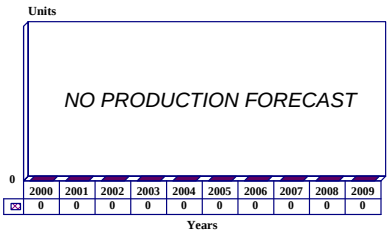
AGM-136/RGM-136 TACIT RAINBOW - Archived 10/2000

Outlook

- The original TACIT RAINBOW program was terminated
- The TACIT RAINBOW proved too expensive for the constricting US defense budget to afford. However, the success of the UK's ALARM during Operation Desert Storm helped to maintain US interest in such loitering ARMs
- Research into loitering anti-radar missiles is still being conducted by the US, but no full-scale development programs have been launched

10 Year Unit Production Forecast
2000-2009



Orientation

Description. Anti-radiation loitering missile.

Sponsor. The United States Department of Defense through the United States Air Force, Navy and Army. The US Air Force Aeronautical Systems Division's Joint Tactical Autonomous Weapons System Program Office, Wright-Patterson AFB, OH, was the executive agent for this program. The US Army was developing a ground-launched TACIT RAINBOW version, which is run out of its then Missile Command (MICOM), Redstone Arsenal, Huntsville, AL.

Contractors. The TACIT RAINBOW air-launched system was being developed and was to have been produced by Northrop Corporation, Ventura Division; Newbury Park, CA, USA. Raytheon Company, Missile Systems Division; Bedford, MA, was to develop/ manufacture the ground-launched version. Design and development work for the ground-launch TACIT RAINBOW was to be performed at Raytheon's Missile Systems Laboratories, Tewksbury, MA. Raytheon was to build the missile guidance and control sections of both versions at the division's manufacturing facility in Lowell, MA. McDonnell Douglas was be responsible for the airframe sub-systems for both versions, while E-Systems was to participate in the development and production of the seeker for the ground-launched system. Raytheon was to be responsible for the guidance and control and ordnance for both missiles. Final missile assembly was to take place at the McDonnell Douglas plant in Titusville, FL.

Major Subcontractors. Delco Electronics Corporation Systems Operations, Ford Aerospace & Communications, M/A-COM, Plessey Electronic Systems Corporation, Singer Company's Kearfott Division, Texas Instruments, Watkins-Johnson, and Williams International.

Second Source. The contractor team of Raytheon Missile Systems Division, McDonnell Douglas Missile Systems Company and E-Systems Melpar Division was selected in mid-September 1989 as the second source on the AGM-136 air-launched TACIT RAINBOW system. Previously identified competitors for the TACIT RAINBOW second-source award had included the teams of Boeing Military Airplanes/Texas Instruments/ Motorola and Northrop/LTV Aerospace.

Licensee. Dassault-Breguet, Paris, France, may begin to market the TACIT RAINBOW to the French Air Force and possible other European formations.

Status. Program concluded. TACIT RAINBOW eventually was sacrificed due to a declining defense budget. Full-scale development was under way when the program was discontinued. The full-scale develop-

ment phase of the TACIT RAINBOW program was expected to be completed near the end of the first half of 1990, with a production decision to follow soon thereafter. The program was being rescheduled by the US Air Force, due to the additional delays caused by the withdrawal of the US Navy (from the air-launched segment) and certain flight test difficulties. The US Air Force, which postponed its low-rate initial production decision into mid-to-late Fiscal 1989, had been forced once again to slip this decision date one additional year. The TACIT RAINBOW was moving into its preproduction verification phase. A production decision for the missile was pending the outcome of contractor and service flight test programs. Operational test and evaluation (OT&E) phase began in 1989, with a decision on full-scale production to have been made in Fiscal 1991.

Total Produced. Northrop announced the construction of the first flight-ready, production-configured AGM-136A in 1987. Serial production never commenced. In early 1987, Northrop began the construction of a new production facility for this missile at Perry, GA. Initial low-rate production of the AGM-136A was expected to commence after the completion of initial flight testing in 1990. The program, at that time, was two years behind schedule.

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. The TACIT RAINBOW, with a loiter capability, is intended as a complement to the AGM-88 HARM (see separate report) and F-4G Wild Weasel air defense suppression aircraft.

