SFExaminer JUL 23 1972

Inside the New Weapons

If You're So Smart, Why Aren't You a Bomb?

By Ted Sell
L.A. Times Service

A "SMART" BOMB is a dumb bomb with a nose job and some tail feathers — more or less.

As U.S. bombing of North Vietnam has intensified, great credit has been given for the accuracy of these new smart bombs. But the fact is they're just the old 2000 - and 3000 - pounders fitted with nose and tail assemblies containing guidance and control systems.

The bombs remain gravity-fall weapons, but they have small wings with flaps fitted to the tail that can make a small degree of change in what is otherwise a free fall along a predictable ballistic trajectory. A guidance system in the new nose directs the tailpiece control system in making in-flight corrections that help keep the bomb falling toward the target.

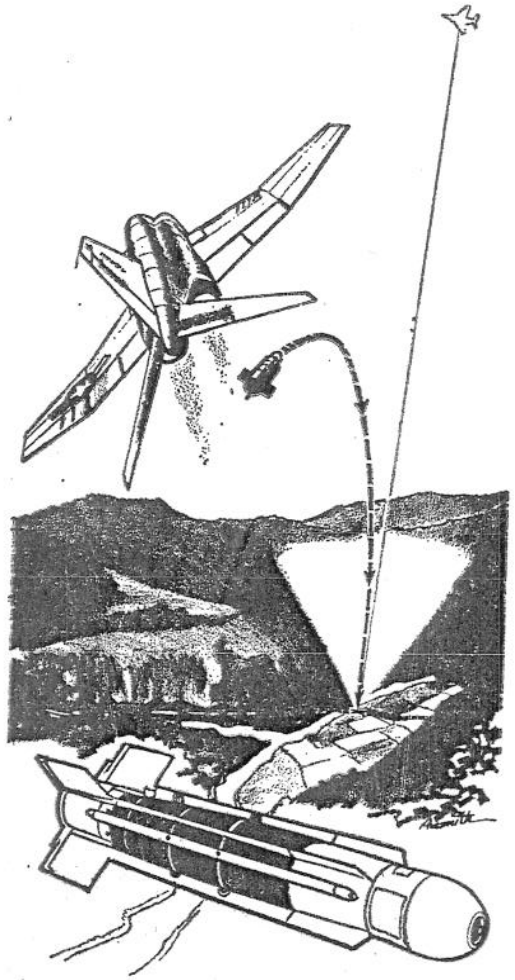
Full guidance of the bombs would require power — such as a rocket motor — in the bomb itself.

The Air Force and Hughes Aircraft are working toward that goal in the Maverick missile, a 500-pounder which may become operational next year. Because it has a rocket engine, it's technically a missile, instead of a bomb. To the target, the distinction doesn't matter much. It's still 500 pounds of high explosive.

★ ★ ★

TO BUILD a smart bomb, the Air Force starts with the same thing — high explosive, a basic bomb of varying size. Every bomb has an arming element, or trigger, attached to the nose. Bombs are normally transported without the arming element inserted.

What makes old bombs smart is a device that combines the trigger with a camera, or a laser beam follower, that can swivel to "see" a target and can then "lock" onto it. The device screws onto the nose of a dumb bomb just as the old arming element did.



In the Homing Bomb System (HOBOS), the bomb is fitted with a sensor that picks up reflected energy aimed at the target from another plane at higher altitude.

But such a lock-on system is useless unless the bomb's free fall can be altered enough to put it closer to the target.

This is done by the tail-mounted control system, linked electrically to the guidance system in the nose by an exterior conduit. Strakes, or tiny streamlined wings, are added to the body of the bomb to provide aerodynamic stability. Four wings, or fins, on the tail section have trailing-edge flaps for flight maneuvering.

Simply stated, an automatic pilot in the nose "sees" and "locks on" the target and then manipulates the tail flaps to keep the bomb pointed directly at it.

★ ★ ★

THE GUIDANCE and control systems for smart bombs were developed in modules; that is, various parts are interchangeable. So a dumb bomb can be equipped with the same control system and various kinds of guidance system sensors.

The most commonly used sensor is the television — called electro-optical — which can be "locked" onto a target image. There are also infrared sensors that can be locked onto a heat source, and sensors that respond to reflected laser-beam radiation.

The electro-optical system, as in the Walleye I and Walleye II bombs — manufactured by Hughes — works about this way:

The nose of the bomb has a tiny television camera that can be swiveled slightly. In the cockpit of the plane is a five-inch television screen.

The pilot, in a one-place plane, or the radar observer (RO) in a two-place plane such as the F-4 Phantom, most common aircraft used in North Vietnam, visually "acquires" the target. All that means is that he sees it.

Through miniaturized computers on the plane, he turns the bomb's camera on and focuses it until, on his five-inch screen, he has a picture.

