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F-15C Eagle
S/N 76-0084
AFFTC
Sept. 13, 1985

Celestial Eagle

Maj. Doug Pearson

F-15C Eagle
S/N 76-0084
AFFTC
1984-1985

Lt. Col. Doug Pearson

F-15C Eagle
S/N 76-0086
AFFTC
1984-1985

Maj. Ed Fillburn

Note:
LtC. Bohn and Maj. Rollins were line pilots assigned to the program but it cannot be verified if their names were actually on these aircraft. We provide their names since they were an integral part of this flight test program.

Lt.Col. Gary Bohn

Maj. Ed Rollins

Maj. Doug Pearson

Note:
Repeat Common Stencils For All Aircraft

Lt. Col. Doug Pearson

Note:
Alternate tail markings for A/C 76-0086

Lt.Col. Billy Brooks

ASM-135 "Flying Tomato Can"

Development

After the Soviet Union demonstrated an operational co-orbital anti-satellite system, in 1978, U.S. President Jimmy Carter directed the USAF to develop and deploy a new anti-satellite system.

In 1978, the USAF started a new program initially designated the Prototype Miniature Air-Launched Segment (PMALS) and Air Force System Command's Space Division established a system program office. The USAF issued a Request for Proposal for the Air Launched Miniature Vehicle. The requirement was for an air-launched missile that could be used against satellites in low earth orbit.

Design

In 1979, the USAF issued a contract to LTV Aerospace to begin work on the ALMV. The LTV Aerospace design featured a multi-stage missile with a infrared homing kinetic energy warhead.

The ASM-135 was launched from an F-15A in a supersonic zoom climb. The F-15's mission computer and heads-up display were modified to provide steering directions for the pilot.

A modified Boeing AGM-69 SRAM missile with a Lockheed Propulsion Company LPC-415 solid propellant two pulse rocket engine was used as the first stage of the ASM-135 ASAT.

The LTV Aerospace Altair 3 was used as the second stage of the ASM-135. The Altair 3 used the Thiokol FW-4S solid propellant rocket engine. The Altair 3 stage was also used as the fourth stage for the Scout rocket and had been previously used in both the Bold Orion and HiHo anti-satellite weapons efforts. The Altair was equipped with Hydrazine fueled thrusters that could be used to point the missile towards the target satellite.

LTV Aerospace also provided the third stage for the ASM-135 ASAT. This stage was called Miniature Homing Vehicle (MHV) intercepter. Prior to being deployed the second stage was used to spin the MHV up to approximately 30 revolutions per second and point the MHV towards the target.

A Honeywell ring laser gyroscope was used for spin rate determination and to obtain an inertial timing reference before the MHV separated from the second stage. The infrared sensor was developed by Hughes Research Laboratories. The sensor utilized a strip detector where four strips of Indium Bismuth were arranged in a cross and four strips were arranged as logarithmic spirals. As the detector was spun, the infrared target's position could be measured and as it crossed the strips in the sensors field of view. The MHV infrared detector was cooled by liquid helium from a dewar installed in place of the F-15's gun ammunition drum and from a smaller dewar located in the second stage of the ASM-135. Cryogenic lines from the second stage were retracted prior to the spin up of the MHV.

The MHV guidance system solely tracked targets in the field of view of the infrared sensor, but did not determine altitude, attitude, or range to the target. Direct Proportional Line of Sight guidance used information from the detector to maneuver and null out any line-of-sight change. A Bang-bang control system was used to fire 56 full charge "divert" and lower thrust half charge "end-game" solid rocket motors arranged around the circumference of the MHV. The half charge "end-game" motors were used to perform finer trajectory adjustments just prior to intercepting the target satellite. Four pods at the rear of the MHV contained small attitude control rocket motors. These motors were used to dampen off center rotation by the MHV.

Test Launches

On 21 December 1982, an F-15A was used to perform the first captive carry ASM-135 test flight from the Air Force Flight Test Center, Edwards AFB, California in the United States.

On 20 August 1985 President Reagan authorized a test against a satellite. The test was delayed to provide notice to the United States Congress. The target was the Solwind P78-1, an orbiting solar observatory that was launched on 24 February 1979.

