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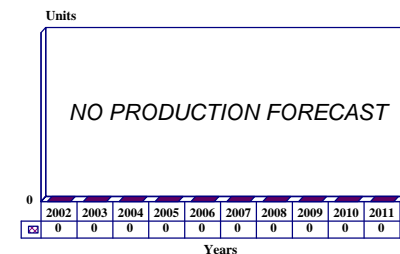
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ALQ-172(V) - Archived 03/2003

Outlook

- In service, ongoing logistics support
- (V)3 upgrades for SOF aircraft
- B-52 support continues

10 Year Unit Production Forecast
2002 - 2011



Orientation

Description. Airborne defensive electronic counter-measure systems.

Sponsor

US Air Force
 AF Systems Command
 Aeronautical Systems Center
 ASC/PAM
 Wright-Patterson AFB, Ohio (OH) 45433-6503
 USA
 Tel: +1 513 255 3767
 Web site: <http://www.wpafb.af.mil>

Contractors

ITT Defense & Electronics Corp
 ITT Avionics
 100 Kingsland Road
 Clifton, New Jersey (NJ) 07014-1993
 USA
 Tel: +1 201 284 2421/4131
 Fax: +1 201 284 4122
 Web site: <http://www.ittind.com>

Status. In service, with ongoing logistics support.

Total Produced. An estimated 943 units (over 6,000 LRUs) were produced.

Application. B-52H, MC-130E/H, AC-130H, AC-130U.

Price Range. Unit cost is estimated at US\$2 million.

Price is estimated based on an analysis of contracting data and other available cost information, and a comparison with equivalent items. It represents the best-guess price of a typical system. Individual acquisitions may vary, depending on program factors.

Technical Data

	<u>Metric</u>	<u>US</u>
Dimensions		
Weight per aircraft:	286.5 kg	1,631 lb

Characteristics

LRUs per system:	7
Systems per aircraft:	2
Antennas per aircraft:	7
MTBF:	64 hr

Design Features. The ALQ-172(V) was designed to improve the low-level penetration survivability of the B-52. It is an automatic, power-managed system that can be reprogrammed quickly for new threats and is made up of up to 12 line-replaceable units (LRUs). These include PD/PR/CW receivers/processors/transmitters, radio frequency (RF) switches and converters, control indicators and monitors, and advanced-design multiple antennas. Because it uses multiple processors throughout, the system was designed to degrade gracefully.

Ongoing upgrades have kept the system capable of countering evolving threats. The latest added a low-band jamming capability for the Special Operations aircraft. In addition, operation of the system has been

improved through the incorporation of gate array technology, expanded memory, flight line reprogrammability, and increased frequency range.

Operational Characteristics. The ALQ-172 (V) is fully automated, and has multi-band coverage, simultaneous multiple threat recognition and jamming, digital computer control, advanced jamming techniques, high effective radiated power, and future threat reprogrammability. It also features high-gain array antenna, threat warning display, a dual MIL-STD 1553-B databus interface, and extensive Built-In Test capabilities.

The ALQ-172(V) can simultaneously jam multiple pulse, pulse-Doppler, and continuous wave threats. It can also counter monopulse radars.

Variants/Upgrades

ALQ-172(V)1. Under the Air Force's B-52G PAVE MINT modification program, 98 ALCM-carrying B-52G aircraft were provided with an updated ALQ-117(V) to counter airborne and ground-based fire control and missile radars. PAVE MINT was considered a way to incorporate ALQ-172(V) advanced technology quickly. It used the core avionics of the ALQ-172(V) but did not replace the ALQ-117(V) fixed-horn antennas. A new embedded digital processor would handle expanded threat files.

The updated ALQ-117(V) PAVE MINT was renamed the ALQ-172(V)1 and installed on most B-52G aircraft using the ALQ-117(V) horn antenna system. It is fitted on selected Air Force C-130 aircraft in standard and new podded versions. The EC-130H was fitted with the system in the COMPASS CALL program, while the EC-130E airborne battlefield command and control center received the system under the CORONET SOLO II program.

