

ARCHIVED REPORT

For data and forecasts on current programs please visit

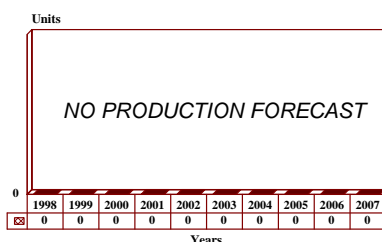
www.forecastinternational.com or call +1 203.426.0800

TIGER G/S (TRS 2105/06 & TRS 2100 Series) - Archived 8/99

Outlook

- Future Thomson-CSF sales will replace TIGER with FLAIR
- Believed to still be in service, but more probably replaced with more capable systems
- **THIS REPORT WILL BE DROPPED IN 1999**

10 Year Unit Production Forecast
1998-2007



Orientation

Description. Lightweight, high-performance ground environment air defense radar tasked with tactical low-level detection and including an integrated control station.

Sponsor

Thomson-CSF

Division Systemes, Defense et Controle
40 Rue Grange Dame Rose
PO Box 34
F-92360 Meudon-le-Foret
France
Tel: +33 1 46 302380
Telex: 270375

Contractors

Thomson-CSF

Division Systemes, Defense et Controle
40 Rue Grange Dame Rose
PO Box 34
F-92360 Meudon-le-Foret
France
Tel: +33 1 46 302380
Telex: 270375

Licensee. It is believed that TIGER or components thereof are produced under license in China by:

China National Electronics Import & Export Corporation

49 Fuxing Road

Beijing

China

Tel: +861 810910

Telex: 22475

It is believed that TIGER or components thereof are produced under license in India by:

Bharat Electronics Limited (BEL)

Trade Center

29/4 Racecourse Road

Bangalore 560001

India

Tel: +91 812 2751/2

Telex: 043477

Prior to Operation Desert Storm, TIGER G was produced under license in Iraq under the designation SDA-G. There are suggestions that TIGER S may also have been produced under the designation SDA-S. The company or state authority for this production remains unknown and probably no longer exists.

Status. Out of production, but in service.

Total Produced. TIGER production terminated in 1994 with a total of approximately 112 TIGER S (TRS 2100) systems produced. Of these, 92 stations were confirmed. Six of these are known to be in Oman. Many were in Iraq, some supplied by France and others built locally. Many of these are presumed to have been destroyed.

An additional 40+ TIGER G (TRS 2105/06) systems are known to have been procured.

Application. TIGER is deployed on a single axle trailer (standard for TIGER S) or twin axle trailer (standard for TIGER G). The Iraqi airborne variant was mounted in

an Il-76 Candid transport while the Chinese airborne version is mounted on a modified ex-Soviet B-29.

Price Range. The TIGER G system is the only member of the family likely to be deployed without an operations cabin (nomenclature by the French as a LARP/FACP) and therefore less expensive. Based on known prices for similar systems, the unit cost is believed to be approximately US\$0.8 and US\$1.2 million (1993 dollars) for the basic equipment. With the addition of an operations cabin, the price range is likely to be between US\$1.2 and US\$1.9 million (1993 dollars).

Technical Data

Characteristics

Dimensions

TIGER S (TRS 2100)

	<u>Metric</u>	<u>US</u>
Antenna size:	5x2.3 m	16.5x7.6 ft
Range:	110 km	68 mi
Ceiling:	12,500 m	41,500 ft
Frequency:	E/F-band	

TIGER G (TRS 2105)

Antenna size:	3x1.6 m	10x5.2 ft
Range:	80 km	50 mi
Ceiling:	5,000 m	16,550 ft
Frequency:	G/H-band	

Design Features. The following description applies to the TRS 2100 Improved TIGER S equipment. Much of the data is equally applicable to the earlier and subsequent members of the TIGER family. A lightweight, high-performance radar, TIGER S has been optimized for the detection of low-flying aircraft. High performance in severe clutter is achieved by the simultaneous use of MTI circuits based on Doppler frequency filtering and on pulse compression to limit the volume in which clutter echoes can mix with useful echoes. For enhanced low-level detection capability, TIGER S features a coherent transmitter with pulse compression, an antenna with narrow azimuth beamwidth and sharp ground cut-off, a high-performance digital MTI, and a constant false alarm rate chain. The performance of the equipment under the influence of severe jamming is enhanced by frequency agility, a wide frequency band, high average power, pulse compression, constant false alarm rate chain and a high gain antenna with low sidelobes.

TIGER S (TRS 2100). The TIGER S radar comes in two main configurations; semi-automated and automated. The automated configuration is fitted with a

processing unit which carries out extraction of plots, self-tuning of receiver parameters and automatic initiation of local target tracking. The semi-automatic configuration does not feature a processor. Both configurations are supplied on a trailer mount which bears the foldable antenna, antenna drive, integrated IFF equipment and transmitter and operations cabinet.

