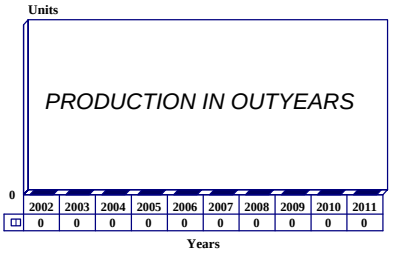
Air-Launched Saturation System - Archived 10/2003

Outlook

- US concluded original ALSS program
- New concepts studies under way
- LEWK could provide a recoverable, low-cost weapon for air defense suppression and possibly other missions
- CUTLASS is being offered to the US Navy by Raytheon and IAI
- US remains interested in weapons with a loiter capability

10 Year Unit Production Forecast
2002 - 2011



Orientation

Description. A low-cost loitering anti-radiation missile system that is programmable before launch.

Sponsor. The US Navy through the Naval Air Systems Command, Washington, DC. Other US services could be participating in this program, including the US Air Force, Aeronautical Systems Center, Eglin AFB, Florida.

Contractors. No specific contractor was selected for the Air-Launched Saturation System program. The program was run through the US Naval Weapons Center, China Lake, California (CA), USA. Program participants may have included Texas Instruments Incorporated, Defense Systems and Electronics Group, Dallas, Texas (TX); Brunswick Corporation, Defense Division, Costa Mesa, California (CA); and Motorola Incorporated Government Electronics Group; Tempe, Arizona (AZ), USA.

Status. Because of funding restrictions, the ALSS program never got off the ground. US Navy sources say there are no plans to revive the program in any form. The Services wanted to commence a full-scale development program in FY94. The US Air Force is exploring other air-defense suppression techniques through its SHARK program (now called Preemptive Destruction).

Total Produced. No production is anticipated.

Application. To reduce aircraft attrition through the destruction of hostile land- and sea-based radar-directed surface-to-air missiles and air-defense artillery systems. This system would have provided an alternative to the Tacit Rainbow UAV. The weapon was designed to act in a dual mode, both as a decoy and a direct attack weapon equipped with a radiation-emitter seeker.

Price Range. Depending on the basis for this new missile, the Air-Launched Saturation System could have cost in the area of $200,000 each. This would have depended on the number of systems procured, the propulsion system provided, and the sophistication of the anti-radiation seeker.

Technical Data

Design Features. The ALSS was expected to use a small turbojet engine, considering the desire for a loiter capability. Its range was to be anywhere between 100 and 200 kilometers, depending on its final configuration.

Variants/Upgrades

No specific variants or upgrades of the ALSS system were mentioned, since only concept studies were ever under consideration. Further studies involving concepts similar to the ALSS are being performed by the US military.

Program Review

Background. Current air-defense networks are making use of ever-increasing numbers of surface-to-air missile (SAM) batteries, rendering aerial operations within these protected zones more and more dangerous for combat aircraft.

During the Vietnam War (1965-1975), the United States developed the Wild Weasel, an aircraft specifically equipped with newly developed anti-radar missiles to seek out and disable or destroy air defenses, particularly surface-to-air missile batteries. The US also resorted to using unmanned air vehicles (UAVs) to perform certain aerial reconnaissance missions over the densest areas of North Vietnam air defenses to reduce casualties and limit the exposure of aircraft and crews to hostile fire. Eventually, this led to the development of aerial decoy systems to fool such defenses into engaging false targets, and the desire to incorporate a loiter capability into anti-radiation missiles.

ALSS. The Air-Launched Saturation System was a potential alternative to the canceled Tacit Rainbow unmanned air vehicle development effort. This new project was aimed at meeting the US Navy's and Air Force's requirements for a low-cost, programmable-before-launch, loitering missile system capable of searching out and attacking radar emitters. The missile would have provided field commanders with a weapon that could suppress or destroy an enemy's ability to acquire and attack friendly aerial forces. It may also have been used for defense saturation. However, funding restrictions prevented the program from ever really getting under way, and the service abandoned this effort soon thereafter.

Aerial Decoys. Various types of aerial decoys have been in service for over 40 years, ranging from the first use of chaff during World War II to blind German air defense radar, to the wide deployment of infrared flares by the Soviet Air Force during its involvement in the Afghan Civil War (1979-89). The Israeli Air Force was probably the first to use active air-launched decoys, commencing with the Israel Military Industries (formerly known as TAAS-Israel) Samson. These decoys are launched from a carrier aircraft and then lure the attacking missile away from the strike platforms by providing a stronger, larger, or more interesting target.