ALQ-172(V)2. This variant is installed on the B-52H as well as AC-130H/U and MC-130H Special Opera-

tions aircraft. The ALQ-172(V)2 uses the PAVE MINT core avionics, but the fixed-horn transmitting antennas have been replaced with electronically steerable phased arrays which increase the effective radiated power that can be directed at a specific target.

Other upgrades eliminate the need to remove units for reprogramming. New hardware makes flight-line reprogramming possible. This variant is also improved with gate array technology and an expanded memory.

ALQ-172(V)3. This variant has a low-band jamming capability for Special Operations aircraft and is being installed on the AC-130H to extend its frequency range. It contains more memory and has better electronic countermeasures (ECM) processing for the Special Operation Forces (SOF) mission. The ALQ-172(V)3 is in-flight reprogrammable.

ECP-93. This Special Operations upgrade is being used by USSOCOM aircraft. It has expanded ECM and is flight-line reprogrammable. Like the ALQ-172(V)2, this variant is improved with gate array technology and expanded memory.

Program Review

Background. The original ALQ-117(V) was developed in the late 1960s under the QRC-510 program, also known as RIVET ACE. The ALQ-

117(V) had replaced the ALR-18(V) ECM system aboard B-52s in the early 1970s.

In 1979, the Air Force issued development contracts to ITT Avionics to incorporate the latest ECM technology into the ALQ-117(V). The end result was the ALQ-172(V). From 1981 through 1985, the Air Force awarded more than US\$700 million in contracts for development and preproduction of the ALQ-172(V). Flight testing and initial operational test and evaluation (IOT&E) took place during 1983 and 1984, leading to a production decision in June 1984. Over 3,000 LRUs had been produced by mid-1990, with plans calling for installation of the ALQ-172(V) on 210 Strategic Air Command B-52s.

On June 17, 1992, then-Secretary of the Air Force Donald B. Rice announced "The Bomber Roadmap," the plan for the manned bomber in the changed world threat climate. With the force freed from the demands of nuclear deterrence, the Air Force would concentrate on conventional capabilities and the rapid response to regional threats.

The B-2 Stealth bomber became the main penetrating platform and was assigned the most demanding missions, such as direct attack on targets in high-threat arenas. The B-1B could be used as either a penetration or standoff platform, adding mass and precision to composite strike packages on targets in low- to medium-threat arenas.

All of the B-52Gs were retired, and an enhanced fleet of B-52Hs converted to launch standoff weapons or to attack low-threat areas with direct conventional weapons. These aircraft were modified with new weapons capabilities and avionics for their totally conventional role. The long-term plan was for a fleet of 66 B-52H aircraft in the active inventory.

The ALQ-172(V) was selected for use on the MC-130E/H Combat Talon I/II Special Operations aircraft. It was also installed on the AC-130U replacement gunship.

GAO Calls for the USAF to Help Upgrade Special Ops C-130s. A November 13, 1998, Government Accounting Office (GAO) report recommended that the US Air Force and United States Special Operations Command (USSOCOM) pool their funds to improve the C-130's EW capabilities. The report was in response to concern by Congressman Patrick Kennedy (D-RI) that threats to the US Special Operations Command's aircraft were increasing, while funds available for electronic warfare were decreasing.

The GAO reviewed USSOCOM's acquisition strategy for aircraft electronic warfare systems in an effort to make it possible to deploy the aircraft anywhere in the world. The effort was prompted by the fact that more sophisticated naval and land-based threat systems were

being fielded in more and more countries. Even nations without complex integrated air defense systems had the means to inflict casualties on technologically superior opponents.

The worldwide proliferation of relatively inexpensive, heat-seeking missiles increased the risk of Special Operations in remote, poorly developed countries. Commercially available second-generation night vision devices were being linked with portable air defense systems, including shoulder-fired missiles – a special threat, since Air Force Special Operations Command (AFSOC) aircrews had historically relied on darkness to avoid detection.

The report said that the Special Operation Command's electronic warfare acquisition strategy was sound, because it was based on eliminating the operational deficiencies noted in an Air Force study, test reports, and maintenance records. This evidence indicated that the existing electronic warfare systems were unable to defeat many current threat systems and had supportability problems. The acquisition strategy was to procure a mix of new systems and upgraded older ones while maximizing commonality within the fleet of C-130s.