On 13 September 1985, Maj. Wilbert D. "Doug" Pearson, flying the "Celestial Eagle" F-15A 76-0084 launched an ASM-135 ASAT about 200 miles (322 km) west of Vandenberg Air Force Base and destroyed the Solwind P78-1 satellite flying at an altitude of 345 miles (555 km). Prior to the launch the F-15 flying at Mach 1.22 executed a 3.8g zoom climb at an angle of 65 degrees. The ASM-134 ASAT was automatically launched at 38,100 ft while the F-15 was flying at Mach .934. The 30 lb (13.6 kg) MHV collided with the 2,000 lb (907 kg) Solwind P78-1 satellite at closing velocity of 15,000 mph (24,140 km/h).

NASA learned of U.S. Air Force plans for the Solwind ASAT test in July 1985. NASA modeled the effects of the test. This model determined that debris produced would still be in orbit in the 1990s. It would force NASA to enhance debris shielding for its planned space station.

Earlier the U.S. Air Force and NASA had worked together to develop a Scout-launched target vehicle for ASAT experiments. NASA advised the U.S. Air Force on how to conduct the ASAT test to avoid producing long-lived debris. However, congressional restrictions on ASAT tests intervened.

In order to complete an ASAT test before an expected Congressional ban took effect (as it did in October 1985), the DoD determined to use the existing Solwind astrophysics satellite as a target.

NASA worked with the DoD to monitor the effects of the tests using two orbital debris telescopes and a reentry radar deployed to Alaska.

NASA assumed the torn metal would be bright. Surprisingly, the Solwind pieces turned out to appear so dark as to be almost undetectable. Only two pieces were seen. NASA Scientists theorized that the unexpected Solwind darkening was due to carbonization of organic compounds in the target satellite; that is, when the kinetic energy of the projectile became heat energy on impact, the plastics inside Solwind vaporized and condensed on the metal pieces as soot.

NASA utilized U.S. Air Force infrared telescopes to show that the pieces were warm with heat absorbed from the Sun. This added weight to the contention that they were dark with soot and not reflective. The pieces decayed quickly from orbit, implying a large area-to-mass ratio.

In the end, the Solwind ASAT test had few consequences for the planned U.S. space station as station completion was pushed beyond the mid-1990s. The record-high level of solar activity during the 1989-1991 solar maximum heated and expanded the atmosphere more than anticipated in 1985, accelerating Solwind debris decay.

15 ASM-135 ASAT missiles were produced and 5 missiles were flight tested.

Operational History

The United States Air Force intended to modify 20 F-15A fighters from the 318th Fighter Intercepter Squadron based at McChord Air Force Base in the United States state of Washington and the 48th Fighter Interceptor Squadron based at Langley Air Force Base in the United States state of Virginia for the anti-satellite mission. Both squadrons had airframes modified to support the ASM-135 by the time the project was cancelled in 1988.

The USAF had planned to deploy an operational force of 112 ASM-135 missiles.

The deployment of the ASM-135 was central to a policy debate in the United States over the strategic need for an anti-satellite weapon and the potential for anti-satellite weapon arms control with the Soviet Union. Starting in 1983, the United States Congress starting placing various restrictions on the ASM-135 program. In December 1985, included a ban on testing the ASM-135 on a target in space. This decision was made only a day after the Air Force sent two target satellites into orbit for its next round of tests. The Air Force continued to test the ASAT system in 1986, but stayed within the limits of the ban by not engaging a space-borne target.

In the same year the deployment of the ASM-135 was estimated to cost $5.3 billion dollars (US) up from the original $500 million dollar (US) estimate. The USAF scaled back the ASM-135 program by two-thirds in attempt to control costs. The USAF also never strongly supported the program and proposed canceling the program in 1987. In 1988, the Reagan Administration canceled the ASM-135 program because of technical problems, testing delays, and significant cost growth.

