

APQ-166

(B-52 STRATEGIC RADAR)

ORIENTATION

Description. Terrain-following and mapping radar.

Sponsor

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Contractors

Westinghouse Norden Systems
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Status. In service, ongoing logistic support.

Total Produced. An estimated 264 radars were upgraded.

Application. B-52G/H.

Price Range. Unknown.

TECHNICAL DATA

Design Features. The Air Force upgraded the performance and reliability of the terrain-following and mapping radar used on the B-52, extending the useful life of the aircraft. A series of evolving improvements to the B-52 force includes various radar modifications.

The Offensive Avionics System (OAS), improved the performance of the B-52G/H bombing navigation system, reduced avionics system support costs, and integrated a cruise missile carriage. This included a reliability modification to the forward-looking radar as well as an improved heading system, integrated controls and displays, a high-accuracy inertial navigation system, digital processing and a new data bus, and a new doppler and radar altimeter. Six production lots of the modified radar resulted, significantly affecting field performance in the B-52.

The Strategic Radar Update (SRP) met the need for a radar update. The radar had been one of the major

contributors to an unsatisfactory daily B-52 operational readiness rate. The number of planes considered fully capable had decreased nearly 20 percent since 1979 – prior to the update. The SRP update was a restructured effort based on the original Electronically Agile Radar (EAR) program (PE 63241F), designed to eliminate reliability, maintainability and supportability problems related to the B-52.

This update replaced 1950s vacuum tube technology with the fully digital APQ-166 strategic radar system. Its eight modules replaced more than 50 units from the old analog system. Norden's two new digital LRUs replaced 14 separate units and provided all processing for simultaneous ground mapping, terrain clearance and navigation. Boeing upgraded the radar's original antenna and provided new interface and display hardware. The update was fielded on 167 B-52Gs and 96 B-52Hs.

The upgraded radar kit modification improved inertial navigation system and cruise missile alignment. The modification resulted in more reliable terrain avoidance and ground-mapping capabilities. Reportedly, the new digital radar was over four times more reliable than the analog radar it replaced.

Operational Characteristics. The Conventional Standoff Capability (CSC) improvement added new operating modes. Sixty-nine B-52s were given the capability to attack precision targets from outside surface-to-air missile (SAM) range. It incorporated three main features into the standard radar. One included two types of Synthetic Array Radar (SAR) processing. The Standard SAR is used against land targets using the motion of the B-52 to emulate a large sensor aperture. Inverse SAR (ISAR) techniques can be applied to ship detection, using the movement of the target to generate a large aperture.

Ground-moving target indication will be the third feature. Up to 69 B-52s affected by this radar modification could be used in a conventional reconnaissance/ strike role.

The ongoing modifications produced a radar which enhanced the aircraft's survivability and improved the overall capabilities of the B-52. It made it possible to launch cruise missiles.

VARIANTS/UPGRADES

There are no specific variants. The radar has been upgraded significantly through its life.

PROGRAM REVIEW

Background. Due to the age of the B-52 bomber force (the last B-52s were produced in 1962), and the lack of a replacement bomber at the time, the Air Force began several programs during the late 1970s to upgrade the Offensive Avionics Systems (OAS) of the B-52. The EAR was developed under PE 63241F, and flight tests were completed in FY80.

During FY81, initial fabrication and laboratory testing of the selected radar modifications began. Integration and testing were completed in FY82 on Block One software for the OAS and Phase B software for the Air-Launched Cruise Missile (ALCM). The first B-52G squadron, modified with the OAS and ALCM, became operational in December 1982. In FY82, initial full-scale engineering development was completed on the Strategic Radar Update.

In FY83, Boeing selected Norden to equip the radars with new processors and video generators. Procurement of kit proof assets and accelerated procurement of antenna components began in FY83.

OAS Block Two software development continued through FY84. This portion of the update included deficiency corrections and improved ALCM capabilities.

In FY84, component SRP qualification testing was completed. The updated radar package was installed onboard the flight test aircraft and integrated with other modification upgrades for flight testing.