Price Range. Due to the sensitive nature of this program plus the fact that it is still in an early stage of development, it was very difficult to state the unit price of this missile. Our best research essentially agrees with the only data released so far, a unit price of $658,000 for serially produced missiles. However, according to Congressional testimony, the per unit production price for the air-launched TACIT RAINBOW had been placed at $110,000 based on a February 1986 USN/USAF estimate. Other sources indicate a unit price of approximately $500,000.

Technical Data

Design Features. The unique design feature of the AGM-136A TACIT RAINBOW was its loiter capability. Although the exact duration of the loiter was classified, this was the first US anti-radiation missile to be equipped with such a capability.

	Metric	**US**
Dimensions		
Missile Length	2.54 m	8.33 ft
Missile Diameter[(a)]	45.72 cm	18.0 in
Missile Weight[(a)]	198 kg	435.6 lb
Missile Wingspan	1.56 m	5.13 ft
Performance		
Speed	high subsonic	high subsonic
Range[(a)]	1000 km	539.96 nm

[(a)]Estimated data. This missile was intended to have an extensive (classified) loiter time over the target as explained in the **Program Review**; therefore, the range figure given above, even if accurate, would have to include a specified loiter time.

Propulsion. This missile was to be powered by a Williams International F107 (WR36) turbofan which is rated in the 2.7kN (600 lb) thrust class. The Boeing Military Airplane BRAVE 3000, which may have been entered into the ground-launched variant competition, may use an Allison-Noel Penny engine. Teledyne CAE was to provide the propulsion system for the Raytheon ground-launched TACIT RAINBOW system.

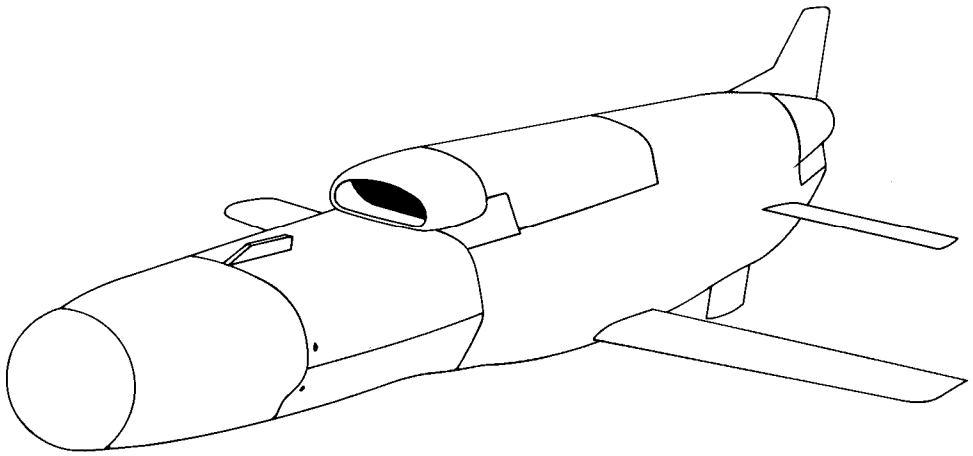
Control & Guidance. Due to the security surrounding this program, little hard information is known regarding

the control and guidance systems of the TACIT RAINBOW. Texas Instruments was known to be involved in this program, possibly providing the electromagnetic radiation seeker assembly. The guidance system for TACIT RAINBOW is expected to contain a significant amount of the technology which was used to develop the AGM-88A HARM's seeker. TI was believed to be assisted by M/A-COM and Watkins-Johnson in this effort. M/A-COM was doing the majority of the sub-assembly work for TACIT RAINBOW, in particular the seeker segment. Other firms known to be involved in the TACIT RAINBOW program, probably in relation to the guidance and control systems, are Singer Company's Kearfott Division, which was said to be developing a low-cost Doppler navigational system for the AGM-136; Delco Electronics Corporation Systems Operations, which was expected to deliver the missile's guidance computer; and Ford Aerospace & Communications (now owned by Loral Corporation), which may have provided its version of the HARM Low-Cost Seeker that is currently under development. It was known that the TACIT RAINBOW missile was programmable and was to be integrated with the existing command and control system. The TACIT RAINBOW missile was a fairly conventional cruise missile design with low-mounted wings and cruciform control surfaces at the rear. The AGM-136A has the capability to return to its loiter mode if the emitter shuts down.

