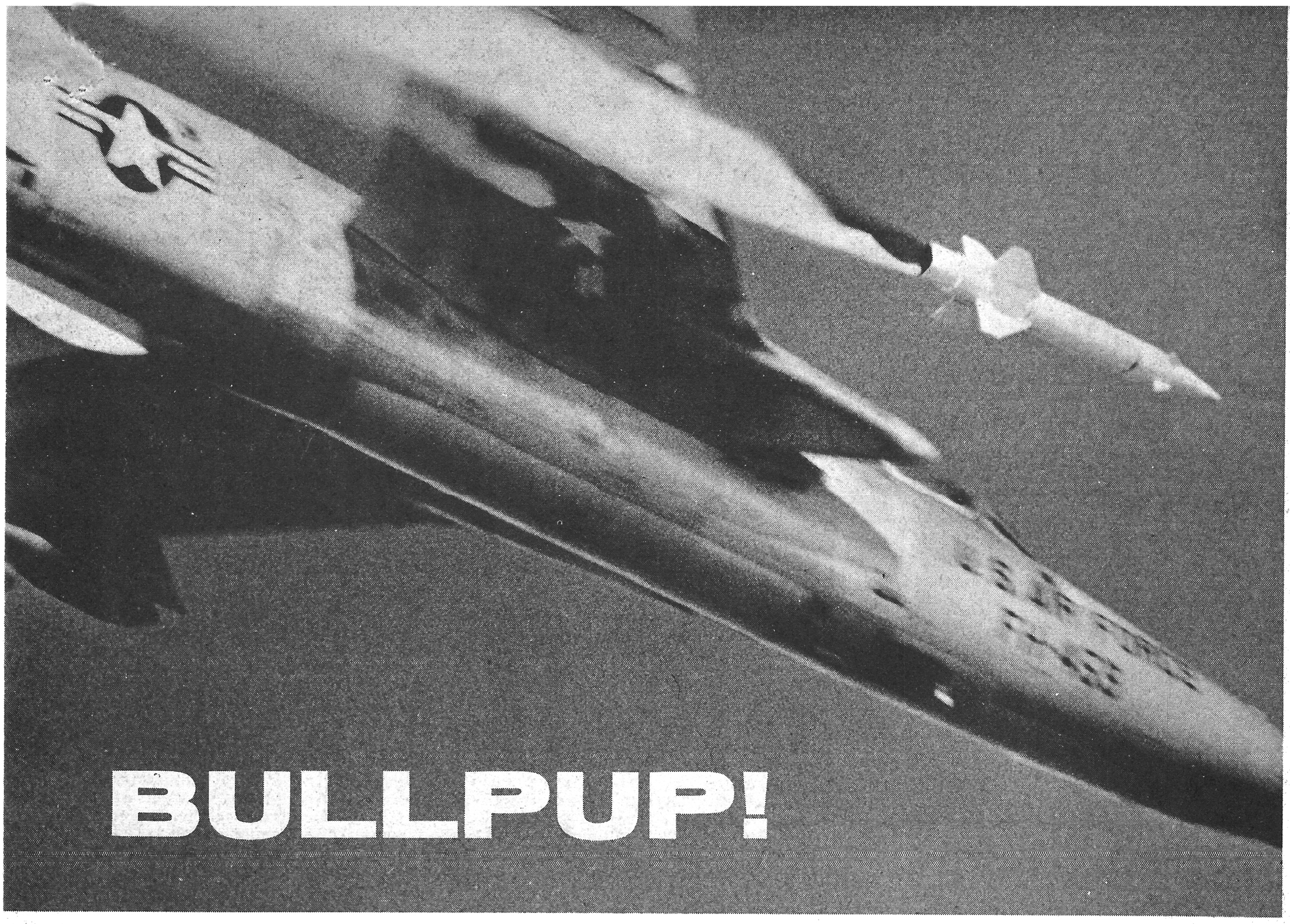


BULLPUP!

"It wasn't the heavy flak up above or the medium flak on the way down that bothered the pilots so much as the small-arms fire from the ground after they had finished their dives. If you'd ever been in a raid, you'd understand."

■ Those are the words of the famed war correspondent, Ernie Pyle, written in the chill of a European night during World War II. He was describing the dangers of dive bombing by the men who flew such missions against Nazi emplacements. Many of them were to be later victims of that flak and murderous small-arms fire.

