

# LIFE OF THE INTRUDER - By Hal Andrews

The Grumman A-6 Intruder could have never won a beauty contest. With its engines and exhaust nozzles at mid-fuselage instead of at the rear end, an ample cockpit canopy over the crew and a bulbous radome nose, it was often described as being pointy at the wrong end. But if a warplane should sport aggressive lines, especially when carrying its lethal weapons, the Intruder measured up with a beauty all its own.

The old adage "form follows function" is appropriate in the Intruder's case. The Deputy Chief of Naval Operations (Air Warfare) staff, the Bureau of Aeronautics(BUAER) personnel who prepared the type specification for the airplane's design, and the Grumman team who put together the winning proposal all played a part in creating a configuration that remained almost unchanged through 30 years of production. Extensive internal changes and replacement of the original wings with new composite construction made little difference in the basic external appearance. Even its direct descendant, the EA-6B Prowler, closely reflects its Intruder roots.

## **Beginnings**

The Navy's Korean War experience, with no jet all-weather strike capability and limited carrier air group night or all-weather effectiveness, prompted research on avionics systems to overcome this deficiency. By the mid-1950's, the Marine Corps defined its need for an all-weather close air support airplane capable of operating from the shortest possible expeditionary field runways.

Meanwhile, the Navy was introducing the first of a new generation of jet carrier aircraft. These ranged from the smallest attack jet, the A-4 Skyhawk, through various fighters, to the long-range, heavy attack A-3 Skywarrior. Their limitations, including no all-weather attack systems in the A-4 and the adverse impact of the A-3's large size in carrier operations, led to studies showing that the application of new avionics technology could produce carrier-based, all-weather attack aircraft capable of long-range conventional or nuclear strike missions flown at low terrain clearance altitudes below enemy radar interception. The complex avionics would require a second crewman for its effective use.

An operational requirement was established by the office of the Chief of Naval Operations in 1956 for an all-weather tactical airplane, combining the carrier

attack mission with the Marine's close-support, short-field capability. Early in 1957, BUAER set forth the demanding mission and operating performance requirements, along with appropriate current design features, such as ejection seats for the aircrew. Typically, various system components and equipment, such as the engines, would be Navy procured and furnished and the proposed contract would require the winning contractor to be responsible for the totally integrated "weapon system." Eight companies submitted 11 designs, ranging from turboprop-powered designs to a supersonic jet and a vertical/short takeoff and landing airplane.



Grumman's proposal was selected in December of 1957, with contract go-ahead for the now designated A2F-1 early in 1958. A unique feature of Grumman's design that played a role in its selection was

tilting exhaust nozzles on the mid-fuselage J52 engines. These exhaust outlets angled down 23 degrees for short-field or carrier takeoffs and landings without producing undesirable pitching moments.

Initial design and wind tunnel testing led to the mockup inspection in September 1958. Many changes in design details would follow, but the overall airframe configuration was well established. Development and construction of initial aircraft was contracted in April 1959. The first aircraft (BuNo 147864) was rolled out in early 1960 and after ground testing at Bethpage, N.Y., was transported to Calverton, N.Y., for its first flight in April.

As flight testing proceeded, various changes were made. The tilting exhaust nozzles didn't give enough improvement to justify their weight, complexity and cost and were eventually replaced with straight tail pipes. The vertical tail shape was changed to correct predicted marginal spin recovery characteristics, and the horizontal stabilizer was revised to a slab which was moved aft to correct a hinge moment problem without redesigning the fuselage attachment components. The speed brakes were perforated to reduce buffeting and supplemented with wing tip brakes for adequate dive-bombing effectiveness. Later, the familiar fixed centerline in-flight refueling probe in front of the windshield was added.

While airframe characteristics, including those of the new nose gear tow catapulting system, were worked out, the new avionics systems were a different story. Not only were there difficulties with individual components, but the

Digital Integrated Attack and Navigation Electronics(DIANE) system was almost unworkable and the unreliability of the components was multiplied in the full system. A combined Grumman-Navy effort to redesign components gradually brought hope of a system capable of use for normal flight and led to solutions for its attack mode problems. Meanwhile, the A2F-1 became the A-6A in 1962 designations.

By early 1963, it was possible to initiate avionics Board of Inspection and Survey trials and at the same time to deliver airplanes for replacement training to Attack Squadron 42 at NAS Oceana, VA. The initial airplanes did not have fully operational avionics, but were adequate to start instructor pilot training. Initial day carrier qualifications were conducted on USS Forrestal (CV-59) in July. Full system airplanes began to arrive soon after and full training for both pilots and bombardier navigators began. While avionics systems reliability and maintenance continued to be a major concern, the first A-6 fleet squadron, VA-75, started its training.

### **Off to War**

Soon after VA-75 completed its training with VA-42, the events of August 1964 in the Tonkin Gulf led to the country's direct military involvement in the Vietnamese War. By spring 1965, preparations to take the new A-6's to war had progressed to the point where VA-75 deployed with Carrier Air Wing 17 on USS Independence(CVA-61) in May, flying its first missions against North Vietnamese targets in July.