Because of budget constraints, however, USSOCOM could fund only portions of AFSOC's acquisition requirements, hampering AFSOC's efforts to correct deficiencies and maximize commonality in electronic warfare systems. For example, although USSOCOM was funding an AFSOC effort to make C-130s less susceptible to passive detection and enhance aircrews' situational awareness, it rejected other requests dealing with radar- and infrared-guided missiles. As a result, the GAO said that in the foreseeable future deficiencies would remain, and AFSOC would have to operate and maintain older and upgraded electronic warfare systems.

According to AFSOC officials responsible for electronic warfare acquisition, AFSOC's C-130s were most vulnerable to three types of threat systems: 1) infrared missiles, 2) passive detectors, and 3) radar-guided missiles. These deficiencies became more critical after Operation Desert Storm in 1991 as more sophisticated threats were developed throughout the world. An ongoing Air Force Chief of Staff-directed study, the *Electronic Warfare Operational Shortfalls Study*, confirmed what AFSOC officials maintained, that there were many electronic warfare-related operational deficiencies within the overall Air Force, including the C-130 fleet. The study identified deficiencies in the areas of missile launch indications and warning times, infrared expendables and jamming effectiveness, signature reduction, passive detection,

situational awareness, and electronic warfare support equipment.

According to the study, AFSOC's aging electronic warfare systems were failing more often and requiring more hours of maintenance. The ALQ-172(V)1 high-band radar jammer, in particular, was problematic, requiring more maintenance than any other AFSOC electronic warfare system. The staff hours charged for maintaining the ALQ-172(V)1 represented 34 percent of the total time charged to maintaining all electronic warfare systems from 1995 through 1997.

AFSOC made several efforts to correct deficiencies and maximize commonality in electronic warfare systems. USSOCOM funded the Common Avionics Architecture for Penetration (CAAP) program, which was designed to make AFSOC's C-130 aircraft less susceptible to passive detection, enhance the aircrews' situational awareness, lower maintenance costs, and improve commonality. In addition, AFSOC replaced the ALR-56M radar warning receiver on its AC-130U gunships with the ALR-69(V) radar warning receiver already on the rest of its C-130s. AFSOC also planned to eventually replace the ALQ-131(V) radar jamming pods on its AC-130H gunships with an upgraded ALQ-172(V)3 radar jammer. At the time, USSOCOM did not have sufficient resources to fund both the CAAP program and the ALQ-172(V)3 upgrade program. Finally, AFSOC planned to replace its ALE-40(V) flare and chaff dispensers with the newer, programmable ALE-47(V) for better protection against infrared-guided missiles. But because of budget constraints, AFSOC kept the ALE-40(V) on two of its C-130 model aircraft; the other models were upgraded to the ALE-47(V).

In prioritizing resources for Fiscal Years 2000-2005, USSOCOM divided AFSOC's C-130s into what are called legacy and bridge aircraft. The older legacy aircraft will receive flight safety modifications but not all of the electronic warfare upgrades, while newer bridge aircraft will receive both. As a result, the legacy aircraft will share less commonality with the newer bridge aircraft over time, even as they became more vulnerable to threats and more difficult to maintain. According to AFSOC officials, because the legacy aircraft are to remain in service for 12 more years, AFSOC will have to operate and maintain more types of electronic warfare systems for the foreseeable future.

The report did point out that AFSOC could implement its electronic warfare acquisition strategy by capitalizing on the Air Force plan to begin a US\$4.3 billion C-130 modernization program, the C-130X program, for all C-130s. Some of the planned elements of this modernization effort were common to AFSOC's

acquisition strategy. USSOCOM would then be able to re-direct significant portions of its funding budgeted for AFSOC C-130 deficiencies to other, unfunded portions of AFSOC's electronic warfare acquisition strategy.

The GAO report further recommended that the Secretary of Defense direct the Secretary of the Air Force to select items that, where feasible, addressed USSOCOM's CAAP requirements or that could be modified by USSOCOM to meet those requirements. The GAO further recommended that the Secretary of Defense direct USSOCOM to use any funds budgeted for, but not spent on, CAAP for other electronic warfare deficiencies or to expand the CAAP program to other Special Operations Forces aircraft.