The growing sophistication of the air defense threat has virtually dictated the procurement of low-cost, expendable systems that will ensure the survivability of existing aircraft. With the expected declines in military budgets, the service lives and the importance of many manned aircraft assets will increase. But regardless of whether an individual is dealing with newly developed or modernized combat aircraft, protecting these assets will be equally important.

The US Air Force was convinced that its Wild Weasel force of F-4Gs carrying anti-radiation missiles needed to be augmented if its strike aircraft were to penetrate the increasingly dense and capable former Soviet air-defense network. Initially, the US Air Force was looking towards loitering, stand-off anti-radiation missiles, such as the now-canceled AGM-136 Tacit Rainbow. At the same time, the US Navy was procuring air-launched decoys such as the Brunswick Corporation Samson and its follow-on, the Tactical Air-Launched Decoy.

However, the principal objection to decoys is that they are designed to be carried by strike aircraft. The US Air Force already is faced with carrying external countermeasures pods on aircraft weapons stations, and is therefore reluctant to give up another station to carry the decoys. However, the successful 1982 Israeli air campaign in the Bekaa Valley, Lebanon, convinced then-Navy Secretary John Lehman that decoys were important. Strong representations from junior officers also played a part in his decision to push the program, according to industry officials.

TALD. The US Navy expects decoys such as the ADM-141 TALD (Tactical Air-Launched Decoy) to degrade enemy air defenses by creating confusion and producing false targets. The TALDs are equipped with Lunesburg lenses to augment their radar cross section, and they also carry chaff. The unpowered glide vehicle has a range approaching 70 nautical miles when launched from an aircraft at high altitude. The decoys can be preprogrammed to execute turns to simulate manned aircraft.

Earlier Samson decoys attained ranges of almost 20 nautical miles when tossed by aircraft executing high speed, low-altitude loft maneuvers. Decoys launched under these conditions are particularly effective, since they appear on air-defense radar screens without warning and confront operators with what appears to be a major attack. Relatively high speeds can be

maintained by programming the decoys to delay extension of their wings until after peak altitude is reached. If the hostile missile crews launch against the decoys, the real strike force can attack while the missile crews are reloading.

The US Navy bought almost 1,000 TALDs from Brunswick in early 1987 on a sole-source contract. The service then released a competitive request for proposals for an additional 1,700 systems. Israel Military Industries (IMI) qualified as a second source and was competing with Brunswick for a share of the production. Brunswick produced a total of 3,000 TALDs at a per-unit cost of $15,000 to $18,000 each. Brunswick was the contractor for the powered version but this program has been taken over by IMI.

TALDs were used extensively by US forces during the initial hours of Operation Desert Storm. Sources say that some 137 TALDs were used during the war.

The US Navy also procured the Improved Tactical Air Launched Decoy (ITALD). The service has been examining the feasibility of combining the TALD with elements of the HARM anti-radiation missile since at least early 1991. The ITALD, equipped with a propulsion system, was looked at as an alternative to Tacit Rainbow. A program aimed at integrating a small propulsion system, a turbojet engine, with the existing TALD was initiated, and the first units, the ADM-141C, were procured in September 1996 using FY94/FY95 funds. A total of 98 ITALDs were purchased. A follow-on order for 110 ITALDs was awarded and paid for with FY97 funds. Further procurement was as follows: 57 ITALDs in FY99; 27 in FY00; 70 in FY01; and 76 in FY02.

Anti-Radar Weapons

SHARK. To deal with mobile surface-to-air and tactical ballistic missiles, the United States is considering the development of a preemptive destruction system, previously known as Silent Hard Kill (SHARK). SHARK was renamed Preemptive Destruction after funding cuts almost caused the project's cancellation. However, the US Department of Defense managed to keep it alive in its FY96 budget. The Preemptive Destruction system would meet the US Air Force's Campaign SEAD (Suppression of Enemy Air Defence) mission need.

Campaign SEAD is a sub-mission of the US Air Force's new Lethal SEAD mission requirement. Lethal SEAD includes two sub-missions: Localized SEAD and Campaign SEAD. Localized SEAD is reactive in nature, envisioning the destruction of surface-to-air missile threats only after they begin emitting. In this case, the US Air Force could use lethal or non-lethal systems, such as electronic jamming, against a SAM immediately prior to and during an engagement. Campaign SEAD envisions suppressing and destroying integrated air-defense systems (IADS) well before they have a chance to engage friendly aircraft. Campaign SEAD is preemptive in nature and most effective through permanent destruction of the enemy IADs.