The story was the same in Korea, although Ernie Pyle didn't live to write about it. There, Task Force 77 struck against the Communist enemy. Navy and Marine Corps pilots flew more than 255,000 sorties in three years of bloody fighting, striking from 13 carriers and from land bases on the peninsula and in Japan.

"We had to come down low," Rear Admiral William A. Schoech reported. As a captain commanding the Carrier Sicily during crucial months of the Korean conflict he knew well the dangers of dive bombing and tactical ground support.

"We hit bridges, trucks and convoys —everything from ox carts loaded with ammunition on up. The CPE (circular probable error) had to be small because the bombs weren't very big," he recalls.

"We were subjected to small arms fire, even rifle fire from ground troops. And—what's worse—the blast from our own bombs. We got tired of pulling pieces of freight cars out of aircraft wings."

The Navy and Marines lost 564 aircraft in enemy action in Korea. Something was needed to give the dive bomber a better chance to survive.

That's why the Navy, Marine Corps and Air Force today have *Bullpup,* a slim, deadly air-to-surface missile which can be launched at surface targets while its "carrier" aircraft is beyond the range of enemy ground fire, then guided to its target with devastating accuracy.

But, there's more to the *Bullpup* story.

In 1951, as the Korean war raged into its second winter, Task Force 77 received an assignment which was to materially affect future bombing and close air support. It was told to evaluate the effectiveness of the Navy's dive bombing operations and to make recommendations for improvement.

Deployed off Korea's east coast, the task force weighed the cost-per-kill for targets of Navy and Marine aircraft. They assessed the casualties, the lost aircraft and the damage inflicted on the Reds.

Pilots were interviewed and battle data sifted to reveal every facet of the problem. The findings: it cost too many men and too many planes to dive bomb enemy positions by conventional means. A better method had to be found.

The USN Bureau of Weapons and Martin Company were given the job of finding that method. The Navy specified a new weapon which could multiply the effective firepower of conventional dive bombing and reduce losses of men and equipment. Such a weapon should be simple, reliable and economical—a large order in anybody's book.

The order was filled on April 25, 1959, when Squadron VA-212 of the Seventh Fleet became the first unit to be armed with operation *Bullpups.*

Today there are several versions of this "bird", operational or nearly operational. The basic *Bullpup,* in Navy nomenclature ASM-N-7A and in Air Force service GAM-83A, is on duty with American forces around the world. It packs a 250-pound warhead in an 11-foot airframe. The Navy is developing a larger conventional warhead version called *Bullpup B* (ASM-N-7B) . . . the Air Force has announced the first production contract for an advanced *Bullpup* with a nuclear warhead (GAM-83B). (Note that the two "B" missiles are entirely different.)

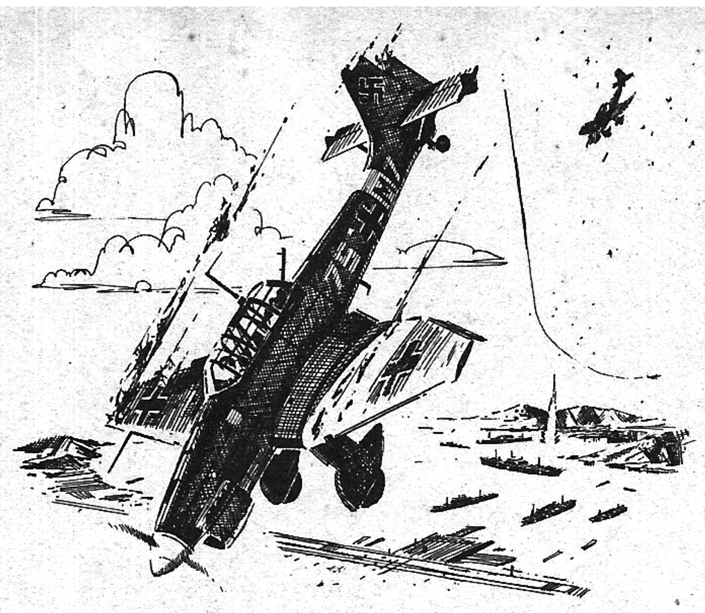
Bullpup's big asset is its simplicity. The missile is carried under the wings of the aircraft. The pilot spots his target and launches the bird on a line of sight toward the target. With a joystick control mechanism in the cockpit he radios directional commands to the missile as it speeds earthward at nearly Mach 2—left, right, up, or down. Tracking is by the two flares in the aft of the missile. The pilot watches these and aligns them with his ground target.