The TIGER S in its basic configuration is road, rail, air (C-130/160) and helicopter transportable. An operations center designated LARP/FACP is designed for operation with the TIGER S radar. The operations center is transportable by any of the methods suitable for the radar equipment and is equipped with two autonomous consoles, a 16-in PPI displaying radar and/or synthetic video, an order and selection keyboard with tracker-ball, a computer (automated configuration only), radar head remote control panel (for unmanned operation and remote deployment of the radar head), full communications fit and an option for active and passive IFF decoders.

The operations center differs according to the selection of the automated or semi-automated configuration of

the TIGER S radar. The automated configuration provides raw radar and/or synthetic video display (labeled tracks, maps, microtabulars) and the automatic correlation, identification and transmission of tracks. It provides calculation of tactical aids such as collision course, time-to-go situation extrapolation, range and bearing vector. The semi-automated configuration (linked to a radar without processor) allows raw radar display and synthetic video, the establishment of a synthetic air situation through computer-aided manual tracking, the identification of targets by active/passive IFF decoding and the remote tracking of plots to another center. Both configurations include radar control and monitoring devices, ground-to-air and ground-to-ground communications facilities.

The system is deployed, and interfaces between operations cabin and radar brought on-line (including the attachment of power source) within 20 minutes by skilled personnel. The single-axle mount has the facility for electronics cabinet detachment, allowing this section to be deployed in a bunker away from the radar head. Masts are available to increase the height of the antenna relative to the ground in either 14 m or 54 m versions. It is possible to remote the system, either using a single coaxial cable (for distances up to 1 km), or a microwave link for longer distances. The remote link allows the deployment of the operations center and monitoring panels away from the vulnerable radar head.

TIGER S is fully solid state (with the exception of the two amplifier tubes in the transmitter) and has an MTBF of 800 hours and an MTTR of 30 minutes. The use of E/F-band makes it possible to have an antenna with a high gain and high angular resolution, but with a relatively small reflector (5 x 2.3 m). The reflector profile is C-shaped with a double curvature, and the vertical pattern has a steep slope at low elevations and is super-cosecant at high elevations. The IFF subsystem is integrated with the primary radar antenna and a BITE facility monitors the main parameters and locates any faulty functions. The TIGER S specific mission repertoire includes the control of tactical operations, low-level detection complementary operation in an air defense network, the alerting and coordination of SAM and AA weapon systems, the airport approach control mission and maritime surveillance.

TIGER G (TRS 2105/06). Similar to the TIGER S equipment from which it was derived, TIGER G employs a G/H-band transmitter and is more closely optimized for deployment with AA and SAM weapon systems. It acts in the surveillance/alert role and coordinates the overall effort. TIGER G is capable of coastal surveillance and control of shore-based Anti-Surface Vessel (ASV) missiles. Operating in the G/H-band increases the ability of air defense networks to resist jamming by widening the frequency spectrum used. The range of the equipment on a 2 sq m target is between 65 and 100 km.

The standard version of the TIGER G radar is installed on a twin axle trailer which carries a cabin housing the electronics suite. Unlike the TIGER S, the TIGER G radar is capable of operating without an operations center, there being a PPI within the cabin for monitoring and maintenance purposes which can also be used for operations. The option for deployment in conjunction with the LARP/FACP operations center is retained, however. The TIGER G basic configuration differs from TIGER S in having an 8 m folding mast bearing the antenna as standard fit, whereas the TIGER S has a cabin-roof-mounted antenna with no facility for extension.

TIGER G retains the option for mounting on the 54 m mast already described. TIGER G is primarily aimed at the export market. Particular emphasis is placed on the radar's suitability for deployment in conjunction with SAM weapons systems. Less stress is placed on the more abstract tactical roles to which Western European users might allocate it.

Operational Characteristics. TIGER can be used as an autonomous detection center with local exploitation of radar data. TIGER can also be used for gap filling as a component part of an overall air defense network. TIGER stations perform the following operational functions: control of tactical operations, low-altitude gap filling, coastal and maritime surveillance, airport aircraft approach control, alert and target designation for SAM batteries, and shore-based anti-surface vessel monitoring and surveillance radar roles.

Variants/Upgrades

Aladin. French Air Force designation for a radar based on TIGER S, with modifications to comply with Air Force requirements. A series of test programs performed with the collaboration of the French Army and overseas armed forces were carried out at a number of

sites where anomalous propagation conditions were known to be prevalent. As a result, improvements to the TIGER system have been developed and are thought to have been incorporated in the Improved TIGER S and TIGER G radar.

Adnan-2. Revealed for the first time at the January 1989 Baghdad arms fair, the Adnan-2 comprises a locally built TIGER G radar installed in a converted IL-76 "Candid" transport aircraft. The antenna was mounted in a fuselage-top rotating radome. The radar's signal processing had to be modified to avoid ground clutter. Three Adnan-2 aircraft were built. One is known to have been destroyed on the ground during the Persian Gulf War while a second defected to Iran, and at time of writing is still there. The fate of the third is a mystery with some reports claiming that it was shot down on the first night of the Desert Storm bombing offensive.

