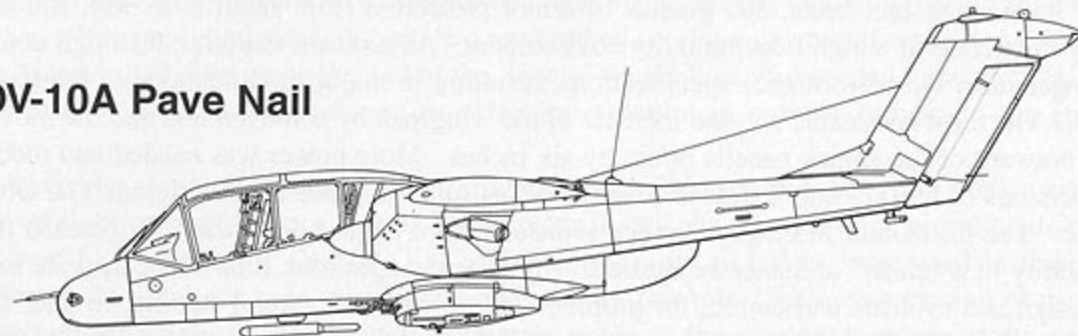
YOV-10



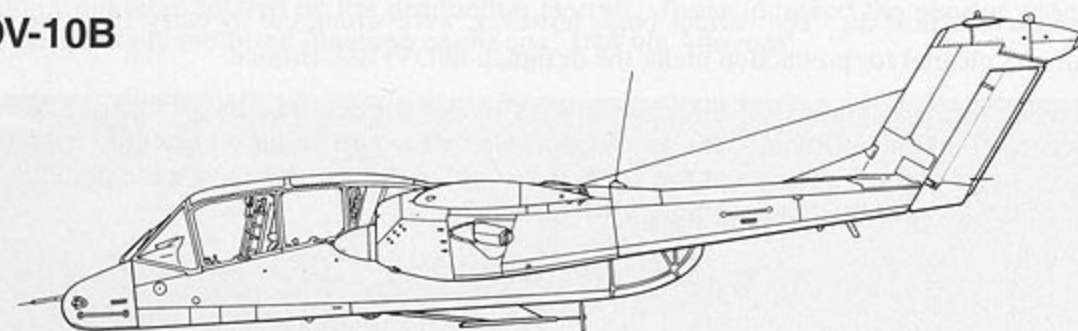
OV-10A



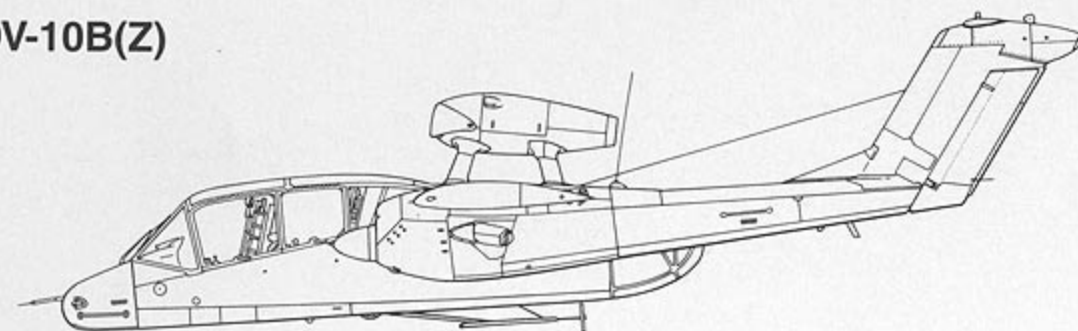
OV-10A Pave Nail



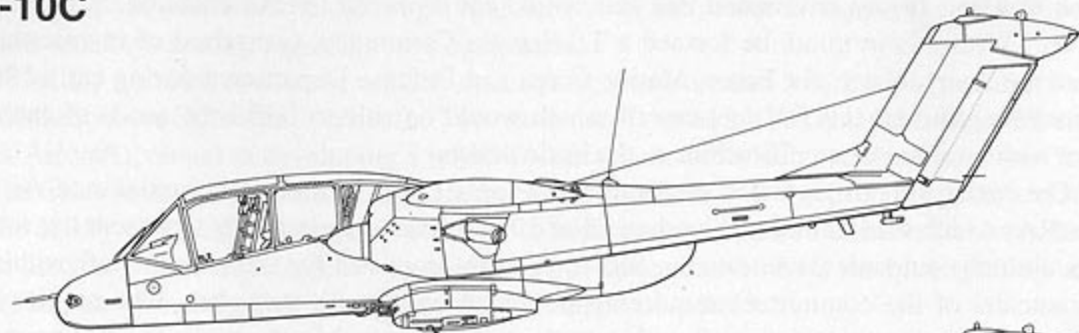
OV-10B



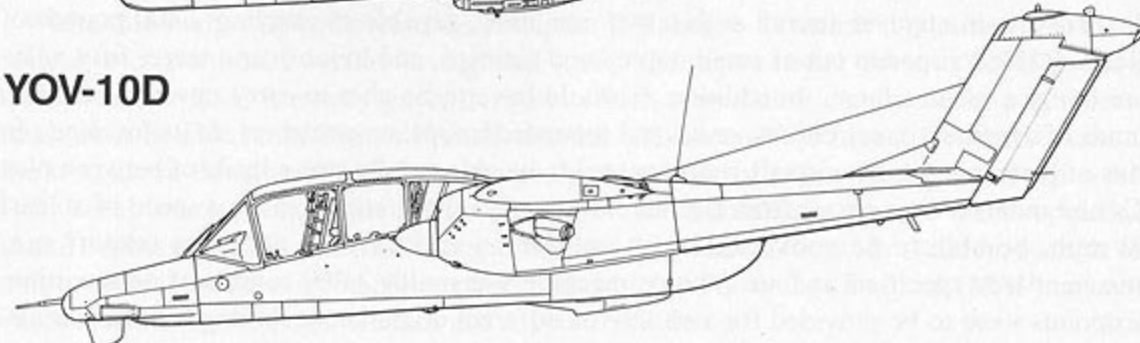
OV-10B(Z)



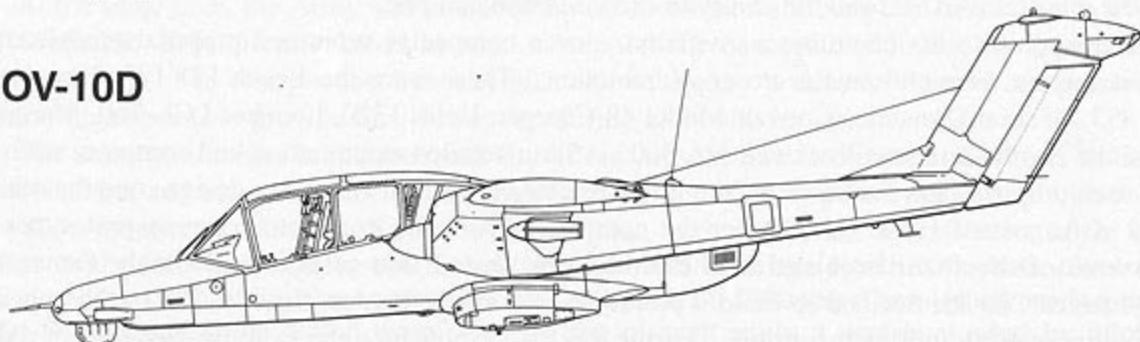
OV-10C



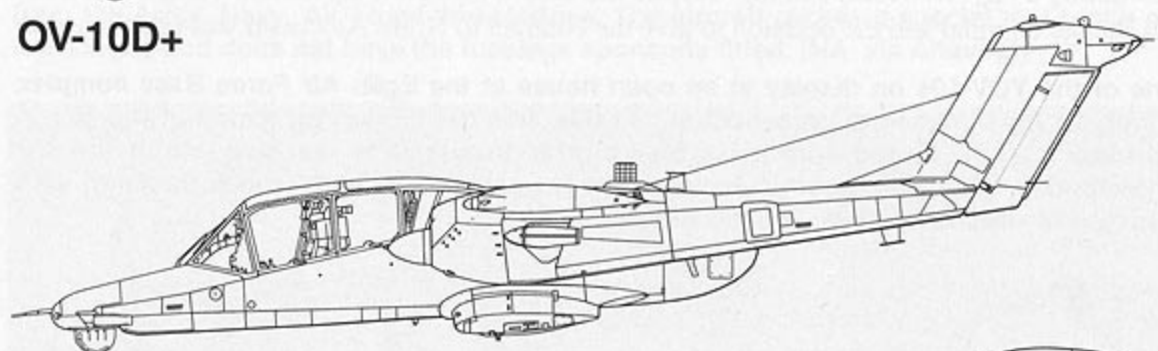
YOV-10D



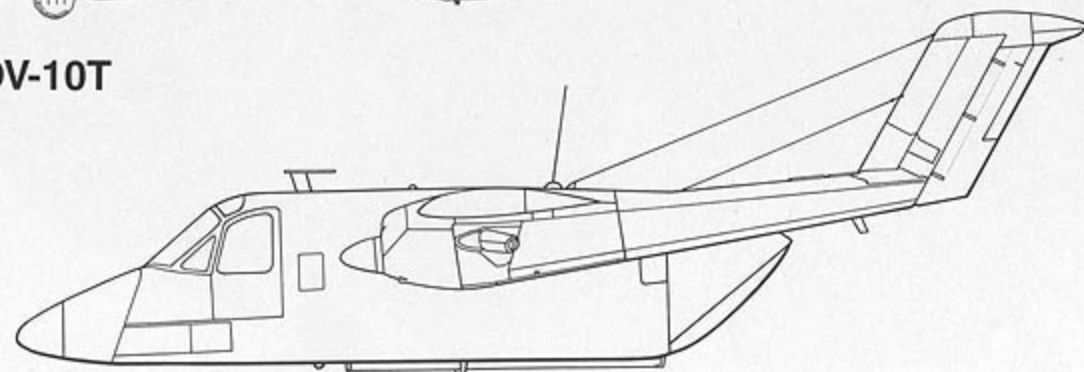
OV-10D



OV-10D+



OV-10T



OV-10A Bronco

While the prototype and early production models of the OV-10 were outwardly similar, there were significant differences between the two aircraft. Various changes had been made to the basic design due to new requirements and battlefield information. These changes resulted in a rework of the airframe. While the fuselage shape remained basically the same, internally additional armor protection was provided for the crew, more communications equipment was added and the sponsons were angled downward. The most noticeable change was in the wing, which had been increased in span by ten feet over the original prototype and the movement outward of the engine booms by some six inches. More powerful engines had been fitted, although these were modified to fit into the existing engine bays so that the nacelles would not have to be lengthened. Internally, self-sealing fuel tanks were installed to lessen the chances of fire or explosion from ground fire.

The end result of this was a unique aircraft, both visually and in performance. It differed from all other aircraft in the inventories of the U.S. forces. The high wing allowed both the fuselage and engine nacelle to be close to the ground, making access to the various components far easier for maintenance personnel. The placement of the wing also allowed for exceptional visibility for the two man crew. Seated in tandem under a large, bulbous canopy, both the pilot and observer had an excellent view toward the front and downward, making target acquisition and spotting much easier than in older type aircraft. Entry into the cockpit was made through large individual upward opening glass panels in the starboard side of each crew position. The panels on the port side also opened and could be used in an emergency. In the event of an inflight emergency, each crewman can eject using his LW-3B zero-speed, zero-altitude ejection seat. While the observer can initiate his own ejection, the pilot can command eject both himself and the observer, a time delay feature insuring that the observer ejects first. Both ejection seats are identical except for the recovery chute location. The observer's seat has the chute on the starboard side and the pilot's seat has it located on the port side. This arrangement pulls the seat outward from each other to preclude a possible collision between the two seats.

The general arrangement of the cockpit was designed to provide service commonalty for all users, which due to certain idiosyncracies of each service was no mean feat. Although each of the two main service users, the Air Force and Navy/Marine Corps have some differences in cockpit equipment, the general arrangements are quite similar. Perhaps the biggest difference is between the various types of communications, identification and navigation systems which are used by each service.

Behind the cockpit is a large cargo compartment which can be configured for a number of different missions. It has a total cargo area of 110 cubic feet and can carry up to 3,200 pounds of cargo. Thanks to the high boom design of the OV-10 the cargo compartment floor is waist high, making it easy to load and unload. Besides cargo, personnel can also be carried. When rigged as a troop carrier, either six infantry or five paratroopers can fit into the compartment, although it is rather close. In a medical evacuation role, a medic and two litter or four walking wounded can be flown out of the forward area for quick medical treatment. The large cargo compartment can also be used for additional avionics, communications or electronic gear. It can also be configured to carry ammunition for special mini-gun turrets and their associated gear which have been tested on the Bronco.

When the engine nacelles were moved six inches outward, this helped to reduce the engine

noise and propeller vibration in the rear cockpit. Due to the change in the initial specification, more powerful engines were needed on the production OV-10A and Garrett-AirResearch T76-G-10/12 turboprops were fitted. To eliminate torque, each engine turned in opposite directions (the starboard engine is the -10 and the port engine is the -12). Each engine produced some 715 shp, an increase of 55 shp over the original T76-G-6/8 engines used on the prototype.

Since the Bronco was to be capable of operation from rough fields, the tricycle landing gear was designed to handle high sink rates when landing and to withstand rough terrain. The main gear was designed around a double telescoping oleo which could withstand a sink rate of up to twenty feet per second. Hydraulically operated, the main gear retracted toward the rear of the nacelle while the nose gear retracted forward. The retraction cycle takes about ten seconds, while gear extension is slightly faster at seven seconds. The nose wheel is steerable to fifty-five degrees left/right of center, allowing for relatively easy maneuvering while taxiing.

The nacelles taper down toward the rear of the boom and flare into a pair of vertical fins/rudders with a sixty degree rearward sweep. On the fin top is a constant cord horizontal stabilizer/elevator which runs between the two booms, ending at the inboard side of each fin. Located in the center (above and below) of the tailplane are mass balance weights.

Unlike previous observation aircraft, the Bronco was specifically designed to carry a wide variety of ordnance on its seven external stores stations. In addition, it also carried four 7.62MM M60 machine guns, two in each side of the sponson with 500 rounds of ammunition per gun. To supplement this firepower, additional gun pods can be carried on the hardpoints, up to the Mk 4 20MM gun pod.

Various types of bombs can be carried on the five sponson and fuselage stations up to 500 pounds, while the centerline station can carry up to 1,000 pounds. They can all carry standard rocket pods except for the centerline station. The two wing stations are wired to carry and fire the AIM-9 Sidewinder air-to-air missile and can also carry standard rocket pods. The centerline station is also plumbed to carry up to a 230 gallon external fuel tank to give the Bronco

There was very little difference in general configuration between the YOY-10 prototypes and the OV-10A, which first came out in February of 1968, The longer wing span and downward angle of the fuselage sponsons were the most visible differences. Additionally, there was a small fillet added to the base of the vertical fin to improve lateral stability, although the first ten aircraft off the production line had to be retrofitted with these. (NA via Altevogt)





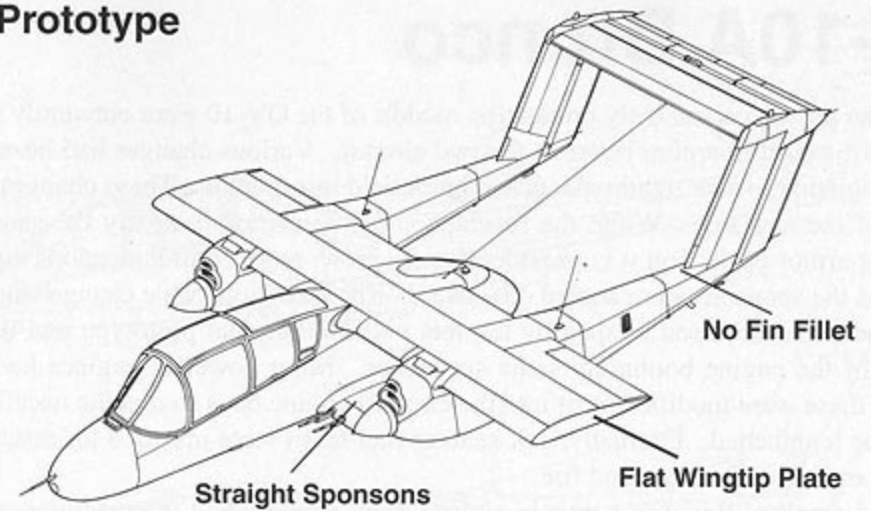
Due to its high wing configuration the OV-10 was easy to maintain and service. The engines and ordnance points were within the reach of the average mechanic or ground personnel and little in the way of specialized support equipment was needed as the aircraft had been designed to live in the field with the troops. (NA via Altevogt)

extended time over target or for ferry purposes.

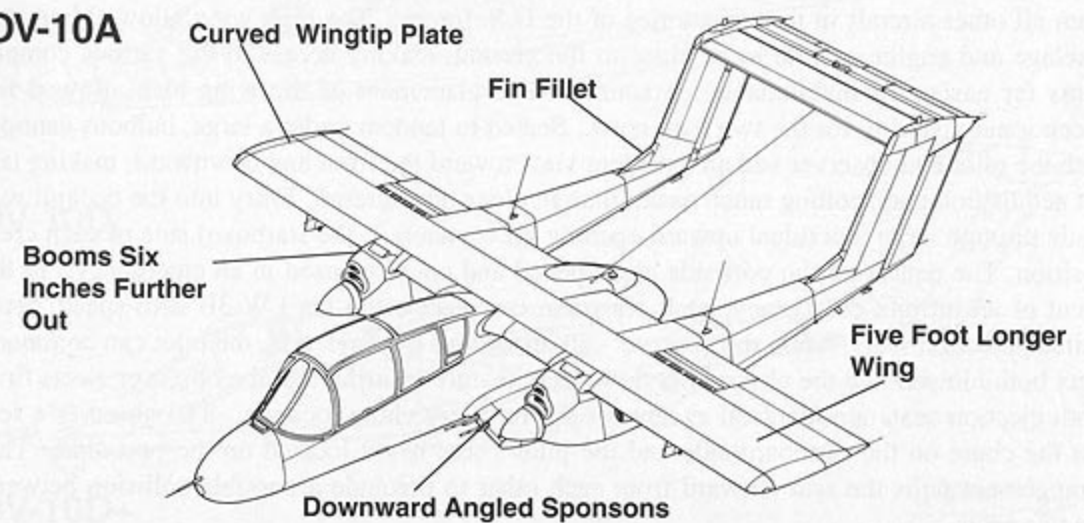
This versatility in ordnance capabilities gave the OV-10A tremendous flexibility and allowed the aircraft to be tailored for any number of combat roles, from observation to strike. Combined with its speed, maneuverability, range and short field performance, the Bronco was ideally suited for use in the war which was raging in Vietnam. The first production models began to roll off the Columbus, Ohio assembly line in February of 1968 and within five months, the Bronco would be taken into combat in Southeast Asia.

Visibility from the cockpit was excellent since the high wing did not block downward observation, an important requirement for a FAC aircraft. The large bulbous canopy allowed the pilot and observer all-round forward visibility with little blockage from the canopy supports. This crew is working with a pair of A-10s which can be seen at the left, during an exercise in Korea. (USAF)

YOV-10 Prototype



OV-10A



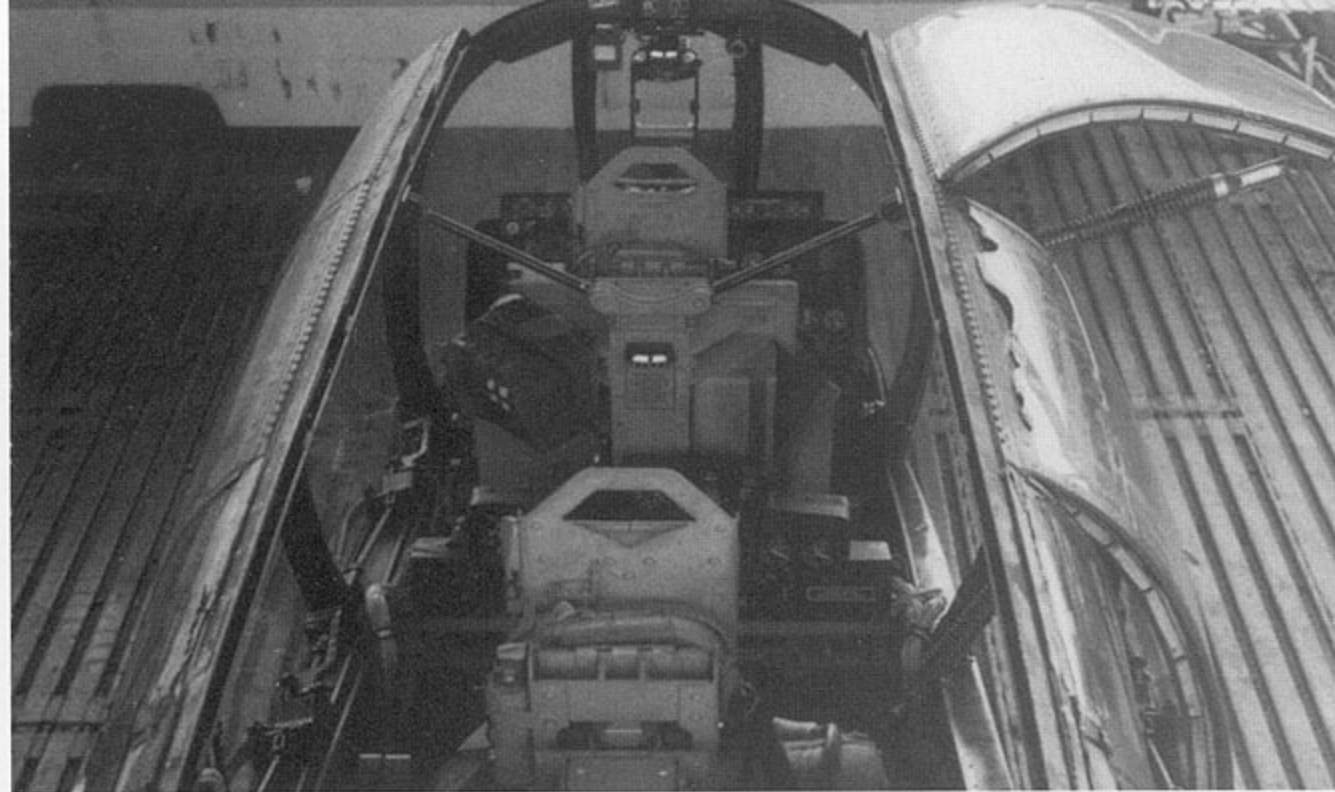
The pilot and observer entered the aircraft on the starboard side (looking forward) through two plexiglass panels which opened outward and upward. Spring activated boarding steps were located below and behind the cockpit for relatively easy entry or exit from the cockpit. The interior of the boarding ladders were painted bright Red. (Terry Love)





The canopy panels on the port side of the aircraft could also be opened but these were used mainly as a means of letting air into the cockpit while the aircraft was taxiing or waiting on the runway since the large canopy heated up very quickly and the Bronco was not equipped with air conditioning. In an emergency these could also be used to escape from the aircraft, but normally entry or exit was done through the starboard side. (NA via Altevogt)

In case of trouble the pilot and observer could eject using their LW-3B zero-speed/zero altitude ejection seats. The observer can eject on his own, while the pilot can command eject both of them with his "D" ring. When this occurs each seat is thrown opposite each other to avoid entanglement or collision. In addition a time delay further insures a clean escape. (Stewart)



Ejection necessitated the breaking of the overhead plexiglas panels and this was accomplished by the headrest canopy breakers on the top of the ejection seat. The device at the top of the forward canopy frame is the gunsight. (Wiggs)

Since the OV-10 was designed for multi-service use the cockpit was basically the same for each of the services with only slight variations. Additional consoles on the sides supplemented the controls on each instrument panel for the two crewmen. The rear control panel had only basic controls to allow the observer to control the aircraft in case the pilot was disabled. (Terry Love)

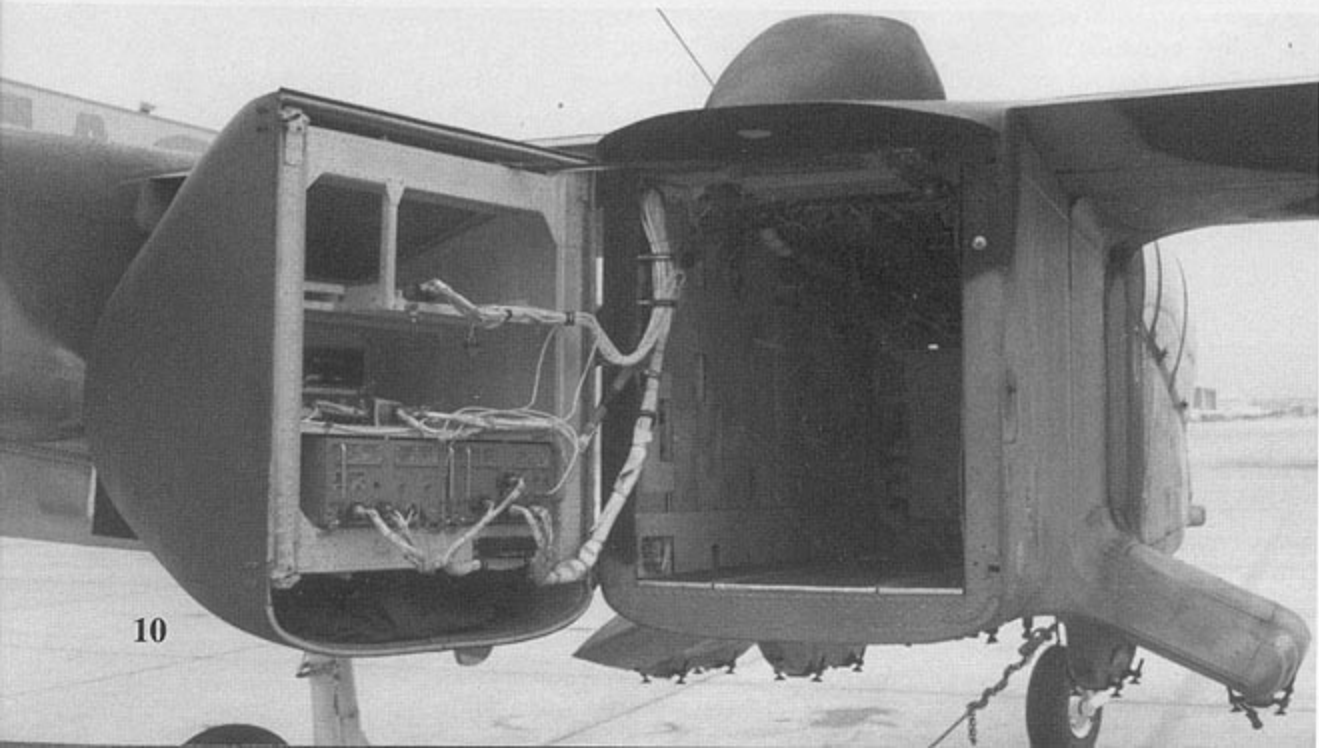




The pilot was equipped with a illuminated reflector, non-computing optical sight for ordnance delivery. The sight reticle could be depressed up to 270 mils. By tilting the reflecting glass the pilot can obtain the proper sight angle for proper release slant range or lead angles for all types of ordnance. (Nick Waters)

