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Iraq War Note: Iraqi Air Defenses and the Battle of Baghdad
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April 1, 2003

The exact strength of Iraqi ground-based air defenses is still unknown, but it is clear they have suffered badly from nearly two weeks of bombing. The four regional air defense centers at Kirkuk (north), Kut al Hayy (east), Al Basra (south), and Ramadia (west) and other major command facilities are underground and hardened. Additionally, there are network of redundant radars and optical fiber command links. Nevertheless, US officials indicate that much of their capability has been sharply degraded and much of their long range radar coverage and ability to characterize US-UK-Australian air operations has been lost.

Some elements of their highly survivable optical fiber command net do remain, and some parts of the air defense system are virtually impossible to destroy. Iraq's heavy surface-to-air missile forces are backed by some 6,000 low-altitude anti-aircraft (AA) guns, and thousands of SA-8b, SA-11, and SA-13 short and medium range missiles – some mounted on vehicles and some man-portable. The Strela 2 and 10 (SA-7 and SA-13) are used for terminal defense of key buildings. Iraq has learned to rapidly move its fire units and sensors, use urban cover and decoys, use “pop-on radar” guidance techniques, and optical tracking.

What is far less clear is that the National Air Defense Operations Center (ADOC) in Baghdad can now do more than control the city's ring of air defenses – if that. The ADOC was designed to maintain the overall air picture and provide Baghdad with information on the course of the air battle. The five Sector Operations Centers (SOCs) covering the north, west, center-east, southeast and far south, which established priorities for air defense engagements, have also probably been severely degraded in capability as well as their links to the ADOC, in ability to control air defense operations in a specific geographic area, and in the level of control over the large numbers of ground-based weapons systems and extensive BM/C4I/SR assets in each sector.

The level of damage to the large number of Intercept Operations Centers (IOCs) designed to provide local air defense control is less clear, but all seem to have been targeted. They had headquarters at Ar-Rutbah, H-1, and H-3 in the West; Mosul and Qayyarah in the north; Al-Taqaddum, Salman Pak, Al-Jarrah, An-Najf, and An-Nukhayb in the center-east; Al-Amrah, As-Salman and Az-Zubayr in the southeast; and Al-Jahrah in the far south. These systems were linked through an extensive optical fiber communications net, and used a TFH 647 radio relay system, a TFH tropospheric communications system, and a large mix of radars supplied by the Soviet Union. Nevertheless, the scattered reports on bombing indicate that all have been hit and many are probably no longer effective.

What is not known is the extent to which Iraq dealt with the poor capability of the SOCs to communicate effectively with each other once the ADOC was destroyed or deactivated. This may mean that the Coalition could attack and/or overwhelm each sector in isolation from the others. During the last Gulf War, the destruction of a given SOC effectively opened up a corridor that could be used to attack the entire country.



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There is no expert consensus on Iraq's land-based air defense assets and air defense system at the start of the war, or on Iraq's holdings of surface-to-air missiles. In late 1998, Iraq retained 130-180 SA-2 launchers, 100-125 SA-3 launchers, 100-125 SA-6s, 20-35 SA-8s, 30-45 SA-9s, some SA-13s, around 30 Roland VI, and 5 Crotale surface-to-air missile fire units. The army operated some of these systems. In addition, Iraq had well over 2,000 manportable SA-7s and SA-14s, and some SA-16s.

The impact of Desert Fox and the years of strikes enforcing the No Fly Zones is unclear. Some estimates claimed a 25% degradation before a new round of intensive strikes began at the end of 2002. Other sources claim that 30% of the radars and major surface-to-air fire units in the south had been destroyed between the time Desert Fox was carried out in December 1998 and the start of the war, and 15% in the north.

The Organization of Iraq's Air Defense Assets

Some broad details are known about the structure of Iraqi forces at the start of the fighting. The key C4I/BM/ISR targets included a Headquarters Center, Air Defense Operations Center, and Air Defense Military Intelligence facilities in the Baghdad area, plus four Sector Operations Centers (SOCs) and an independent SOC to protect Saddam's palaces and key Republican Guards and security operations.

Iraq's ground-based defenses remain concentrated around Baghdad, Basra, and Kirkuk, as they were during the pre-war period. Iraqi territory is too large to attempt territorial defense, and Iraq has always concentrated on defending strategic targets, and deploying air defense zones to cover critical land force deployments.