ASM-135 Test Launches

21 January 1984 - Missile successfully tested without miniature vehicle

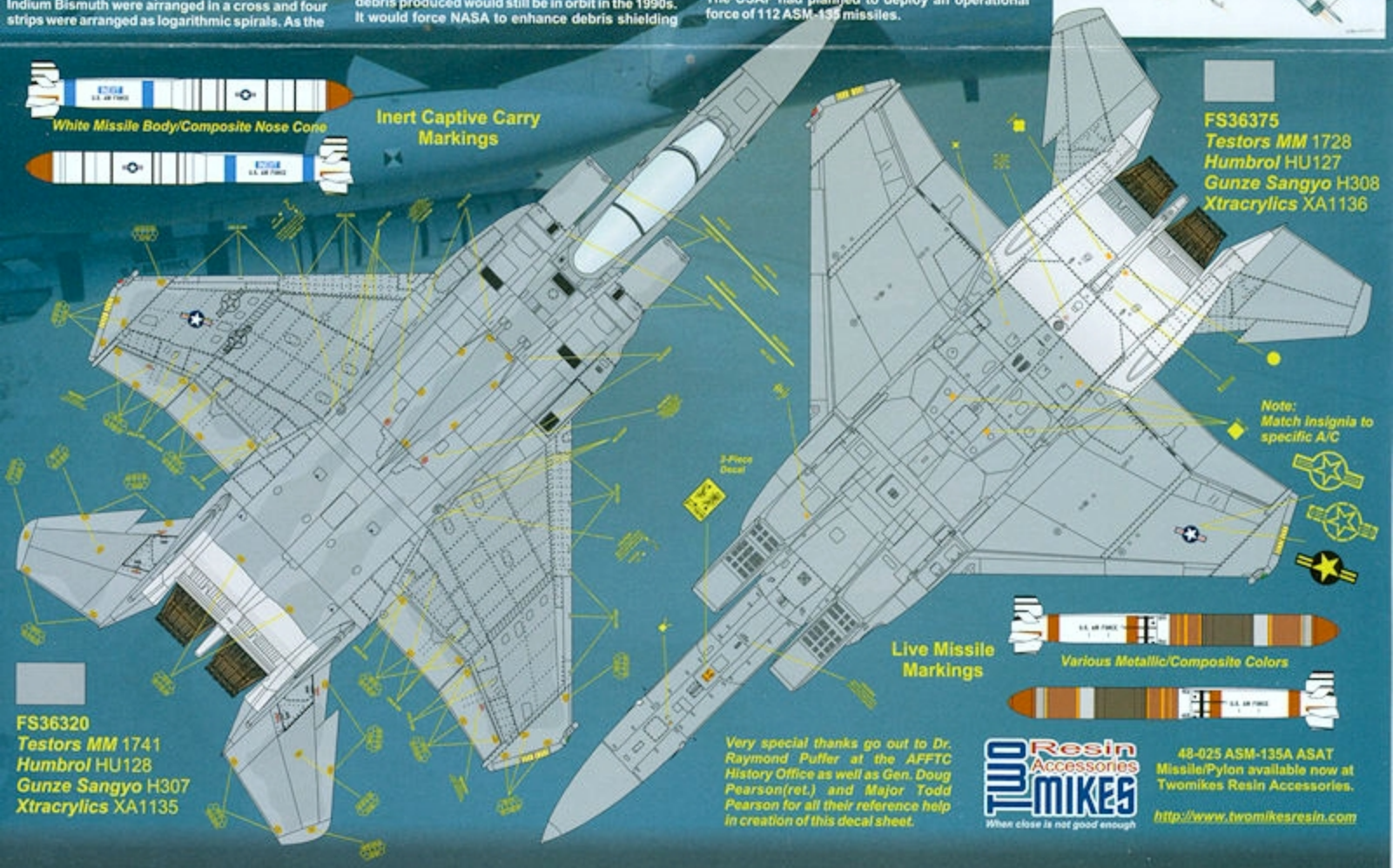
13 November 1984 - Missile failed when MHV was directed at a star.

13 September 1985 - Missile successfully destroys the satellite P78-1 Solwind

22 August 1986 - Missile successfully tested when MHV was directed at a star.

29 September 1986 - Missile successfully tested when MHV was directed at a star.

Source: Wikipedia.com; verified through AFFTC History Office



Very special thanks go out to Dr. Raymond Puffer at the AFFTC History Office as well as Gen. Doug Pearson(ret.) and Major Todd Pearson for all their reference help in creation of this decal sheet.

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