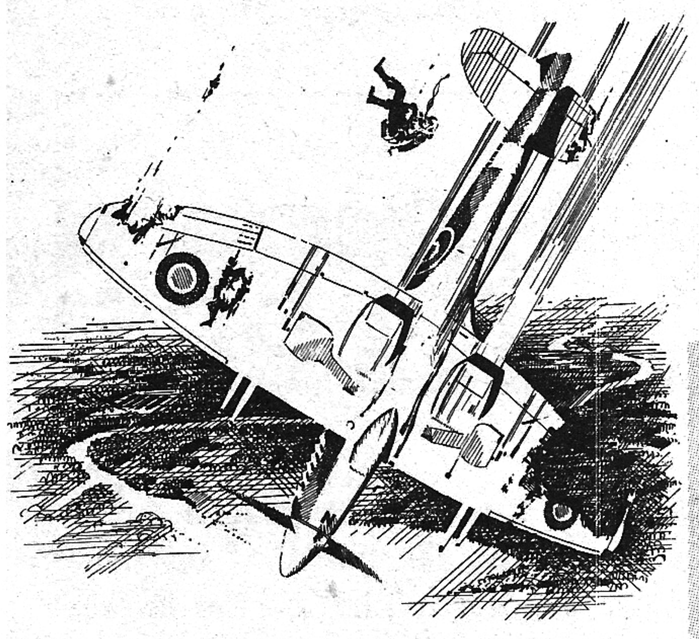
Then . . . impact! The pilot, beyond the range of most enemy ground fire, can pull away and head for another target.

Bullpup, then, is a far cry from bombs and unguided rockets of World War II and Korea when pilots put their lives on the line because they had to drop within almost suicidal distance of their targets. Also, in the years between the screaming Stuka dive bomber which paved the way for Hitler's early conquests and the development of *Bullpup,* techniques and technologies changed greatly. High performance jet aircraft moving at sonic speeds could not be used safely for low-speed, low-altitude dive bombing missions. Weaponry had to be improved to match performance of the planes.

Actually, the electronically guided missile, employed as a tactical weapon, first was used successfully by the Axis powers during World War II—although the French had launched rockets from Nieuport 17 C.1's with limited results in World War I.

Germany made the dive bomber famous with its JU-87 Stuka. But the Nazis learned the dangers of low-level attack. The JU-87 was a slow machine, vulnerable not only to anti-aircraft fire but also to small arms fire. Although the JU-87 was most suitable for attacking pinpointed targets such as railway junctions, bridges or ships, in order to





bombing and low-level support was encountered by other powers in World War II.

The Japanese discovered it with their Type 99 Val Mk. 2 attack bomber, the Type 97 Kate torpedo bomber, and other aircraft of similar vintage. Early in the war they found that level bombers could not give them the accuracy demanded for target destruction. Dive bombing and torpedo bombing were preferred methods of attack. However, as the war in the Pacific progressed and the American forces became stronger, the diving Jap bombers met the same explosive umbrellas of lead which were ripping Nazi Stukas halfway around the world.

The story was much the same for the Allies in World War II. From the powerful P-47 to the SBD Dauntless, to the English Mosquito and even to basic fighters like the P-51 and the Spitfire, any bombing or strafing mission at low altitudes meant heavy losses.

Realizing the need for weapons capable of being launched from a point beyond the range of Allied anti-aircraft defenses then accurately guided to target impact, the German high command assigned the task of creating such devices to teams of German rocket scientists.

These scientists opened the era of guided missile warfare with a strike from the skies above the Bay of Biscay on August 25, 1943. A British convoy was steaming off the western coast of France on the alert for enemy submarines. German aircraft were known to be in the area.

Suddenly, an observer spotted what seemed to be a small dive bomber whip out of a turn and speed straight for his ship. Anti-aircraft guns thundered from the ship's decks, but the object was small and moving fast.

As it approached it did not drop a bomb and pull out as the amazed seamen expected. It continued unerringly on course until it lanced into the ship, impacting with explosive havoc.

The strange weapon was the German HS-293, the only powered air-to-surface missile used in World War II. It was a radio-controlled propelled bomb, used in several modifications, launched and guided from a German aircraft. After release a liquid rocket motor suspended below the bomb increased its glide speed to about 350 miles an hour. It carried a 1,000 pound warhead.