The Pentagon partially agreed with the GAO, concurring that electronic warfare vulnerabilities existed and that it should study and document what savings would be possible by combining programs. However, the DoD stopped short of agreeing to make the recommended changes, opting instead to require the Air Force to document common requirements between the two programs and evaluate how funds could be saved through commonality efforts.

In conclusion, classified test reports and threat documentation corroborate the study's findings. According to Air Force officials, electronic warfare deficiencies are so extensive that the solutions necessary to correct all of them are not affordable within the framework of Air Force Fiscal Year 2000-2005 projected budgets.

Recent CBD Announcements. In a March 2001 *Commerce Business Daily*, the Air Force Materiel Command published a notice of intent to issue an engineering services task order against an existing Basic Ordering Agreement with BAE Systems for engineering services applicable to the USM-464 for development of an ALQ-172(V)1/2 Test Program Set (TPS) Exerciser. The ALQ-172 (V)1/2 systems would be analyzed using the results of a study performed under contract F09603-98-G-0025-0011 in an effort to make the TPS independent of the Operational Flight Program and Mission Data.

In a July 2001 *Commerce Business Daily*, the United States Special Operations Command Directorate announced that it intended to negotiate on a sole-source basis with ITT Avionics to modify, test, and deliver production quantities of the ECP 0093 upgraded ALQ-172(V)1 line replaceable units (LRUs) and shop replaceable units (SRUs), and to fabricate, test, and deliver production quantities of support equipment and spare SRUs.

In an August 2001 *Commerce Business Daily*, the Air Force Materiel Command released a sources-sought

announcement for engineering and manufacturing development and production of a Fiber-Optic Towed Decoy (FOTD) system to be integrated with the ALQ-172(V). The resulting system will provide Special Operations Forces aircrews with improved RF

self-protection. The FOTD system will be integrated with baseline ALQ-172(V)1 and (V)3 systems installed on 59 Air Force Special Operations Command AC/MC-130 aircraft.

Funding

Ongoing efforts are funded from Operations and Maintenance accounts.

Recent Contracts

(Contracts over US\$5 million)

<u>Contractor</u>	<u>Award (\$ millions)</u>	<u>Date/Description</u>
ITT	17.8	Sep 1998 – Contract to upgrade the electronic countermeasures of the US Special Operations Command's C-130 fleet to the ALQ-172(V)1 ECP-93 version. Procurement options permit increases up to US\$44,660,997. This upgrade provides expanded ECM and Operational Flight Program memory capacity, additional PR channels, and flight-line reprogrammability. (USZA22-98-C-0004)
ITT	13.5	Aug 2001 – FFP time and materials contract to upgrade the ALQ-172(V)2 on the B-52H. The contract requires the delivery of 12 installation kits, five spare kits, one ALM-252(V) Hot Mock-Up, one upgraded integrated support station, one upgraded semi-automatic test station, and one weapon system trainer. To be completed August 2003. (F09603-01-C-0198)
Litton Systems	5.0	FFP contract for four line items of spares for the ALQ-172(V). (F09603-01-C-0475)

Timetable

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
	1972	Initial production contract
	1978	RIVET ACE Phase VI-Avionics update II installation
	1979	ALQ-172(V) development begins
	1981	ALQ-117(V) production completed; RIVET ACE Phase VI modifications complete
Oct	1983	ALQ-172(V) flight tests begins
	1987	Final incorporation of ALQ-172(V); ALQ-172 tail installation completed; prototype systems integration on ECM system
	1988	ALQ-172(V) full-scale development completed
	1991	Combat operations in the Persian Gulf
Mid	1992	B-52H ECM upgrade completed
Jun	1992	Bomber Roadmap released
Sep	1993	First modified B-52H rolled out
Nov	1994	First AC-130U rolled out
	1994	HAVE NAP capability, last B-52G retired
Mar	1995	First AC-130U squadron operational
	1997	B-52 conventional weapons upgrades completed
Sep	1998	ECP-93 upgrade contract

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
Nov	1998	AC-130H upgrades completed
	2001	Special Operations upgrades under way
	2030	Planned life of B-52 fleet

Worldwide Distribution

This is a US only program.