Launcher Mode. Initially, deployment of the AGM-136 air launched system was to be on the US Air Force's fleet of B-52G bombers, where it will be carried internally. This was to be followed by deployment on the US Navy's A-6E and A-7 aircraft. However, a study concluded in 1989 stated that the B-52, rather than tactical aircraft, should be the primary launch platform. The US Air Force said that it will use the B-52G as its primary carrier aircraft for TACIT RAINBOW, and that it had greater potential than either the fighter or ground-launched options. The TACIT RAINBOW could have been eventually integrated with various tactical aircraft including those mentioned above, as well as the F-16, the A-10, and the F/A-18.

The US Army was expected to deploy its ground launch TACIT RAINBOW missile within a modified version of the LTV Aerospace 22.7 centimeter Multiple Launch Rocket System (MLRS) launcher.

Warhead. The TACIT RAINBOW missile, like the AGM-88 HARM, was intended to destroy the hostile emitter. While it was certain that an 18.19 kilogram (40 lb) high explosive/fragmentation warhead was on this missile, the warhead's composition and other data were sensitive. It was probable that the warhead has a high degree of fragmentation capability built into it. The developing agency, the US Naval Weapons Center at China Lake, had designated the warhead the WDU-30/B.



AGM-136 TACIT RAINBOW

Source: Northrop Corporation

Variants/Upgrades

The two TACIT RAINBOW versions mentioned prior to the program's termination were an air- and ground-launch system. Additional upgrades were under consideration for the TACIT RAINBOW missiles, but the program did not reach a stage in its development that would have allowed the incorporation of such enhancements. For additional information, please see the pertinent entries under the **Program Review** section.

Program Review

Background. The TACIT RAINBOW was first revealed in early January of 1987; the disclosure of this program was a result of its partial declassification to allow for the possible participation by NATO members. Often referred to as the son of HARM, TACIT RAINBOW has the same mission as the Texas Instruments missile although the TACIT RAINBOW, or the AGM-136, to use the type designation, is designed to have an extensive loiter capability which the AGM-88 does not have.

The beginnings of the TACIT RAINBOW program, the US Air Force designation for the program which developed the AGM-136 missile, probably were in the early eighties. The United States' experience in Southeast Asia, where its forces faced a variety of radar directed weapon systems, plus the experiences of Israel, which faced an even greater array of such technology, resulted in the knowledge that the easiest countermeasure to missiles which home in on electromagnetic emissions is to switch off the transmitter. This action forces the missile to break lock, rendering it essentially useless. An early counter-countermeasure to the switching off of the transmitter was thought to be the incorporation of a memory in the missile which would direct the missile to the last known location of the emitter. However, this technology is expensive and is not nearly assured in its results. Another tactic, demonstrated by Israel in 1982, is to employ unmanned air vehicles to stimulate the hostile radar to radiate and reveal their location so that they can be destroyed by other weapons. However, this tactic is applicable only to a few scenarios and only where air superiority is primarily held by the side wishing to destroy the radar, a probability that cannot be counted on by the United States in Europe.

Loiter. Research conducted in the late seventies and early eighties convinced US Air Force planners that the answer to the difficult mission area of the destruction of hostile radar would be a combination of a direct attack missile and another missile which would have a loiter capability in the region of the hostile emitter so as to defeat the tactic of switching off the radar. The United States had experience with the direct attack missile, having had the AGM-45 and AGM-78 anti-radiation missiles in service for over a decade; this experience included combat use in Southeast Asia. In addition, a new anti-radiation missile, the AGM-88 HARM, was in advanced development and due to be fielded as the standard anti-radiation missile for the United States for the remainder of the century. For a detailed analysis of the AGM-45 and AGM-88, we refer the reader to the pertinent reports in this section.