Then, if he is within the range of the bomb, he tugs the bomb-release handle. With the image of the target impressed into its limited memory, the bomb falls but by manipulating its flaps it can keep itself falling toward the precise point it was told to fall on. It's tantamount to skydiving, in that a skydiver can move his legs and arms to effect minor course changes before he opens his parachute.

★ ★ ★

HOW FAR from the target an aircraft can release its smart bombs accurately depends on many variables including wind, speed and altitude. The most important is altitude. A bomb released in a ballistic trajectory at 30,000 feet and 600 m.p.h. can be expected to make corrections in a longer flight that one dropped at 5000 feet and 300 m.p.h. cannot. The plane's speed imparts forward direction to the bomb itself; gravity does the rest.

The laser guidance systems are even more expensive than the TV ones. (These days, the nose of the bomb costs three times as much or more as the bombs themselves.)

The difference is that the laser bombs can function in bad weather, while the TV bombs require visual acquisition of the target. Moreover, the laser bomb can be programmed to focus on a beam either from the aircraft which drops it or from another plane specifically equipped with a laser projector circling at extremely high altitude well above antiaircraft fire range.

The target can be acquired by radar. The projecting plane then flashes laser rays onto the target and the bomb is locked onto the beam's reflected energy.

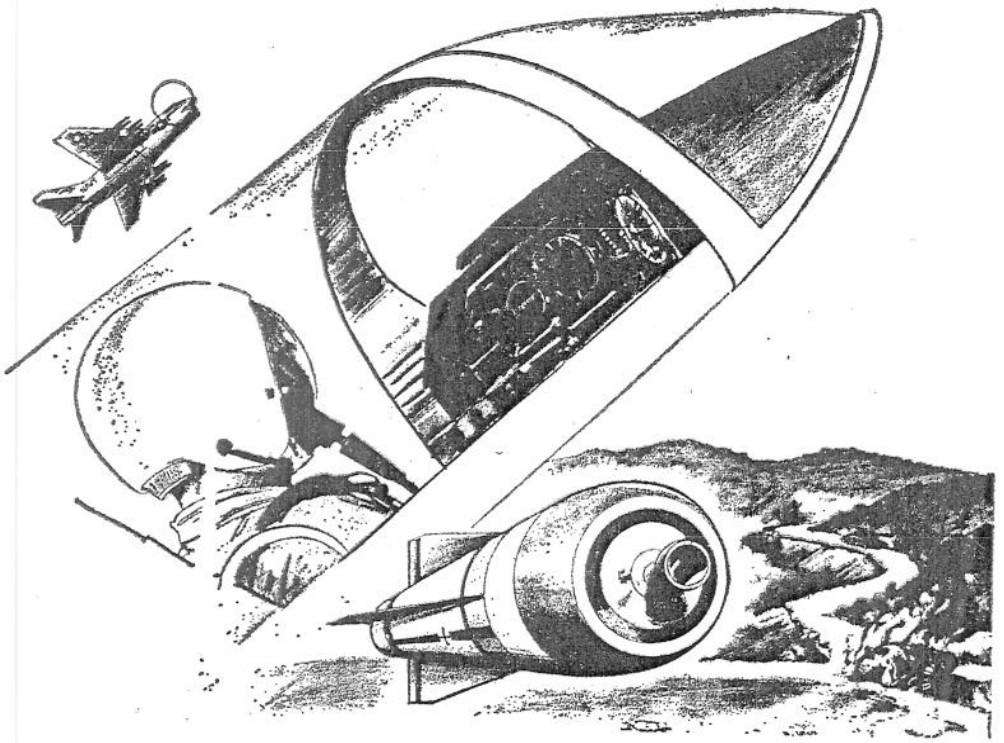
Laser, like any other light, is a form of energy. When the directed beam hits the target, part of that energy is reflected upward. The invisible reflection forms an upside-down cone. The laser-guided bomb guides itself down that upside-down cone. If the beam was directed correctly, it means the bomb goes right down to the narrow end of the cone.

★ ★ ★

PILOTS CALL the laser- and TV-guided bombs HOBOS for homing bomb systems. One major guidance system is produced by North American-Rockwell.

The various forms of HOBOS have enabled U.S. planes to effectively strike targets that had defied air attack. The bridge at Thanh Hoa, for example, became a challenge to pilots from 1965 until the new air offensive.

The problem was that planes in position to destroy the bridge with dumb bombs also were under the muzzles of radar-directed antiaircraft artillery. They got shot down. But with the smart bombs, the planes could make the necessary target alignments without having to fly through the most dangerous "envelope" of antiaircraft fire. The bridge was felled, finally, by smart bombs.



The Maverick antitank missile with its TV nose cone