

ON TARGET MODELS

1/72 SCALE SCUD AND M1M-104 PATRIOT

SS-1 SCUD/AL HUSSEIN MISSILE

The missile labelled by NATO as the SCUD is a Soviet design known as the R17E and labelled in the West as the SS-1 SCUD. It is categorized as a TBM or tactical ballistic missile. This liquid-fueled missile is mobile and transported on an eight-wheeled MAZ-543 transporter which serves as its erector and launcher (TEL). Control is by moveable fins with command from a simplified inertial-guidance system. Early models were transported on obsolete tank chassis.

The first upgrade to the SCUD B model was deployed to the field in the mid-sixties. Although it is no longer used by the Soviet Union, it was sold in numbers to all Warsaw Pact nations and to Egypt, Iraq, Iran, Libya, North Korea, South Yemen, and Syria. It was first used in combat during the 1973 Arab-Israeli war by Egypt. Then it was used by both Iraq and Iran during their eight-year war when both sides used it to terrorize the other's capital.

Initially the SCUD B had a range of 100-180 miles with a conventional warhead. Since Iraq wanted a missile with the range to hit Tehran, they modified their missiles. With the help of foreign specialists they modified the SCUD into two longer-ranged versions, the Al-Hussein and the Al-Abbas with ranges up to 400-600 miles.

The missiles measure out at 2'9" diameter, while their lengths vary according to the particular models. The SCUD B is generally acknowledged to have a length of 37'4" (11.4m). With its primitive guidance system its

accuracy is roughly a half-mile radius around the target. Part of this is due to the primitive aerodynamics of the missile which the guidance system cannot compensate for in flight. The modifications to the Al-Hussein and Al-Abbas consisted of lengthening the fuselage to accommodate more fuel. Since the rocket motor only had so much thrust, the greater the fuel load, the smaller the warhead that could be carried. The lengthened fuselage also increased the drag which made its accuracy even more speculative.

With the outbreak of war by the United Nations Coalition against Iraq, Iraq began to launch these missiles against Israel and bases in Saudi Arabia. With such poor accuracy they could only be considered terror weapons unless they carried nuclear, biological or chemical (NBC) warheads. The real fear was that Iraq would use NBC warheads against Israel in an effort to draw them into the war, and Israel's retaliation would serve to destroy the Arab unity in the UN Coalition. This did not come about because of political pressure on Israel by the United States, and also because of the US supplying defense hardware such as Patriot missile systems and the effectiveness of those systems.

An estimated force of 300 modified SCUDs were on hand with a 400-500 mile range. When the air war started, the TELs were a primary target. Initially, it was believed that Iraq had procured only 45-65 TELs, but that soon proved to be wrong, as the TELs could easily be built in-country. It was also believed the TELs would

provide an easily-detected target because of the hour-long refueling/targeting/launching procedure. It was thought that the IR signal from a SCUD being refueled would be detected by IR satellites, but the Iraqis took to using special insulated refuelling tankers to mask the IR signature. The first SCUDs were launched against Israel on the second night of Desert Storm, which began on January 17, 1991. During the first 24 hours, 7 SCUDs hit Haifa and Tel Aviv, followed by three more the next day. By the end of the war, 81 SCUDs had been launched; thanks to the Patriot missile system, most had little effect.

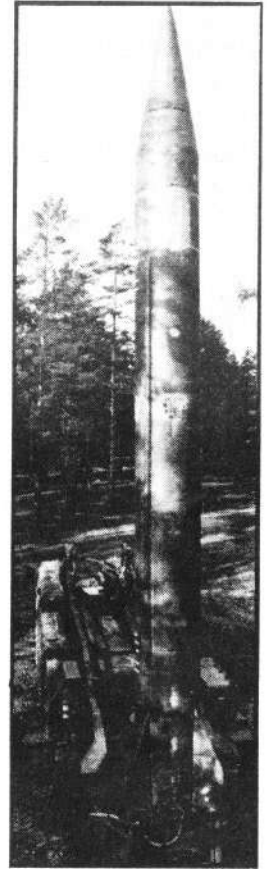
The greatest number of casualties occurred when a SCUD was either hit by a Patriot or broke apart in mid-flight, its intact warhead falling on an American barracks in Dhahran, Saudi Arabia. Twenty-eight Americans died as a result of this attack. Although Syria was a coalition member, it took the \$2 million it received as part of an aid package to partake in the operation, and immediately purchased advanced SCUDs from the Chinese. Syria had developed its NBC capabilities in parallel with Iraq and lies within easy targeting range of Israel.