(Right) The compartment was a tight fit but could carry up to 3,200 pounds of cargo or six troops. Paratroopers could be dropped, although only five could be carried due to their parachutes. For medical evacuation, four walking wounded or two litters and a medic could be carried. (Stewart)

A unique feature of the Bronco was its large cargo compartment located behind the cockpit. This could be used for carrying cargo, troops or wounded personnel. It could also be used for carrying additional communications equipment or special armaments packages. Its low level to the ground made for easy loading and unloading. (Mesko)





Since the OV-10 was designed to operate out of forward, unprepared airstrips its landing gear had to be able to withstand a tremendous amount of punishment. The double telescoping landing gear was designed to withstand a sink rate of twenty feet per second and this allowed the aircraft to operate out of extremely rough conditions. (Lundh)

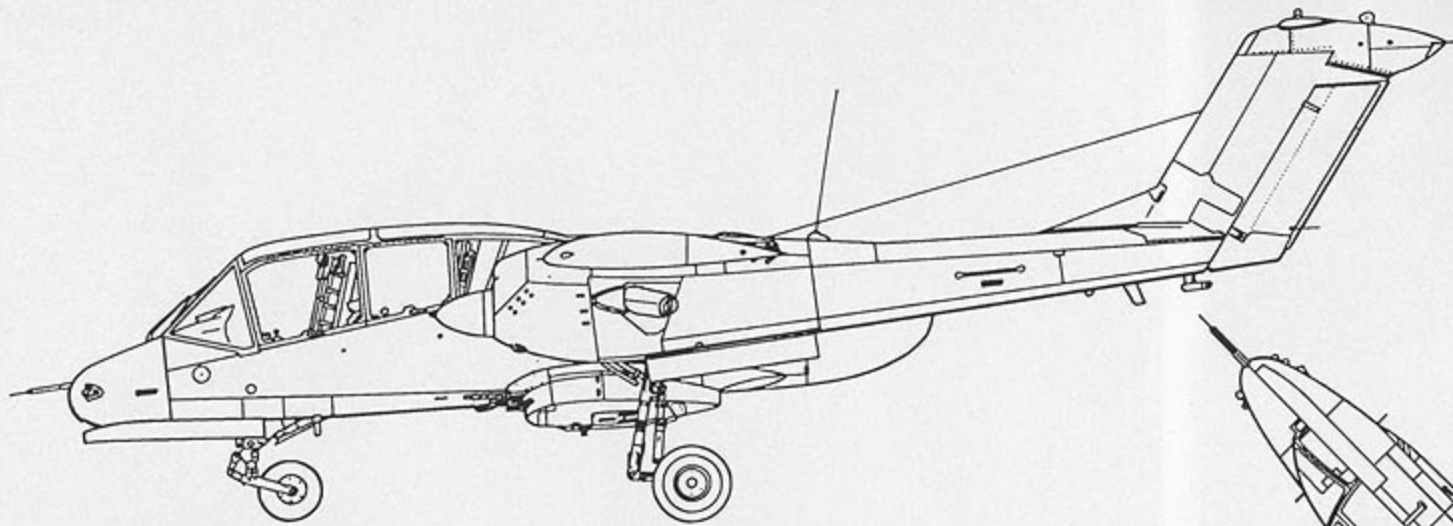
To help improve lateral performance the Bronco was fitted with spoilers to help improve aileron control. These spoilers were geared to the ailerons manually and move through a range between 9 and 89 degrees. This combination gave the OV-10 an outstanding roll rate with very little force applied to the stick. (Mesko)



The nose gear, of similar design to the main gear, retracts forward while the main gear retracts rearward. The nose gear can be turned for steering purposes up to 55 degrees to either side. Normally the aircraft is towed from the nose gear, but in the event main gear towing is needed, rearward tow bars are attached to each of the main gears by means of a special latch. (Lundh)

The first ten aircraft off the production line did not have the small fin fillet at the base of the dorsal fin. A special bolt-on fin was added while this change was incorporated on the production line for future aircraft. This aircraft was the first Air Force Bronco with what appears to be the original bolt on fillet. (Mesko)

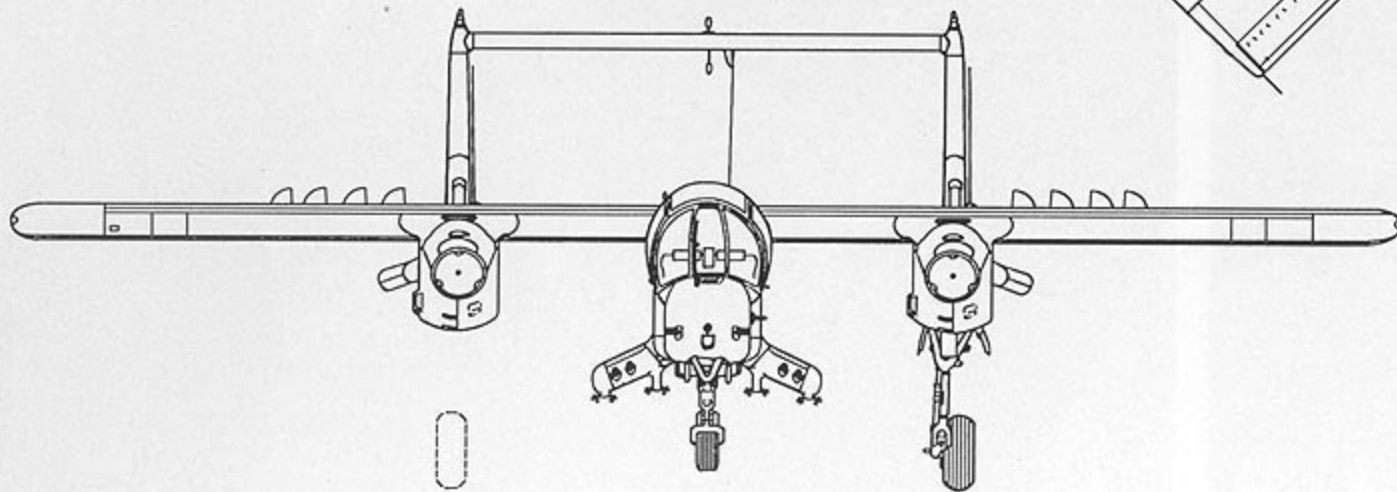
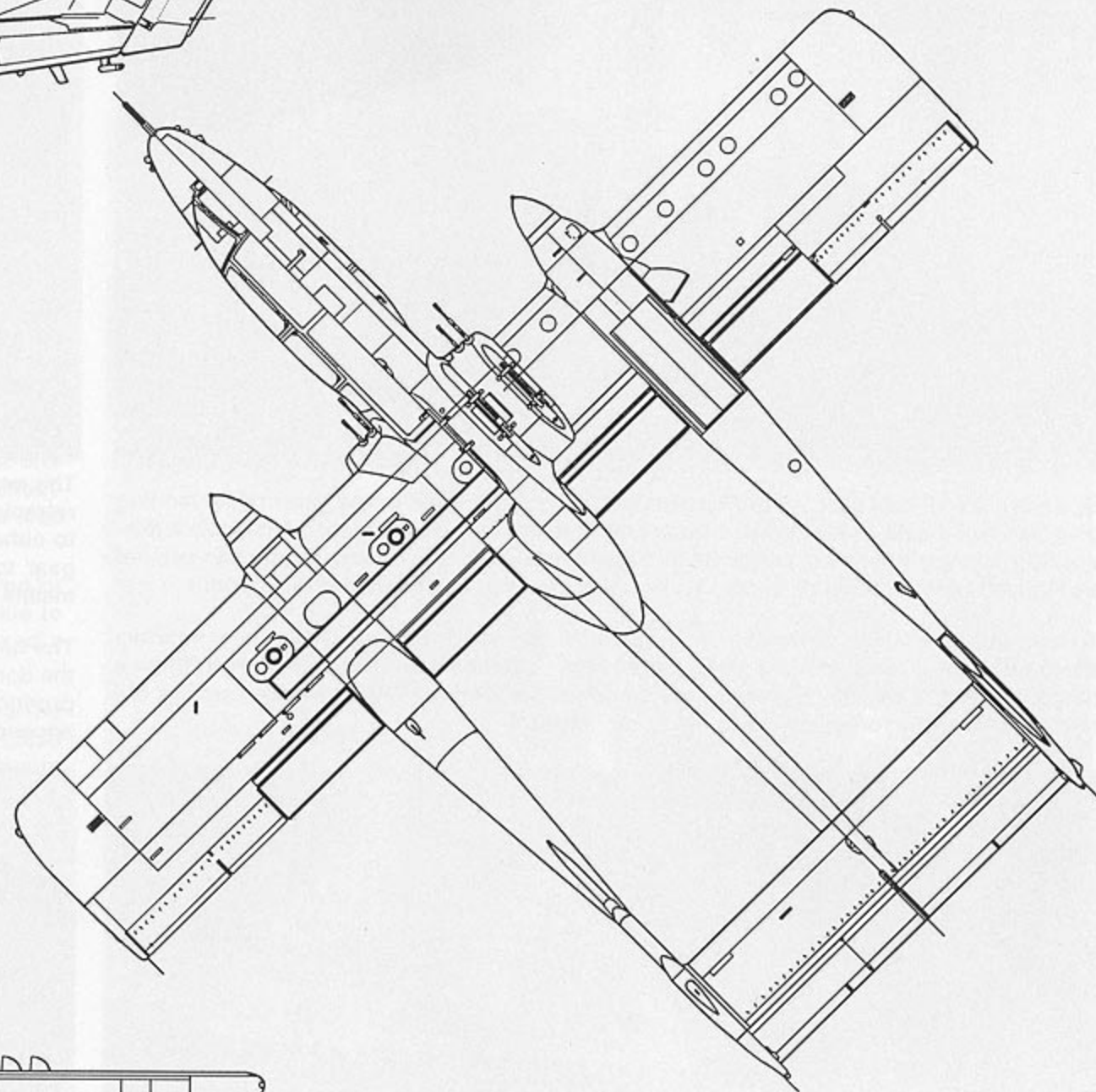




Specification

North American Rockwell OV-10A Bronco

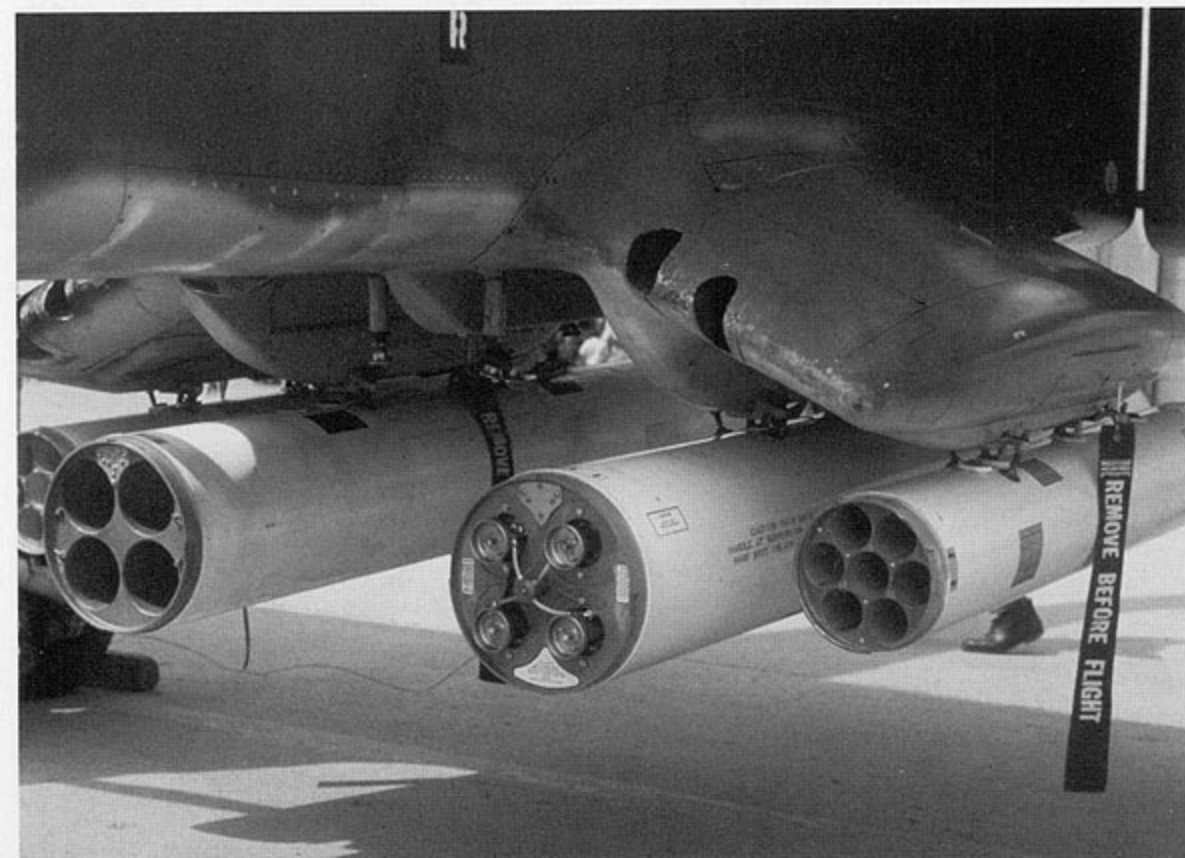
Wingspan.....	40 feet (12.19 m)
Length.....	41 feet 7 inches (12.67 m)
Height.....	15 feet 2 inches (4.62 m)
Empty Weight.....	6,893 pounds (3,127 kg)
Maximum Weight.....	14,444 pounds (6,552 kg)
Powerplant.....	Two 715 shp Garrett T76-G-410/412 turboprop engines
Armament.....	Four 7.62MM M60C machine guns.
Speed.....	281 mph (452 kph)
Service Ceiling.....	24,000 feet (7,315 m)
Range.....	576 miles (358 km)
Crew.....	Two





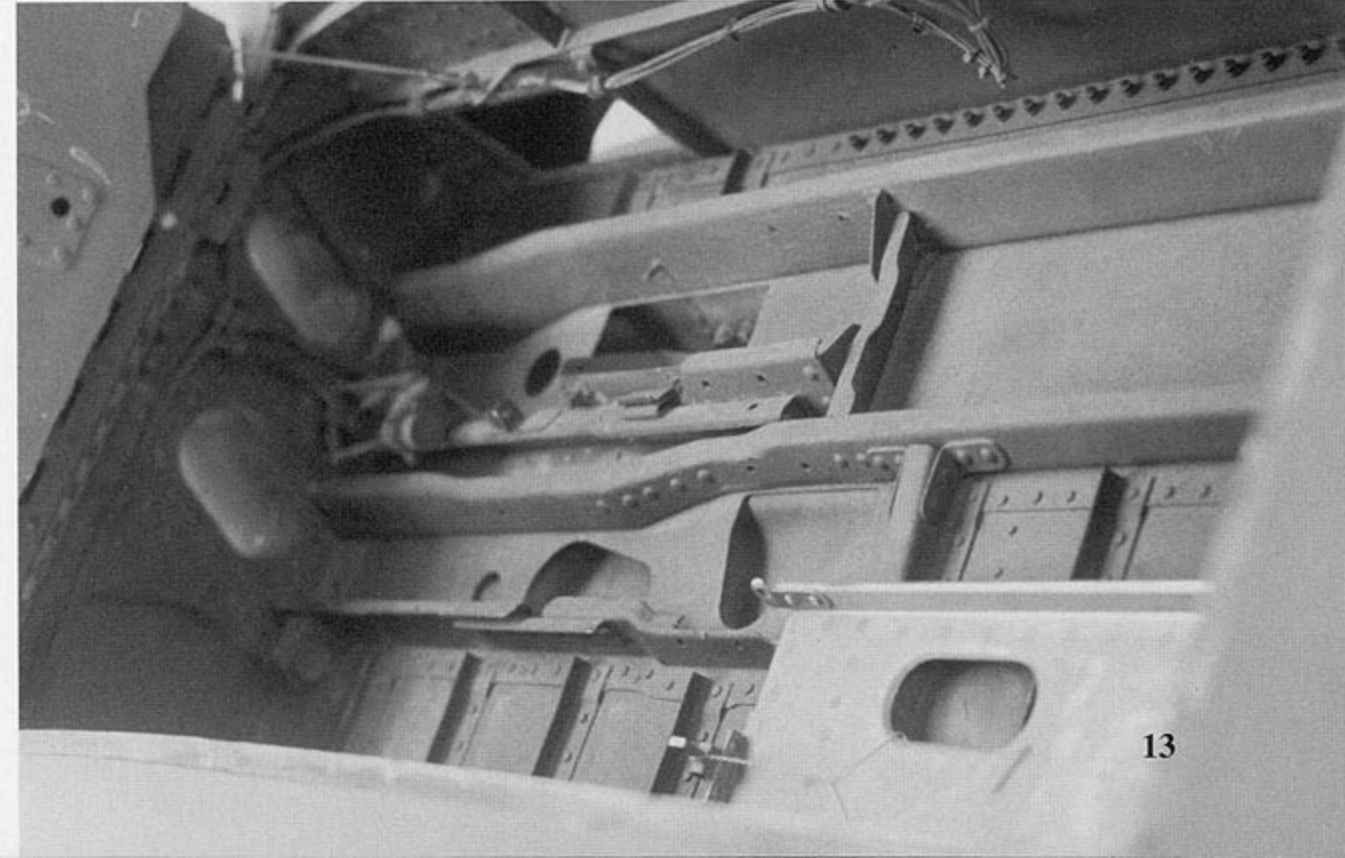
One obvious change from the prototype to the OV-10A was the way the fuselage sponsons were angled downward (the prototype's were parallel to the ground). Each sponson was equipped with two 7.62mm machine guns that were similar to the standard M60 machine gun used by ground forces. Designated M60Cs, each gun had 500 rounds of ammunition in the sponson weapons bay. (Stewart)

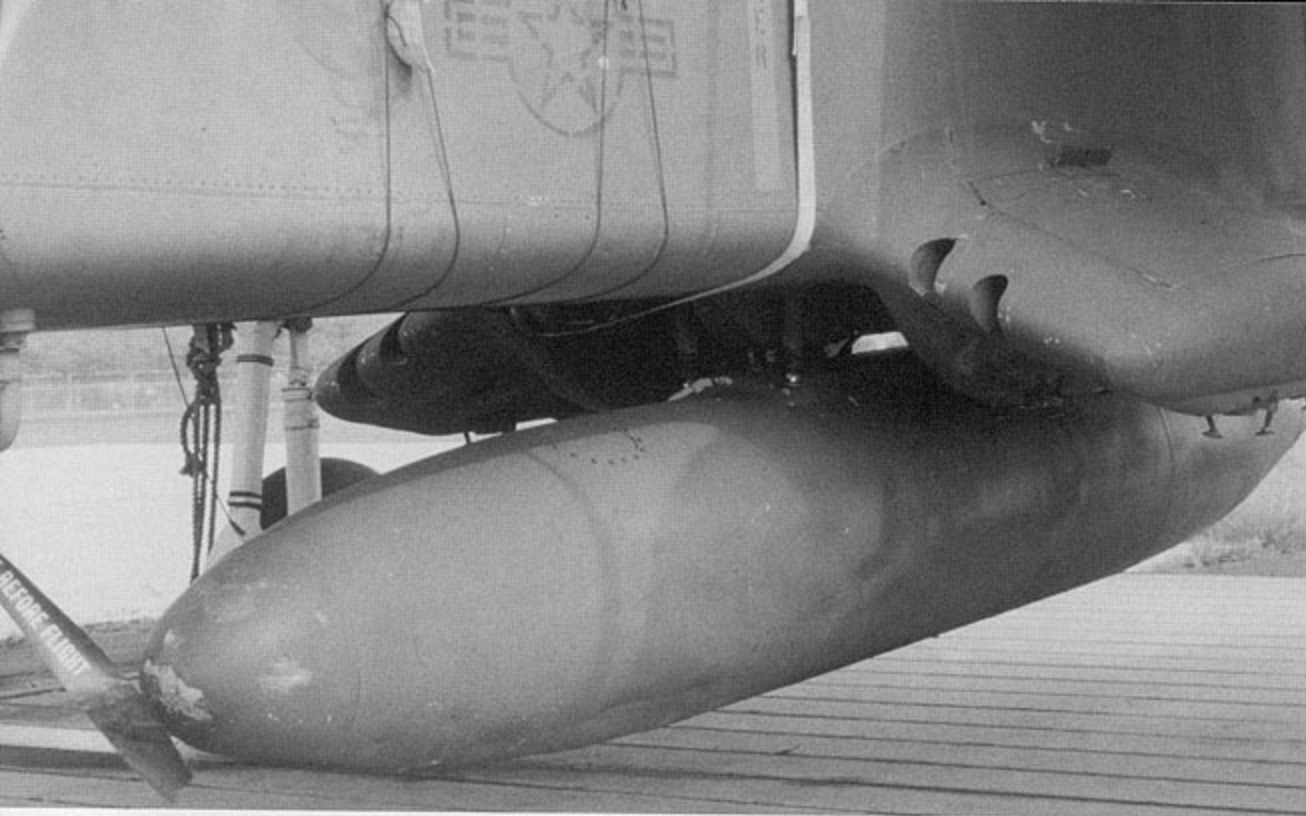
Weapons combinations, such as these four shot 5 inch Zuni rocket launchers and seven shot 2.75 inch rocket pods could be tailored to the particular needs of a mission. (Love)



Access to the guns was through a panel on top of the sponsons which was held in place by two screws. The sponson hardpoints could carry a wide variety of ordnance, including bombs and rocket launchers such as these seven shot 2.75 inch tubes. (NA via Altevogt)

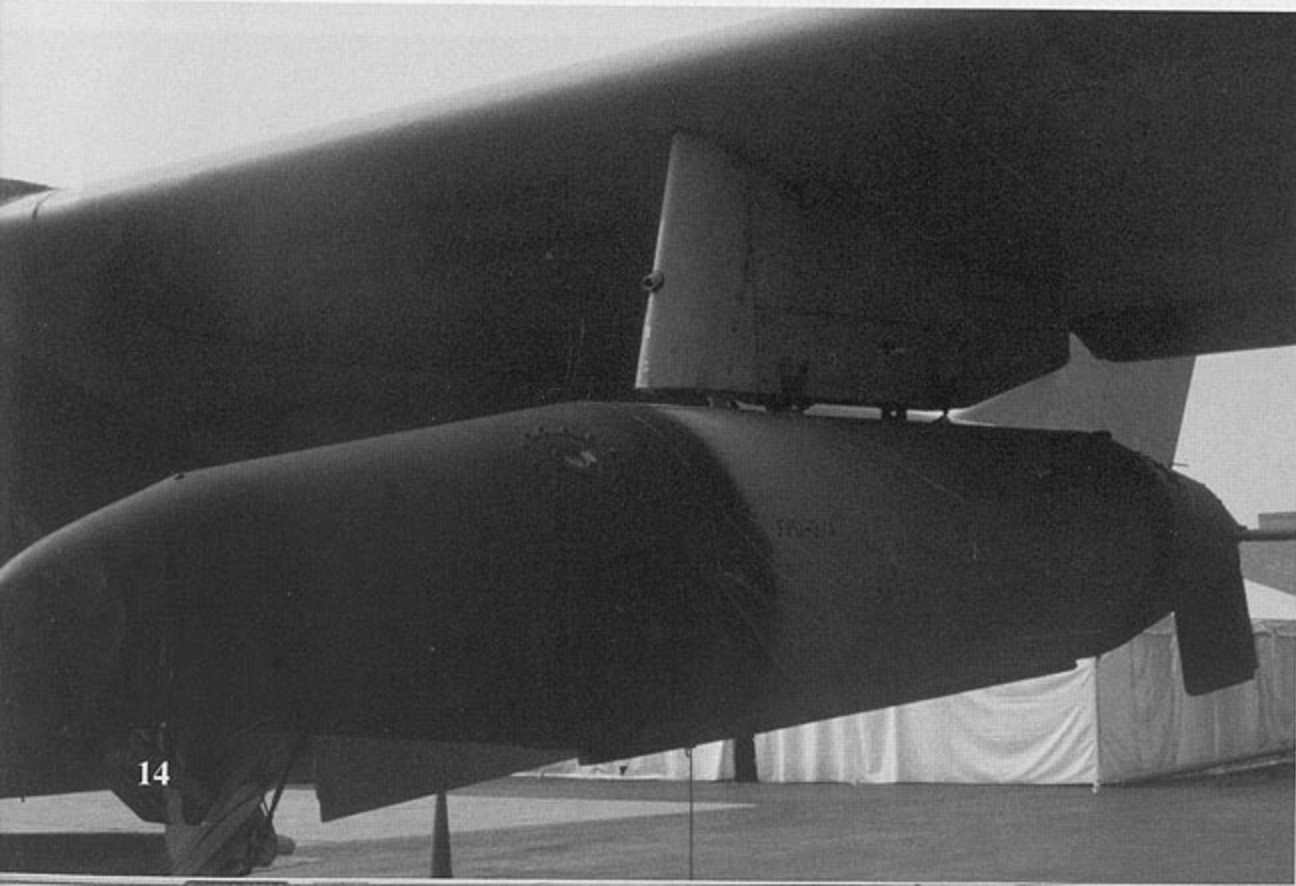
The sponson weapons bay was large and easy to service. The two 7.62mm machine guns have been removed from this Bronco for servicing. (Mesko)





In addition to ordnance, fuel tanks could be carried on the centerline hardpoint to extend time-over-target or for ferry purposes. These included both 150 and 230 gallon drop tanks. Later a 300 gallon tank was produced for ferry missions. This Bronco is equipped with a 230 gallon tank. (Mesko)

The outer wing hardpoints could also be used to carry either ordnance or fuel tanks such as this 100 gallon tank. The OV-10A could also be configured to carry AIM-9 Sidewinder air-to-air missiles. This this option was used operationally by the Marines during Operation DESERT STORM. (Mesko)



OV-10 Pave Nail

Following the initial deployment of the OV-10A to South Vietnam, the Air Force became interested in improving the aircraft's ability to operate at night and in poor weather and to be able to direct more precise air strikes. During 1970, LTV Electrosystems modified fifteen Broncos to a special configuration designated OV-10A Pave Nail. This modification involved adding a stabilized night periscope sight, a combination laser range finder and target illuminator, a LORAN navigation receiver and a Lear Siegler LORAN coordinator. This combination, called Pave Spot, allowed the aircraft to illuminate a target with a laser beam, or permitted an accompanying aircraft to use an offset vector to attack a target. A special pod was fitted under the rear cockpit and was operated by a weapons system operator. This system was used in the latter days of the Vietnam conflict, proving particularly useful when helping to locate downed pilots during Search and Rescue (SAR) missions. Operated by the 23rd Tactical Air Support Squadron (TASS) the aircraft were often employed as pairs, one high to direct incoming strike aircraft and one down low to designate targets with its laser beam and maintain close surveillance of the battlefield. Following the end of the war, the surviving aircraft were converted back to standard OV-10A configuration.