In July 1984, Boeing was awarded a US\$105 million contract for the first production lot of the updated digital strategic radar for the B-52G bombers.

Lot 6 production for the OAS system was completed by the end of FY85. Production of SRP Lots III and beyond began in FY86. By that time, the first B-1Bs were becoming operational.

FY86 was the last year of research and development funding for the B-52 Strategic Radar. The first B-52s equipped with the Strategic Radar Program Upgrade rejoined the operational fleet in early 1987. By mid-1986, kits were being produced at the rate of six per month (three or four B-52Gs and two B-52Hs). The Air Force completed upgrading its B-52s by December 1990.

USAF Bomber Roadmap. On 17 June 1992, 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 being freed from the demands of nuclear deterrence, the Air Force would concentrate on conventional capabilities and the rapid response to regional threats.

Under the new plan, the B-2 Stealth bomber would become the main penetrating platform, assigned the most demanding missions. Low-level penetration will be a major tactic of the Stealth bomber as it makes direct attacks on targets in high-threat target arenas. The B-1B would be either a penetration or standoff platform, adding mass and precision to composite strike packages. The B-1B will be assigned targets in low- to medium-threat arenas.

All B-52Gs were retired by the end of FY94. An enhanced fleet of B-52Hs will be used to launch standoff weapons and attack low-threat arenas. New weapons capabilities and modified avionics will adapt the operational aircraft to the totally conventional role they will be assigned. There were no radar upgrade plans announced.

The Air Force plans to draw down to 40 B-52H PAA (Primary Aircraft Authorized - 32 combat coded, 8 training) and 30 Reconstitution Reserve H-model aircraft.

Funding

US FUNDING

	FY94		FY95		FY96 (Req)		FY97 (Req)	
	QTY	AMT	QTY	AMT	QTY	AMT	QTY	AMT
Procurement (USAF)								
B-52 Mods	-	37.4	-	33.3	-	4.9	-	10.0

NOTE: Radar upgrades are now a very small portion of the B-52 funding requested. Most work will be interfacing and integrating the radar with the new conventional weapons systems.

All US\$ are in millions.

Analysis. The B-52 has served the Air Force well for over three decades. The avionics capability grew constantly as the life of the airframe was extended and the mission of the B-52 changed to accommodate new missions. The current radar bears no resemblance to the original system. The B-52 strategic radar is not the latest technology, but it has performance capabilities matched to the airplane's mission and abilities.

The War in the Persian Gulf reestablished the use of a high-altitude conventional bomber to drop large amounts of high explosives on large area targets. The Air Force's Bomber Roadmap capitalized on this by

Timetable

Dec	1976	SAC ROC 6-75 approved Electronically Agile Radar
Jan	1980	Advanced development of Agile Radar complete
Oct	1981	Radar Update RDT&E model delivered
Mar	1984	Radar Update flight testing completed
Jul	1984	Contract award for Strategic Radar Program
	FY85	Start aircraft modifications
	FY90	Completion of radar upgrades
Jun	1992	Bomber Roadmap released
	1994	Have Nap capability, B-52G retirement
	1997	Conventional weapons upgrades complete

assigning the B-52H force to this conventional role in a low-threat regime.

Since the B-52 will be primarily a high-altitude bomber and stand-off weapons launch platform, there is little need for another major radar upgrade. Most of the work has been done to the rest of the avionics suite and is now developing a new weapons capability. Weapons release is based on a variety of inputs. As software capabilities increase, some new updates can be expected through the turn of the century.

Recent Contracts. No recent DoD contracts over US\$5 million recorded.

WORLDWIDE DISTRIBUTION

The B-52 is a US only aircraft.

FORECAST

Rationale. The APG-166 radar serves the veteran B-52 long-range bomber well. Various modification programs are extending the B-52 Stratofortress's service life and changing its mission profile. No major radar upgrades are planned.

The support need has been reduced as the bomber inventory is trimmed to accommodate budget reductions. Bomber debate now focuses on the B-1B and B-2.

Ten-Year Outlook. There will be no further production.

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