M1M-104 PATRIOT

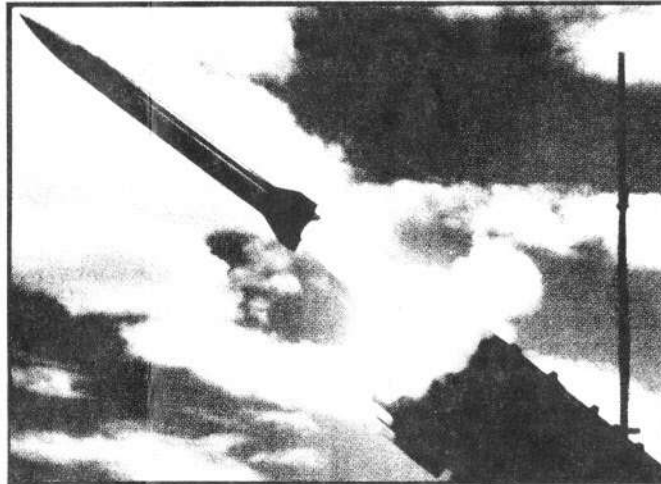
The original specification for the Patriot (then known as the SAM-D) missile was laid down in 1965, and was to provide for an aircraft intercept and destruction system. Due to the complexity of its system, (the software necessary to allow Patriot to intercept TBMs consists of over 1,000,000 lines of programming), it was not ready for operational deployment until 1980. Raytheon, its developer, developed a modified software program known as PAC-1 which was intended to allow the Patriot to defend itself against incoming short range ballistic missiles. PAC-2 was also successfully tested in 1987. The targets used in the tests were Lance and other Patriot missiles. Further anti-missile refinements included other software changes, a new warhead and fuzing system changes to make the already-difficult intercept more likely to be successful.

Israel had negotiated for the purchase of Patriot batteries, but the deal was postponed. After Israel suffered her first SCUD attacks, the US dispatched units from Germany in defense of Tel Aviv. Additional Patriot brigades from the 11th Air Defense Artillery Brigade were deployed to defend the forces of Desert Storm. Each battery consisted of 85 personnel, MSQ-104 engagement control station, MPQ-53 phased array radar, MJQ-24 power plant and 5 to 8 four-tube launchers. Two Air Force missile warning spacecraft were maneuvered into geosynchronous orbit over the Equator, 2,700 miles south of Iraq, each with a 12 foot infrared telescope that viewed Iraq every 12 seconds. The system was able to detect 166 SCUD launches during the Iran-Iraq war, but the short (7 min.) duration of the SCUD flights during Desert Storm didn't allow enough time to disseminate all the information of the launch and track. However, it did allow about ninety

seconds warning of the inbound missiles, which was relayed to the ground units. Even with this short of a warning, the Patriots were able to track the SCUDs. The PAC-1 upgrade allowed the radar to track from just under 45° to about 90° overhead, and quick IFF and tracking analysis allowed the Patriot system to determine if the missile was an immediate threat or not. In the event of confirming a threat, the command center launches two Patriots to intercept at the best predetermined point. The radar continues to feed information to the Patriot until the missile locks on to the reflected signal from the TBM, homes in and detonates. While a direct hit is preferable, the warhead breaks into large fragments, each hitting the target with the impact of an automobile hitting a brick wall at 80 mph. If the missile had been determined to overshoot its target, the command center ignores it-in one attack on Riyadh, Patriots knocked down all 9 SCUDs engaged, and let others fall into the Gulf. In an interception, the difficulty increases with the speed of the incoming target. A TBM increases its reentry speed as a direct function of range. The A-Hussein reached speeds of Mach 6 on reentry. The Patriot has a speed of Mach 3, so the processing and command must be very quick and accurate. The SCUDs were picked up on radar at 100 mile out and would be engaged at 10-20 miles, and up to 100,000 feet. The Patriots would be launched to allow a flight time to intercept of only 15-18 seconds, making the kill 10-30 km from the launcher with closing rates on the order of 2,000-4,000 feet per second. The system is usually run automatically, but 20-30% of the intercepts during Desert Storm were done while in the manual mode. New software is now being developed to allow Patriot to intercept smaller and faster targets. The newest update could be fielded within three years. The success of the Patriot during Desert Storm caused a flurry of purchase inquiries from other nations. At a going rate of \$500,000 to \$1,000,000 per missile, it's not cheap.