The loiter capability missile was a different story, no missile of its type having been developed at that time. At first, the US Air Force, in conjunction with the Federal Republic of Germany, embraced the use of an unmanned air vehicle to address this mission area under a classified program called Locust; it is still not certain whether Locust would have had a loiter capability, but this point is moot as the program died for lack of funding from first the Germans then the United States. Then the US Air Force embraced a revised effort in this area using another unmanned air vehicle in the classified PAVE TIGER program. While PAVE TIGER and the possibly similar PAVE PANTHER programs may still be active, apparently around 1982, the Air Force decided to pursue the development of a winged (or cruise) missile for the loiter capability in the anti-radar mission.

Missile Description. The AGM-136 was essentially a small cruise missile, with a roughly cigar shaped fuselage having the air intake for the F107 on top at the rear. The aft end of the missile mounts the cruciform control surfaces, the bottom one being a simple fin. While Northrop was the prime contractor, support was coming from the Boeing Military Airplane Company, most likely due to its long involvement with the AGM-86 Air Launched Cruise Missile.

System Operation. The TACIT RAINBOW missile was envisioned to find and interdict radar emitters, while the AGM-88 is envisioned for more mission specific targets; however, the two mission areas were expected to almost certainly overlap. The TACIT RAINBOW missile could be programmed before flight allowing for maximum tactical flexibility; it may have also been possible to modify or update the program during flight

by a data link in order to respond to changing tactical situations. The missile flies to the target at subsonic speed and attacks the hostile emitter in a diving manner. If the emitter ceases radiating, the missile can either use information in its memory to complete the mission or can loiter in the area until the emitting commences again and then complete the mission.

The amount of time that the missile can loiter was highly classified but, given the excellent fuel efficiency of the F107 engine, it must be considerable. This long loiter time was an advantage as the hostile emitter either had to remain silent, thus denying guidance and control to its weapons, or had to again begin radiating, thus exposing itself to attack from the TACIT RAINBOW missile.

Testing. Development testing of the TACIT RAINBOW was to overlap with initial operational testing and evaluation. A total of 25 test launches are planned during the two-phase effort - 13 from a B-52 bomber and 12 from an A-6 attack aircraft. These two aircraft were scheduled to receive the first production models. Previously, the AGM-136A had been expected to be deployed on the EF-111 medium-bomber and the F-16 fighter aircraft.

Northrop had completed the required four successful tests prior to the missile's entering the developmental test and evaluation/initial operational test and evaluation (DT&E/IOT&E) phases. The TACIT RAINBOW was successfully tested on April 12th, 1988. After the missile was launched from an A-6E intruder, it followed a pre-programmed flight path to the designated target area. The missile then loitered until a target became available. On January 10th, 1989, Northrop successfully completed its third TACIT RAINBOW test.

The failure of a late March 1989 flight test helped the US Navy to eventually decide to withdraw from the program, as well as prompting the Defense Department to ask for an additional Defense Acquisition Board (DAB) review of the entire TACIT RAINBOW effort. During the March 30 test, the AGM-136 crashed into the side of a mountain at the China Lake test facility after completing roughly 80 percent of its flight profile/ test objective. Supposedly, the problems with the system revolve around recurring quality control and management difficulties. Investigation into this failure concluded that the problem was not design-related, but that a wire rubbed against a rough part of the alternator, causing a short circuit that resulted in a spurious signal to the missile's computer to slow down the propulsion system.

However, on May 17th, 1989, the service did achieve a full success. On this second of 25 planned developmental and operational test flights to be jointly conducted by the Air Force and Navy, the missile was captive carried by a B-52 for more than three hours, before being rotated into launch position. The B-52, through an automatic sequence, launched the missile, which transitioned to stable flight, and initiated engine start. The programmed mission profile was executed totally and autonomously following launch. The missile impacted the target after completing both loiter and reloiter maneuvers over the designated strike area. This test success may have helped save the TACIT RAINBOW program from possible cancellation.

On May 30th, 1989, the US Air Force added an additional successful test to that of May 17th. The service demonstrated the missile's ability to return to loitering mode after the radar emissions ceased, re-attack the radar once it commenced emitting, and hit the target. This was the third test in the combined development test and evaluation/initial operational test and evaluation flights. However, some have questioned this second success since the missile required unplanned manual guidance to reach the target area, after which it properly acquired and hit the target. The mid-course guidance did not work because navigation data was erased before flight.