The Pave Nail Bronco was an attempt by the Air Force to allow the aircraft to operate more effectively at night or in bad weather. These aircraft were easy to identify by the special laser designator pod located under the observers position which was used to designate a target. Fifteen OV-10As were modified to this configuration and were used in the later stages of the Vietnam War by the 23rd TASS. (USAF)



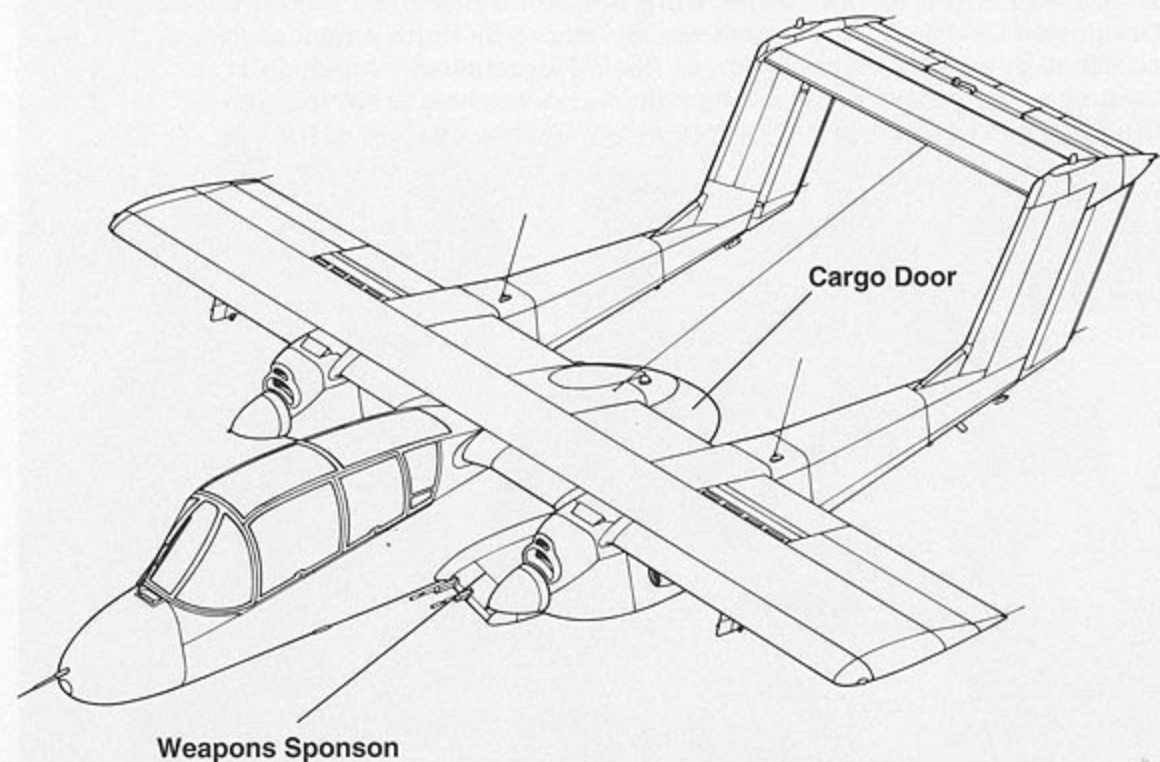
OV-10B

The OV-10B was basically an OV-10A which was manufactured for West Germany as a target towing aircraft. The OV-10B carried no armament and had the sponsons and underwing hardpoints removed. The targets were carried in a pod below the fuselage which could be controlled by a winch operator in the rear of the fuselage. This necessitated a clear field of vision and a transparent cone replaced the rear cargo hold door. The observer's seat and related equipment was also deleted since no observer was carried on these missions.

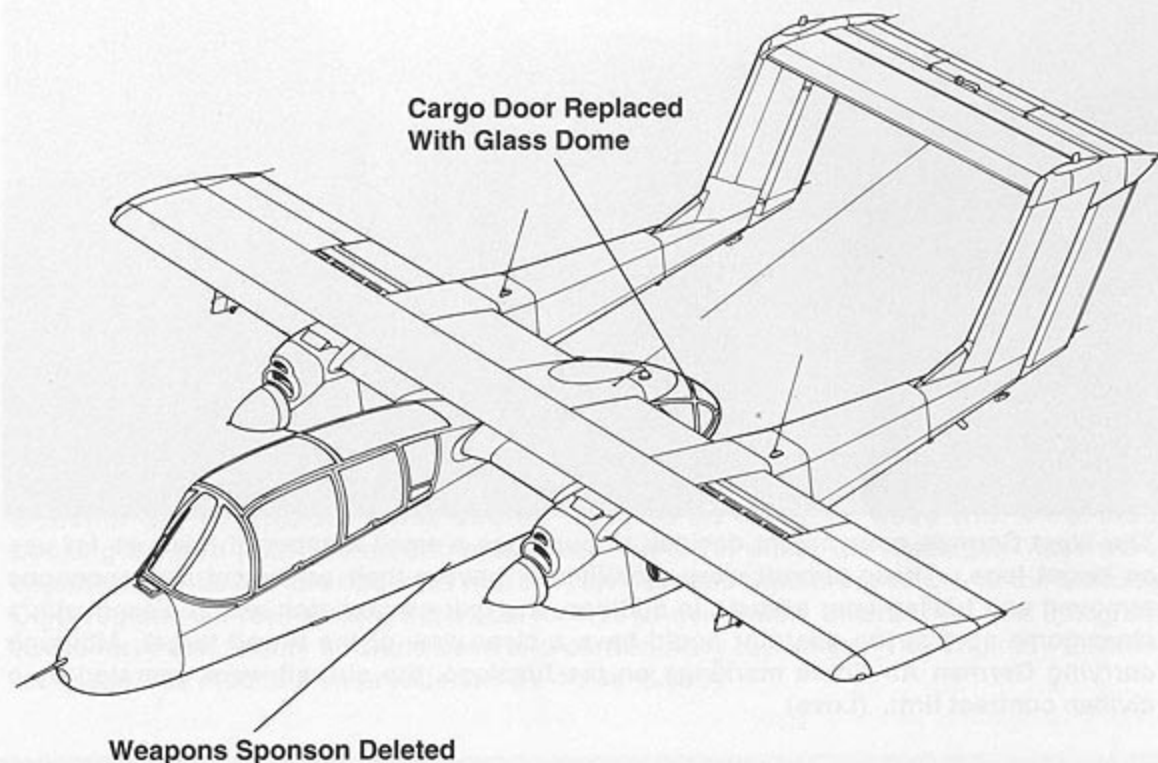
The OV-10B(Z) was the same basic aircraft fitted with a General Electric J85-GE-4 turbojet engine in a special nacelle mounted above the fuselage center section behind the cockpit. This increased the normal speed of the Bronco by 100 mph. In addition to the speed increase, the 2,950 lbst turbojet also tripled the rate of climb and cut in half the take-off run.

The West German government ordered six OV-10Bs and twelve OV-10B(Z)s. The first OV-10B flew in April of 1970, followed in September by the B(Z) variant. The German firm of Rhein-Fluggenbau handled all but one of the conversions, but evidence indicates that the jet pod was only used for any length of time on a single aircraft. Operated by Deutsch Lufthart Berlangschent, a civil target towing company, the OV-10B and OV-10B(Z)s flew out of Lerbeck where they replaced the Hawker Sea Furies in this role. These target towing Broncos operated for two decades, but age and the difficulty in obtaining spare parts finally led to their withdrawal during the early 1990s. They were replaced by Pilatus PC-9s.

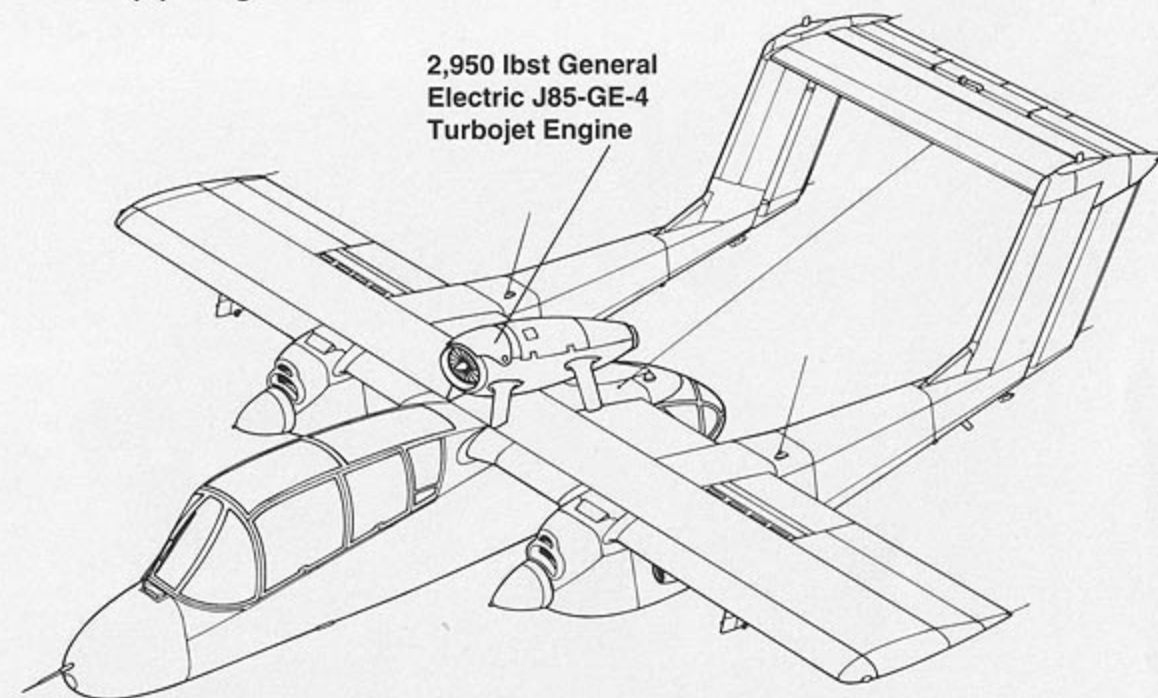
OV-10A



OV-10B Target Tow



OV-10B(Z) Target Tow





The West German government decided to purchase a small number of Broncos for use as target tugs. These aircraft were modified by having their armament and spsons removed and towing gear added. In addition, the rear cargo hatch was replaced with a clear dome so that the operator could have a clear view of the towed target. Although carrying German Air Force markings on the fuselage, the aircraft were operated by a civilian contract firm. (Love)



This particular Bronco has not had the rear hatch replaced with the clear dome and still in civilian markings. It may be on its way to be modified to the tow target configuration but the spsons have already been deleted. (Love)



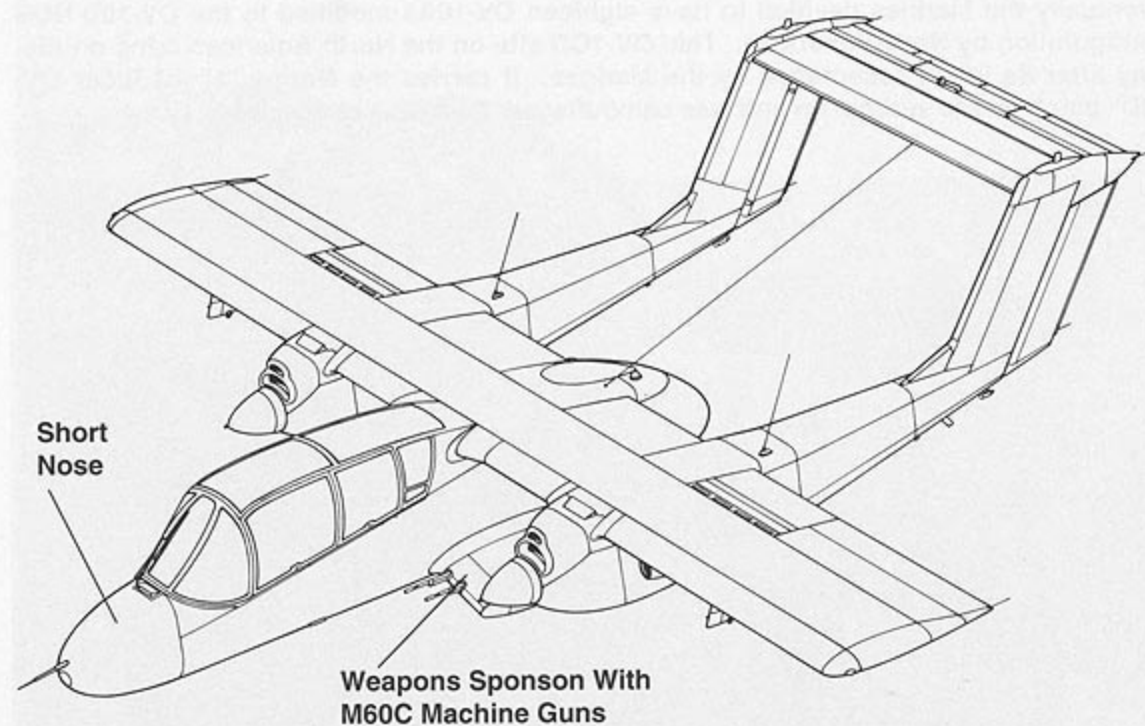
To give the OV-10 additional power, a special jet pod was developed which was fitted to the center wing section behind the cockpit. Designated OV-10B(Z) this variant was developed by North American in conjunction with the German firm of Rhein-Flugzeugban. Although at least one aircraft flew in this configuration, it is believed problems with the jet pod resulted in very limited use of this system. (NA via Miller/Burin)

OV-10D

Although satisfied with the OV-10As initial service in Vietnam, the Marine Corps wanted to develop a relatively cheap night interdiction aircraft to help spot NVA and VC troop and supply movements under the cover of darkness. After soliciting proposals, the Marines selected the one submitted by North American Rockwell in conjunction with LTV for the conversion of two aircraft for this role. Two OV-10As were modified with the addition of a M-197 20MM gun turret under the rear fuselage and a Forward Looking Infrared (FLIR) turret in the nose. To accommodate these changes, the sponsons were removed from the sides of the fuselage and the nose was extended thirty inches. Designated the YOYV-10D Night Observation Gunship Systems (NOGS), the Bronco proved ideal for such conversion. Its large cargo compartment provided ample space for the ammunition and related equipment for the gun system and the underwing stations were modified to accept external fuel tanks, providing for additional time-over-target.

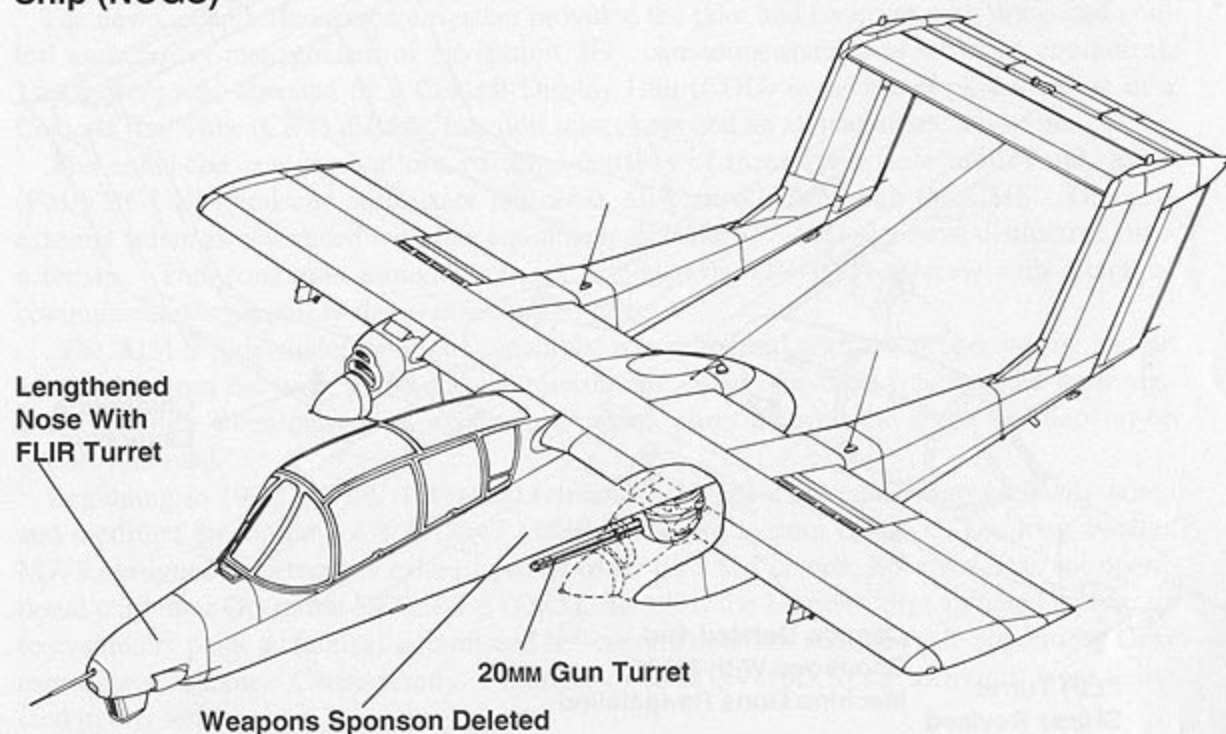
The two aircraft were turned over to the Marines during 1970 and flown to the Naval Weapons Center at China Lake, California, where they were fitted with their armament and operational equipment. After undergoing tests which proved successful, it was decided to test the two aircraft under combat conditions in Vietnam. Attached to Light Attack Squadron Four (VAL-4) Black Ponies, at Binh Thuy, the two Broncos were used for a variety of missions during the period 5 June through 13 August 1971. Over two hundred missions were flown and nearly 300 enemy troops were credited to the two aircraft. In addition, on two occasions, the Marine Broncos were instrumental in saving beleaguered outposts from being

OV-10A

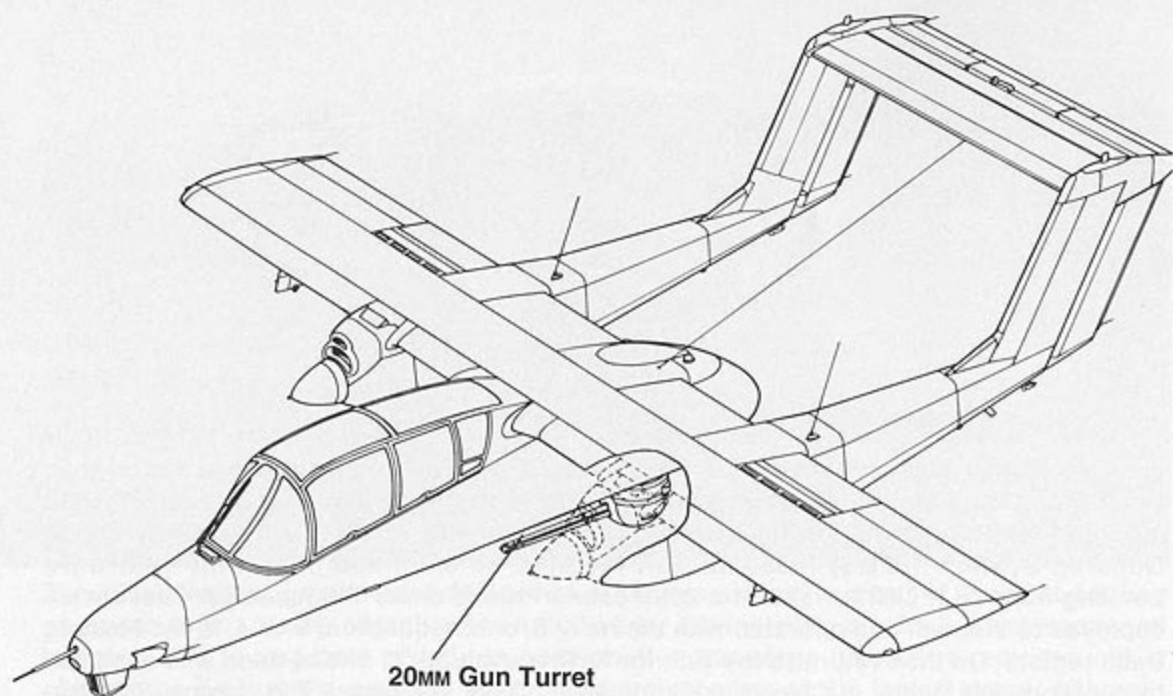


In an attempt to improve the ability of the Bronco to operate in the night interdiction role, the Marine Corps tested two aircraft which North American in conjunction with LTV had modified for the night interdiction role. Designated the YOYV-10D Night Observation Gunship System (NOGS) these aircraft featured an extended nose with a Forward Looking Infrared (FLIR) turret and a 20MM cannon turret under the fuselage. These were deployed to Vietnam and operated with the Navy Bronco Squadron, VAL-4, in the Mekong Delta region. On their return to the U.S. for further evaluation, one of them was assigned to the Navy test facility at China Lake and carried Navy markings. The original FLIR turret shape was modified on production OV-10Ds (Love)

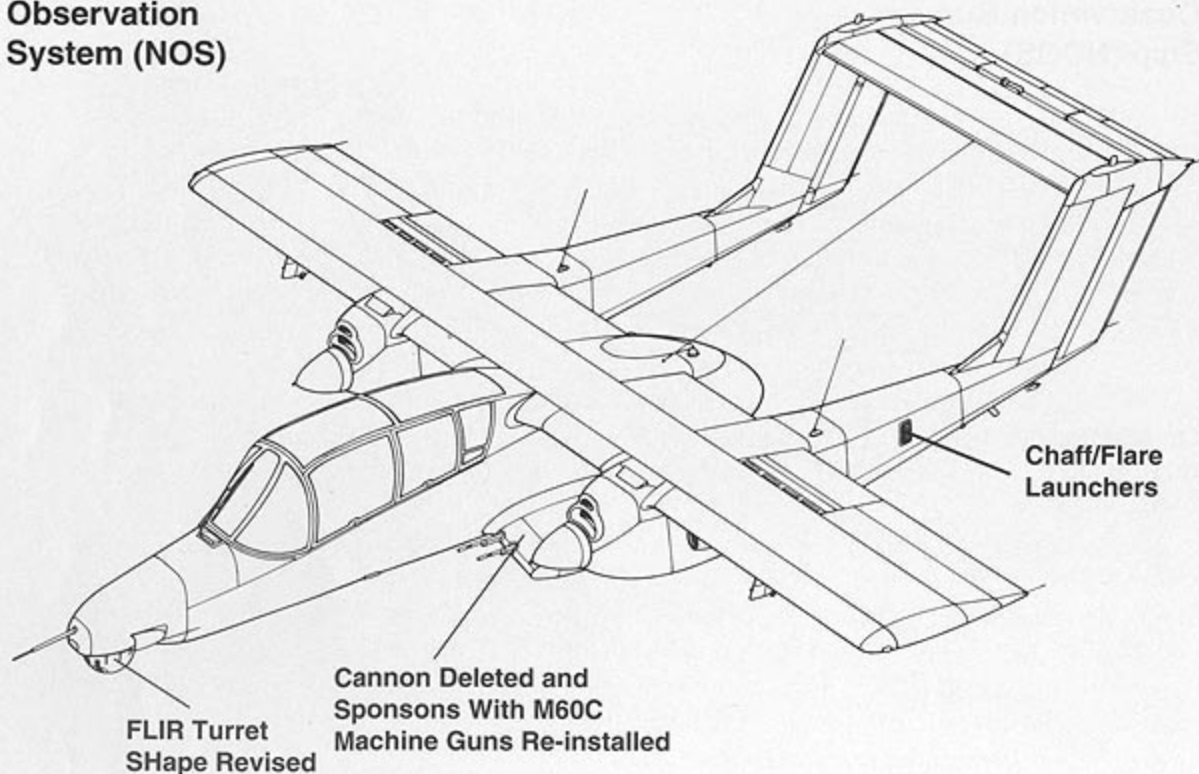
YOYV-10D Night Observation Gun Ship (NOGS)



YOV-10D NOGS



OV-10D Night Observation System (NOS)



overrun by communist troops. During this test period, minor bugs were discovered in the system, but overall the Marines were very pleased with the test results. The FLIR worked well in discovering enemy troops at night and the 20MM cannon provided the aircraft with a lethal punch. When operations were terminated in mid-August, the aircraft were returned to the U.S. for further testing.

The Marine Corps, although generally satisfied with the combat tests, set out to improve the YOV-10D concept. Found to be under-powered, the aircraft was upgraded with 1,040 shp Garrett T76-G-420/421 engines driving propellers made from composite materials. The sensor system was changed to the Texas Instruments AN/AAS-37 FLIR with LRF (Laser Rangefinder Designator). With the majority of the FLIR system avionics mounted in the cargo bay door, the para-drop mission capability was no longer possible. The gun turret, while it had worked very well in combat test, would not be installed due to program budget limitations. Instead, the original sponson armament was retained and the fuselage modified to accept the gun turret, if it was ever funded. The Sidewinder missile wing pylons were replaced with new pylons which could carry external fuel tanks as well as a variety of ordnance. Either by design or error, the original Sidewinder capability was lost when the associated wiring was not extended into the new pylons. The gross weight of the OV-10D was now 14,400 pounds.

The program was approved during 1978 to convert a total of eighteen OV-10As to the newly designated OV-10D NOS (Night Observation System) configuration. Delivery of the OV-10D began in late 1979 with eight aircraft being assigned to VMO-1 (MCAS New River, North Carolina) and nine to VMO-21 (MCAF Camp Pendleton, California). One aircraft was retained by North American Rockwell for the testing of defensive countermeasures systems. The reserve squadron, VMO-4 (NAS Atlanta, Georgia) was equipped solely with OV-10As. The OV-10Ds were delivered with infrared (IR) suppressive exhaust stacks and a new IR suppressive Green paint scheme. All remaining OV-10As were eventually repainted in this new paint, but none were retrofitted with the new exhausts.

