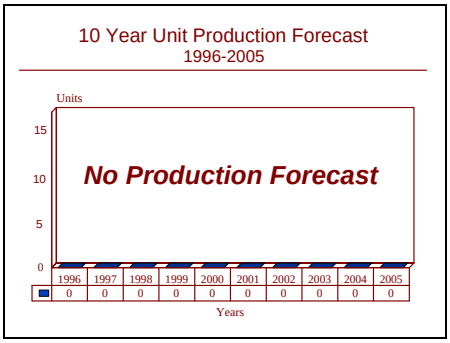
Fieldguard - Archived 8/97

Outlook

- In service
- Swiss plans for acquisition appear on hold
- Near term production eliminated
- Battlefield ESM capabilities limit utility of system



Orientation

Description. All-weather fire control system for field artillery and multiple rocket launchers.

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Licensee. Fieldguard is being produced under license in Turkey under the name Fireguard. Avibras of Brazil, which was offering a license-produced version of Fieldguard with its ASTROS 2 artillery saturation system, now offers a domestically developed command and control system, the VCC, that is able to provide fire control for up to three batteries at a time. The VCC, however, does not have a radar, so Avibras still apparently offers the Fieldguard for those customers requiring a radar capability.

Status. In service.

Total Produced. The German Army received a total of 80 Fieldguard Mark 1 radars during 1981/82. Fieldguard is known to be in use with six countries. Total production is reported to have terminated at 200 systems. Turkish production is large, with some reports indicating over 180 systems were covered by the original licensed production agreement.

Application. Fieldguard was designed to provide an all-weather artillery fire control system using trajectory measurement for aim correction. It is deployed on a wheeled or tracked vehicle or in a dedicated container.

Price Range. In 1982 a Fieldguard artillery fire control radar as delivered to the German Army was priced at US$1.25 million. By 1985 the quoted cost of Fieldguard was US$1.7 to 2 million. This suggests a current unit value of around US$3 million.

Technical Data

Characteristics

	Metric	US
Operating frequency:	I/J-band	
Azimuth accuracy:	1%, 0.5 degrees	
Range discrimination:	100 m	110 yards
Maximum range:	60 km	37.5 miles

Design Features. Fieldguard consists of a tracking radar, digital equipment, operator console, data transmission unit, weapons display console and power supply. The tracker radar operates in the J band (15.5-17.5 GHz) and can track through 6,400 mils in azimuth and -175 to +1,500 mils in elevation. For the rocket launchers the displayed information includes bearing, elevation, fuse time, pilot firing command, countdown, and effective firing command. For the cannon the displayed information includes: shell type, fuse data, charge, firing mode, rounds, fire density, countdown, azimuth, elevation, elevation jump, timing and timing leap. The complete package is housed within a shelter which can be moved by helicopter, truck or tracked vehicle.

Forward observers (FOs), battlefield surveillance radars, observation aircraft and other sources supply target information which is then stored in the fire control center (FCC) computer with display possible on a TV monitor or printer. After the FCC commander selects a target, the necessary data are sent to Fieldguard. Fieldguard's computer has a storage capacity of up to 50 different targets which are on tap at fingertip control.

Operational Characteristics. Fieldguard reduces the time interval between a request for fire support and the launching of the first fire-for-effect round by making corrections without the need for registration. This is achieved by tracking a "pilot" round for an average 70 percent to 80 percent of its trajectory. The tracking distance can be as low as 50 percent of trajectory with only a slight degradation in accuracy. Taking the information received, the impact point can be predicted. As many as six pilot rounds can be discharged to allow the calculation of a mean point of impact.

If desired, a self-destruct fuse is used for the pilot round to avoid alerting an opposing force that incoming fire is on its way. Because occasional problems have occurred with self-destruct fuses that use a timer, the pilot rounds can be fired at a known offset angle from the target line with a line switch for fire-for-effect. Fieldguard trials have shown that an approximate 75 percent reduction in time to fire from target acquisition is possible compared with traditional methods.

Forward Observer (FO) teams operate with portable target locating equipment linked to a radio set. The primary mission is to detect, identify and locate moving targets, subsequently sending the data to the FCC or straight to Fieldguard. A forward observer is not required when engaging stationary targets. The target locating gear is made up of a laser rangefinder, goniometer, and an electronic angle transmitter, all mounted on a tripod, with a cable connection to the artillery tactical terminal. The artillery tactical terminal is linked to a radio for data exchange.