Forecast Rationale

The B-52 is a conventional rather than nuclear bomber, the B-52H serving as a stand-off missile launcher in addition to being used for conventional saturation bombing missions. A mine-laying capability has been added as well. The mission change extended the planned operational life of the bombers, and conflicts in Iraq and elsewhere have shown that the old airplanes are still a vital part of US strategy. B-52s have been crucial bombing assets in the War on Terrorism in Afghanistan. Budget constraints discouraged significant upgrades to the B-52 ECM system, while avionics and aircraft upgrades are considered more cost-effective. The current B-52 ECM suite, including the ALQ-172(V), will probably remain in service for the life of the bombers still in the active inventory.

During the Persian Gulf War, the old bombers served well, dropping heavy loads of conventional bombs on Saddam Hussein's Republican Guards with devastating effect. No bombers were lost to enemy missiles or anti-aircraft guns. They were also used as cruise missile launch platforms during Operation Desert Fox, the December 1998 attack on Saddam Hussein's facilities for weapons of mass destruction. The bombers have carried a heavy load during the war on the Taliban and al Qaeda forces in Afghanistan.

The Air Force is evaluating a variety of structural and engine upgrades and enhancements for the B-52. As a result of problems identified during Operation Desert Storm – limits in quadrature coverage, adding a third ALQ-172(V) to the B-52 was evaluated.

The ALQ-172(V)3 selection for the Special Operations C-130 variants, the MC-130E/H and AC-130U, validates the system's combat-proven reputation. The number of systems in operation and the priority of the Special Operations aircraft will support an ongoing spare parts and repair services market for the foreseeable future. Over 6,000 LRUs have been delivered.

The ALQ-172(V)2 continues to be updated, with the changes driven by Special Operations and conventional bombing mission requirements.

The Special Operations aircraft have been a major asset in Afghanistan. The number of units fielded will sustain a small support market. No new system production is anticipated, because units are available from pre-procured stocks and retired B-52s and can be upgraded by adding low-band jamming capability and other enhancements. The GAO recommendations may prove valuable in helping the Air Force and USSOCOM to solve their modernization funding problems.

There are no plans to extend ALQ-172(V) availability into the Foreign Military Sales (FMS) arena.

Impact of the War on Terrorism. When terrorists attacked the nation on September 11, the idea that America was completely protected by oceans was shattered, the feeling that we knew what threats the nation faced evaporated, and the thought that there was time to prepare went out the window. The murderous attacks on the World Trade Center in New York City and the Pentagon in Washington sent shock waves across the nation and planners into overdrive.

First came rescue and recovery, then retaliation, protection of the homeland, and eliminating (to the extent possible) terrorism around the globe. This was followed by planning for the longer term effort of providing a homeland defense, while at the same time making sure the US military was ready to defend against the conventional threats and support the missions it faced around the world. Budget restraints were lifted, and Congress appropriated US\$40 billion in emergency funds, twice what the President requested. Planners began to evaluate how to best spend the defense money.

It was not possible to make many changes in the FY02 budget, so changes would be more prominent in future cycles, beginning in FY03. The attacks revealed a need for prioritizing that could end up with some efforts

being found less important and not as time-critical as once thought. Weaknesses in intelligence and homeland protection could result in significant amounts of money being diverted from DoD accounts to the budgets of agencies like the NSA, CIA, and FBI, or to meet the protection needs of local governments. Instability and uncertainty may characterize defense spending over the next few years.

In the longer term, program uncertainty is greater. Besides the possibility of programs being found irrelevant, ill-timed, or unnecessary, a budgetary ripple effect could result in the delay or even demise of some programs. The early emphasis on intelligence, homeland defense, and Special Operations equipment may result in some more strategic or conventional combat weapons programs being revised. Major weapons programs, naval systems, and some heavy ground weapons are vulnerable. Light, mobile systems are favored, boding well for the Army's transformation, and some "black" budget items for intelligence and counter-terrorism will surface.