Eventually the Marines decided to have eighteen OV-10As modified to the OV-10D NOS configuration by North American. This OV-10D sits on the North American ramp on display after its initial acceptance by the Marines. It carries the Marine "Night Rider OV-10D" patch on the vertical fin and was camouflaged in various shades of Gray.



What the Marine Corps had, with the expanded capabilities of the OV-10D, was an observation aircraft uniquely capable for a wide variety of other missions. Primary missions included day or night Visual/FLIR Reconnaissance, Forward Air Controller (Airborne), Tactical Air Controller (Airborne), Artillery and Naval Gunfire Airspot, Helicopter Escort and Close-in Fire Suppression. Other missions included Laser Designation, Radio Relay, Visual Combat Air Patrol (VISCAP), Road Convoy Escort and Anti-Helicopter Operations.

Throughout the 1980s, all the OV-10A/Ds were retrofitted with a variety of defensive systems. First was the AN/ALE-39 Countermeasures Dispensing Set (Chaff/Flare/Jammer). Next was the AN/APR-39 Radar Warning Receiver and then the AN/ALQ-144 Infrared Countermeasures System. Beginning in the mid-1980s, all OV-10A/Ds were repainted in the new IR suppressive Black, Green and Light Gray camouflage.

The Service Life Extension Program (SLEP) was initiated in 1985 to extend the life of the aircraft beyond the year 2000. The program eventually called for the upgrade of fourteen OV-10Ds, and the conversion of twenty-three OV-10As to the OV-10D SLEP standard. Deliveries of the new "D Plus", as it became known, began in 1990 to the active duty squadrons. The reserve squadron, VMO-4, began transitioning to the OV-10D+ in early 1991.

Very similar in appearance to the original OV-10D, the OV-10D+ was modified by the Naval Air Rework Facility (NARF) at MCAS Cherry Point, North Carolina. The SLEP involved installing structural reinforcements, new and improved engines, new avionics, new wiring and plumbing, an improved FLIR, and enhanced communications capability and a reconfigured cockpit featuring a Cockpit Management System (CMS). The gross take-off weight of the aircraft increased to 15,000 pounds.

To accommodate the new laser and sensor systems, the nose on the OV-10D was extended nearly two and a half feet. The FLIR Laser Designator turret is different from the one used on the original YOY-10D tested in Vietnam. (Stewart)



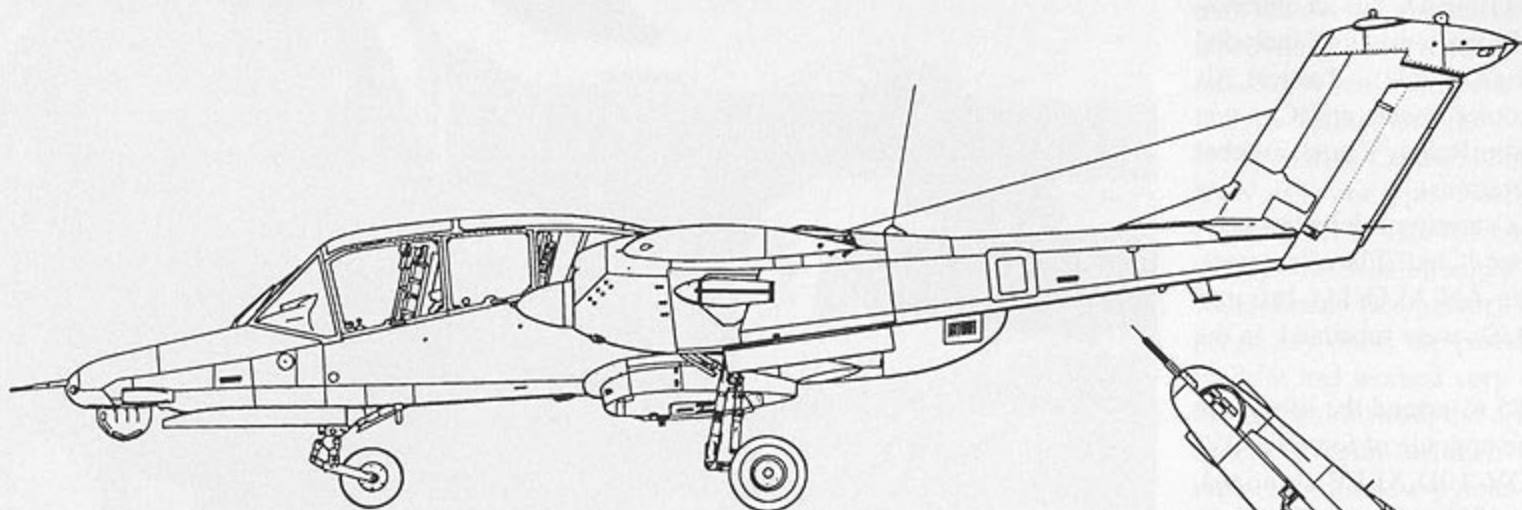
The large window in the center of the turret covered the Forward Looking Infrared system while the smaller windows to the right covered the laser designator. The center window on the nose covered the landing light while the small covers on either side were for additional radar warning antennas. Also there were large air scoops mounted on either side of the nose for internal cooling. (Stewart)

The new Cockpit Management System provided the pilot and observer with integrated control and display management of navigation, IFF, countermeasures and weapons equipment. This system was operated by a Control Display Unit (CDU) in each cockpit consisting of a Cathode Ray Tube (CRT) display, function select keys and an alphanumeric keyboard.

The enhanced communications package consists of three solid state multi-band radios (FM/VHF/UHF) and one solid state HF radio, all controlled through the CMS. The new external antennas associated with this equipment gave the OV-10D+ its most distinctive characteristic. This communications equipment provided the OV-10D+ aircrew with a tactical communications capability that was second-to-none.

The AIM-9 Sidewinder air-to-air capability was reinstated with the proper wiring and an adapter between the wing pylon and the missile rail. Also reinstated was the para-drop mission capability when new quick disconnect cannon plugs allowed the cargo bay door to be readily removed.

Beginning in 1990, the OV-10D+ and remaining OV-10A airframes were gradually wired and modified for the new AN/AAR-47 Missile Warning System (MWS). The long awaited MWS, designed to detect the exhaust plume of an IR SAM launch; however, was not operational until after Operation DESERT STORM. In 1991, the Marine Corps initiated a program to eventually paint all tactical aircraft and helicopters in a new standard Air Superiority Gray camouflage scheme. Consequently, a number of final OV-10D SLEP airframes were delivered in this scheme.



Specification

North American Rockwell OV-10D Bronco

Wingspan.....40 feet (12.19 m)
Length.....44 feet (13.41 m)
Height.....15 feet 2 inches (4.62 m)
Empty Weight.....6,893 pounds (3,127 kg)
Maximum Weight.....14,444 pounds (6,552 kg)

Powerplant.....Two 1,040 shp Garrett T76-G-420/421
 turboprop engines

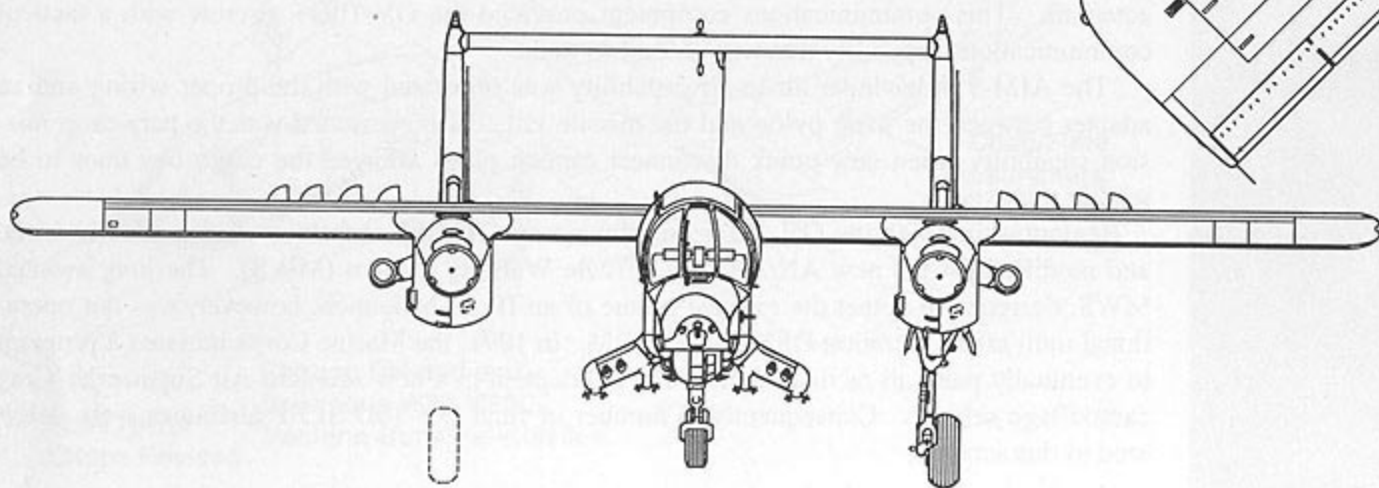
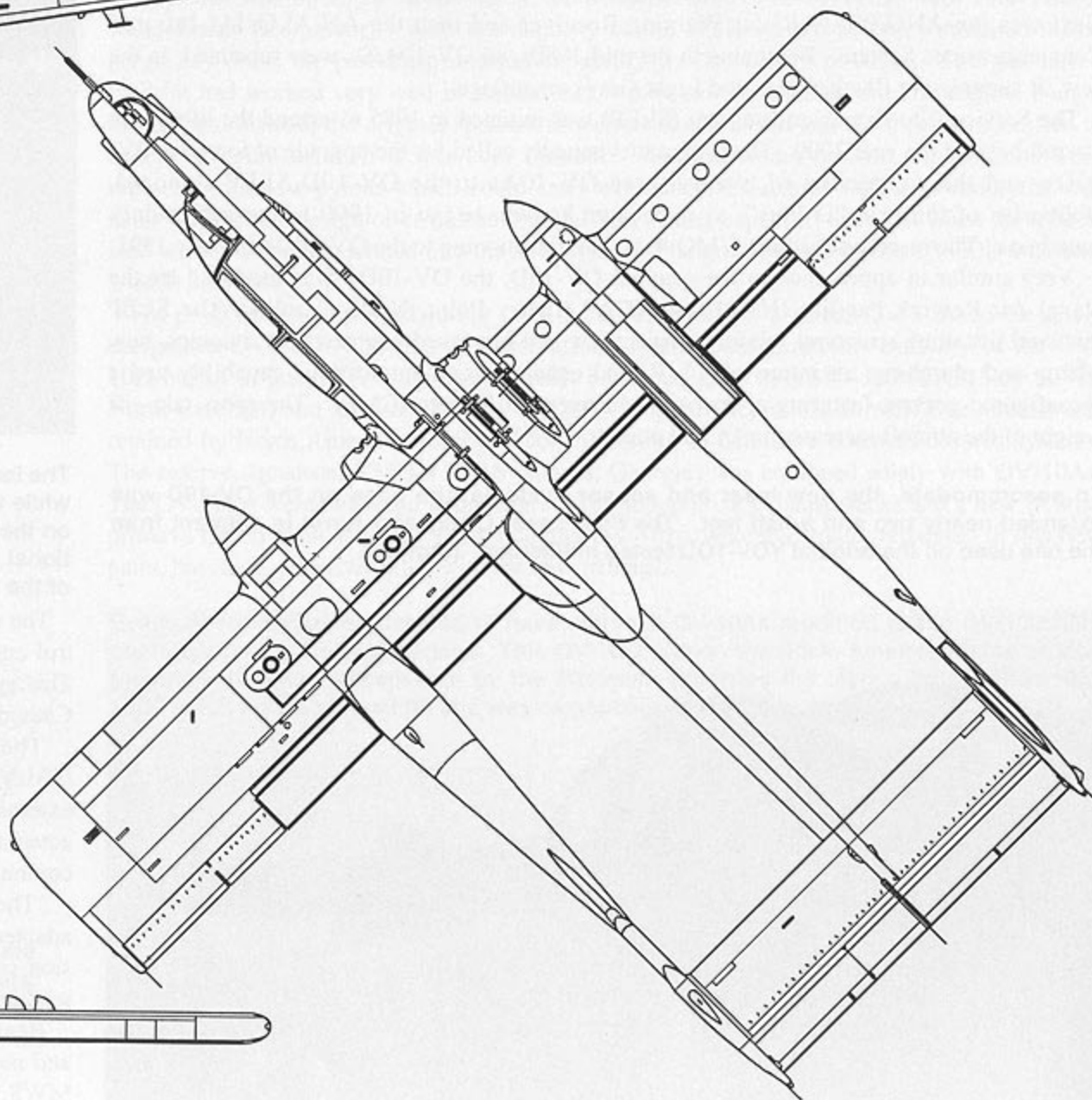
Armament.....Four 7.62MM M60C machine guns.

Speed.....288 mph (463 kph)

Service Ceiling.....30,000 feet (9,150 m)

Range.....1,382 miles (2,224 km)

Crew.....Two



Access to the nose was relatively simple since the nose cone lifted upward to expose the FLIR and laser equipment. The tubular structure around the equipment pod is the ground handling ring which made removal of the unit very simple. The small box on the bulkhead behind it is the laser ground safety panel. (Mesko)

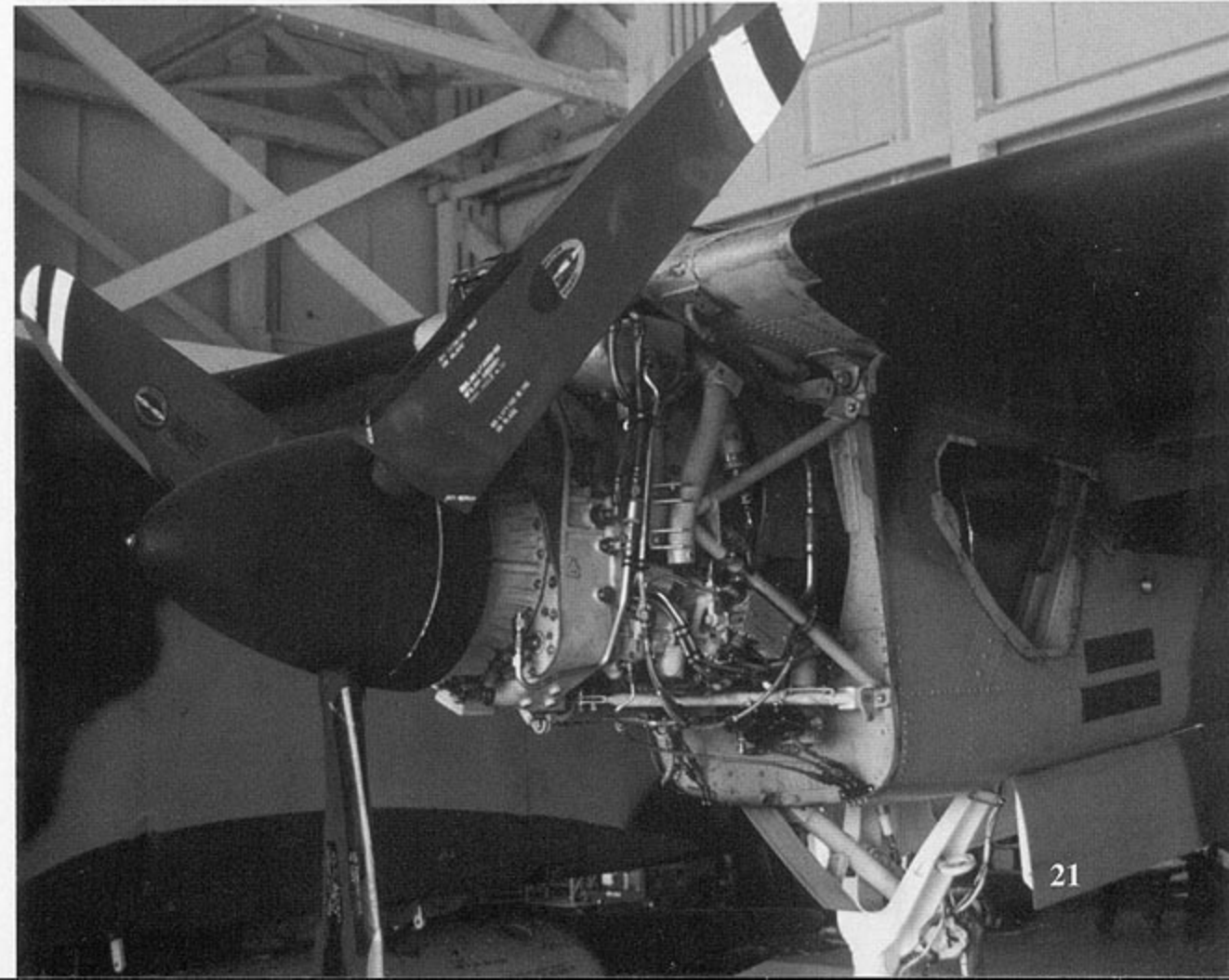


The OV-10D+ proved its tactical value time and time again, particularly at the numerous Combined Arms Exercises over the years and during Operation DESERT STORM. The Bronco had long proven to be the Marine ground commanders most capable and only dedicated Observation and Supporting Arms Coordination asset airborne. Not long after Operation DESERT STORM; however, the armed forces of the United States faced significant force reductions due to economic and political factors. The Marine Corps was soon required to initiate cut-backs in both ground and aviation personnel. Marine Air decided to phase out the OV-10 squadrons early to reduce the number of airframe types it operated and to help meet its personnel reduction requirements. As a result, VMO-2 was deactivated in May of 1993, VMO-1 was deactivated in July of 1993 and VMO-4 was deactivated in June of 1994. The Marine Corps shifted the missions of the OV-10 over to the already over tasked F/A-18D and AH-1W communities.

Most of the few remaining OV-10A airframes became fire fighting lead planes for the California Department of Forestry. A number of OV-10D+ airframes were transferred to the Bureau of Alcohol, Tobacco, and Firearms (BATF) for the purpose of day or night surveillance support. The majority of remaining OV-10D+ airframes went into storage at the AMARC facility at Davis-Monthon Air Force Base, AZ.

(Note: This section by Jim Mesko and Major Jeff Clements, USMC [Ret])

Due to the additional weight of the NOS modifications, the OV-10D had more powerful engines, 1,040 shp Garret AirResearch T76-420/421 power plants which provided a forty-five percent increase in available power. Like the earlier engines, these were easy to maintain and the propellers rotated opposite to one another to eliminate torque problems. (Mesko)





Provisions were made for ALE-39 chaff/flare dispensers in the tail booms. These could hold a container of thirty flares. The flare port was basically just an insert with the electrical connections. When not in use a flat plate could be bolted over the opening to improve airflow. ALE-39 could help defeat the SA-6 and SA-7 surface-to-air Russian missiles which first appeared operationally during the late stages of the Vietnam War and the 1973 Yom Kippur War. (Clements)

The pilots instrument panel changed very little from earlier models except for the addition of a FLIR display and switch panel mounted on top of the panel. (Mesko)

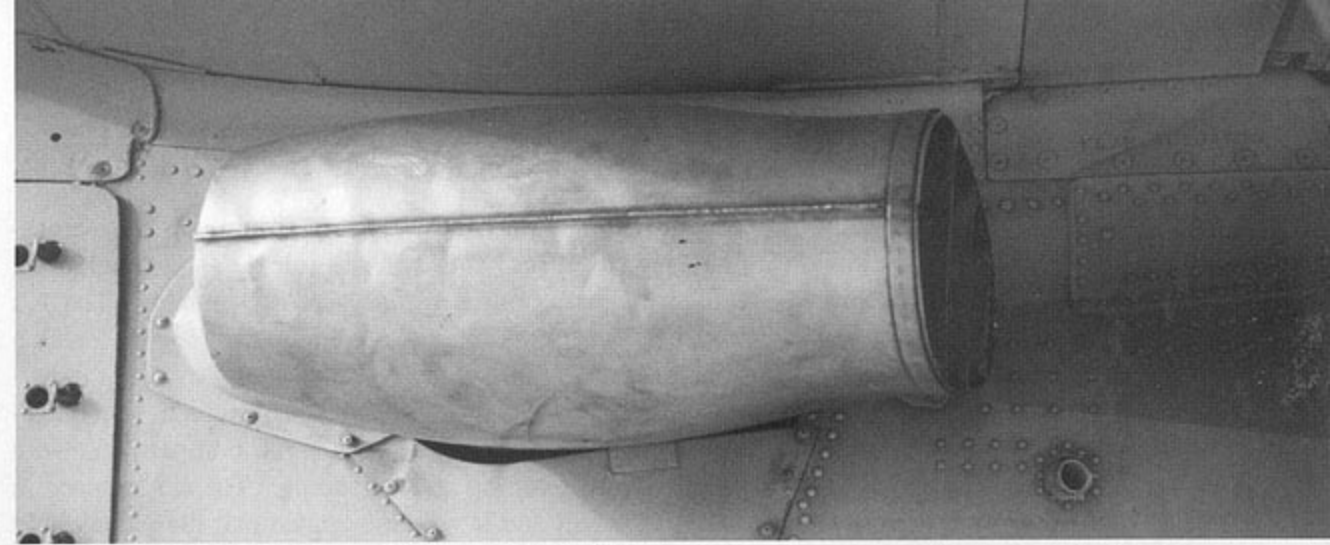


The observers panel had more numerous changes including a nine inch FLIR display screen on the left, a FLIR control panel to its right, and a video tracking control underneath it. In addition, a target tracking control and tracking sensitivity control were added to the consoles on either side of the observer. (Mesko)



Deliveries of the OV-10D NOS began in 1979. While only the nose and new turret were different externally from the OV-10A, the new aircraft had a certain tough and rugged look to it which was further enhanced by the new three-tone Dark Green, Dark Gray and Light Gray camouflage scheme -- It just looked mean! (North American Rockwell)



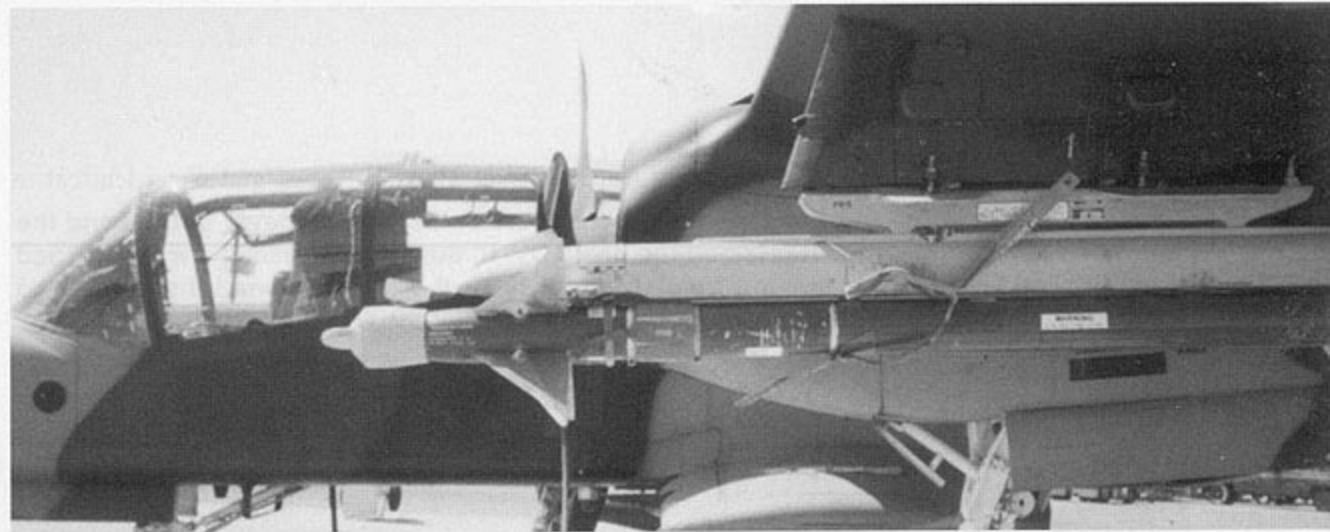


OV-10D and OV-10D+ aircraft were fitted with an infrared suppressive exhaust stack. This exhaust stack mixed cool air into the exhaust stream to lower the infrared signature. (Clements)