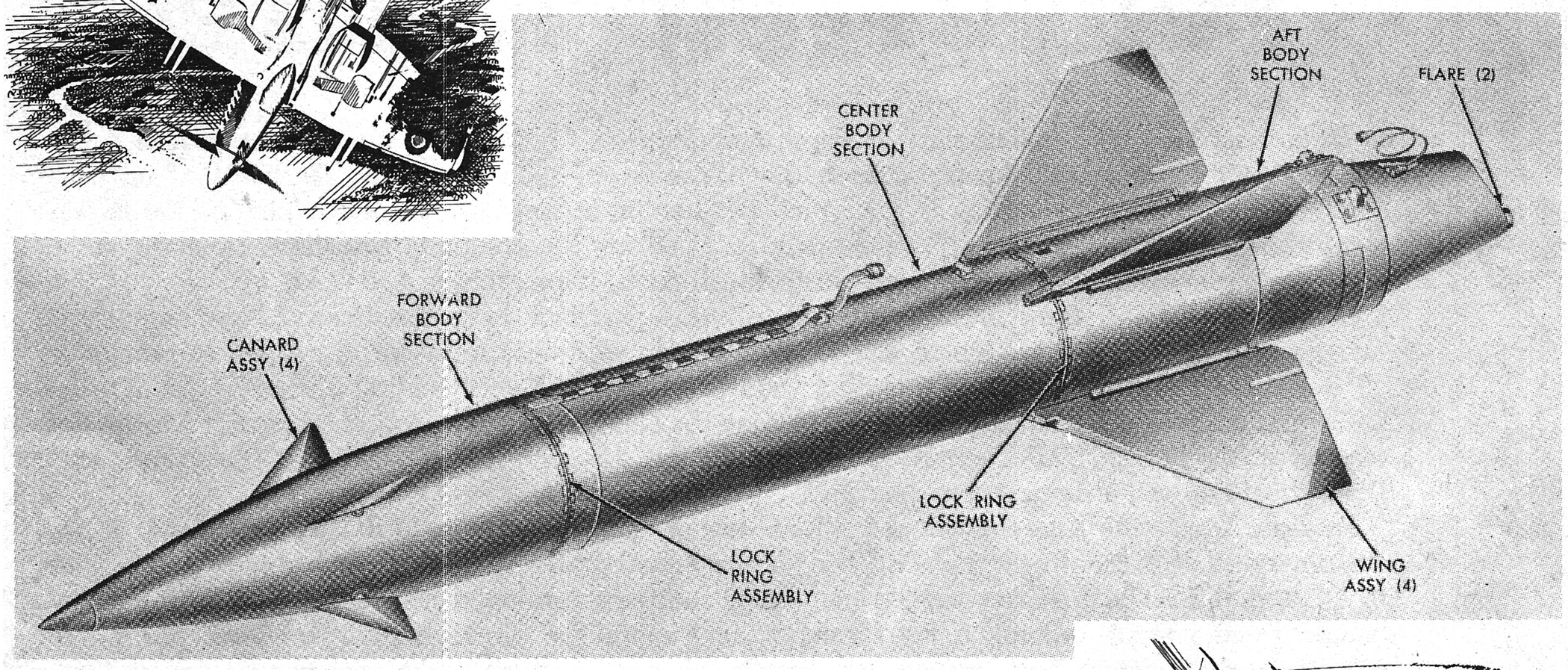
German guided missiles were the only ones to have any appreciable effect upon the conduct of World War II, with the main effort concentrated on surface-to-surface (V-1 and V-2) systems. In the air-to-surface field, not even the Germans could evolve a truly effective system.