These regional forces included:

- The 1st Sector Operations Center is at Taji Military Camp in Northern Baghdad and covers central and eastern Iraq and the greater Baghdad area. While locations change, Jane's reports that it has two missile brigades near al Dorah and at al Habaniah with a total of 10 SA-2 batteries and 6-9 SA-3 batteries, plus a range of independent batteries with SA-2s, SA-3s, SA-6s, Rolands, and possibly captured IHawks. It has four early warning radar regiments and an ECM unit.
- The 2nd Sector Operations Center covers western Iraq and is located near H-3 (al Waleed) air base near the Jordan border. It covers the Syria border, the Mosul area, and northern Iranian border. It has a brigade with 4 SA-2, 6 SA-3, and some SA-6 batteries, a Roland battalion, ZSU-23-4 and other AA gun unites, and an early warning radar unit.
- The 3rd Sector Operations Center covers southern Iraq and is located in Imam Ali Airbase near Nasseria. It covers the Saudi, Kuwaiti, and Jordanian borders and the southern Iranian border. It has at least one missile brigade and AA gun unites, plus an early warning radar and control unit.



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- The 4th Sector Operations Center is headquartered at al-Hurriya Airbase near Kirkuk. It defends Mosul to the north, the Iranian border to the east and the al Jazirah area in the west. It has at least 4 SA-2 battalions.

Iraq also has an independent SOC based in Baghdad to defend the palaces, Republican Guards, and key security facilities. It has SA-2, SA-3, SA-8, SA-9, SA-11, and Roland batteries, plus SA-7s and SA-14s. The SRG and Republican Guards have independent batteries.

Iraq redeployed some missiles before the war to create surface-to-air missile "traps" near the "no-fly zones". These traps were designed to attack aircraft with overlapping missile coverage when they attacked launchers deployed near the no-fly zones. While such Iraqi efforts seem to have failed, and some of these units seem to have been brought back into the Baghdad area before the war, it is not clear what portion survive or what other detailed redeployments Iraq has made in recent days and weeks.

Iraq's Other Capabilities

Iraq's air defense C4I system had a wide range of radars, including Soviet Spoon Rest, Squat Eye, Flat Face, Tall King, Bar lock, Cross Slot, and Thin Skin radars. Iraq also had Soviet, Italian, and French jamming and electronic intelligence equipment. There is no way to know how many of these radars in Iraq's underground command and personnel shelters survive, but it seems likely that at least some survived.

Iraq has developed some crude countermeasures to US AGM-88 HARM anti-radiation missiles since the Gulf War, and has recently begun to get significant equipment through Syria. This may include more advanced radar guidance kits for the 2K12 (SA-6 missile). There have been dubious claims it has acquired equipment to jam the GPS guidance systems. In US aircraft and munitions, there are more credible claims Iraq has mounted some of its SA-3s on rotating launchers on trucks to give them some mobility. Reports of more advanced Czech and Ukrainian radar deliveries are possible but the details are unclear.

Iraq also still has massive numbers of AA guns and many manportable and light surface-to-air missile launchers. These are not valuable against US aircraft flying at high altitudes and launching JDAMs or longer-range systems. They should not, however, be dismissed. They have shown they can be very effective against helicopters and may prove more effective against low flyers in close air support as the battle of Baghdad progress. The AV-8B could be vulnerable, and even the "armored" A-10.

Iraq's Warfighting Capabilities as of April 1st

Coalition briefings indicate that the air defenses of cities outside Baghdad are now of limited effectiveness, and non-stealth aircraft can now operate far more freely even in the periphery of Baghdad. It is unclear, however, that normal fighters and attack helicopters are able to operate over Baghdad proper, or its inner defenses without serious risk.



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The Republican Guards and other combat units are evidently taking significant losses to their short range air defenses, possibly including some mobile SA-6s, but there is no way to quantify them.

As an informed guesstimate, it seems likely that most land combat units retain at least 50-75% of their prewar AA guns and some 40-60% of their SAMs. There are probably still significant numbers of SA-6s in the Baghdad area that can fire suddenly on a target of opportunity basis by using optical trackers and pop-on radar and some SA-2 and SA-3s.

As a total guesstimate, there may be 20 SA-8s, 30 SA-9s, some SA-13s, and around 20 Roland, VI and 5 Crotale surface-to-air missile fire units in the Greater Baghdad area. In addition, Iraq probably retains at least 1,000 manportable SA-7s and SA-14s, and some SA-16s.

Key Weapons Units

SA-6: A tracked armored launcher with a three-missile rail and self-contained radar. It has semi-active radar homing and a TV/optical seeker. Max speed: Mach 2.8, max effective range: 24-28 kilometers, min. effective range: 3-3.5 kilometers. Max effective altitude: 14 kilometers. Warhead: 59 kg HE fragmentation with contact and proximity fuses. Reload time, 10 min. Deployment time for Combat: 5 minutes Reaction Time: 20-22 seconds between target detection and missile firing. Fire control radar has a maximum range of 55 - 75km and a 10,000m-altitude capability depending upon the conditions and target size. The long track radar that moves with some units can detect and acquire targets out to 150 kilometers.