Rather than depending on separate artillery meteorological sounding systems for atmospheric information, the Fieldguard radar tracks the pilot shot on its own line-of-flight. Fieldguard calculates the new and weather-corrected firing command by taking the difference between the calculated and the measured pilot round's point of impact. It does so individually for all the weapons in a battery/battalion and automatically transmits the commands to each cannon/launcher.

Fieldguard is capable of operating at regimental or battery level with one Fieldguard unit able to control up to 24 launchers/guns. One potential customer was interested in using the system with up to eighteen 155 mm guns. Because of Fieldguard's mobility, a number of fire zones can be covered by one unit. Upon the commencement of fire-for-effect, the Fieldguard unit proceeds to the next zone and duplicates the procedure for the next battery. One Fieldguard unit is needed per tube artillery battalion, but when using rocket artillery, one unit is needed per firing platoon.

The Fieldguard system is usable with tube artillery and also can be adapted to any rocket system such as the Brazilian ASTROS, the American MLRS, the Israeli LAR-110 and LAR-160, the Italian FIROS 25, the Spanish Teruel 2/3, etc., with ranges up to 60 kilometers. With tube artillery it can be used with guns of 105 mm caliber and in combination with all kinds of ammunition. Numerous test, comparison, and acceptance firings have been successfully carried out by NATO members and other countries' armed forces. When used in combination with light artillery rocket systems, the results demonstrated an improvement of over 50 percent in accuracy compared to conventional fire direction. Evaluation trials in 1983 were carried out by the US Army's Field Artillery School using Fieldguard in combination with M109A3 howitzers. Compared to conventional MET&VE procedures, the 135

missions (total of 1,500 rounds fired) showed a reduction of more than 50 percent in radial deviation.

Variants/Upgrades

With the introduction of Fieldguard Mark 2, Contraves achieved a substantially increased range of approximately 60 km. Since that time, artillery ranges have been creeping up and the range of Fieldguard Mark 2 is barely adequate to control the existing generation of rocket artillery systems.

Program Review

Background. Fieldguard was developed to improve the accuracy of the German LARS artillery rocket system which had failed to meet the specifications. Before starting on Fieldguard, Contraves examined problem areas commonly occurring during artillery fire - namely, why, all else being equal, fire-for-effect is ineffective. Contraves pinpointed three factors in such system error: target-location error, time-lag error and delivery system error.

Target-location error is a result of a forward observer or the unit calling in fire support providing incorrect plotting of a target's position, or because of a transmission error to the fire-control center of the target's coordinates, or due to target location apparatus problems. Contraves would solve this problem by making sure that the observer knew his exact location at all times and had a reliable way of forwarding data to the fire-control center.

According to Contraves, time-lag error is the time interval between detecting a target and the firing of the first firing-for-effect round. The longer the time interval, the more likely it is that the target will have shifted and new data will be required. Delivery system error, the third factor, can be separated into weapon and ammunition, meteorological and fire-direction errors, with meteorological mistakes being the primary source of error in this category.

By addressing these problems, Contraves came up with Fieldguard, which provided a threefold increase in accuracy. Also, the LARS system did not need to carry out complicated computer calculations on the basis of "safe" firing positions. Furthermore, up-to-date weather data were no longer required, and reaction time was cut markedly down to five minutes. In fact, improvements were so positive that only one rocket launcher in place of the usual three launchers was required per target area. The results of these trials induced the German Army to extend the use of the system to their tube artillery. Fieldguard was also briefly evaluated by the US Army.

The original Fieldguard Mark 1 system was introduced to service in 1981. It resulted in an immediate threefold improvement in the effectiveness of the rocket batteries to which it was assigned. Fieldguard Mark 2 was first announced in 1985 and features improved operational capabilities. The Royal Thai Army ordered the system in 1987, with the equipment being delivered in early 1989. It is believed a repeat order was placed in mid-1989 to provide radar fire control facilities for the Chinese 130 mm rocket launchers accidentally acquired as part of a major arms purchase. This order eventually failed to be ratified as a result of a priority re-alignment. Four other countries including Brazil and Turkey are known to have ordered the system. The most recently announced order for Fieldguard was placed in 1990 when Switzerland ordered the system to control fire from its field and fortress artillery.