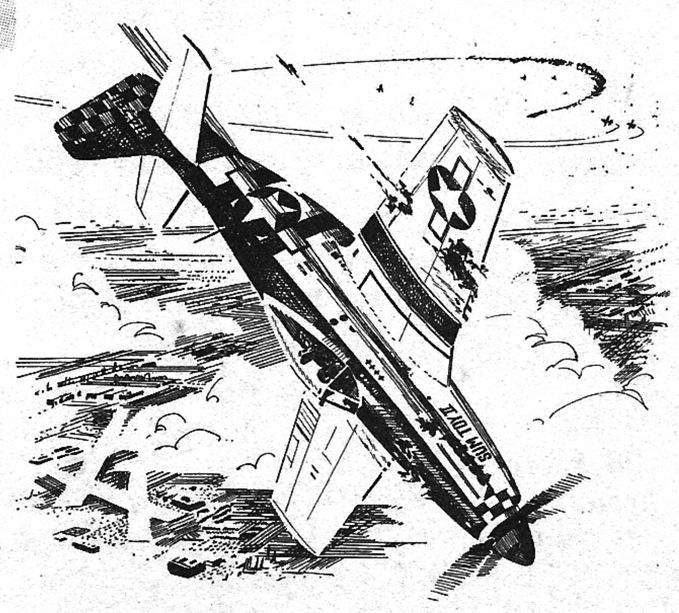
The Hs 293, the "Fritz X" (an armor-piercing radio-controlled bomb) and even air-launched V-1s (with 2,000 pound warheads) were Germany's major efforts. Range, accuracy and reliability were inadequate.

The Japanese tried the *Baka*—a suicide missile guided by a pilot inside it. It was too slow and usually fell prey to American aircraft before hitting its target.

The United States developed numerous guided bombs during the war. Such systems as the radar homing *Bat,* the radio command *Azon* and *Bazon* and

(*Continued on page* 90)

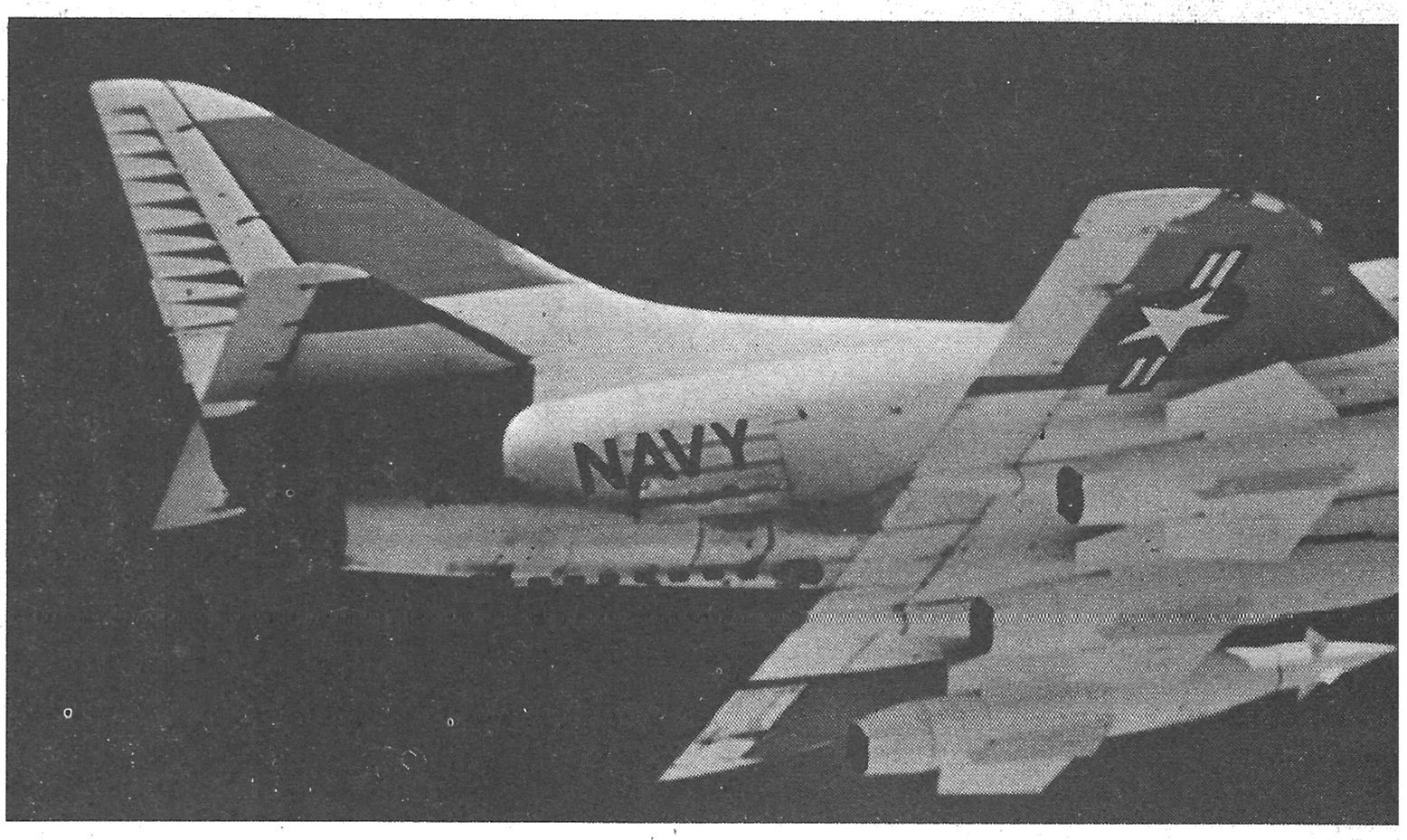




obtain maximum results the pilot was continually putting his life on the line.