The A-6's initial combat record was anything but auspicious; the Intruder suffered problems typical of a new combat aircraft entering operational use and combat simultaneously. Premature explosion of bombs soon after release accounted for the first, and some subsequent, combat losses. This and the unreliability and excessive maintenance of the complex integrated avionics systems on which its all-weather bomber capability depended were tackled head on. The first was solved by fusing and wiring changes and by adding multiple ejector racks on the five store stations. The second was more pervasive and was a continuing problem. These technical aspects led to indecision on operational mission assignments: whether to assign A-6 missions based on large bomb-carrying capability or on all-weather capabilities.

Over the next several years, as subsequent A-6 squadrons rotated through Seventh Fleet duty, both the technical and operational problems reached resolution. Changes were made to various DIANE components, and successful missions in monsoon season weather dispelled planning for follow-on models with reduced avionics systems capabilities. With less emphasis on close

support dive-bombing, the fuselage dive brakes were disabled and locked closed, finally being replaced in production by plain skin.

An electronic warfare EA-6A version was developed for the Marines; 28 were converted from A-6As. In combat, they operated from both shore bases and carriers. A fuselage extension forward of the cockpit and an upper fin antenna fairing housed the "electronic Intruder's" countermeasures systems. Fuselage speed brakes were retained to allow wing tip antennas.

Other special-purpose versions, with systems optimized for surface-to-air missile site attacks with standard anti-radiation missiles and for around-the-clock attacks against traffic on the Ho Chi Minh Trail, were built in smaller numbers-19 A-6Bs and 12 A-6Cs, respectively.



These were integrated into regular A-6 squadrons. Interest in a tanker version led to 1970 conversions of early A-6s by removing avionics mission systems and installing a rear fuselage-mounted hose and drogue system. The resulting KA-6Ds were also operationally integrated into A-6 squadrons in small numbers.

As avionics digital technology moved rapidly forward, major replacement of DIANE components-including a single multimode radar that could perform both the search and track radar functions, and updated computers-resulted in a "new insides" model, the A-6E, though it arrived too late to see combat in Southeast Asia. To expedite transition to this greatly improved systems capability, A-6As were converted to A-6Es.

### **Anywhere, Anytime**

Production of new A-6Es and conversion of As to Es continued through the late 1970s. A-6Bs and Cs were phased into the E conversion line as capabilities similar to those of their specialized systems became available. Changes continued to keep the A-6Es up to date. With development of the full Target Recognition and Attack Multi-sensor(TRAM) system using a small turret-mounted forward-looking infrared sensor, a full update package was established for production, resulting in the A-6E TRAM configuration. Its TRAM turret under the radome and a ram air inlet on the port side of the upper fuselage for additional aft bay systems cooling were among the few external changes made to the Intruders. Internally, a new Carrier Airborne Inertial

Navigation System (CAINS) and new universal missile wiring and pylons were of equal importance to the TRAM in crew effectiveness and combat capability.

The major concern in the 1980s was the increasing problem of older A-6s using up their wing fatigue life. With the objective of extending the service life of the A-6Es, the Navy sought the construction of new, longer life wings, awarding the contract to Boeing for its proposed composite-construction wings.

At the same time, early studies leading toward a stealthy "advanced technology attack" replacement for the A-6 suggested a significantly improved A-6 would be a useful interim development. A contract was signed with Grumman for five development A-6Fs in 1984. These would have the composite wings, a revolutionary radar system and new GE F404 engines. The engines would be the same as those in the F/A-18 Hornet, except without the afterburners. With other changes to enhance survivability, the A-6F would mark a major improvement in the A-6's effectiveness.

The first A-6F flew in August of 1987, the second later that year. By the time the third flew in the summer of 1988, funding constraints ended the program, except for avionics testing as a possible future upgrade.

Meanwhile, Intruders had seen further combat: over Lebanon in 1983 and more effectively against both Libyan and Iranian vessels and targets in 1986 and 1988, respectively. Intruders remained mainstays of the fleet, even as their contemporaries, the F-4 Phantom and A-7 Corsair II, were being replaced by the F/A-18.



On 17 January 1991, Desert Shield became Desert Storm, and Intruder squadron aircrews were once again in combat. Loss of two Navy A-6s in the first day's action led to

tactics revisions, and only one more A-6 was lost to enemy ground fire during the remaining nearly six weeks until the 27 February cease fire. KA-6Ds and A-6Es using buddy tanker stores were part of an extensive aerial refueling force. Two shore-based Marine A-6 squadrons flew all-weather deep strike and later close air support missions without losses.

Just before Desert Storm, the A-12 program was canceled due to cost growth. The various efforts for an A-12 replacement failed to find an affordable

approach, and with the collapse of the Soviet Union more focus was placed on U.S. military expenditures. Potential reductions in total operational squadrons brought an end to A-6E procurement, and deliveries ended in January 1992. Navy operational units underwent major reductions in 1993 as part of post-cold war cutbacks. Each deployed carrier's air wing still included an A-6E squadron; however, a decision was made to retire the last A-6Es in 1997.

Following final deployments of the last two squadrons, VA's 196 and 75 were disestablished on 28 February and 31 March, 1997, respectively. One hundred composite wing Intruders went to the Aerospace Maintenance and Regeneration Center (AMARC), Davis-Monthan AFB, Arizona., for storage, while mostly older metal and composite-winged versions went to various museum and display locations.

The Intruder served with distinction as the Navy's primary medium-attack aircraft for 34 years-winning our respect and our hearts.