This new concept of preemptive SEAD differs from the previous US procedure, which emphasized reactive and immediate attacks on SAM sites, in that it is to enable the destruction of SAMs from two hours to two days before a group of strike aircraft penetrates the area. The US Air Force says that the destruction must be so thorough that the SAM site is rendered ineffective for as long as three to five days. During Operation Desert Storm, Iraqi SAM sites simply shut down their radar when Coalition SEAD aircraft attacked. The most important criterion for Preemptive Destruction is that the system be able to locate and target an air-defense radar based on just one transmission of several seconds duration.

SHARK, now Preemptive Destruction, is part of the US Air Force's Joint Smart Munitions Test and Evaluation Program. Both the US Air Force and Navy are supporting this effort. Some sources believe that the SHARK will have to be an area weapon that can engage multiple targets.

The SHARK program includes two segments: one involving a kill mechanism, and the other the capability to find and identify mobile targets. The SHARK weapon system requirement is expected to be fulfilled via the modification of an existing weapon system. Candidates for SHARK modifications include the AIM-120 AMRAAM, the Tactical Munitions Dispenser, the HARM, the Joint Direct Attack Munition (JDAM), the Maverick, and the AGM-130. A total of 10 concepts, reduced from 54, proposed for the SHARK kill mechanism involve five sensor technologies: millimeter-wave radar, imaging infrared, synthetic aperture radar, global positioning system, and laser radar.

The greatest challenge of the SHARK system will be to pin down the target and transmit the data to an attack aircraft so it can fire before the target has a chance to relocate. Creating such a capability is the US Air Force's goal for the concept exploration phase. The services do not know if an existing platform can be used for this part of the requirement, although such systems as the E-8 JSTARS and surveillance satellites could be used to feed information to aircraft involved in SHARK missions.

Funding for the SHARK (Preemptive Destruction) was provided in FY94, in support of both concept exploration and a cost and operational effectiveness

analysis that lasted through 1995 and was to be completed in early 1996. A Milestone I concept demonstration decision could have been made in 1996, although if the technology being proposed was mature, it could have been combined with Milestone II development approval. However, no decision was made and this program may remain simply a research project. Outside contractors expressing an interest in this project included AEL, Boeing, Brunswick, Hughes, Lockheed Martin, McDonnell Douglas, Northrop Grumman, and Raytheon.

CUTLASS. A possible follow-on to the SHARK could be the Combat UAV Target Locate and Strike System. Known as CUTLASS, this program could provide loitering anti-radar weapons to suppress enemy air-defense systems. During Operation Allied Force, the initial phase concentrated on suppressing the Serbian air defense network. While surface fixed sites were quickly disabled or destroyed, mobile units are a different story. By some estimates, 80 to 90 percent of all SAMs that NATO thought were damaged or destroyed were in fact decoys erected by the Serbians.

Raytheon and IAI are offering a modified Harpy to meet this perceived need. Both firms funded the development of CUTLASS and have partnered to market the technology to the US Navy. CUTLASS is designed to suppress enemy air-defense systems. Such a system would be of considerable use to the NATO alliance, especially against mobile air-defense systems. The mere presence of a CUTLASS UAV loitering above a battlefield could force air-defense gunners to shut down their systems in order to avoid attack – thereby accomplishing the suppression mission.

The CUTLASS UAV is equipped with an automatic target recognition (ATR) payload and a seeker from the AIM-9 Sidewinder, resulting in a capability to hunt for targets contained within its database. Once targets are located and classified, the air vehicle can be used to engage them.

The CUTLASS is preprogrammed to fly in a designated search area using GPS waypoints. The air vehicle performs the search autonomously until a target is located. Once this is accomplished, the information is transmitted to a ground control station which must approach weapons release. CUTLASS can be also adapted for ship-based operations.

The CUTLASS has a 1.83-meter wingspan, weighs 125 kilograms, and has a cruising speed of 100 knots. The air vehicle can fly for six hours at its cruising speed and has a maximum range of 1,000 kilometers. The direct line-of-sight range is 150 kilometers, but it can be extended via relays built into each weapon. Maximum operating ceiling is 4,572 meters. The CUTLASS is launched with rocket assistance from a canister. Each canister contains two weapons and has a shelf life of 10 years.

With a buy of 5,000 units, the air vehicle is expected to cost $160,000 each. However, should the US decide to procure an anti-radar drone, it could take a minimum of three months to get it into the field, which may or may not be too late to join in on the current round of fighting.

Supports of this program believe the CUTLASS would complement any unmanned combat aerial vehicle (UCAV) purchased by the US Navy.