For example, during the battle of Britain, Spitfire and Hurricane pilots found the Stukas defenseless from aerial attack as well as from ground fire. Even during the dive, because of the drag of the Stuka's externally hung bomb load, the aircraft could reach a speed of only 150 miles an hour.

Other German aircraft were developed to improve the Stuka concept—the Ju-88, the Do-217 and the He-177. However, loss of aircraft and pilots was always high. The high cost of dive



"Bullpup"

(*Continued from page* 39)

the television command *Robin* and GB-4 were used with limited success. Indeed, they gave somewhat better accuracy and range. But not enough.

Thus, *Bullpup* is an end-product of hard, bloody experience. Weapons which had fulfilled their missions at least partially in World War II were inadequate over the craggy hills of North Korea. Pilots still had to fly low into the range of enemy ground fire. Because accuracy of free-falling bombs and even unguided dive bombs is limited, repeated runs had to be made. Large quantities of bombs and rockets were dropped with no assurance of a kill.

The Navy's assignment to Task Force 77 laid the problem on the line. *Bullpup* became the answer—a bomb which can be delivered accurately from an aircraft while it is still outside most enemy ground fire.

Bullpup first went on duty aboard carriers patrolling those same Pacific islands and atolls over which many a World-War II attack aircraft met destruction. Under the wings of FJ-4B Furies and A4D-2 Skyhawks, the Navy tested and re-tested its new weapon. Its soundness was emphasized when the Air Force began to "monitor" the Navy program. A year-and-a-half after the Navy's first *Bullpup* became operational, the USAF's 522 Tactical Fighter Squadron had operational *Bullpups* under the wings of their F-100 Super Sabres.

Even before the Navy or the Air Force received their first operational missile they knew they had something unique in modern weaponry. The simplicity desired by the Navy and produced by Martin engineers added up to a proposal by Martin to do away with all pre-flight electronic test equipment for the missile.

Extensive tests showed that the bird was reliable enough to be assembled, loaded on the aircraft and launched without being checked after it left the Orlando, Florida, production line. *Bullpup* is the only missile in the Free World's arsenal which is handled as just another round of ammunition.

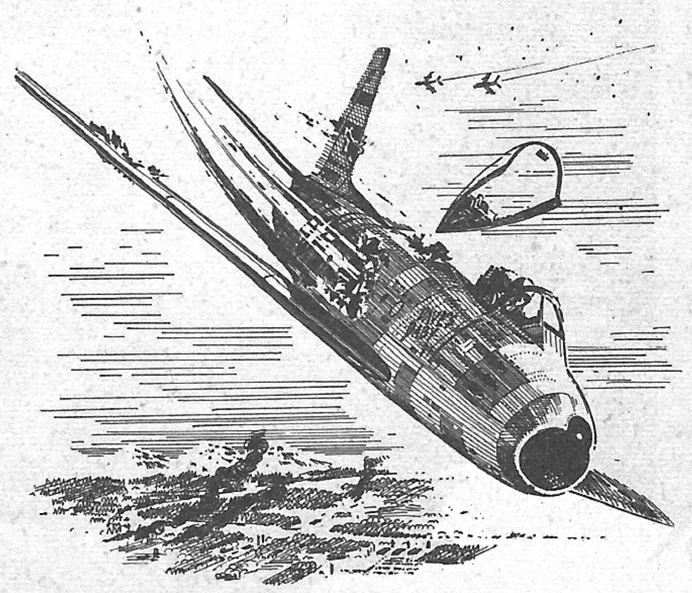
The Navy is now in the process of adding *Bullpup* to the firepower capabilities of its latest fighting aircraft —including the 1,600 miles-an-hour F4H Phantom II. The A3J Vigilante, the F8U-2NE Crusader and the A2F Intruder are scheduled for various *Bullpup* configurations. The Air Force, which mounts *Bullpup* on its F-100s and F-105s, plans to make missile part of the armament of its F-110 version of the McDonnell Phantom.