The first launch from an A-6E fighter in early August 1989 was also a success, as was the following firing on August 31, the sixth on September 15, the seventh (the sixth successful) on October 6, and the eighth from a B-52 on November 3. On the ninth test, an anomaly which occurred during the terminal phase of the flight resulted in this run being scored as a partially successful flight. The flight was successful except that the missile did not impact in the target area.

The US services had been awaiting the completion of Northrop's flight testing program, prior to making a production decision for TACIT RAINBOW. An initial low rate production decision on TACIT RAINBOW was expected sometime around June 1989, after the DT&E/IOT&E phases were completed. However, due to funding problems and testing delays, this decision was postponed to mid-1990, at which time the current DT&E/IOT&E flight tests were scheduled to be completed. Full-scale development was expected to be completed by January or February of 1990, but this was also delayed, and eventually terminated.

AGM-136A Second Source. In mid-September the contractor team of Raytheon Missile Systems Division, McDonnell Douglas Missile Systems Company, and E-Systems Melpar Division was selected as the second source on the AGM-136 air-launched TACIT RAINBOW system. The competitors for this award include the teams of Boeing Military Airplane/Texas Instruments/Motorola and Northrop/LTV Aerospace.

These teams were also competing for the ground-launched TACIT RAINBOW development contracts (see RGM-136 entry). Since a single contracting team could have been selected for both roles, Northrop may have become its own second source. If this had transpired, LTV would have acted as the prime on the air-launch second-source program and Northrop as the lead on the ground-launched system development effort. A second source short list was announced in 1989, although initially final contractor selection could have been as far off as Fiscal Year 1991.

Northrop was expected to deliver parts and material necessary for the second source to construct two AGM-136A missiles in 1990. The Air Force was then to begin a 30-month program to evaluate and qualify the Raytheon design, including five flight tests. That was after the transfer of technical data from Northrop. Raytheon planned to use a Texas Instrument seeker employed by Northrop for the testing program. However, the firm was expected to eventually develop its own seeker system. E-Systems was to provide mission planning systems and the radar-homing seekers. The second source company was expected to begin delivery of production vehicles 32 to 34 months after the contract award. The decision on the second-source contractor followed the completion of contractor developmental test flights. However, the need for a second-source was being questioned due to the decline in the overall procurement totals after the withdrawal of the US Navy from the program.

Qualification of the second-source was estimated to occur in the Fiscal 1994-1995 time frame, depending on the status of the prime source program. In 1993, the US Air Force planned to award a directed buy to fully demonstrate the contractor capability for annual competition, starting in 1994.

RGM-136 US Army Procurement. Along with being selected as the second source contractor for the air-launched AGM-136, the Raytheon team was also responsible for the development of the US Army's ground-launched TACIT RAINBOW system. In April of 1987, it was learned that the US Army was interested in the TACIT RAINBOW missile (tentatively designed RGM-136) for several missions including the attack of tactical ballistic missile sites, and strikes against or jamming different sensors. However, the US Army wished to fire the missile from the same launcher used for the LTV Aerospace 22.7 centimeter Multiple Launch Rocket System (MLRS); this proved difficult due to the design of the AGM-136 missile, which has the air intake on top of the fuselage.

The US Air Force issued a Request For Proposal (RFP) for a ground-launched version of the TACIT RAINBOW on January 8th, 1988. Only the prime manufacturers were said to have been eligible to receive this RFP, although other companies were expected to be allowed to bid on the program. Boeing Military Airplane, which had been working on this requirement the longest, planned to offer a reconfigured BRAVE 3000 for this mission. The BRAVE 3000 had the advantage of alleviating some of the problems with integrating the system into the MLRS launcher due to its lack of an upper air-intake, which is prominent on the Northrop system.

Potential competitors for the ground-launched TACIT RAINBOW had included Northrop's Ventura Division, Ford Aerospace and Communications Corporation, Lockheed Missiles and Space Company, Martin Marietta Orlando Aerospace, McDonnell Douglas Missile Systems Company (formerly Astronautics), Raytheon Company's Missile Systems Division, and Texas Instruments. Other potential competitors had included General Dynamics' Convair Division with its Ground Launched Cruise Missile (GLCM), but according to company officials, General Dynamics has decided not to bid on this contract. (Boeing had also entered its BRAVE 3000 in the competition for the air-launched version.) LTV was also expected to compete for the ground-launched contract.