During the Second Gulf War, the Iraqi Army was known to deploy Fieldguard as part of the rocket artillery battalions attached to the Republican Guard divisions. These were largely destroyed, in some cases when the Fieldguard emissions were detected by battlefield ESM equipment and served to locate the batteries to which they were attached.

Funding

Fieldguard was developed by Contraves under a German MoD contract in response to a German Army requirement.

Recent Contracts

No contractual information has been made publicly available.

Timetable

Early	1972	Development began
Late	1976	Development completed
	1978	Production began
Dec	1980	First firing trial with tube artillery occurred
Oct	1981	Firing trials completed
	1981	West German Army received Fieldguard
Nov	1983	US Army evaluated Fieldguard/M-109A3 combination
	1985	Contraves showed Fieldguard training simulator
		Fieldguard Mk 2 announced
	1986	Venezuela tested Fieldguard/LAR-160 combination
	1987	Austria tested Fieldguard/GHN-45 combination
	1987	Fieldguard ordered by Royal Thai Army
Nov	1988	Fieldguard Mk2 trialed by Swiss Army
	1989	Repeat order for Fieldguard from Royal Thai Army
	1990	Switzerland ordered Fieldguard

Worldwide Distribution

Brazil (Up to 24 systems used with 180 mm rocket launchers)
Germany (80 Fieldguard Mark 1 upgraded to Mark 2 status)
Iraq (Approximately 20 acquired, believed now destroyed)
Switzerland (50 systems reported ordered for field artillery to be followed by additional batches for rocket and fortress artillery units)
Thailand (Up to 24 system ordered in two batches)
Turkey (Up to 180 Fireguard systems)

Forecast Rationale

The importance of providing proper artillery fire control systems has been emphasized by the new generation of long-range 155 mm 52-caliber guns and multiple-launch rocket artillery. These guns range up to 40 km while the rocket systems currently reach out to 60 km. During the Persian Gulf War the Iraqi Army, while equipped with artillery of this performance, was unable to exploit the range and power of its guns and rockets due to very poor target acquisition and fire control technology. A standard coalition tactic for destroying the Iraqi artillery was to move guns quickly into position and loose off a salvo before the Iraqi guns could respond. This required artillery fire control of a very high order.

The conflict also exposed a significant weakness in the Fieldguard concept. The emissions from the radar provide a reasonably precise location fix to any hostile force with reasonably capable ESM equipment. Its use also tends to highlight the importance of the artillery assets being controlled. Both these effects expose the artillery assets in question to counter-battery fire. Where the hostile forces has excellent command control and can respond very quickly, the results are lethal for the Fieldguard-controlled batteries

Fieldguard is a highly specialized system. It will mainly be of interest to the more sophisticated armies or those who purchase the radar as part of an integrated system. However, in the current climate of financial stringency, systems of this type tend to be neglected in favor of equipment with higher priorities. This factor probably explains the lack of announced orders over the last three years.

Fieldguard is most effective when its acquisition is unannounced. Thus, we suspect that many contracts for the system remain undisclosed. As a result, determining the exact extent of Fieldguard use is made difficult by Contraves' (understandable) regard for client confidentiality and by the extent of licensed production by Brazil and Turkey. There are considerable grounds for believing that Fieldguard production and users are greater than the six users totaling 135 sets officially admitted. States mentioned as possible purchasers include Argentina, Chile, Libya, Syria and South Africa.

Fieldguard has found particular favor with users of salvo rocket launcher systems. These are normally inaccurate and unduly responsive to weather conditions. Fieldguard can, in their case, make radical improvements in system accuracy. Fieldguard or its Turkish/Brazilian-built equivalents have appeared extensively in this connection. This includes some unexpected combinations, one of which is a reported Syrian use of the system to control Soviet-built BM-27 rocket launchers.

Although no new orders have been announced since the Swiss contracts, steady production of Fieldguard was forecast as a result of the major sales to the Swiss Army. Swiss plans to acquire additional Fireguard systems for rocket artillery and fortress artillery units appear to have been put on hold. This has caused us to effectively eliminate current Contraves production. This will impact upon the financial resources of Contraves and makes the once-planned development of Fieldguard Mark 3 improbable.

Ten-Year Outlook

**** No production is forecast ****

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