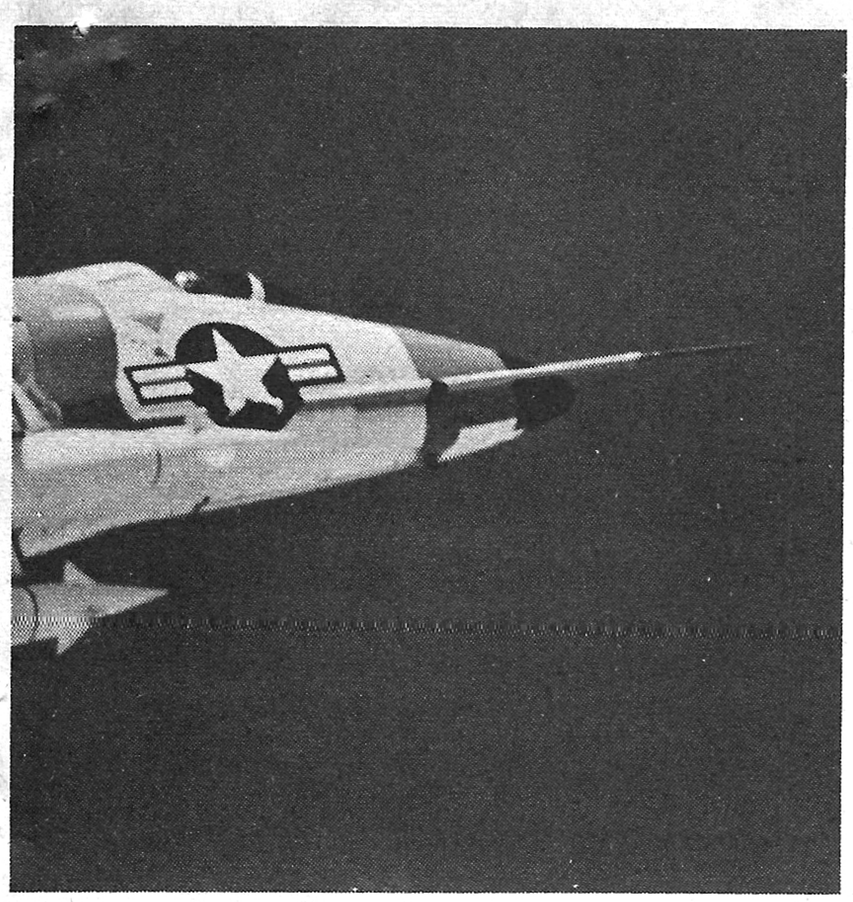
In addition, four North Atlantic Treaty Organization nations are working with the U. S. Navy to set up a *Bullpup* production line in Europe. The missile will be built in Norway and utilized by the Norwegian Air Force, England's Fleet Air Arm, the Danish and Turkish air forces. The Navy and Martin will supply technical guidance to this NATO program.

But even as the basic *Bullpup A* was gaining world-wide respect, the Navy saw the need for a more powerful missile of the same general characteristics. Big, brutish *Bullpup B* is being readied for that USN assignment.

Officially tabbed ASM-N-7B, *Bullpup B* is to provide a new measure of lethality in limited-war situations. The *"B"* extends *Bullpup*'s stand-off capabilities in range and in warhead effectiveness. Its principles reflect back to the bullet-sprayed skies over World War II and Korea battlefields.

With *Bullpup A* the ground-support aircraft could be effective against enemy ground emplacements, pillboxes, tanks, landing craft and similar targets. But there was still a need for the same type of effectiveness against larger targets—bridges, large ships, hard-





First Bullpup "B" missile photo (lt.) showed the birds under wings of A4D Skyhawk. A vital "limited war" weapon, the "B" totes 1,000-lb conventional warhead.

ened fortifications. The big *B* is the weapon for those jobs. Its mission is two-fold. It must destroy all tactical surface targets, particularly those requiring penetration and great force. And it must continue to provide pilot and aircraft attrition rates well below those of weapons in use prior to *Bullpup*.

B will augment but not replace *Bullpup A*. Both have vital missions to fulfill.