Potential entrants to this competition were expected to be new developments, and not the modification of old or existing systems. The US Army's insistence that its new anti-radiation system be compatible with the MLRS was said to be one of the reasons the AGM-136A was chosen over the Boeing Military Airplane BRAVE 200 SEEK SPINNER (see separate report in the *Unmanned Vehicles Forecast*).

In May 1988, three study contracts were awarded for the ground-launched TACIT RAINBOW program to Boeing Military Airplane/Texas Instruments/Motorola, Northrop/LTV Corporation and Raytheon/McDonnell Douglas/E-Systems. Each of these companies submitted proposals in March 1989, with a formal Request For Proposals on the ground-launched system following in April. The US Air Force's Aeronautical Systems Division's Joint Tactical Autonomous Weapons Systems Program Office – the executive agent for the overall AGM-136/RGM-136 TACIT RAINBOW effort – announced in September that it had selected the Raytheon-led team as the prime contractor for full-scale development for the ground-launched missile.

Raytheon also got the nod as the prime contractor for second-source production of the air-launched version currently produced by Northrop. (The Raytheon/ McDonnell Douglas/E-Systems team competed against

teams composed of Boeing Military Airplane Company/Texas Instruments and Northrop/LTV Corp.) McDonnell Douglas was a major subcontractor to Raytheon for both programs, and was to be responsible for design and manufacture of the missile airframe, propulsion integration and final assembly of the complete air vehicle.

The RGM-136 program was expected to enter full-scale development concurrently with the second source effort. The US Army planned to include in its development contract two low-rate initial production options prior to completion of the full-scale development phase. The first of these options was to be exercised in mid-1992, before the four-and-one-half year full-scale development program was completed.

Contractor flight tests were scheduled to begin in the Fall of 1991. The RGM-136 was to have an all-new airframe design to make it compatible with the MLRS, as well as a new propulsion system to be developed by Teledyne CAE. Teledyne was to supply an engine from the company-sponsored Model 300 Series activity, which had been ongoing for several years. Development and qualification of the engine was planned to take place at the Teledyne research and development facility in Toledo, OH. Future production of the new engine was slated for the Teledyne facility in Gainesville, GA.

While the exact propulsion system designation was unknown, Teledyne CAE had an engine series that met the missile's needs. The AGM-136 air-launched TACIT RAINBOW was powered by a single Williams International 600 lbst F107 engine, but several industry followers have concluded that the production-standard ground-launched RGM-136 system may be heavier than the air-launched AGM-136. If so, Teledyne CAE's J402 series, rated at 640-960 lbst, could meet the power requirements. If the RGM-136 had emerged as a totally redesigned AGM-136, engines of other power outputs would have been considered. Teledyne had several developmental projects under way that might meet the missile's power needs, including the Model 312, rated at 135 lbst, and the Model 320, rated at 200 lbst.

Raytheon received an initial funding allotment worth $110 million for both the AGM-136 second source ($5.1 million) and the RGM-136 development ($105 million) efforts in late January 1990. The funding covered the development of the US Army ground-launched TACIT RAINBOW system and technology transfer of the data package for the US Air Force's air-launched AGM-136 second source effort. The US Army Missile Command, Redstone Arsenal, Huntsville, AL, managed the ground-launched program. The RGM-136 missile's full-scale development phase was expected to last approximately 50 months.

There had been indications of dissatisfaction with the ground-launched TACIT RAINBOW program within the US Air Force. The Tactical Air Command was (and is believed to still be) interested in the ground-launched version since the airborne version would have taken up already limited ordnance space. The announcement that the US Air Force's B-52 bombers would be the optimum aircraft may have helped to alleviate this dilemma. Furthermore, the management of the RGM-136 program from the US Army Missile Command, although maintaining US Air Force overall monitoring, could have also supported this point of view.

Unofficial production levels for the ground-launched TACIT RAINBOW were as follows: Lot 1, 100; Lot II, 400; Lot III, 1,200; Lot IV, 1,600; Lot V, 3,000.