Light Defender. The Light Defender is a loitering stand-off attack missile developed by Israeli Military Industries (IMI). In 2000, the US Navy became the first customer for Israel's Light Defender when it purchased a small number of Light Defenders for testing. The service wants to evaluate the system's performance when carried by its helicopters. The Light Defender is based on IMI's Delilah loitering decoy system.

LEWK. One of the new Advanced Concept Technology Demonstration (ACTD) projects for FY01 was the Loitering Electronic Warfare Killer (LEWK). The LEWK ACTD is led by the US Air Force, with participation from the US Army, Navy, and Marine Corps. The US European Command is the user-sponsor for the four-year ACTD effort. Prime Contractor is Science Applications International Corporation (SAIC), McLean, Virginia.

The LEWK will demonstrate a $40,000 UCAV that measures 10 feet long and 1 foot in diameter, and weighs 650 pounds (some sources say less than 1,000 pounds), and carries a combined 200-pound lethal and non-lethal payload. The UAV will use a turboprop propulsion system and will be able to fly at altitudes of 100 to 15,000 feet and at airspeeds of 70 to 150 knots. The maximum endurance of the LEWK is expected to be eight hours, and range will be up to 1,000 miles.

In its carriage configuration, the LEWK is about the same size and weight as a general-purpose bomb. Once launched, the LEWK transforms into an aerobatic air vehicle by using unique inflatable airfoils and is commanded through data links and on-board sensors. The system can be air-, ground- or sea-launched, and recovery is via parachute. The air vehicle will be small enough to be launched from a helicopter.

The LEWK ACTD will demonstrate preprogrammed and in-flight re-tasked support jamming for conventional and low-observable systems, delivery of combined-effects cluster munitions to GPS coordinates or designated targets from on-board electro-optical and infrared sensors, and signal relay/battle management.

The low-cost and performance goals will be attained by integrating a number of recently developed commercial and military technologies. These include low-cost sensors, GPS and inertial guidance avionics, high-speed computers, a radar support-jamming payload, existing munitions, and a heavy fuel piston engine.

Planned completion of the LEWK program will be in FY06. The US European Command will determine by 2005 whether the LEWK should be produced and fielded. The current program has enough funding to build up to 12 units. The LEWK is not considered to be a substitute for more sophisticated US Air Force unmanned air vehicles, such as the Global Hawk or Predator.

Funding

Funding into anti-radar missiles, technology, and unmanned air vehicles is contained within numerous Pentagon project accounts.

Recent Contracts

No Air-Launched Saturation System contracts have been awarded by the US Navy. The ALSS was an in-house program being run out of the US Naval Weapons Center, China Lake, California.

Timetable

Year	Major Development
1991	Air-Launched Saturation System program announced
1992	Funding for ALSS provided
2001	US launches LEWK ACTD
2002	ITALD procurement to conclude
2006[(a)]	LEWK effort to be completed
2006-10[(a)]	US to introduce new anti-radiation missile

[(a)] Estimate

Worldwide Distribution

Currently, there is no way of determining export sales for the ALSS since its final configuration has not been determined. If developed, the initial operators of the ALSS could be the **United States Air Force** and **Navy**.

Forecast Rationale

While the Taliban did not present a significant threat to US aircraft, any invasion of Iraq will be preceded by an extensive effort to suppress its air-defense network. If such a campaign is launched, it could provide valuable insight on how the US might meet its future SEAD requirements.

Since Operation Allied Force, the United States has been studying assorted means for meeting its future air-defense suppression needs. One method calls for the development of a lightweight weapon that may possess a loiter capability. This new weapon could be launched directly against known air-defense systems or placed in "loiter mode" over a designated area believed to contain hostile air-defense systems. This system could also engage a specified target, or launch on-board weapons against it.

Currently, the United States has no immediate plans for the US military to procure a loitering anti-radar missile or air vehicle. The current priority for the Pentagon is the procurement of an Advanced Anti-Radiation Missile (AARM). This weapon is similar in concept to the existing AGM-88 HARM, but outfitted with a more advanced guidance system. Even if ongoing demonstration efforts are successful, procurement of a loitering anti-radar weapon system will probably not be fielded until after 2005.

The following forecast represents the potential development by the United States of a "new" anti-radiation missile. In the meantime, the US will depend on upgraded versions of the AGM-88 HARM to meet its anti-radiation missile requirements.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR PRODUCTION

			High Confidence Level				Good Confidence Level				Speculative			
Missile	**(Engine)**	**thru 01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**Total 02-11**
NOT SELECTED													
US ADVANCED ARM (a)	UNSPECIFIED	0	0	0	0	0	0	0	0	0	0	0	0
Total Production		0	0	0	0	0	0	0	0	0	0	0	0

(a) Forecast does not include RDT&E units.