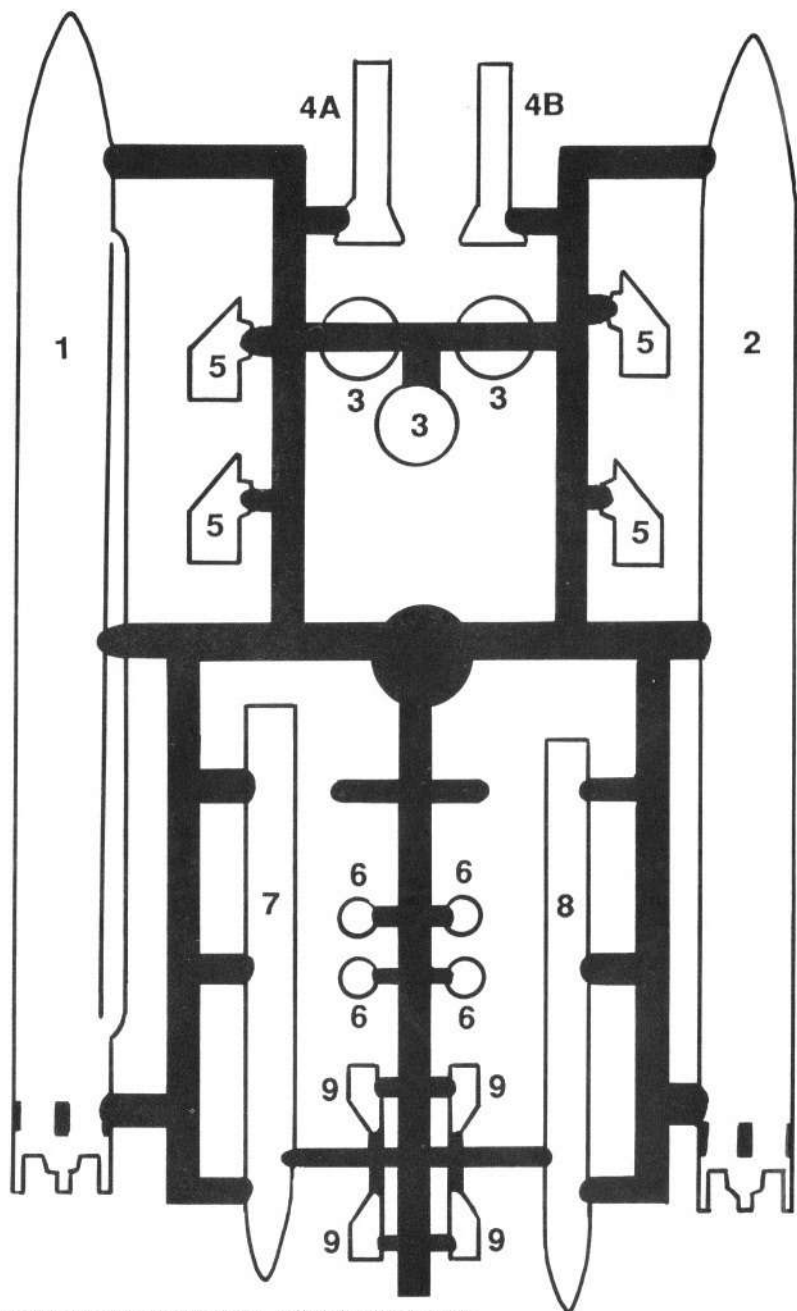


▲ SCUD MISSILE IN LAUNCH POSITION ON MOBILE LAUNCH VEHICLE (TEL)



▲ PATRIOT MISSILE LEAVES ITS LAUNCHER. NOTE THAT THE BOX-LIKE LAUNCH TUBES ALSO FUNCTION AS SHIPPING CONTAINERS.

Wash all parts in warm soapy water before removing from sprue! Use care in cutting parts from sprue—a razor saw is recommended to avoid damaging parts.