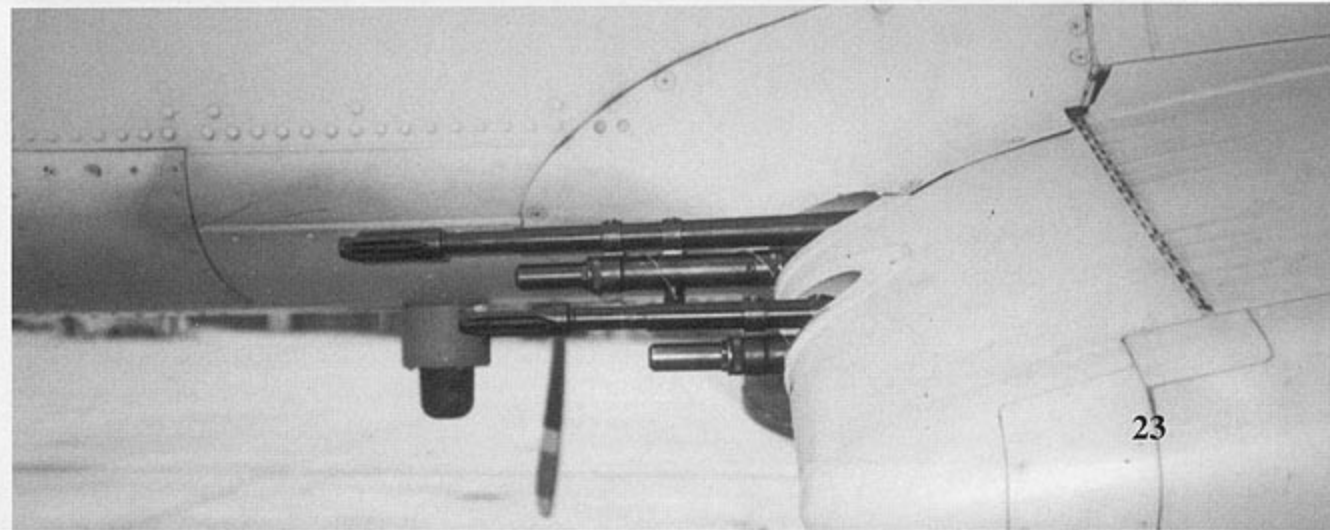
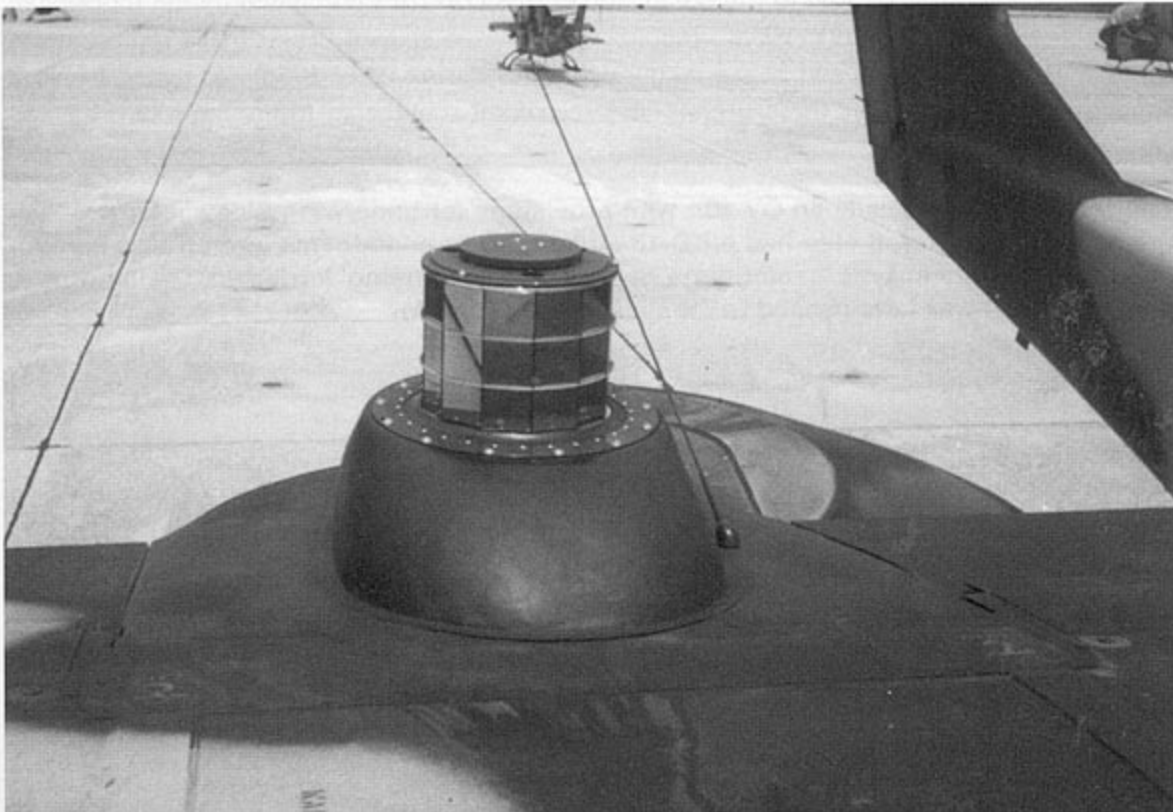
While the pylon on the OV-10D could not carry an AIM-9 Sidewinder missile, the OV-10D+ had the capability restored. In order to carry the Sidewinder, an adapter rack had to be developed to go between the underwing pylon and the missile rail. This Sidewinder is a Blue painted inert practice round. (Clements)

While the number of hardpoints had not changed since its introduction into service, the variety of ordnance the Bronco could carry did. The OV-10D could carry nearly anything (within weight restrictions) in the U.S. inventory on the main fuselage stations. The basic internal armament had not changed; however, and although there were provisions for mounting a M-97 20mm gun turret as tried during the Vietnam War, it is believed that this turret was not used operationally. (North American Rockwell)

One of the improvements made to the countermeasures installed on late OV-10Ds and OV-10D+s was the ALQ-144 Infrared Jammer (commonly known as a "Disco Light"). The jammer is designed to help defeat infrared homing weapons systems, both air-to-air and surface-to-air. (Clements)



The OV-10D and OV-10D+ both carry M60C machine guns. The strobe light just under the fuselage replaced the rotating beacon used on earlier variants of the Bronco. (Clements)



OV-10T

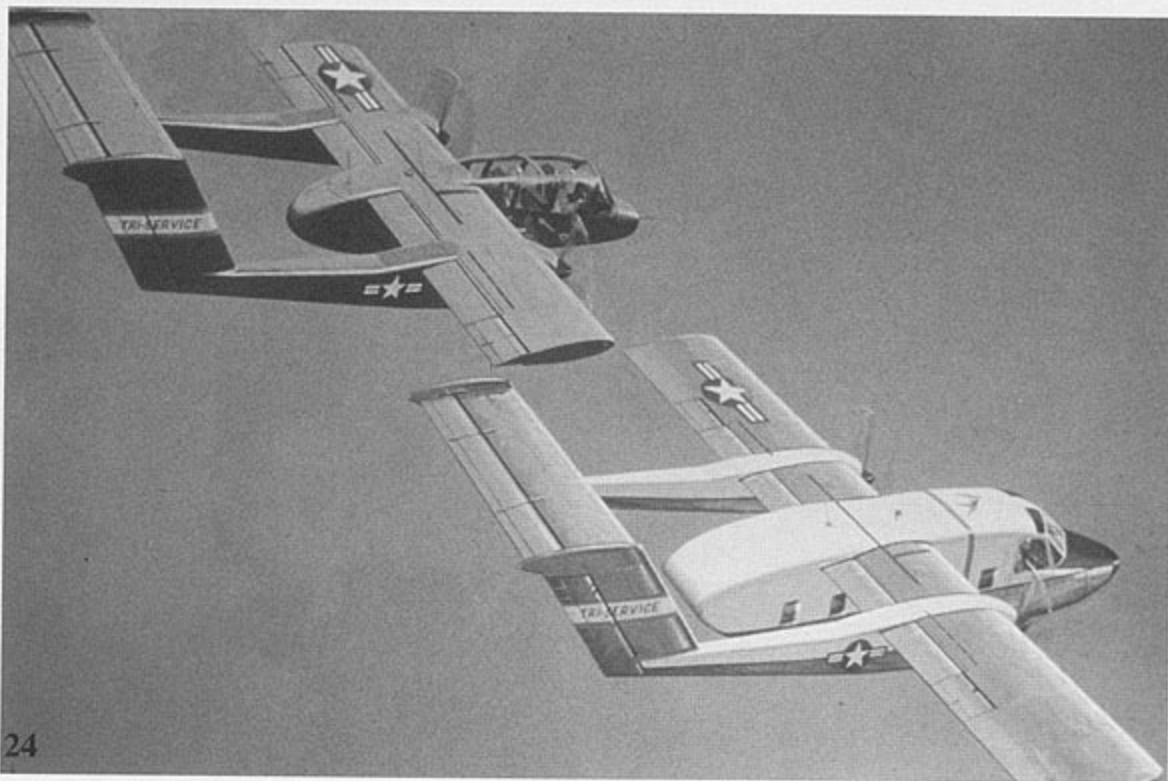
One of the more intriguing proposals to come out of the Bronco program was for a transport/cargo variant which could also be adapted for the "strike recon" role, i.e. a gunship along the lines of the AC-47 Spooky, which was just coming into service in Vietnam. The Air Force approached North American about this in early 1966 and the company responded with a proposal based on a beefed up OV-10A airframe.

Basically the wings were enlarged to fifty feet and a new fuselage was designed. This fuselage featured side-by-side seating for the crew and a much larger cargo compartment with twin hatches, one of which served as a ramp for loading and unloading. The cargo space in the new compartment was close to 400 cubic feet and it was anticipated that the plane could carry 4,500 pounds of cargo. In addition, it could carry eight passengers, twelve paratroops or six stretcher cases with two medics. The initial Air Force interest waned; however, and aside from artists drawings, no actual work was ever done on the design.

In the early 1970s, North American again came up with a proposal, this time for the Navy for a multi-purpose aircraft which could be used for logistical support, ECM, early warning, and attack. This proposal envisioned a new wing and LAF 502 turbofan Avco Corporation engines. A large version using four GE-TF34 engines was also proposed, but neither of these ever got beyond the conceptual stage. In each case the basic fuselage and twin boom tail configuration was kept intact.

OV-10C

The OV-10C was produced specifically for the Royal Thai Air Force and was identical to **As far as is known the transport version of the Bronco, the OV-10T never got beyond the artist concept stage. While it retained the basic OV-10 outline, the fuselage was enlarged and featured side-by-side seating for the flight crew. It was envisioned that the cargo variant would be able to carry nearly double the weight of the OV-10A. (NA)**



the OV-10A except for the deletion of the underwing stores racks and the addition of a KB-18 strike camera. Powered by the T76-G-412/413 engine, the OV-10C had identical performance to the OV-10A. The initial order for sixteen aircraft was placed in November of 1969, with the first aircraft being delivered in early 1971. A second contract for sixteen aircraft was placed in May of 1972, with deliveries starting in June of the following year. As additional six aircraft were acquired in 1977 as replacements for attrition losses. Additional losses led Thailand to request another batch of aircraft, but the number of aircraft involved was not enough to make it economically feasible for Rockwell to reopen the OV-10 production line.

The Broncos equipped Nos 411 and 711 Squadrons for use in the counterinsurgency role and to patrol Thailand's border with Cambodia and Laos. In this role the aircraft have seen combat with Cambodian and Vietnamese forces with at least one OV-10 being lost to a surface-to-air missile. Attrition and the lack of replacements have reduced the total number of available aircraft and, while the RTAF would like to find a suitable replacement for the aging OV-10s, severe budgetary restrictions have made this all but impossible.

OV-10E

In the early 1970s, Venezuela decided to replace its aging fleet of North American B-25 Mitchell bombers with the Bronco. These Broncos were designated OV-10Es, although there was little difference between them and the standard OV-10A. The first aircraft were officially accepted in February of 1973, and in May two aircraft were ferried from Hulbert Field, Florida to Venezuela where they replaced the B-25Js of No 40 Squadron. Eventually, sixteen aircraft were acquired and they were used primarily in the counter-insurgency role. Based initially in Barcelona, the surviving aircraft (eleven) were later assigned to No 15 Special Operations Air Group based at Maracaibo, where they were used to patrol the Colombian/Venezuelan border.

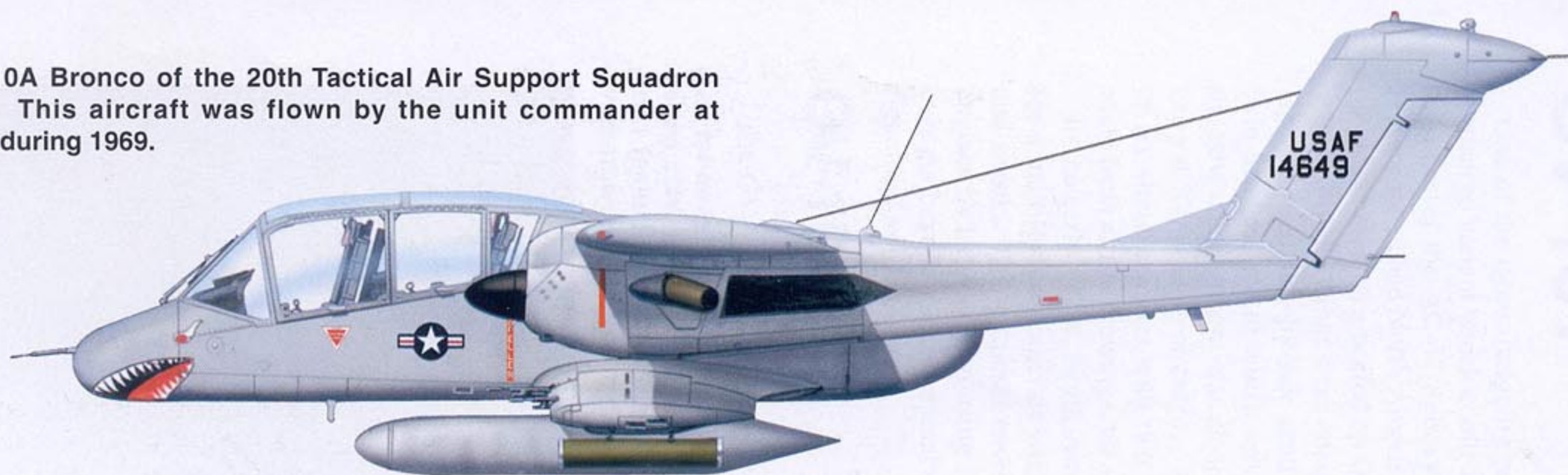
OV-10F

Like the other Broncos sold to foreign air forces, the OV-10Fs purchased by the Indonesian Air Force were basically OV-10As. Indonesia purchased sixteen OV-10Fs as replacements for their P-51D Mustangs and began taking deliveries during early 1976. Assigned to No 3 Squadron, based at Baucau, these aircraft have seen combat in the air-to-ground role

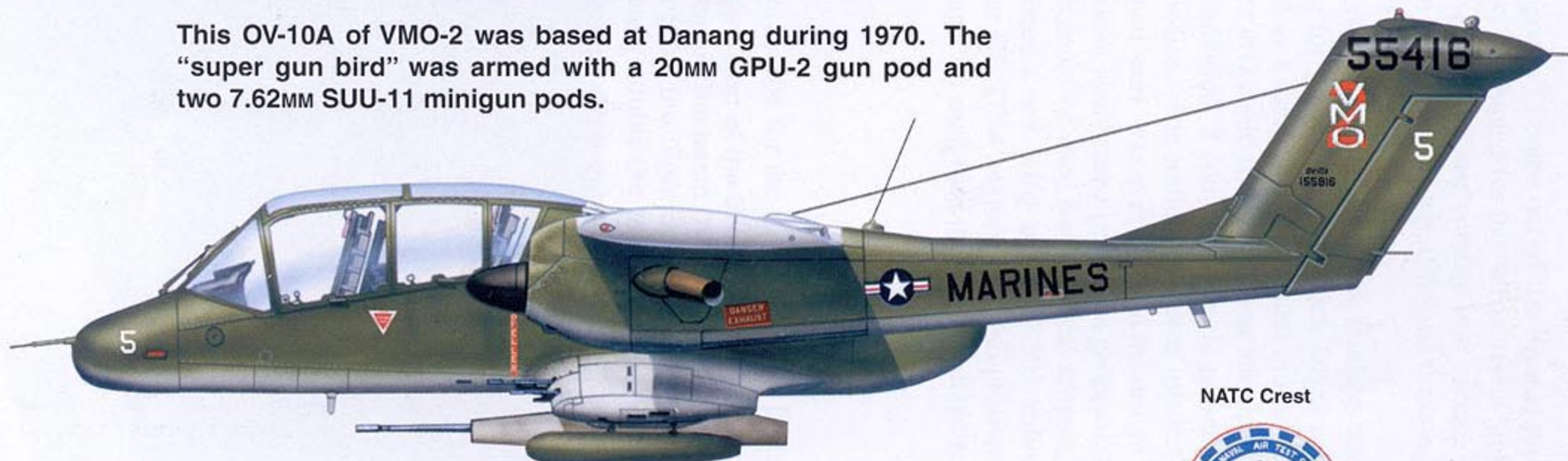
The OV-10C was basically an OV-10A with provisions for underwing Sidewinder missiles removed. Some aircraft also had a KB-18 strike camera added. This aircraft was camouflaged in a Vietnam type camouflage pattern and was being ferried to Thailand. It is believed that it was later passed to the Philippines. (DAVA)



An OV-10A Bronco of the 20th Tactical Air Support Squadron (TASS). This aircraft was flown by the unit commander at Danang during 1969.



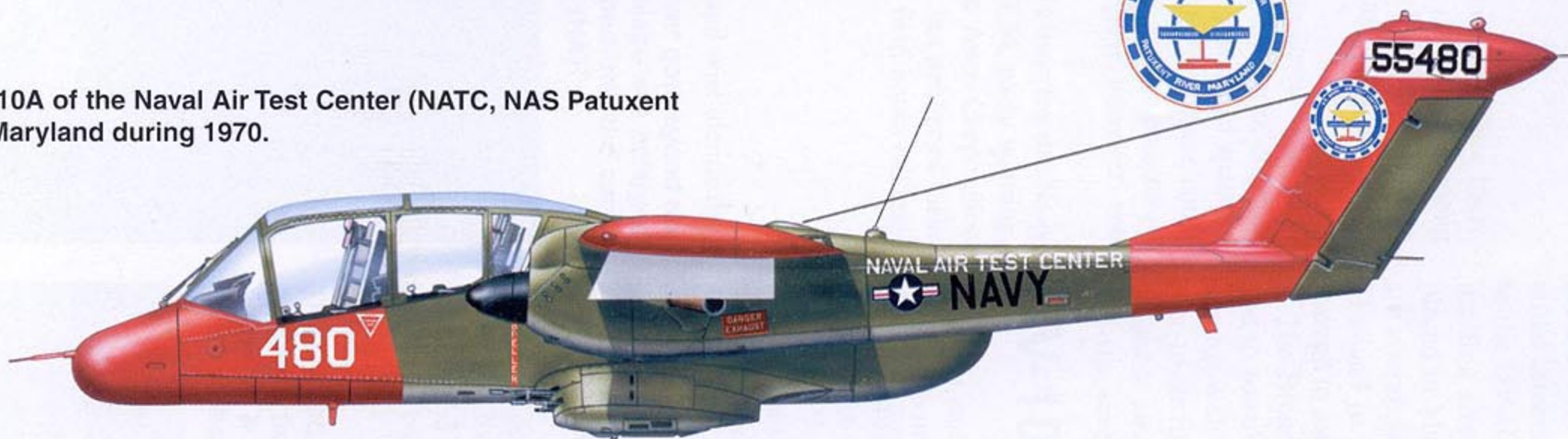
This OV-10A of VMO-2 was based at Danang during 1970. The "super gun bird" was armed with a 20mm GPU-2 gun pod and two 7.62mm SUU-11 minigun pods.



NATC Crest



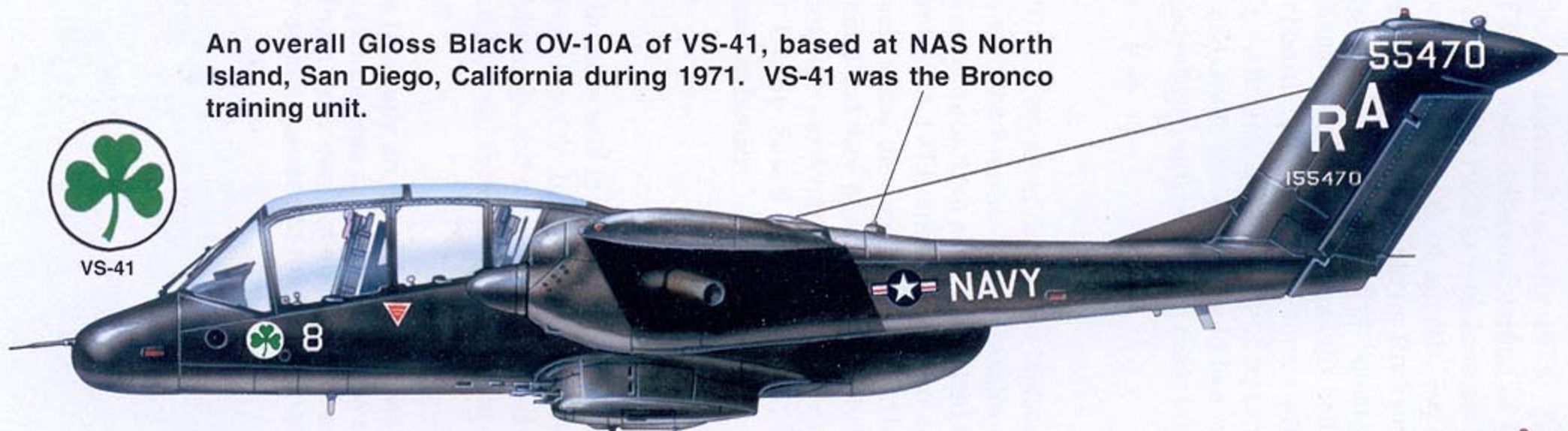
An OV-10A of the Naval Air Test Center (NATC, NAS Patuxent River, Maryland) during 1970.



An overall Gloss Black OV-10A of VS-41, based at NAS North Island, San Diego, California during 1971. VS-41 was the Bronco training unit.



VS-41

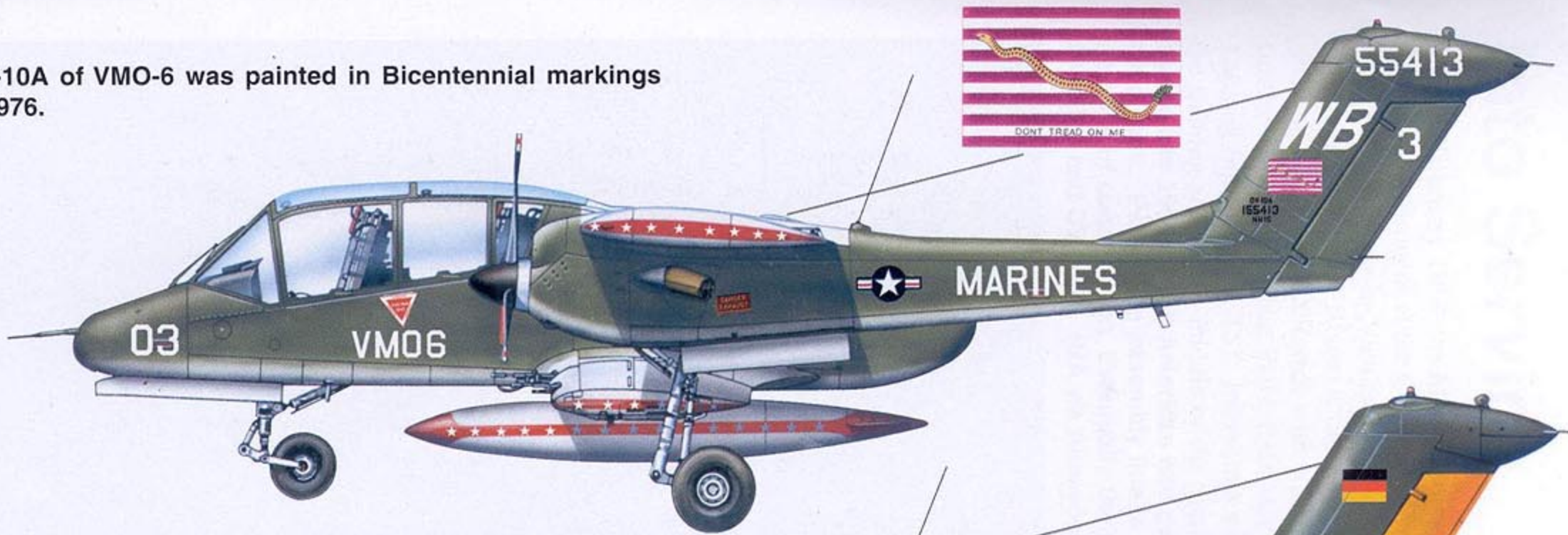


This OV-10E was assigned to No 40 Squadron, Venezuelan Air Force at Barcelona during 1973.

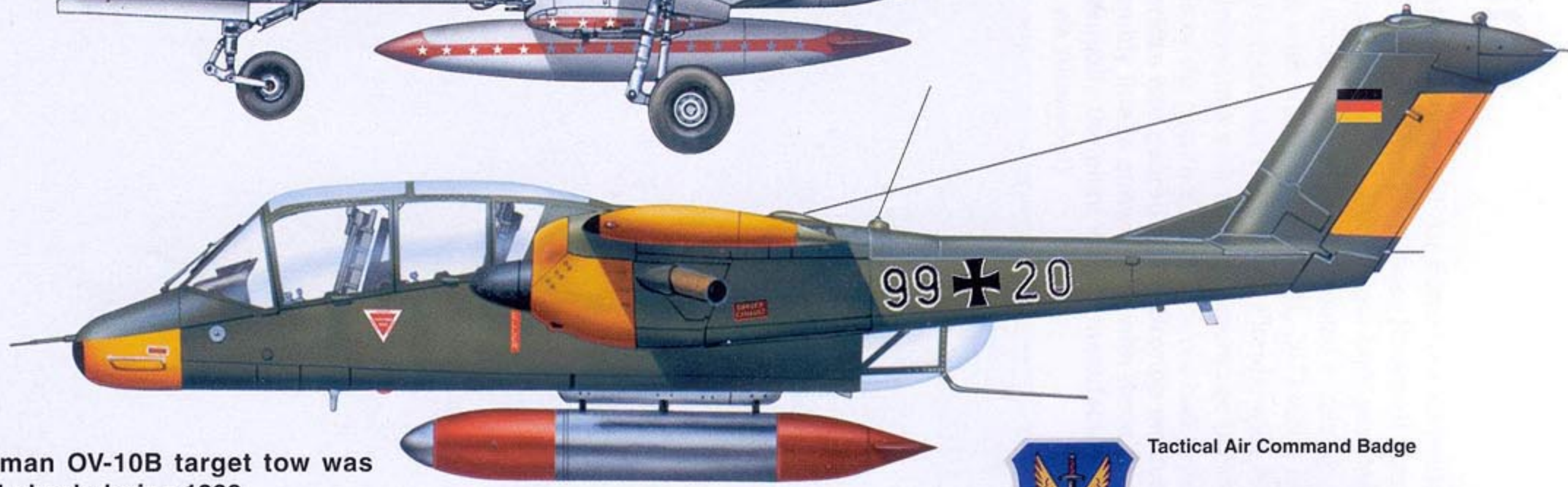
Venezuelan Air Force Insignia



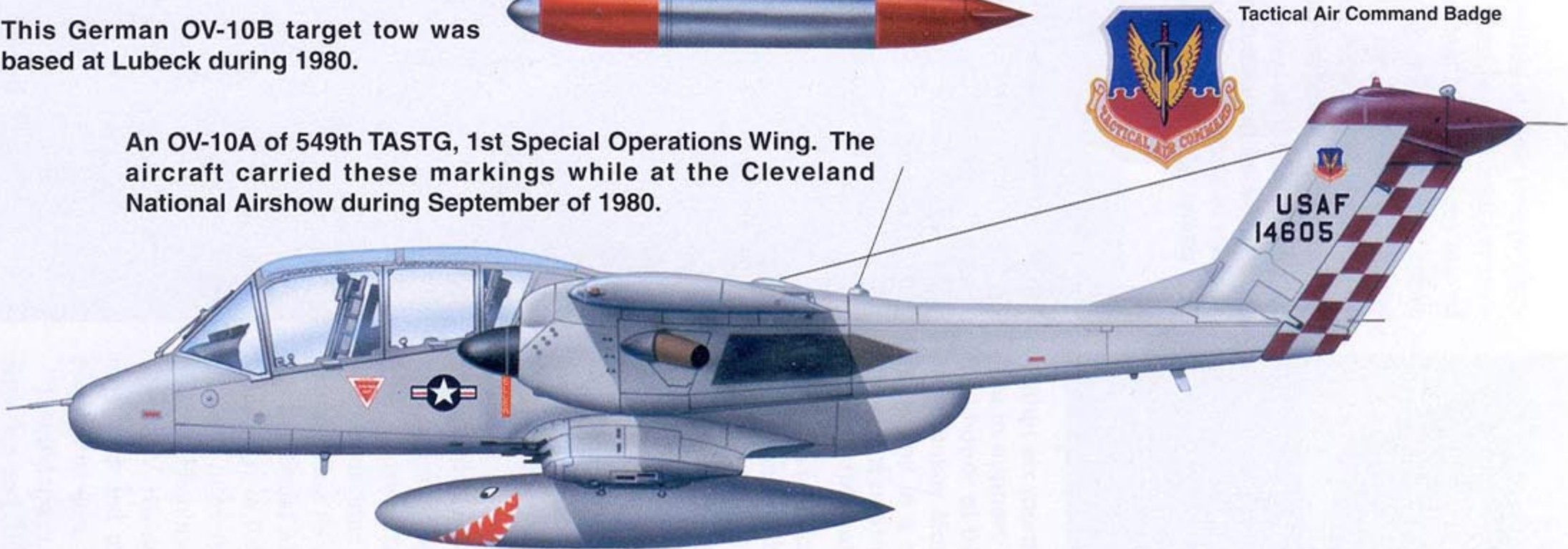
This OV-10A of VMO-6 was painted in Bicentennial markings during 1976.