The *Quadrennial Defense Review 2001* was delivered to Capitol Hill on September 30, 2001. Unlike previous reviews, this *QDR* made no specific recommendations on force size or procurement numbers for any particular weapons system. These recommendations would be generated by ongoing reviews and studies aimed at providing strategic guidance for the future.

These studies will have a direct impact on individual programs and projects over the next decade and beyond, but will not have much influence until the FY03 and FY04 budgets. FY02 was in the final stages on Capitol Hill and guidance for FY03 had already gone to the Services. This could be adjusted, but the most impact on budget planning will be felt in FY04 and beyond. Besides dealing with ongoing plans, these budgets will contain adjustments needed to get programs hit by emergency cuts and delays back on track.

Projecting exact changes in development, production, etc., is difficult at this early stage. There are too many unknowns and uncontrollable variables to make firm plans. At this stage, understanding the various influences and possibilities is more important than trying to predict what will happen. This makes it possible to better understand the implications of the rapidly changing operational situation for specific programs.

The intensity and duration of the anti-terrorism conflict will determine how much defense money will have to be diverted to meet operational needs and for how long. Some programs will need to be enlarged and expanded and some deferred or ended. Moreover, upgrade programs will be initiated and new developments started. Anti-terrorism operations and an emphasis on

homeland defense (such as Combat Air Patrols over selected US cities) will increase spare and repair parts requirements. This will in turn increase the percentage of defense funding for Operations & Maintenance.

By the end of 2001, the bipartisan spirit on Capitol Hill was beginning to crumble as lawmakers began looking to the 2002 elections. Partisanship became a part of the debate, with political posturing becoming more significant, even though there was a fine line to be walked between criticism which could hinder the war and scoring political points against the opposition.

The Senate went so far as to invoke a seldom-used parliamentary maneuver to block legislative moves by the House during the House/Senate conference on the FY2002 defense appropriations bill. Without Senate Rule 28 being enforced, House Members and party leaders could have inserted forgotten legislation and earmarked hometown projects into the bill without having to go through a House Floor vote. This tactic saved what can sometimes be a time-consuming part of the appropriations process that could have made it impossible to send the two-month-late bill to the White House for signature.

It also helped short-stop items that could have pushed the bill over the top-line limit that the President said would cause him to veto the bill. As a result, the FY2002 Defense Appropriations bill cleared Congress just days before Capitol Hill recessed and left town for Christmas.

A major wild card is the economy. There were conflicting indications as to whether the fiscal health of the nation would improve or not. More than anything else, this would be the biggest determiner of how much support Congress could give to the Department of Defense and support of Homeland Defense over the next few years.

The economy will also be the main source of Congressional squabbling, with defense budget requests getting caught between the partisan bickering and posturing for the mid-term elections (with a major push to ensure control of the House and Senate consuming both parties) and a lack of funding. The Congressional Budget Office is saying that the Bush tax cuts enacted in 2001 did not help the economy as promised, Capitol Hill did not pass an economic stimulus bill before the end of the first session of the 107th Congress, and the surpluses left by the last administration are gone.

This came as the war in Afghanistan appeared to be winding down and calls for funding of the war against terrorism less vocal, releasing the pressure to control partisan urges. Republicans are digging in on tax cut issues, while Democrats are trying to make political hay

with calls for increases in funding for domestic programs, homeland defense, and health care. The Pentagon made plans to ask for a US\$20 billion-plus increase in FY03.

It does not take a rocket scientist to figure out that something is going to come up short, and defense issues are at risk. Under the best of circumstances, defense requirements will have to compete with funding for civil agencies and airport security, an intelligence overhaul (some experts say a re-do may not be needed and would be very costly, and that capitalizing on many

current programs would be better). A new type of congressional earmark (pork) is likely to emerge – funds for district-specific security projects. All if this will impact the defense top line for years to come.

Because Special Operations were showcased in Afghan operations, anything having to do with USSOCOM and AFSOCOM will likely see increases rather than cuts. Many other programs could be tapped to fund all manner of upgrades and acquisitions. Just what will be sought is to be determined, although system upgrades can be expected to be high on the agenda.

Ten-Year Outlook

No further production planned.

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