US Army Commonality Problems. There had been some concern noted that Army changes to the system would erode Pentagon commonality requirements. This deals with the US Army's desire to have TACIT RAINBOW compatible with its Multiple Launch Rocket System (MLRS), which would result in sacrificing commonality between the ground-launched and air-launched versions of the missile. The government had only stressed commonality between the ground-launched and air-launched systems, but never specifically stated a requirement.

But the Air Force accepted an Army request to change the design so that the system could be integrated with the MLRS. Information indicated that the services were willing to sacrifice commonality between the air- and ground-launched variants. The program was never truly a tri-service effort, with the Navy and Air Force cooperating to develop the air-launched system, and the Army more-or-less working on its own.

Funding

No additional funding has been provided for the TACIT RAINBOW after 1991.

Recent Contracts

Raytheon was awarded $110 million for the AGM-136 second-source and RGM-136 full-scale development program in late January 1990. Approximately $5.1 million was awarded to the Raytheon-led team for the AGM-136 second-source program, and another $105 million for the RGM-136 development effort.

Timetable

Month	Year	Major Development
Early	1980s	Concept definition began
Mid	1984	TACIT RAINBOW became joint US Air Force/Navy program
	1984-88	Prototype fabrication and flight testing program began
Jan	1987	Program unveiled
Apr	1987	Northrop began construction of production facility
	1987	First production unit completed
	1988	Contractor flight testing continued
	1989	Contractor flight testing completed
	1989	Ground-launched study contractors selected
	1989	Second source decision expected
Mid	1990	Program difficulties continued
	1991	Program concluded; production never commenced

Worldwide Distribution

No exports were made, due to the termination of this program.

Forecast Rationale

The United States remains interested in a loitering anti-radar weapons, but has yet to launch an active development effort. The Kosovo crisis could help those interested in developing such a system. For in the aftermath of the fighting, the NATO alliance began to realize that far fewer air defense systems, especially the mobile units, had been put out of action as previously thought. By some estimates, 80-90 percent of all SAMs believed destroyed or damaged by NATO aircraft were in fact decoys erected by the Serbians as part of their deception campaign.

The suppression of enemy air defenses (SEAD) missions are among the most dangerous to perform, placing the pilot and aircraft at great risk. Furthermore, aircraft assigned to SEAD missions are just that many more assets unavailable for use against other targets. Some in the Pentagon think that this situation could be avoided in the future, or its impact at least reduced, with the use of loitering anti-radar weapons.

The United States is continuing to examine loitering anti-radar weapons, one being the Combat UAV Target Locate and Strike System (CUTLASS) program. Raytheon and IAI are offering a modified Harpy drone to meet this perceived need. Although a drone, if successful this technology could be applied to what is considered traditionally a missile.

Future US suppression of enemy air defenses (SEAD) weapons are likely to take on many forms, as the former attempts to deal with a rapidly evolving threat. Various options are being explored, including the development of all-new ARMs and the modification of in-service cruise missiles to perform the SEAD mission, and their possible use in conjunction with unmanned air vehicles. However, the introduction by the United States of a new anti-radiation missile, loitering or otherwise, is not expected to take place until after 2004.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR PRODUCTION

			High Confidence Level			Good Confidence Level				Speculative			
Missile	**(Engine)**	**thru 98**	**99**	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**Total 99-08**
NORTHROP CORPORATION													
AGM-136A (a)	F121-WR-100	123	0	0	0	0	0	0	0	0	0	0	0
Subtotal - NORTHROP CORPORATION		123	0	0	0	0	0	0	0	0	0	0	0
RAYTHEON COMPANY													
RGM-136 (b)	MODEL 384	2	0	0	0	0	0	0	0	0	0	0	0
Subtotal - RAYTHEON COMPANY		2	0	0	0	0	0	0	0	0	0	0	0
Total Production		125	0	0	0	0	0	0	0	0	0	0	0

(a) Thru year figure includes initial RDT&E prototypes (complete missiles), and RDT&E integration and flight test missiles and developmental/operational test missiles.
(b) Thru years include developmental test models and other RDT&E units.