Adnan-1. Originally known as Baghdad-1, this aircraft also comprised an Iraqi-built TIGER G radar installed on an IL-76 airframe. However, in Adnan-1 the radar was installed effectively upside down with the antenna hanging out where the rear ramp on the IL-76 used to be and covered with a ventral bulge. This unlikely-sounding conversion was originally believed to fulfill

an AEW function. However, subsequent investigations forming part of the intelligence run-up to the second Gulf War have revealed that this was a parallel development to Adnan-2 and was intended for ground surveillance paralleling the JSTARS role but with vastly inferior technology and no real operational capability. Two Adnan-1 aircraft were built, and both were destroyed in the second Gulf War.

Chinese AEW. The Chinese also appear to have experimented with the installation of TIGER radars on an airborne platform. In their case the radars were installed on a modified Tu-4 Bull bomber, a Soviet copy of the World War II US B-29. The Chinese make no pretext about this installation being anything other than an experimental testbed and technology development tool. Its importance lies in the fact that the experience gained in the installation was made available to Iraq which used it to develop their Adnan aircraft which did purport to be operational.

Program Review

Background. Development of the TIGER radar family began in the early 1970s under the direction of the French Ministry of Defense. The Aladin version was in production by 1978, as were TIGER S systems for various foreign clients. In 1983 a new version designated TIGER G was launched. Aimed specifically at the export market, this radar, along with improved TIGER S, was in series production by 1984. The antenna has been the subject of extensive optimization studies, and is a most efficient compromise, given the desirability of a small antenna and the associated sidelobe problems that are usually inherent in such designs.

The TIGER system is known to have been widely exported, and reports indicate that there is a likely customer base consisting of seven states outside France. Six of these are Algeria, China, Egypt, Iraq, Oman and Zaïre. TIGER G is produced under license by the Iraqi Government under the designation SDA-G. There is no indication as to how many of these sets have been built. China has also acquired some TIGER radars and is believed to have included much of their technology in the CEIEC JY-8 radar. Some years after the Chinese

acquisition of TIGER, the Chinese released details of a radar designated the JY-9. This has many characteristics in common with TIGER and was thought to use TIGER technology. Subsequent investigations have revealed that this radar is, in fact, derived from Swedish Giraffe technology obtained via Pakistan.

A list of states likely to have purchased TIGER would include Saudi Arabia, Kuwait, Abu Dhabi, Chile and Greece. According to a 1990 statement from Thomson CSF, some 96 TIGER stations are in operation around the world. A number of TIGER radar are likely to have been bought by foreign states to operate in conjunction with SAM systems purchased from French manufacturers. TIGER would be a prime candidate for incorporation into an air defense system using Crotale missiles, Shahine missiles and possibly Roland, but it must be remembered that these systems have dedicated tracking and surveillance radar. As a surveillance radar in the coastal role, TIGER stations would be suitable for deployment with Exocet missiles. Production of the TIGER radar has now ceased in favor of the more modern and effective FLAIR radar.

Funding

Initial development of the Aladin (French Air Force designation) and the very similar TRS 2100 radar are thought to have been funded under a French Ministry of Defense development contract. It is likely that the subsequent models TRS 2105/2106 were developed as private ventures by Thomson-CSF.

Recent Contacts

No contractual information has been made publicly available.

Timetable

<u>Year</u>	<u>Major Development</u>
1978	TRS 2100 ordered by French and foreign clients
1983	TRS 2105 TIGER G model launched for export
1987	Oman introduced TRS 2100 radar
1988	Oman ordered two additional TRS 2100 radars
1989	Iraq revealed airborne variant of TIGER G
1993	FLAIR replacement for TIGER revealed

Worldwide Distribution

The numbers of TIGER radars supplied to any given country are held strictly confidential. The TIGER system is known to be in use by **Algeria, China, Egypt, France, Iraq, Kuwait, Oman** and **Zaire**. It is also believed that TIGER has been supplied to India, may be produced under license there and that TIGER technology has been used in the development of some members of the Indra radar family produced in India. A list of states likely to have purchased TIGER would include Saudi Arabia, Abu Dhabi, Chile and Greece. It can be presumed that the Iraqi systems are no longer operational and probably destroyed. In 1996, it was revealed that one Kuwaiti system had survived Operation Desert Storm and had been returned to Kuwaiti service.

Forecast Rationale

During their extended production run, the TIGER family of radars had been updated and modified to keep pace with the threat of more sophisticated ECM and passive sensors. However, by 1993 the TIGER system could no longer keep pace with the rapidly changing EW environment and was subsequently phased out of production.

TIGER, though out of production, has remained a viable system for low-level air defense surveillance into the late 1990's. The replacement for the TIGER family was revealed at the 1993 Paris Air Show where the new

FLAIR fully mobile 3-D E/F-band target acquisition radar was revealed. This system is now being offered to potential clients where TIGER would have previously been the proposed solution.

Due to both a replacement system being available coupled with a Thomson-CSF statement that TIGER production had ceased no forecast is available for this system. For more information on its replacement, FLAIR, see the report of the same name in the *Radar Systems* binder.

Ten-Year Outlook

No production forecast. **THIS REPORT WILL BE DROPPED IN 1999.**

* * *