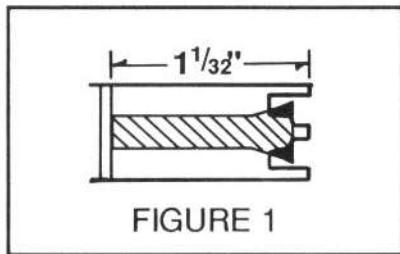


FIGURE 1

ASSEMBLY INSTRUCTIONS

Remove bulkheads (3) for SCUD from sprue and sand to fit inside missile body halves. Position and glue engine bulkhead in position (see Figure 1). Insert two remaining bulkheads and glue body halves together. Glue engine halves (4A/4B) together and insert in bottom of missile, taking care to center it on the bulkhead. Add fins (5) to body. Sand, fit, and glue bulkheads (6) into Patriot halves (7/8) and glue halves together. Add fins (9). Assemble stand according to exploded diagram. Use only cyanoacrylate-type glue on metal parts. See painting information for proper finishes for missiles.

SPECIFICATIONS:

Patriot missile Length: 17' 5" Diameter: 16" Fin span 3'
Launch weight: 2,195 lbs. Speed: Mach 3 Range: 42 mi.
Ceiling: 72,000 feet. Warhead: 221 lbs. fragmentation

SCUD missile Length: 37' 4.75" Diameter: 2'9" Launch weight: 14,043 lbs. Speed: Mach 6 at 400 miles. Range: 174 miles with conventional warhead (400 mi. for Al-Abbas). Warhead: 1,892 lbs., less on Al-Abbas/Al-Hussein variants.

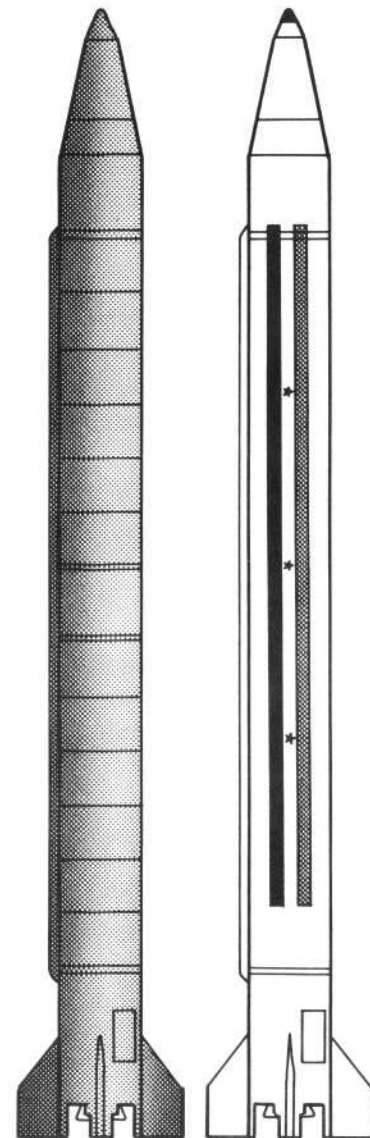
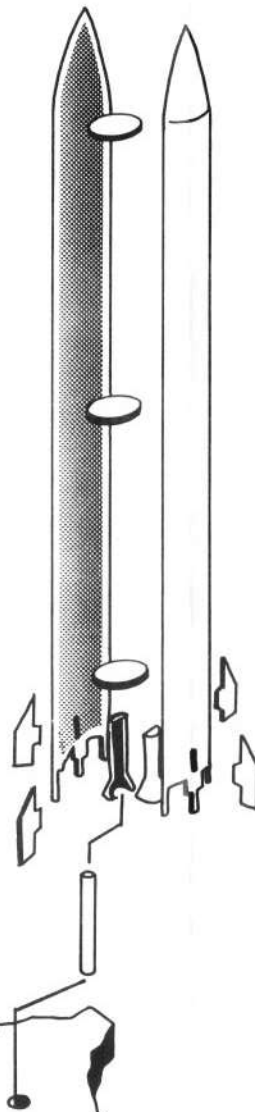
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SCUDs on military display were seen to have been painted overall white with an Iraqi flag running along the side of the missile. Operational missiles were likely finished either in Soviet armor green (as delivered) or more appropriately in a sand or khaki finish for better camouflage. Patriot missiles are finished in overall greenish olive drab, with a translucent white nose cone.