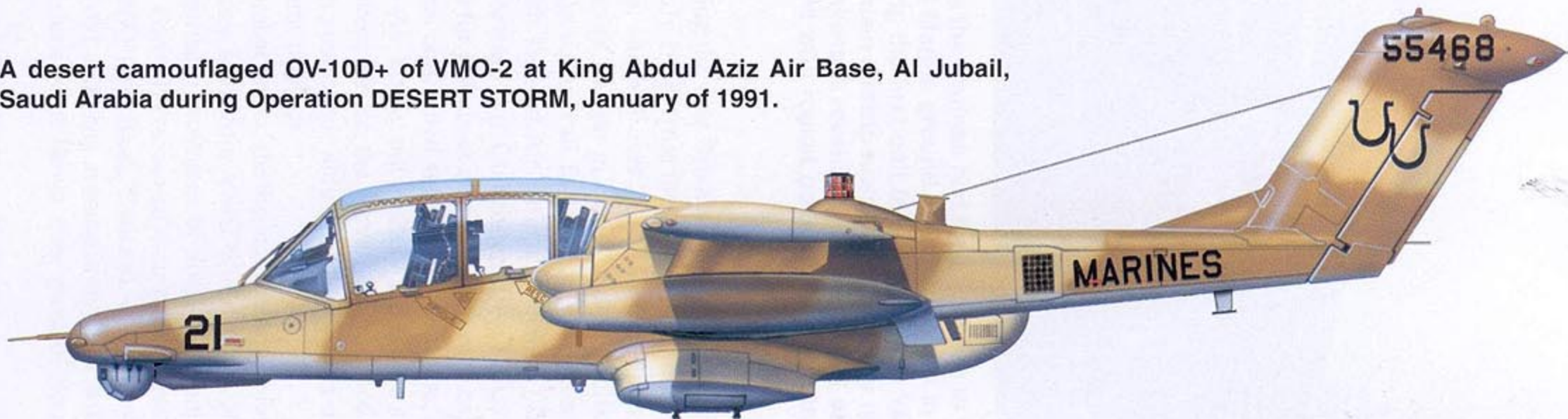
This German OV-10B target tow was based at Lubeck during 1980.



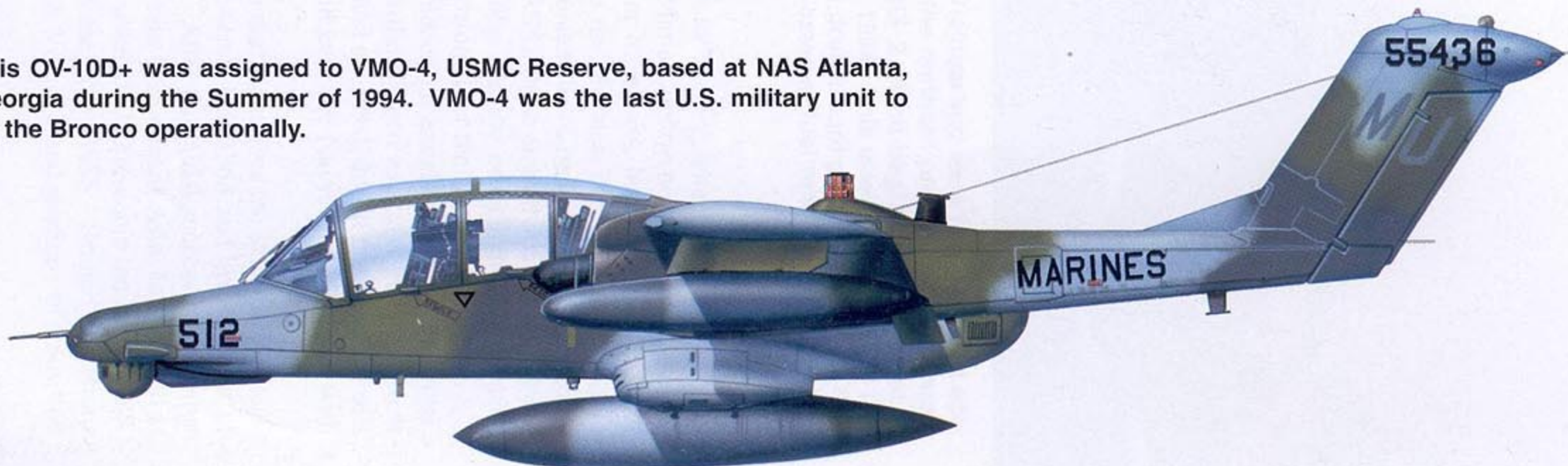
An OV-10A of 549th TASTG, 1st Special Operations Wing. The aircraft carried these markings while at the Cleveland National Airshow during September of 1980.



A desert camouflaged OV-10D+ of VMO-2 at King Abdul Aziz Air Base, Al Jubail, Saudi Arabia during Operation DESERT STORM, January of 1991.



This OV-10D+ was assigned to VMO-4, USMC Reserve, based at NAS Atlanta, Georgia during the Summer of 1994. VMO-4 was the last U.S. military unit to fly the Bronco operationally.



Into Service

On 23 February 1968, the Marine Corps and Air Force took deliveries of their first production OV-10A Broncos at the Columbus North American Rockwell plant in an official ceremony. Due to the war in Vietnam, production shifted into high gear and both services moved quickly to get the OV-10 into action. The Marines initiated a training syllabus for their crews at Camp Pendleton, California with VMO-5 (later HML-267) while the Air Force conducted similar training at Hulbert Field, Eglin Air Force Base, Florida, with the 4409th Combat Crew Training Squadron (CCTS). Instructors with combat experience in Southeast Asia conducted the training and by the middle of the Summer, both services had deployed their first combat units to Vietnam. By the late 1960s North American had geared up for Bronco production at its Columbus, Ohio plant. Part of the assembly line is shown here with three Bronco wings in various degrees of construction. Eventually the plant was to manufacture or remodel nearly 400 OV-10As and OV-10Ds. (NA via Altaevogt)



Within six months the Marines had their Broncos in Vietnam and were flying combat sorties in support of Marine ground units in I Corps in the northern part of South Vietnam. The honor of being the first unit in combat fell to VMO- 2 which began operations out of the Monkey Mountain airstrip near Danang in July of 1968. This new production OV-10A is parked in a makeshift revetment of sand filled oil drums during August of 1968. The aircraft was armed with rocket pods and carried an external fuel tank on the centerline station. (Mikesh)

units to Vietnam.

The honor of being the first Bronco to see action went to VMO-2, which flew its first combat mission on 6 July 1968, from the Marble Mountain Marine airstrip near Danang. The first Air Force Broncos, shipped over in C-133 Cargomaster transports, began operating out of Bien Hoa, northeast of Saigon in early August. Unlike the Marines, the Air Force chose to initially deploy only six aircraft for combat evaluation under the "Combat Bronco" program. Assigned to the 19th Tactical Air Support Squadron (TASS), these aircraft were unarmed and used solely for Forward Air Controller (FAC) missions. On the other hand, the Marine Broncos were used for just about every mission ever envisioned for the aircraft.

Initial operations confirmed that the Bronco was indeed an excellent weapons system. Unfortunately, the Air Force, not entirely satisfied with the Bronco as a gun platform, went back and forth between having the aircraft being armed and unarmed, due in part to losses suffered under certain conditions, although the Marines and later the Navy, normally flew with all four machine guns in place.

Following its combat debut, the Bronco became a familiar sight over the skies of Vietnam. An additional Marine squadron, VMO-6, arrived in November of 1968 and operated out of Quang Tri in the northern provinces of South Vietnam. After the initial success of "Combat Bronco" more Air Force Broncos and their crews were sent to Southeast Asia, being based at Nakhon Phanom (NKP) Air Base, Thailand, where they were used to re-equip the 23rd TASS. More OV-10s arrived and they subsequently flew with the 20th TASS. Bronco operations expanded and missions were flown over most of South Vietnam and portions of Laos and North Vietnam.

Toward the end of 1968, the Navy became interested in the Bronco for use in support of its Riverine and SEAL forces operating in the Mekong Delta (see "Riverine" by squadron/signal

for more details of these operations). Stateside training began with eighteen aircraft taken from the Marines during January of 1969 and the unit, designated Light Attack Squadron Four (VAL-4), deployed to Vietnam during March with eight aircraft sections being based at Vung Tau and Binh Thuy. Nicknamed the "Black Ponies" the Broncos of VAL-4 were soon crisscrossing the Delta in support of U.S. and ARVN forces and in search of targets of opportunity. Normally operating in two ship formations, designated Light Attack Fire Teams (LAFT's) the lead ship would normally carry a Mk 4 20MM gun pod and rockets, while the second ship would carry a 7.62MM mini gun pod and additional rockets. In the Summer of 1971, two Marine YOY-10Ds joined the unit to evaluate the NOGS aircraft in combat. Although originally assigned to VMO-2 at Danang, when they arrived in-country they found that their assigned unit had stood down and as a result they operated with VAL-4 crews for three months. The Black Ponies continued operations until April of 1972, when they stood down, the last Navy squadron in-country to do so.

While the war in Vietnam became more unpopular in the U.S., Bronco operations became even more diverse. They began to drop sensors along the Ho Chi Minh Trail, flew night interdiction over Laos and Cambodia using "Starlight" scopes. During the Cambodian invasion in May of 1970, Navy and Air Force OV-10s flew FAC, strike and convoy escort missions for U.S. and ARVN troops. But the numbers of Broncos were dwindling as the U.S. cut back on its troop strength in Vietnam as a result of the anti-war movement in America. When the North Vietnamese began their massive ground assault in the Spring of 1972 (the Easter Invasion) only the Air Force had any Broncos left in the war zone. These were used to direct the massive retaliation carried out by U.S. air power in response to the blatant NVA attack. Unfortunately, the NVA introduced the shoulder launched SA-7 Strella ground-to-air missile

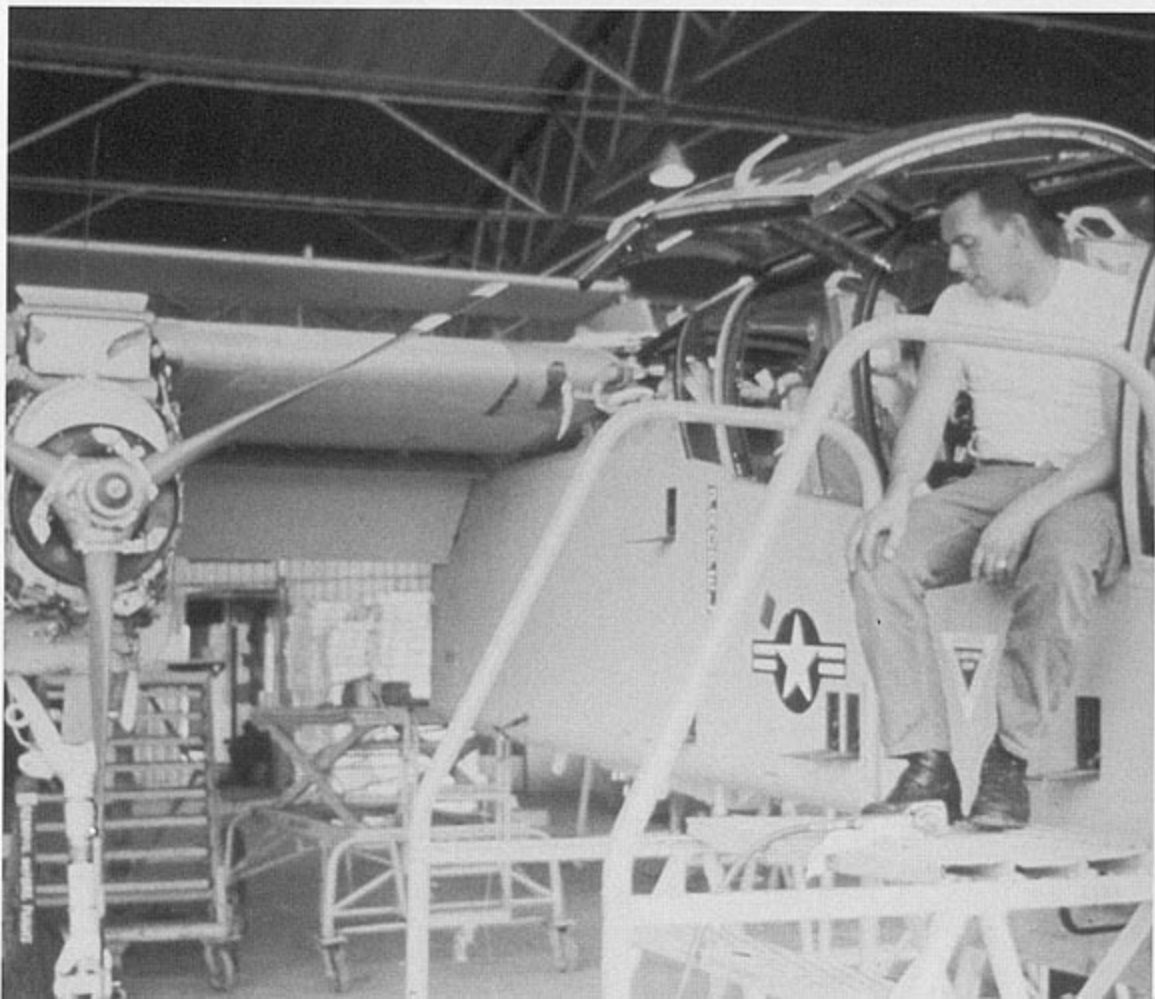
The Air Force began training at their counter-insurgency facility in Florida at Hurlbert Field, part of the Eglin Air Force Base complex. This training was conducted by the 4409th Combat Crew Training Squadron, part of the 4100th Combat Crew Training Wing. The aircraft in the background is an Air Commando C-123. (Boksanski via Dodyk)

during this campaign and a number of OV-10s were lost or damaged to these new weapons. An Air Force Captain, Steve Bennett, from the 20th TASS won the Congressional Medal of Honor posthumously when he saved the life of his observer whose ejection seat was disabled by a SA-7 hit on the aircraft's engine. Bennett made a water landing but was unable to escape despite the efforts of his observer to rescue him.

Prior to the withdrawal of U.S. forces from Vietnam, there was a large influx of aircraft to beef up the South Vietnamese Air Force, but no thought was given to upgrading their FAC strength with Broncos. When South Vietnam fell in the Spring of 1975, OV-10s, based in Thailand stood by in case they were needed to support the evacuation of civilians by the U.S. Navy, and later played a significant part during operations to free the crew of the SS Mayaguez and against Khmer Rouge troops on Koh Tang Island.

Following the end of the Vietnam War, the Bronco continued to soldier on in a variety of roles, although it was mainly used as a FAC. In Marine Corps service, there were a number of squadrons, both active and reserve, which used both the OV-10A and OV-10D. The Navy, although retiring the Bronco from front-line use after Vietnam, employed OV-10s in a variety of weapons tests and research roles. The Air Force kept their OV-10As as FAC aircraft in Tactical Air Command and deployed units to Europe, Korea, Panama and in the continental U.S. Gradually; however, each service began to downgrade their Bronco fleet and by the early 1990s, only a few Marine and Marine Reserve units were still flying the venerable air-

The first Air Force OV-10s arrived in Vietnam at Bien Hoa Air Base, northeast of Saigon at the end of July, 1968 aboard C-133 Cargomasters for evaluation under the code name "Combat Bronco." After arrival, the aircraft had to be reassembled at Bien Hoa. (NA via Altevogt)



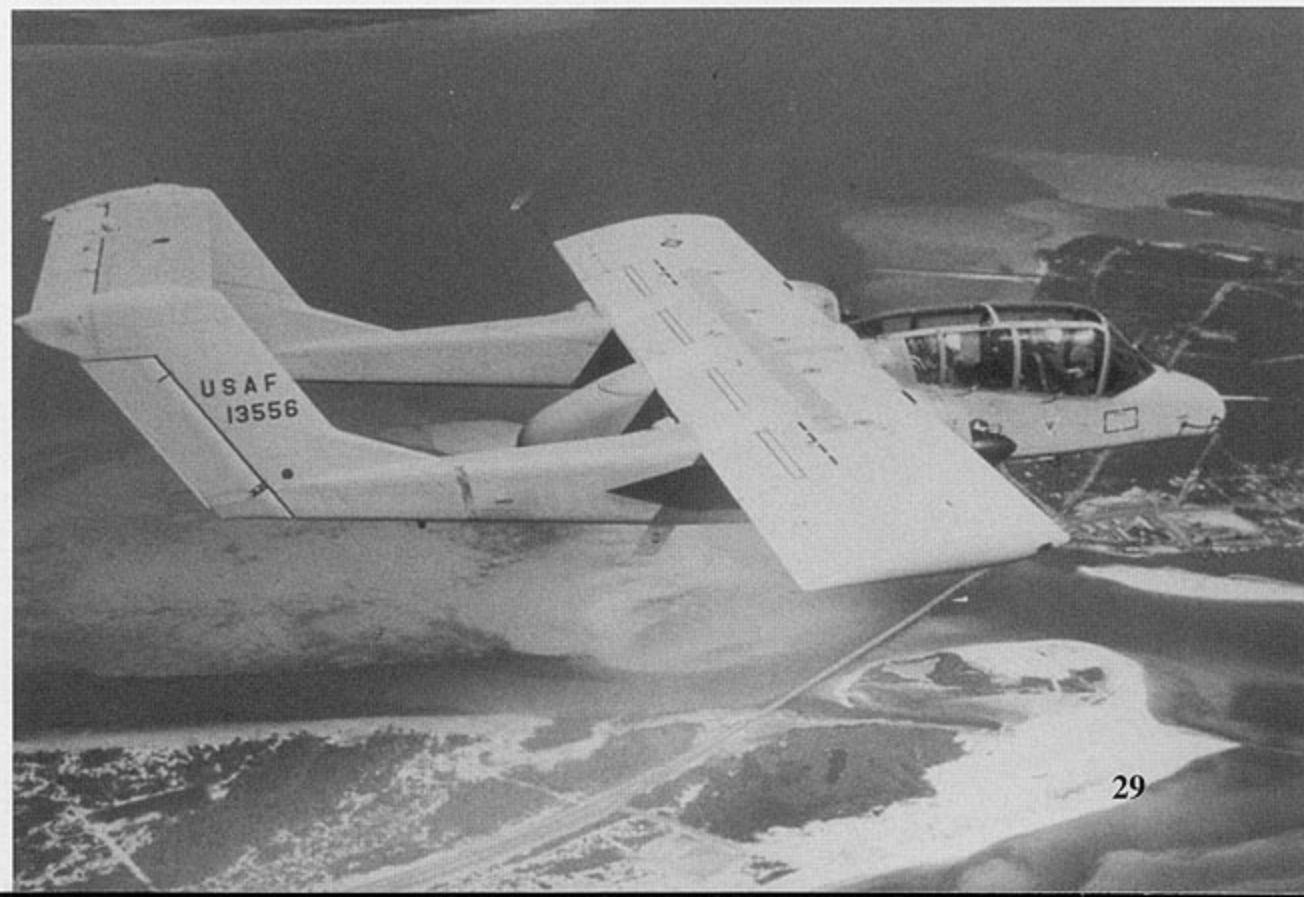


The first assembled Bronco was accepted by the Air Force in Vietnam from the North American Rockwell technical representative. Despite the fanfare around the new airplane the Air Force was, nevertheless, not entirely happy with the OV-10, preferring instead a much more potent aircraft for the FAC role. (NA via Altevogt)



While the Air Force was less than happy in many respects with the Bronco, the Marines loved it and used it in a variety of roles. This OV-10 from VMO-2 patrols with a mixed load of 2.75 inch rocket pods along the South Vietnamese coast south of Danang. The initial insignia of VMO-2 was a diving Red bird on a Gold four pointed star with the words the "The Angry Two" on a White scroll. (NA via Altevogt)

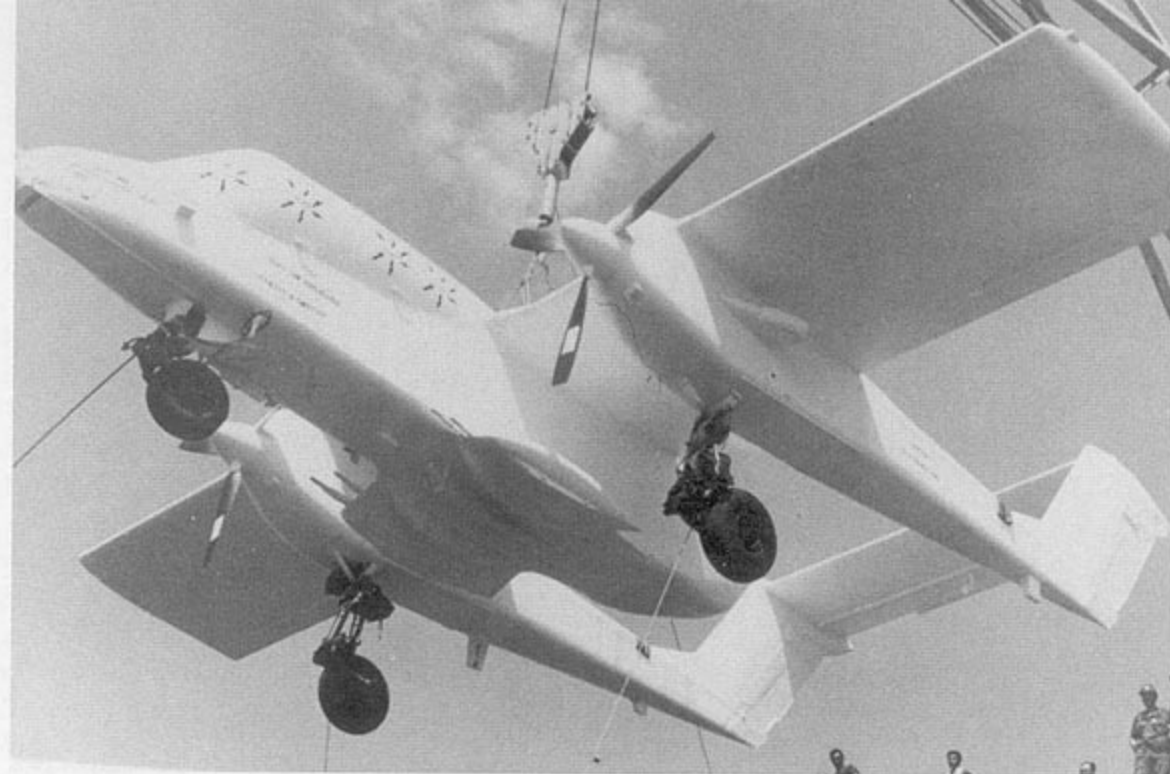
Eventually, the Air Force became more user friendly toward the OV-10 and following the initial evaluation program in Vietnam, a special training program was set up using pilots from the evaluation group and other FAC veterans. This core of instructors made the training syllabus very realistic and imparted important information to the new pilots. A student pilot and his instructor fly a training mission along the Florida coast during the late 1960s. The aircraft has a faded Red band around the starboard tail boom. (NA via Altevogt)





An Air Force Bronco flies over the South Vietnamese country-side in search of enemy concentrations or supply points. The lightning bolt on the tail indicates that the aircraft is from the 20th Tactical Air Support Squadron. If a target was found the OV-10 crew would then call in fighter-bombers to attack it. (USAF)

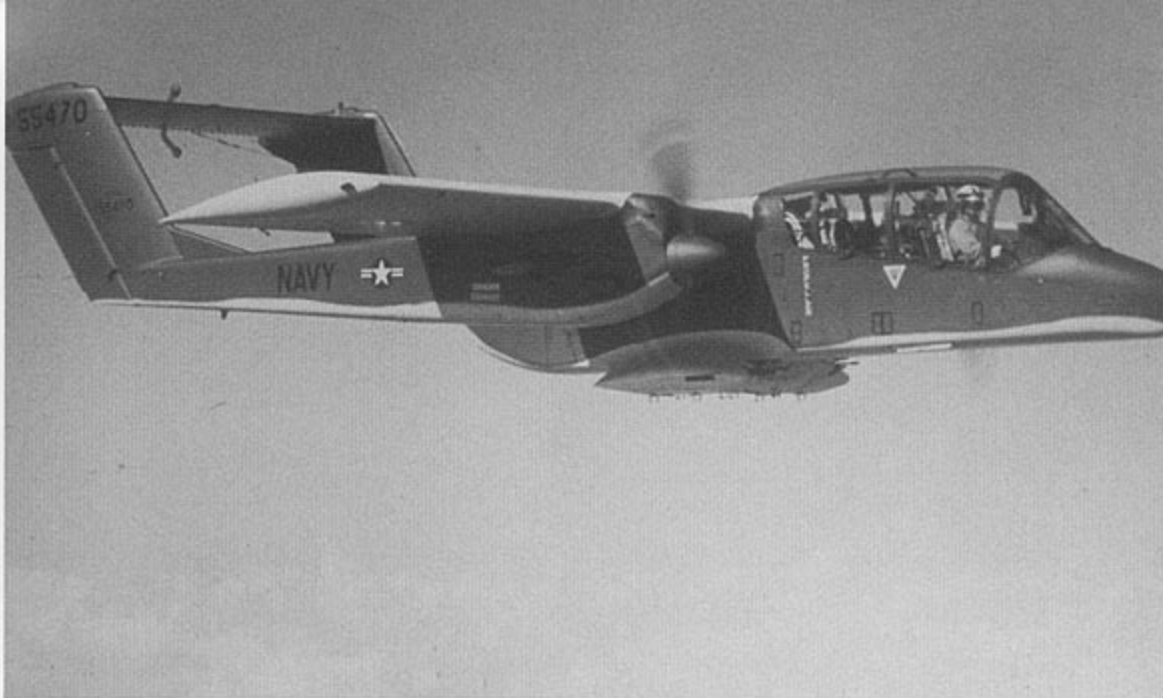
Though the OV-10 could carry an extensive array of armament the Air Force went back and forth between having the sponson mounted M60 machine guns fitted due to losses sometimes suffered when pilots went down on the deck to slug it out eyeball-to-eyeball with enemy ground units. These OV-10s carry a load of 2.75 inch rocket pods for target marking to direct fighter-bombers, but no machine guns were carried in the sponsons, which have the gun ports covered over. (USAF)