The Air Force went another route in looking for more lethality from the GAM-83A system. Its weaponeers sought a nuclear warhead capability. Their "B" is GAM-83B, Nuclear Bullpup. An entirely different series of requirements arise in development of a nuclear warhead missile than with conventional warhead versions. One big problem is safe separation distance between the aircraft and the nuclear burst.

To assure the safety of Air Force pilots, military and Martin engineers devised the "off-set" delivery technique for nuclear *Bullpup*. In this delivery mode, the pilot can fly parallel to the target instead of directly toward it, launch the missile forward, then guide it to the target while banking in the opposite direction to escape.

The Air Force has yet another version of *Bullpup* nearly ready for action. But this one will never be fired in anger. It is the TGAM-83 *Bullpup* Trainer missile—a small, simple, inexpensive version. The trainer uses the stockpiles of 5-inch HVAR rocket motors left from World War II and Korea for propulsion and simplified *Bullpup* guidance components to exactly simulate launch and flight conditions of the operational weapon. Like the other *Bullpups,* the trainer packs two flares in its aft section by which the pilot tracks the speeding weapon to the target.

The Air Force also has awarded Martin a contract for a new version of *Bullpup*. No details are yet available.

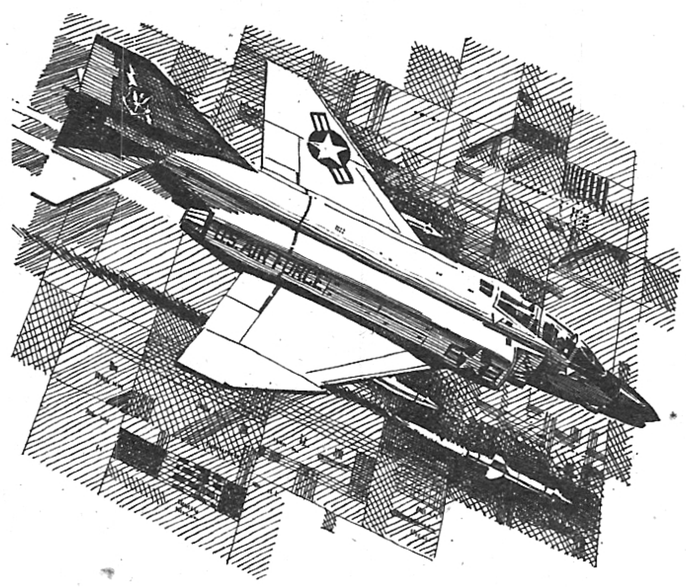
Essentially, the *Bullpup* "family of missiles" has taken a considerable measure of hazard from aircraft assault. In the future the prime task of tactical air forces will be to cripple enemy potential in the battle area or immediately behind it. The *Bullpup* these air units will be using may be any of the several versions. However, aside from different warhead sizes the missiles are quite similar in storage, assembly, installation and launching.

Navy and Air Force "A" *Bullpups* are identical except for the control systems. The Navy presently uses a "bang-bang" command on the guidance stick in the cockpit, sending pulsed commands which cause the missile's control canards to deflect fully but for only an instant. The Air Force uses a "proportional" control technique, allowing partial deflections of the canards for longer periods.

Both "A" birds reach the military in three sections—nose containing guidance, center with a warhead and aft end containing either a solid propellant motor or a pre-packaged liquid engine. The pre-packaged liquid by Thiokol's Reaction Motors Division is the latest development.

The sections are stored either separately or assembled without wings and canards. Any center section will fit any aft or nose. When needed for action, they are taken to the flight line and can be installed on launcher pylons by three crewmen in a few minutes. Wings and canards are attached, aircraft checks are made and the mission is underway.

The same method of operation holds true for the Navy's *Bullpup B*. Operational details of the *Nuclear Bullpup* are still classified.



The simplicity—and *Bullpup* may well be the most uncomplicated missile in the U. S. inventory—is carried one step farther. Under Navy and Air Force cognizance, Martin is developing a "universal" nose section which will fit any of the various operational versions. For example, the same nose section will work on the "A" as on the larger, more powerful "B".

Beyond the present variations are plans to give the missile all-weather capabilities, longer range and broader operating characteristics. Most of these plans fall behind the veil of security.

The entire program has been marked by excellent cooperation between the services and the contractor. The Navy and Air Force have kept abreast of one another's developments. They have pooled their ideas and plans and adopted technical advances developed by the other. Both have backed Martin strongly on a cost reduction program which has seen the price of *Bullpup* drop 75