SA-7: An aging manportable missile with a slant range of about 4.2 km, a ceiling of about 2300 meters, and a speed of about 500 meters per second (Mach 1.75). It is an IR-guided tail-chase missile system, and its effectiveness depends on its ability to lock onto the heat source of low-flying fixed- and rotary-wing aircraft targets.

SA-8b typically has two BAZ-5937 resupply/transloader vehicles, carrying 18 missiles each (boxed in sets of three) that supports a battery of four launch vehicles. A target can be brought under fire both with one missile as well as a volley of two missiles. The SA-8b or GECKO Mod 1, introduced in 1980, is mounted in a rectangular launch box and incorporates improved guidance and higher speed providing an increased maximum range of 15000 meters. The warhead of both missiles is fitted with proximity and contact fuses, and the 19 kilogram warhead's lethal radius at low altitude is about 5 meters. The system reload time is five minutes, and combat deployment time is four minutes with system reaction 26 seconds. The conical-scan fire control radar has a maximum range of 35 kilometers and an effective range of around 30 kilometers against a typical target.

SA-9 is a short-range, low-altitude self-propelled SAM-carrying system on the BRDM-2 chassis. The vehicle carries quadruple SA-9 SAM launchers on a revolving mount. It uses an IR seeker and the minimum range is 560 meters and the maximum range 8000 meters (increasing to a



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possible 11000 meters when used in a tail-chase engagement) within altitude limits of 10 to 6100 meters. When engaging a head-on target the system has a considerably reduced range.

SA-13 is a short-range, low altitude SAM system. It has a maximum speed of Mach 2. It carries a 5 kg HE warhead and is fitted with either an improved passive lead sulfide all-aspect infra-red seeker unit, or a cryogenically cooled passive all-aspect infra-red seeker unit. The estimated minimum range of the SA-13 is 500 meters and the maximum effective range of 5000 meters with altitude engagement limits of 10 to 3500 meters. The launch vehicle has a passive IR detection system and range only radar, and carries four fire-ready missiles on a swivel launcher and eight reloads inside.

SA-14 is a man-portable the successor to the SA-7/SA-7b with a new seeker system. The enhanced seeker allows the SA-14 to be fired against targets from much broader angles, as well as defeating countermeasures such as exhaust shrouds. Optical filtration was added to the seeker to reduce vulnerability to typical IRCM flares. The warhead is nearly doubled in weight. The SA-14 has a maximum range of 4500 meters, and a maximum altitude of 3000 meters.

SA-16 is a man-portable surface-to-air missile system, which features a new seeker and employs an IR guidance system using proportional convergence logic, and an improved two-color seeker (presumably IR and UV). The seeker is sensitive enough to home in on airframe radiation, and the two-color sensitivity is designed to minimize vulnerability to flares. The SA-16 has a maximum range of 5000 meters and a maximum altitude of 3500 meters.

Roland is intended for anti-aircraft defense of armored and mechanized the units to counter aircraft flying to nearly Mach 1.5 and hovering helicopters. It is deployed on a tracked vehicle derived from the tank AMX 30, and comprises a radar with a range of 16 km, a sighting tube with an infra-red locator that measures the difference between the missile in flight and the line of sight of the fire control radar, and a computer antenna for remote control. Two arm-beams for launching carry each one a missile in its launching tube, and two ammunition stores. Three operating modes are available: optical mode; radar; and the optical mode recopy-radar or radar-recopy-optics. The missile is ready with the shooting inside its container (tactical packing), itself placed under the arms launchers of the tank. The vehicle has two missiles ready for firing and eight in the trunks. Maximum range is 6,000, and minimum range is: 700 to 2,000 m. Ceiling altitude is 5,500 meters Detection range is 16.5 kilometers.

Crotale is a mobile, all-weather, low-altitude surface-to-air missile designed to combat targets flying at a speed of M1.2 at an altitude of 50 to 3,000 m and an equivalent radar area of 1 m² with a maximum range of the missile is 8km up to 5000m altitude at the a speed of Mach 2.3. It is equipped with digital radio command missile line of sight to target line of sight.. A typical platoon consists of one Acquisition and Co-ordination Unit (ACU) and two to three firing units, with a battery having two platoons. The system cannot operate on the move, but takes less than 5 minutes to become operational once it has stopped.