Additional OV-10s were shipped to Southeast Asia via U.S. Navy escort carriers reconfigured as aircraft transport ships. These aircraft were cocooned to prevent damage from salt air while at sea. A Bronco is offloaded from one of the ships at the port of arrival, Cam Ran Bay. (USAF)

Surprisingly, the Air Force did consider replacing their A-1 Skyraiders with Broncos for the SANDY rescue escort and support missions to save downed pilots. The endurance and ordnance capabilities of the A-1 far outweighed that of the OV-10 and the A-1 was kept for the role. This Bronco sits beside an A-1 of the 56th Special Operations Wing based out of Nakhon Phanom, Thailand which controlled air activities over Cambodia, Laos and North Vietnam. (NA via Alterrogt)





In 1969 the Navy also got into the Bronco business when it decided that it needed a light support aircraft to provide cover for naval forces operating in the Mekong Delta. The Navy borrowed the needed aircraft from Marine inventories and began to train pilots and ground crews at Naval Air Station North Island at Coronado (San Diego), California. This training was conducted by Replacement Air Group (RAG) Squadron VS-41. (NA via Altevogt)



Some of the Navy OV-10As carried a rearing stallion painted on the nose and eventually this would be used for the units official and semi-official insignia and for shoulder patches worn by Bronco crews. This particular aircraft carries a mixed load of 2.75 and 5 inch rockets along with a mini-gun pod and its standard sponson mounted M60Cs. (Wiggs)

The Navy activated a new unit to operate their OV-10As, Light Attack Squadron Four (VAL-4), nicknamed the Black Ponies. VAL-4 was the only such squadron commissioned by the Navy during the Vietnam War. The Navy Broncos originally carried the same camouflage as Marine OV-10As and carried the tail codes UM on the fin in Black. VAL-4 operated alongside armed UH-1 Huey helicopters in patrolling the rivers and inlets of the Delta in support of the Riverine forces, SEAL teams, PBR patrols and AVRN forces engaged in what became known as Riverine operations. (JEM Aviation)





A pair of VAL-4 Broncos patrol over the Mekong Delta with a lethal combination of ordnance under their fuselages and outer wing racks. The larger rocket pods under the sponsons are for 2.75 inch rockets while the longer ones are for 5 inch Zuni rockets. Zunis are also under the outer wing stations, while the lead aircraft carries a mini-gun pod on its starboard sponson station. (US Navy)

During this period of the Broncos existence it carried little in the way of unusual markings, unlike other aircraft in service at the time. This OV-10A of the 4409th CCTS, 4100th CCTW was one of the more colorfully marked Broncos with a large TAC patch and lightning bolt on the tail. It also had White, Black, Blue and Red bands on the tail boom and a Red scroll on the nose. It was finished in overall COIN Gray and White. (Taylor/Kasulka via USAF Museum)



Whichever branch of the service operated the Bronco, they all were in agreement on one point - it was an easy to maintain aircraft which lived up to its design specifications of being able to "live" in the field with the troops. Marine ground crews from VMO-2 perform minor maintenance on an OV-10A at the Marble Mountain Marine facility. (NA via Altevogt)

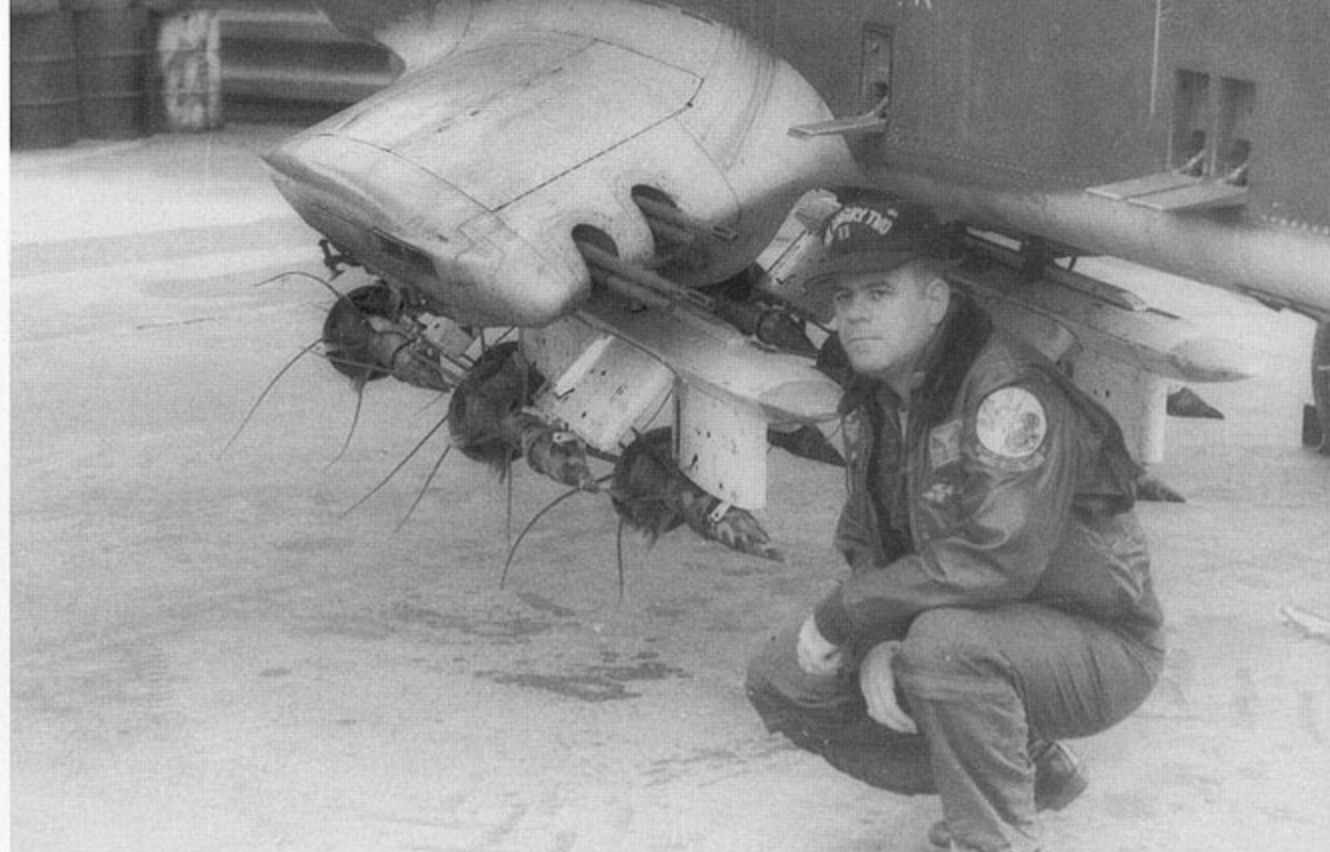
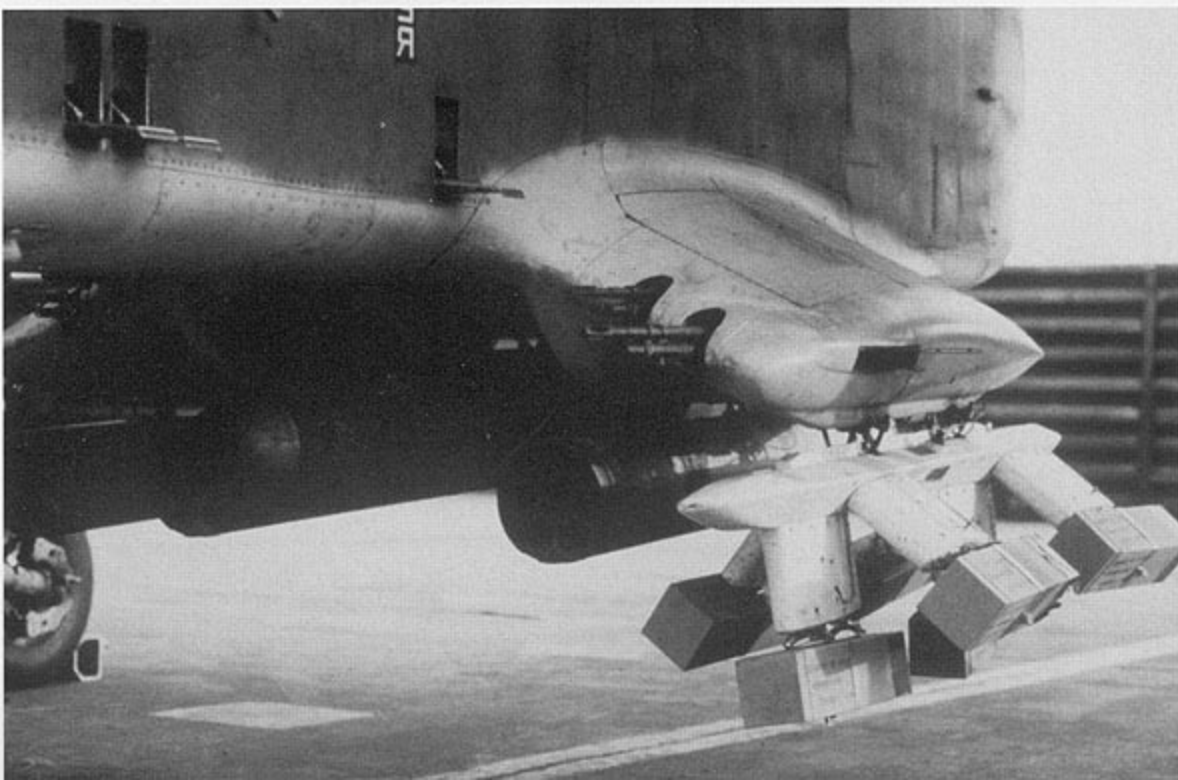
VMO-1, based at Marine Corps Air Station (MCAS) New River, also carried some unusual marking on their Field Green and Gray OV-10As. These included Red and White spinners, White ER tail codes and a Red and White face on the nose outlined in Black. (Nick Waters III)





As the war in Vietnam progressed the Bronco was used with a variety of ordnance loads, some of which were quite interesting to say the least. This OV-10A from VMO-1 carries a GPU-2 20MM gun pod, two SUU-11 mini-gun pods and two seven shot 2.75 inch LAU-59 rocket pods in addition to its M60Cs in the sponsons. This "Super" gun bird carried the Superman crest on the nose and the VMO-1 insignia under the pilots cockpit. (Burin)

In particular, Marine Broncos carried a wide variety of ordnance and other loads on their aircraft. In addition to the rocket pods and mini-gun, this aircraft also carries Mk-6 float flares which were used to mark night targets on the ground with either Red or Green flames. A total of six flares could be carried on the special rack. (Burin)



The OV-10 was also used to seed the Ho Chi Minh trail with Air Delivered Seismic Sensors (ADSIDS) to detect movement by enemy forces at night along the trail. These picked up motion and sent messages back as part of Project Igloo White. Bronco pilot Chuck Burin, who helped greatly on this book, poses with a rack full of the sensors. (Burin)

This Marine observer used a XM-76 Monocular Sight System to acquire a ground target. This system was gyro-stabilized and used with mixed results due to the curved canopy surfaces of the OV-10. (Burin)





The Air Force also tried to improve the effectiveness of the Bronco at night and in poor weather under the Pave Nail configuration. Operated by the 23rd Tactical Air Support Squadron the laser pod under the fuselage was used to locate or designate a ground target. Fifteen of these aircraft were acquired and used until 1974. (USAF)

Two VAL-4 aircraft sit in revetments at Vung Tau Air Base, near the mouth of the Saigon River prior to a mission. Normal procedure for the Black Ponies was to operate two, eight aircraft sections out of Vung Tau and Binh Thuy in support of U.S. and Vietnamese naval units in the Mekong Delta region. (Wiggs)



An Air Force OV-10 is prepped just prior to a mission. Normally only a pilot flew on daylight missions, unlike the Marines and Navy who used both a pilot and observer on most sorties. One of the aircraft the Bronco was to replace, a Cessna 0-1 Bird Dog, can be seen in the revetment to the left of the OV-10. (NA via Altevogt)

During the middle of 1971, the Black Ponies began to change the paint schemes used on their aircraft from the Marine Field Green and Gray to Gull Grey and White. At the same time a new insignia was painted on the aircraft, being carried on the nose while the older rearing stallion was enlarged and placed on a shield on the fin. This particular aircraft was based at Vung Tau. (Mesko)





A section of VAL-4 aircraft prepare to take off from Binh Thuy Air Base, during August of 1971 as they await clearance from a ground crewman at the right. His informal attire was typical of naval personnel serving in-country during the war compared with those assigned to surface ships off-shore due to the conditions and closeness of the enemy to shore installations. (Gatewood via Bishop)



A lineup of VAL-4 Broncos on the ramp at Binh Thuy, South Vietnam during the Fall of 1971. During the course of the war seven OV-10As were lost by the Black Ponies, both due to combat and accidents. Due to the pullout of American troops from the war zone plans were drawn up to deactivate the unit and in April of 1972 the unit stood down. (Gatewood via Bishop)



Personal markings were rather scarce on most OV-10As. This U.S. Air Force Bronco was one of the few OV-10A Broncos to carry a sharkmouth marking during the Vietnam war. This particular Bronco was the personal aircraft of the Commanding Officer of the 20th Tactical Air Support Squadron. (USAF)



Surprisingly, given its initial reluctance to use the OV-10, the Air Force was the last of the three services to use the aircraft in Vietnam. During the 1972 Easter Invasion by the North Vietnamese, an Air Force pilot won the Medal of Honor when he gave his life to save his Marine observer in the back seat who could not eject after the aircraft was hit by a SA-7 missile. Captain Steve Bennett made a water landing to save the observer but was unable to get out and drowned in the crash. (USAF)

The Navy squadron responsible for training was VS-41 which operated out of Naval Air Station North Island, in Coronado, California, across the bay from San Diego. One of their aircraft carried a rather unusual Black color scheme during 1971. Most of the unit's aircraft were in the standard color scheme of Marine Field Green and Gray. (USN)

When the Black Ponies were deactivated during 1972, the remaining OV-10As were returned to the Marine Corps. The Navy; however, continued to use the Bronco for a variety of test roles. This particular aircraft was used by the Naval Air Test Center unit at Pax River, Maryland. The aircraft was in the standard Field Green and Gray scheme with a Red and White wing upper surface along with Red nose, fin and horizontal tail surfaces. The insignia was not the standard Pax River unit crest. (Love)

Another Pax River OV-10 with similar markings but with the Pax River insignia on the vertical fin. The Bronco was a reliable aircraft for testing purposes and served in this role for nearly two decades. (Love)





A number of Broncos were also used by the Naval Weapons Evaluation Facility (NWEF) at China Lake and carried the units distinctive Thunderbird style tail marking. These aircraft were painted in the standard Marine finish. (JEM)

One aspect of the Bronco's capability which never got much coverage was its use to drop paratroopers or cargo out of its large bay area behind the observer and pilot. This OV-10 makes a cargo drop over Camp Pendleton in 1972 during a training exercise. When used in this role the cargo door was removed. This aircraft is from VMO-2. (USMC via Burin)



Following the war, both the Air Force and Marine Corps operated the OV-10 in a variety of roles with a number of units. One of the more nicely finished Air Force aircraft was this one from the 549th TASTG which had a Red checkerboard tail and Red trim on its overall COIN Gray color scheme. During this period Broncos did not carry tail codes in Air Force units. (Love)

If the gear was retracted, the OV-10 was also a fairly safe aircraft to belly land due to its flat belly and high mounted engines. Even with the sponsons and a drop tank this pilot brought his aircraft in for a safe landing at Camp Pendleton during 1972. Assigned to VMO-2, this aircraft was eventually put back into flying status. (Burin)





The OV-10 saw a great deal of use in different units in both the U.S. and overseas with both the Marines and Air Force. One of the lesser known units which flew the Bronco was Marine Headquarters and Maintenance Squadron 36 (H&MS-36) which operated out of Marine Corps Air Station Futenma, Japan. The units tail code was WX. (JEM)

VMO-2, out of Marine Corps Air Facility, Camp Pendleton, California, carried perhaps the most unusual tail markings of any Marine squadron, a vertical VMO on top of a Red two. The light colored wing was to make the aircraft easier to spot by fast moving attack aircraft when the OV-10 was down on the deck. (Burin)



A pristine Bronco of Marine Observation Squadron One (VMO-1) sits to the side of the runway at Marine Corps Air Station, New River, North Carolina. VMO-1 was one of the early OV-10 units which saw service in Vietnam. (Love)

This stylized W tail code matches no known Marine squadron and is rather unusual for any Navy or Marine aircraft. (JEM)





A few Bronco squadrons marked their unit designation on the noses of their aircraft, such as VMO-6, which operated out of MCAS Futenma, Japan (Okinawa). The Tomcats flew in support of the 3rd Marine Division until deactivated at the end of 1976. Their job was taken over for a short time by H&MS-36 until it too was deactivated. (USMC)

The other Reserve unit, VMO-4, was initially based at Grosse Ile Municipal Airport, Michigan but relocated to NAS Atlanta, Georgia, and eventually became the last Marine Bronco unit to stand down. With their designation on the nose and the MU tail code, there was no mistaking VMO-4's aircraft. (JEM)



In addition to regular Marine units, two Reserve squadrons also flew the OV-10, VMO-4 and VMO-8. VMO-8 flew out of Naval Air Station Los Alamitos, California until its deactivation and carried the tail code QN. These crewmen are suiting up after what appears to have been an airshow in 1975. (Love)

Air Force OV-10s began to lose their light Gray color schemes during the 1980s when they switched over to the European three tone scheme of Greens and Grays. This particular Bronco was making a rocket marking pass at a target during training at the Eglin AFB complex in Florida. Initially the aircraft did not carry any identifying markings on their tail when the camouflage scheme changeover was first made. (USAF)





Eventually tail designation markings were added for identification, which were normally carried on the side of the fin. This aircraft is from the 549th TASS/507th TACW based at Patrick AFB, Florida. Originally the tail code was FL, but this was changed to PF during the late 1980s. The tip of the fin has a Yellow band with small Black stars on it. (Love)

On occasion the 27th TASS also marked their squadron designation on the fin along with a Black horse on the rudder. These markings seem appear not to have been used widely, if at all, during actual operations by the unit. (Love)



This OV-10A belongs to one the more colorfully marked units, the 27th TASS/602nd TACW out of George AFB, California which often used shaded letters for the aircraft serial numbers and tail code. The fin tips were colored Blue and Yellow. The placement of the letters on top of the fin was unique to this Bronco unit. (Love)

The 22nd TASS/326th Air Division out of Wheeler Air Force Base Hawaii flew in an overall camouflage scheme of Gunship Gray with Blue fin tops. Their tail code was WH. (USAF)





This Bronco from the 22nd TASS has teamed up with two OV-10s from the 19th TASS/5th TACG based at Osan Air Base, South Korea during a joint exercise. The middle aircraft is camouflaged in the European One scheme while the other two are overall Gunship Gray. Tail codes for the 19th TASS was OS. (USAF)

A very unusual scheme was carried by this OV-10, believed to be from VX-5. The aircraft was overall Pale Orange with a Field Drab Green sprayed in random patterns. The absence of all markings, including a serial number is quite unusual. (JEM)



This Marine OV-10A appears to be painted in a color very similar to Zinc Chromate, but the purpose behind this scheme on a fully marked aircraft is unknown. During the 1980s a number of unusual schemes were tried and evaluated by the Marines for their Broncos. (JEM)

When the Marines began flying the OV-10D, some of the aircraft received a camouflage scheme of Green and two shades of Gray. This aircraft from VMO-2, carrying the double horseshoe tail markings, taxis out on a training mission from the Marine Air Facility at Twenty-Nine Palms, California. (Stewart)



Desert Storm

When Kuwait was invaded by Iraq on 2 August 1990, the U.S. responded with a massive aerial deployment to the Persian Gulf under the code name Operation DESERT SHIELD. While the Air Force decided not to deploy their OV-10s to the region, feeling the aircraft was too vulnerable to survive in such a high threat environment, the Marines had no such qualms and deployed the Marine Air Ground Task Force (MAGTF) to the region.

VMO-2 of MCAF Camp Pendleton, California launched three OV-10As and three OV-10D+s to Southwest Asia in late August. The detachment first flew to the U.S. east coast, then to Goose Bay, Labrador. From there the flight continued to Greenland, Iceland, the United Kingdom, Spain, Sicily, Crete, Egypt and finally to Saudi Arabia. The OV-10s arrived in September and were based with the AV-8B squadrons at King Abdul-Aziz Air Base on the Persian Gulf coast. The Bronco and Harrier squadrons were attached to Marine Air Group Thirteen (MAG-13) of the 3rd Marine Air Wing (3rd MAW). The 3rd MAW was the designated Aviation Combat Element (ACE) of the 1st Marine Expeditionary Force (1 MEF). Reinforced with two more OV-10D+ aircraft that arrived via container ship, VMO-2 began tactical training and area familiarization flights throughout the region.

On 18 December 1990, VMO-1 of MCAS New River, North Carolina departed from Norfolk, Virginia with seven OV-10D+ aircraft and five OV-10As aboard the aircraft carriers USS ROOSEVELT (CVN-71) and USS AMERICA (CV-66) for Saudi Arabia. The squadron deck launched off the ships near Spain and headed eastward, arriving in Saudi Arabia on 16 January 1991.

VMO-2 began supporting the air war of Operation DESERT STORM on 16 January 1991. One aircraft was maintained on alert station twenty-four hours a day, providing as needed

The possibility of duty in the Middle East led to experiments with desert type camouflage patterns such as this one of Tan, Brown, and Black. This OV-10D was probably assigned to VMO-2. In light of subsequent events, this idea was to prove very prophetic. (JEM)



Visual/FLIR Reconnaissance, Artillery and Naval Gunfire Airspot, Radio Relay, and Forward Air Controller (Airborne). VMO-1 was ready to support air operations on 18 January 1991, and their OV-10s were initially assigned to operate south of 1 MEFs designated Fire Support Coordination Line (FSCL) located near the southernmost Kuwaiti border. The faster and more capable OV-10Ds were used as much as possible to provide the required coverage; however, OV-10As were used, if needed, on daylight operations.

The primary anti-air threat facing the units was small arms fire, optically sighted Anti-Aircraft Artillery (AAA) and IR homing surface-to-air missiles. The radar controlled AAA threat was almost completely suppressed. OV-10 aircrews utilized the Bronco's defensive countermeasures systems and the aircraft's high maneuverability to survive. The OV-10D+ aircraft came with IR suppressive exhausts that helped defeat IR guided weapons. Five of the six VMO-2 Broncos were given a desert camouflage of two tone Brown uppersurfaces over Light Blue undersurfaces. The VMO-1 aircraft were in their standard camouflage, and several were repainted in Air Superiority Gray camouflage. Due to a potential Iraqi fighter threat, the aircraft normally flew with one AIM-9 Sidewinder for self-defense. The normal offensive load was the four M60Cs, a Zuni pod loaded with White Phosphorus (WP) marking rockets, another Zuni pod with High Explosive warheads (HE) and, at night, a pod of LUU-2 paraflares were usually carried.

On the first day of the war, the OV-10s were active locating Iraqi artillery and controlling AV-8 airstrikes. On day two, an OV-10A from VMO-2 was shot down by an IR guided missile. The crew ejected safely, but were captured by Iraqi troops. After this incident, the IR missile zones were redefined and after this, the OV-10s had no further problems with them.

For the remainder of the air war, the OV-10s were active locating a variety of Iraqi positions for AV-8 and A-10 airstrikes. VMO also received target information from Navy SEALs and Marine Recon units behind Iraqi line. Some OV-10s were used to control Naval Gunfire missions. One of the targets was an Iraqi ammo dump near the Kuwaiti coastal highway. When the Iraqis attacked Khafji, an OV-10D+ was the first to spot the advancing Iraqi force and controlled A-6 airstrikes against them. Throughout the day of the attack, OV-10s continued to relay enemy position information and supported the Coalition counterattack.

When the ground war began, VMO-1 and VMO-2 both supported the Marine attack on 24 February, with a minimum of three aircraft on station, twenty-four hours per day. During the final Marine offensive to take the International Airport, one OV-10A of VMO-1 found itself over an Iraqi trench complex and before it could egress the area, an IR missile hit the right engine. The explosion killed the observer, the pilot ejected and was captured by the Iraqi troops. Throughout the remainder of the 100 hour ground war, the OV-10s continued to provide support for the Marines, until the cease fire brought an end to the fighting.

During the war, only two aircraft, both OV-10As were lost, both to ground fire. Questions; however, were still raised about just how effective the Bronco could be in a high threat situation and after the war, the powers that be began to give the Bronco and its mission a serious examination. Although it was initially thought that the Bronco would remain in the inventory until the turn of the century, at least with VMO-4, the Atlanta reserve unit, budget cuts by the anti-military Clinton Administration and questions about the aircraft's usefulness led to the decision to retire the Bronco from Marine service during 1994. This had already been done by the Air Force with their remaining OV-10s during 1993. In July of 1994, during an impressive ceremony at Dobbins Air Force Base, the Broncos of VMO-4 were retired, after a quarter century of service.

(Note: This section by Major Jeff Clements, USMC [Ret])

(Right) When Iraq invaded Kuwait in the late Summer of 1990, the Marines deployed a number of aircraft in support of Marine ground units. Both of the remaining active duty Bronco units provided aircraft and crews and these were sent over by a variety of means. This OV-10A takes off from a carrier for a base in Spain before continuing the rest of its journey to Saudi Arabia. Both OV-10A and OV-10D+ aircraft were used during the war. (USMC)

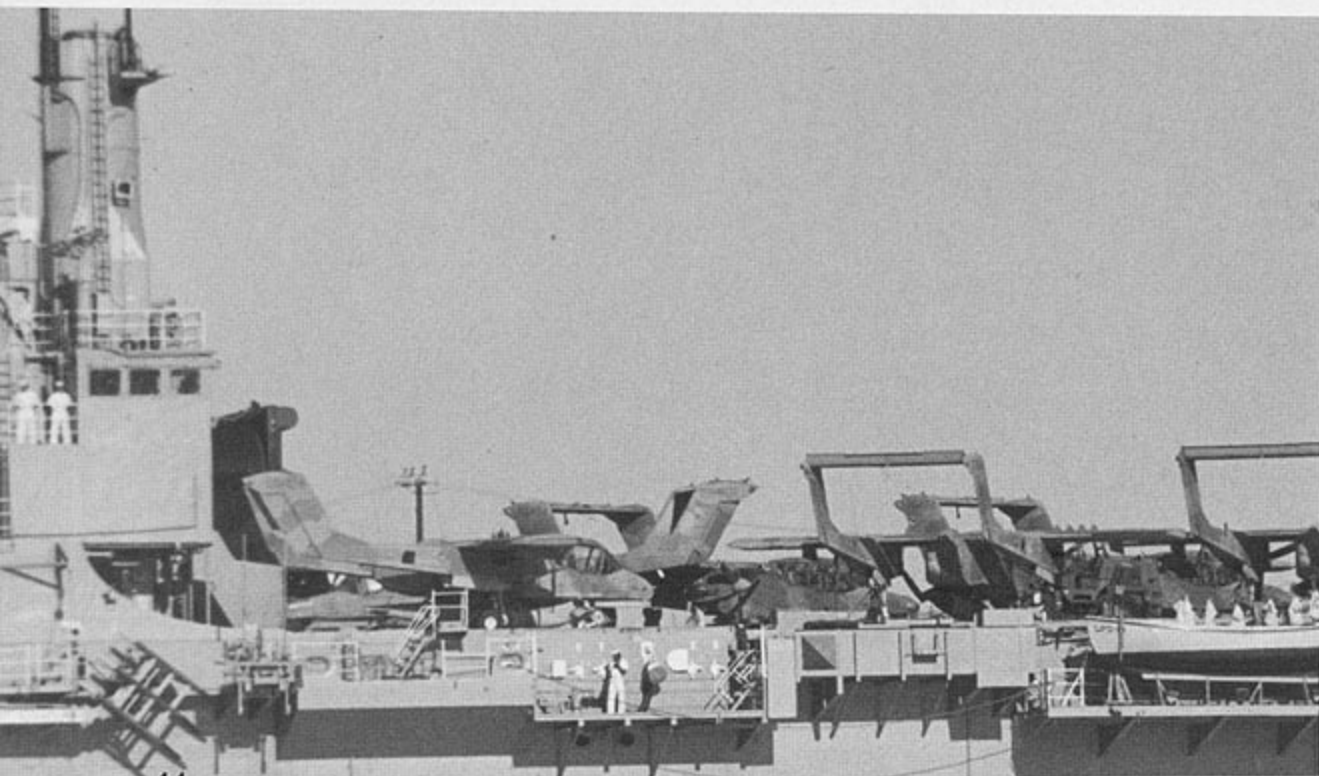


A Marine OV-10D+ of Marine Air Group Thirteen (MAG-13), 3rd Marine Air Wing flies along the coastline just off Kuwait City, Kuwait during Operation DESERT STORM looking for Iraqi targets. The OV-10D+ was much more capable of operating in this high threat area than the earlier OV-10A because of its improved countermeasures systems. (USMC via Nick Waters)





When the war was over the Broncos were brought back to the U.S. by ship. A group of six OV-10A and OV-10D+ aircraft are visible on the forward deck of this Navy amphibious ship as it returns from the Persian Gulf. Only two OV-10As were lost during the war, both to Infrared guided missiles fired by Iraqi ground troops. (USN)



When the Broncos arrived in the war zone they were repainted in a desert style camouflage pattern of Tan and Brown over Light Blue. This OV-10A of VMO-1 returned to Atlanta after the war still carrying this desert scheme. (Colvin)

The Air Force did not deploy their OV-10s to the Persian Gulf, feeling that they were too vulnerable to ground fire. The last Air Force units to fly the Bronco were the 20th and 21st TASS of 507th TACW out of Shaw AFB, South Carolina. A formation of OV-10s of the 20th TASS do an aerial demonstration during an exercise. The 20th TASS carried the name "Misty" on a Red and White tail band while the 21st carried the name "Raven" on a Blue and White band. The units were deactivated in the late Summer of 1991. (USAF)



Foreign Service

Broncos have been supplied to Germany (OV-10B and OV-10B[Z]), Thailand (OV-10C), Venezuela (OV-10E) and Indonesia (OV-10F), all being basically OV-10A models (except for the OV-10Bs). Additionally, refurbished ex-U.S. OV-10As have also been acquired by several other nations

Broncos saw combat in Venezuela in December of 1993, when the Fuerza Aerea Venezolana led a coup attempt against the government along with elements of other armed forces units. The Broncos were used to attack the presidential palace and Barquisimeto Air Base, where they destroyed three CF-5A fighters on the ground. During the fighting, two Broncos were shot down by a patrolling F-16A and a single CF-5A that had scrambled from the base before the attack.

The rebel base was soon surrounded by loyal government troops and the Broncos were active in attacking targets in Caracas and the troops around the air base. A third OV-10 was shot down by ground fire, but the crew ejected successfully. Finally, the Broncos departed the rebel base and the Army regained control. Some of the rebels escaped to Peru while some one thousand officers and NCOs were arrested.

During 1981, the Royal Moroccan Air Force acquired six ex-Marine Corps OV-10As which had been refurbished by North American. Although supposedly twenty-four aircraft were eventually to be sold, only six of these were delivered due to political problems. These six were based at Marrakech-Menara and saw action against Polisario insurgents in the western Sahara region.

The Philippines also acquired surplus Broncos as part of an aid package from the U.S. to bolster the government of Corozon Aquino. The limited budget of the Philippines Air Force had not allowed for modernization under Ferdinand Marcos and the PAF had been forced to make do with ageing T-28s for the counterinsurgency mission. Many of these were destroyed during the aborted coup by military dissidents in the Summer of 1987. Following this American officials offered refurbished Broncos as part of a package involving aid in return for base use. It is believed enough aircraft were received to equip the 16th and 25th Attack Squadrons of the 15th Strike Wing based at Sangley Point Air Base.

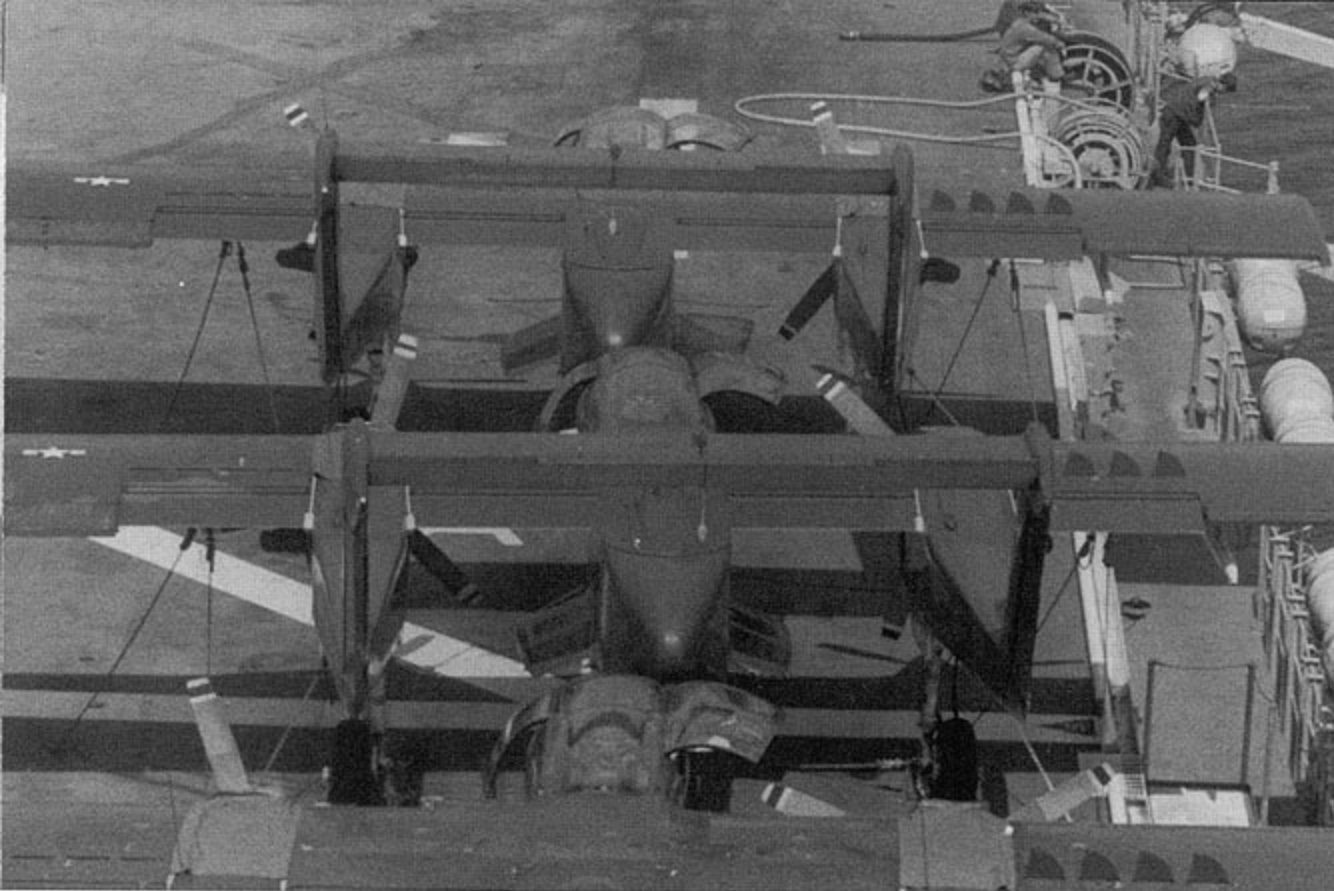
The Venezuelan Air Force purchased a total of sixteen Broncos under the designation OV-10E. Originally operated by No 40 Squadron at Barcelona, eleven aircraft were later transferred to No 15 Special Operation Air Group based at Maracaibo. In late 1993, a number of cadets and recently graduated pilots assigned to No 15 SAOG joined in a coup attempt. During the fighting three OV-10Es were lost. (via Dan Hagedorn)



A flight of four OV-10Cs of the Royal Thai Air Force. Thai OV-10s have seen combat in the border fighting between Thailand and Cambodian/Vietnamese troops. At least one aircraft was lost to an IR guided surface-to-air missile on the Thai side of the border. Thailand purchased a total of thirty-eight aircraft and had expressed interest in obtaining more during 1980, but by that time the production line had closed and new production OV-10s were no longer available. (USN via Nick Waters)

The *Tenara Nasional Indonesia-Angkatan Udara* (TNI-AU Indonesian Air Force) purchased twelve OV-10As under the designation OV-10F assigning them to No 3 Squadron at Baucou. These aircraft have also seen combat, being used against rebels on the Island of Timor in the early 1980s. This aircraft, S-110, was the first Bronco delivered to Indonesia. (TNI-AU via Nick Waters)





Three Marine OV-10As are parked on the forward flight deck of USS SAIPAN (LHA-2) during the ship's transit to the Teamwork '80 NATO exercise in Norway. Just prior to arrival off Norway, the aircraft were readied for a flyoff to a forward Marine landing field. (Nick Waters)



Marine OV-10As and later OV-10Ds have been active in flying off the Tarawa Class Amphibious Assault Ships (LHAs). This OV-10A is being towed by a MD-3A tractor to a new parking position aboard USS NASSAU (LHA-4) during 1983. (USN)



DESERT STORM was not the first time Broncos have flown from flight decks. A deck crewman watches as a Marine OV-10A takes-off from USS SAIPAN (LHA-2) during Teamwork '80, a NATO exercise held in Norway. The Bronco has no catapult or arresting gear and can only "deck launch" from a carrier or LHA. Without arresting gear, they can not return to the ship and must proceed to a landing at a shore base. (USN)



An OV-10D+ fires a salvo of 2.75 inch rockets against a ground target at the Avon Park bombing range in central Florida. The Bronco was assigned to VMO-4, which made its last deployment to the range just prior to the squadron's disbandment in the Summer of 1994. The aircraft was in the overall Light Gray color scheme, while the drop tanks were in the older two color Gray and Green scheme. (Davis via Clements)

A surprising number of Broncos have also been preserved in museums or are slated to be. This YOYV-10A was the one fitted with a Pratt and Whitney T74 turboprop for test purposes and is currently being restored by the Yankee Air Museum in Michigan. (Bailey)



The last unit to fly the Bronco was VMO-4, a Marine Reserve unit based at NAS Atlanta, Georgia who retired their aircraft in the Summer of 1994. Aside from their regular military duties the Marines also were employed as part of the U. S. Drug Interdiction Task Force and took part in a number of encounters with drug smuggling aircraft. It was camouflaged in the Green and Gray scheme adopted late in the OV-10s career. (Love)

The end of the line for many Broncos was the storage facility at Davis Monthan Air Force Base, AZ. Many of these aircraft; however, were later refurbished and given to various U.S. allies and government agencies, such as NASA and the AFT, so the OV-10 will continue to soldier on probably into the turn of the century. (Love)



Civil Use

While the military was the prime operator of the Bronco, a number of U.S. government and state agencies have acquired OV-10s for various types of missions. The National Aeronautics and Space Administration (NASA) began using an OV-10 during 1968 to test the concept of a cylindrical flap as opposed to the more traditional type. Another one, a YOV-10A prototype, was acquired in the early 1970s and used for research on engine noise. Unlike the first one, which was borrowed from the Marines, the second aircraft flew with full NASA markings.

In the Spring of 1984, NASA's Cleveland Lewis Research Center, located at Cleveland Hopkins Airport, Ohio acquired an OV-10A from North American for engine and noise abatement experiments. This aircraft, although officially assigned to the Navy, had never flown operationally, but had been retained by North American for research and test work in Columbus. With all related ordnance systems, spousons and hard points removed or made inoperative, this Bronco was fitted with a prominent nose boom, VHF radio equipment and internal modifications for housing instrumentation packages. NASA felt that the OV-10 offered a unique test bed since the engines, which turn their propellers inboard, could be interchanged for various combinations. In addition, the large cargo compartment in the rear fuselage allowed a large payload capacity, giving the aircraft tremendous research capabilities.

One of the larger civil users of the Bronco is the National Aeronautics and Space Administration (NASA) which operates a number of OV-10s out of Langley, Virginia and Cleveland, Ohio. This particular aircraft operates out of the Langley Research Facility and carries a very attractive White and Blue color scheme. (NASA via Coe)



The NASA Cleveland facility has four OV-10s currently in their inventory including the first production aircraft which was used in the official acceptance ceremony in February of 1968 at Columbus. It is currently used for a variety of noise abatement tests and carries its original Marine Corps Field Green and Light Gray color scheme and both its military and civilian registration numbers. A special addition is the nose boom used for acquiring air data, ahead of the aircraft's airflow. (NASA via Ranaudo)

Working in conjunction with NASA Langley, research was done related to internal and external engine noise characteristics. With support from outside civilian contractors a large amount of information was generated, and as a result of this work, NASA received the Collier Trophy in 1987. Since then work in noise abatement problems have been one of the main areas the OV-10 has been used, working in conjunction with the U.S. Air Force's Bioacoustics Research Laboratory at Wright Patterson Air Force Base at Dayton, Ohio, less than an hour's flight time away and the Bose Corporation in Farmingham, Massachusetts. This led to the introduction of a new noise canceling headset which improved communications significantly with regards to outside noise interference. Additional work is also envisioned in the areas of new audio and visual technological equipment and helmet mounted systems.

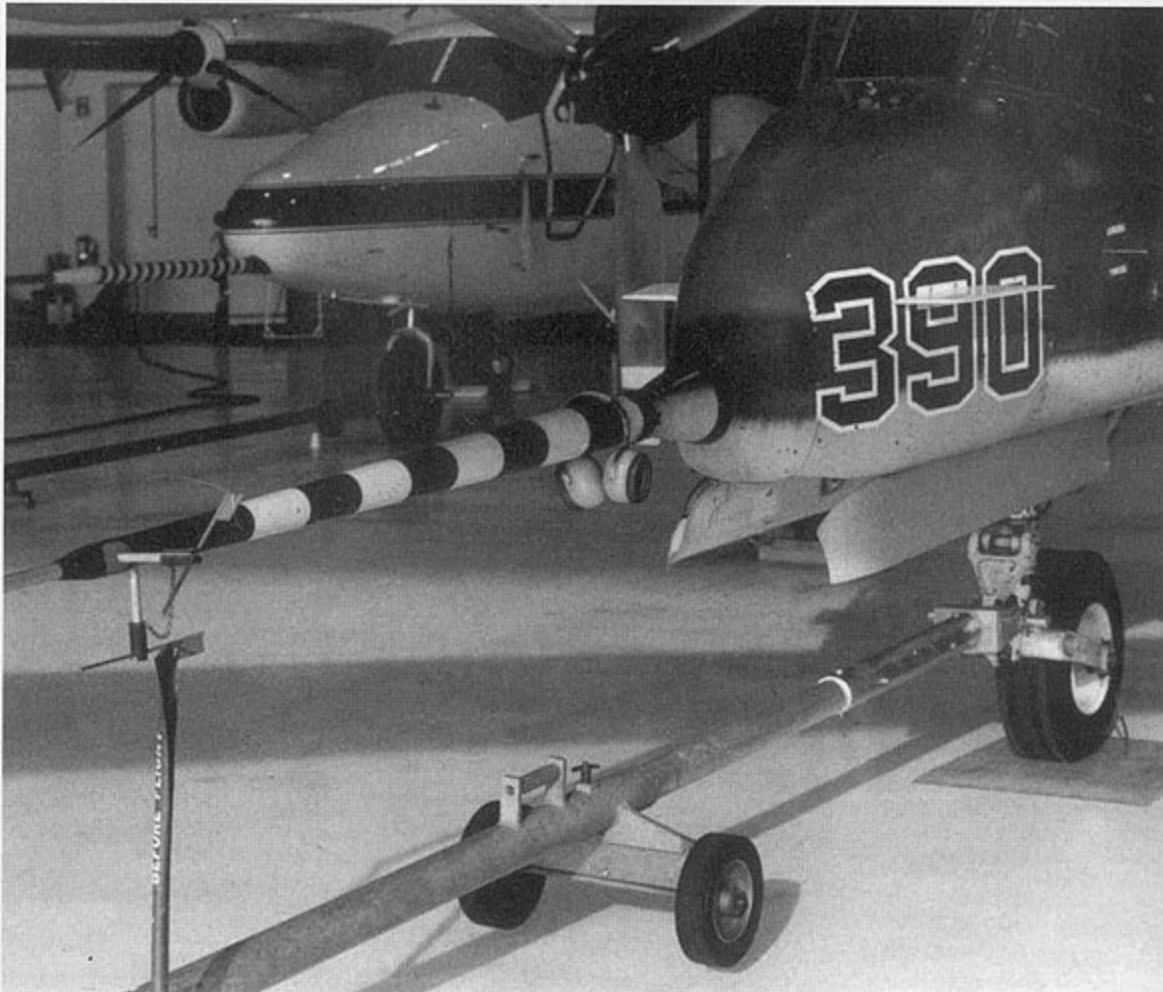
Currently NASA Lewis is operating a single OV-10A, but with the phase out of the Bronco from military service, the Lewis facility has acquired three additional aircraft. One is an OV-10A from the 21st TASS, Shaw AFB, which will serve as a "parts" airframe, and when no longer needed will probably go to the Alcohol, Tobacco and Firearms (ATF) division of the Justice Department. Two OV-10Ds were acquired when VMO-4 decommissioned the Bronco during the Summer of 1994. While both aircraft will become operational, the high time airframe will eventually become a spares aircraft. Both aircraft still carry their FLIR equipment, but the laser unit was deleted. Thus the future looks bright for continued flight operations with the OV-10 out of the NASA Lewis Research Facility.

When the phase out of the Bronco from military service began, other government and state agencies also began to acquire the aircraft. The largest single group of Broncos, twenty-two aircraft, appears to belong to the ATF, which will probably use them in anti-drug related oper-

ations. The Bureau of Land Management has fifteen aircraft for use in survey work. To help in forest fire fighting, the California Forestry Department has been using some Broncos for spotting purposes to locate "hot spots" and direct ground and aerial units against such sites. In Washington State, the Bronco may possibly be used for survey work or for night time surveillance of fishing vessels which attempt to overfish the coastal waters. Other agencies may also decide to use the OV-10, and while its use in the military is over, there is a good chance that the Bronco will be operating well into the 21st century, not bad for an aircraft which first flew three decades ago.

(Right) When VMO-4 was deactivated in July of 1994, NASA acquired two of their aircraft and numerous spare parts. Both the aircraft acquired were OV-10D+ models and arrived at the Lewis Research facility in almost their original military configuration. This particular aircraft is painted in the multi-tone camouflage pattern of Green and Grays. (Mesko)

The Broncos used by NASA carried a special nose mounted test boom used to collect air data during flight tests. The boom was painted Black and White and extended a considerable distance in front of the aircraft. The aircraft side number was Black with a White outline. (Mesko)



NASA also received another OV-10D+ in overall Gray. It is believed that this aircraft will probably be used for flight tests while the other aircraft serves as a source of spare parts. This aircraft has the FLIR housing and wing tanks camouflaged, indicating that these were taken from other aircraft. (Mesko)





Framed by the large NASA hanger at the Lewis Research Center this OV-10A sits on the north side of Cleveland Hopkins International Airport. The former USAF Bronco had formerly been assigned to the 21st TASS at Shaw Air Force Base, South Carolina and was received by NASA during 1992. It will be used for spare parts to keep their OV-10A operational. When all spare parts are removed the hulk is slated for use by the ATF. (Mesko)

An OV-10A of the California Department of Fire. These aircraft are used as spotters for fire bombers and to direct fire teams to hot spots. The aircraft is overall White with Red panels on the nose, wing tips and fins. The boom codes and nacelle trim is in Black, while the FIRE logo on the boom is White. (CDF via Clements)



This OV-10D of the ATF was parked on the ramp at Tamiami Airport, Florida during the Spring of 1995. The aircraft was painted overall Law Enforcement Blue with Red and White striping and a Red N number with a White outline. The ATF plans on using the Broncos for surveillance. (Clements)

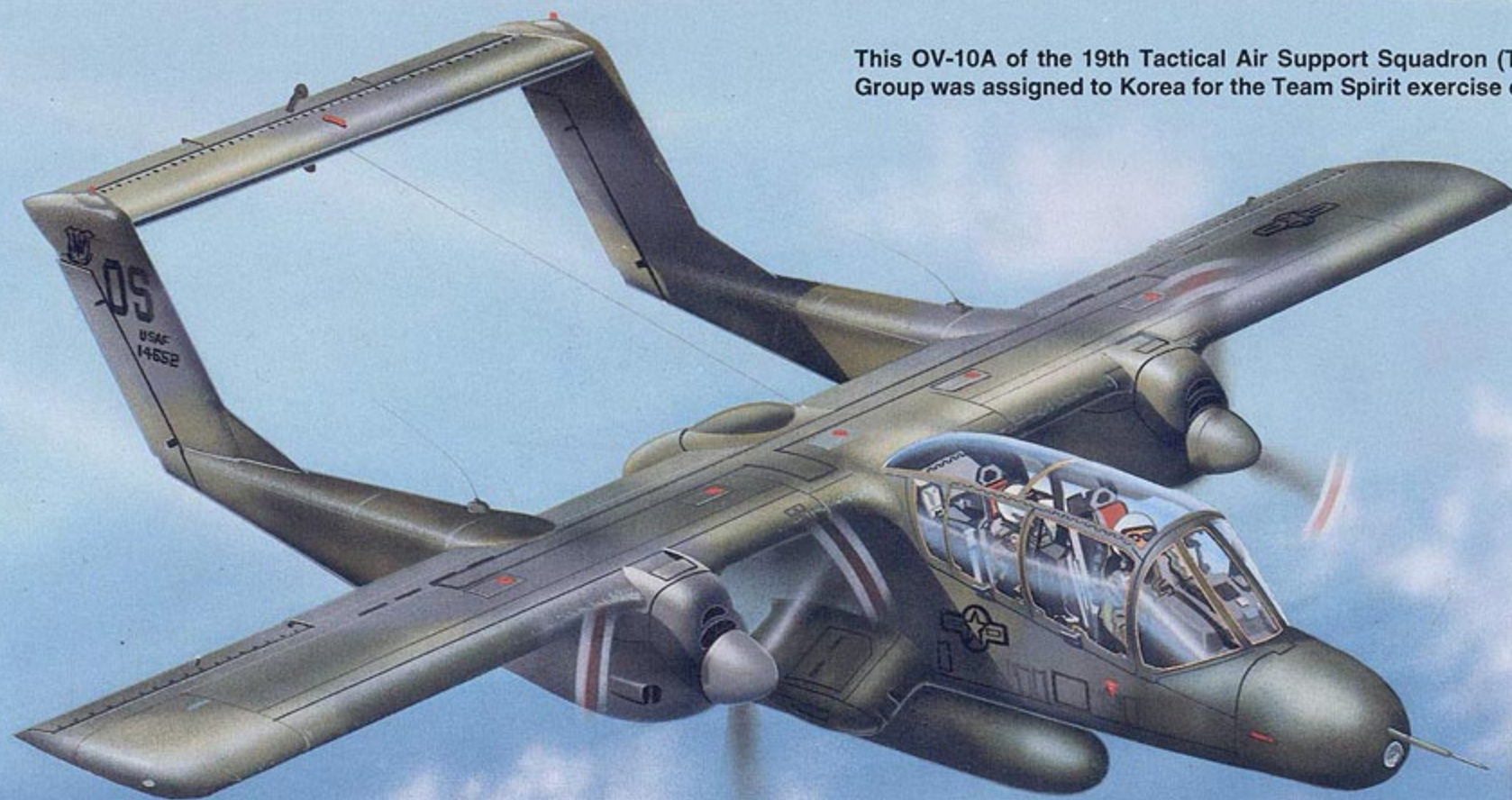
This OV-10A is operated by the Bureau of Land Management for survey work. The aircraft is overall White with Medium Green wing tips and fin trim. The spinners and nacelle trim is in Light Blue. The upper fuselage cheat line is in Medium Green while the lower one is in Light Blue. Inboard of the Green on the wing tips are bands of Red and Light Blue, while the horizontal stabilizer has Red bands. All lettering is Light Blue with a Black outline. (Burin)



The Marine OV-10A was assigned to H&MS-24 at the China Lake weapons test facility, California, during 1975.



This OV-10A of the 19th Tactical Air Support Squadron (TASS), 5th Tactical Air Control Group was assigned to Korea for the Team Spirit exercise during the Fall of 1985.



ISBN 0-89747-340-X



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