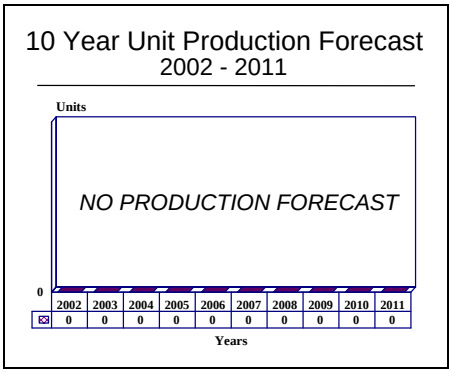
TTC-39(V) - Archived 10/2003

Outlook

- Software upgrades continue
- TTC-39(V) being replaced by TTC-56(V)
- Barring any further activity, this report will be archived in the near future



Orientation

Description. The TTC-39(V) is a tactical automatic switching system.

Sponsor

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Contractors

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Status. Production complete; modifications continue.

Total Produced. An estimated 134 TTC-39(V)s were delivered by year-end 1997.

Application. The TTC-39(V) was designed to be the nucleus of the TRI-TAC communications system, a tri-service tactical field communications system.

Price Range. The price cannot be determined from available information.

Technical Data

Design Features. The TTC-39(V) circuit switch is engineered to function in the hostile environments found on the modern battlefield and is optimized for nuclear electromagnetic pulse survivability. Network interfaces and internal components are EMI/EMP shielded. Vital functions are automated on redundant processors. When under attack, each surviving switch preserves access service for local subscribers, and configures alternate routes when the primary link to a tandem switch is lost. Mission-essential local users are automatically patched from damaged switches to a designated alternate switch.

The TTC-39(V) simultaneously processes both secure and non-secure calls, a task that previously required multiple battlefield networks. Electronic transmission security is provided by internal COMSEC units with end-to-end encryption of digital voice and data calls.

The switch also accepts approved loops (physically secure lines).

Switch Architecture. The TTC-39's comprehensive connectivity is accomplished through the use of interchangeable line interfaces and analog/digital matrices. Each analog switch matrix supports 120 lines; digital matrices each handle 150 lines, of which 24 can be analog. Matrices can be configured as needed to serve largely analog subscriber communities or all-digital subscribers. Many different models of the original TTC-39 are now available.

The 600-line version is housed in two S-280 shelters mounted on separate transporters. Two, three, or four 600-line switches can be configured to provide up to 2,400 lines of reliable communications. The 300-line version's single S-280 shelter houses the same family of subsystems found in the 600-line version, which includes sheltered and optional remote call service positions. This switch supports three interchangeable analog/digital matrices (maximum two analog or three digital) and attaches up to 426 outside lines. The circuit switch can also be delivered for permanent installation in a fixed-plant configuration.

The TTC-39(V) is highly transportable, with both 300- and 600-line shelters easily and safely movable by M-923 trucks, M-832 mobilizers, C-130 aircraft, C-47 helicopters, rail cars, or amphibious shipping.

Operational Characteristics. The TTC-39(V) supplies powerful network facilities that optimize switching resource allocation, automate recovery from enemy action or malfunction, minimize dependence on external control gear, and carry out network maintenance support functions.

An all-trunks-busy or a lost-link condition on the primary route causes the switch to automatically search through up to seven alternate channels for call completion.

Should a major switch failure occur, the TTC-39(V) patches designated users to an adjacent switch. Analog users are manually switched by the switch supervisor; digital users are electronically patched. Each surviving switch can supply service for up to 60 digital subscribers from each of two disabled switches.

Direct-access service (DAS) switched circuits give dependable off-hook service for up to 60 subscribers per switch. Recorded messages alert a caller or a receiver of a precedence violation, a preprogrammed conference, an unassigned/out-of-service number, or an access violation.

Subscriber Services. The TTC-39(V) provides a full complement of switching services to its local subscribers, although the availability of some services depends on the subscriber's equipment. Other services are individually tailored by programmable service classmarks.

The circuit switch uses a 13-digit numbering plan compatible with NATO, tactical, and AUTOVON numbering plans. Classmarked subscribers have access to dialing shortcuts.

Priority traffic is ensured prompt service by each subscriber instrument being classmarked for one of five precedence levels from Routine to FLASH Override, plus all levels below the classmark. Higher-level calls can preempt lower-level ones.

Interfaces. The TTC-39(V) interfaces with the US AUTOVON and AUTODIN networks, with NATO communications systems, and with a wide variety of current and planned TRI-TAC subscribers, switches, COMSEC, transmission systems, and technical control elements.

Interior view of a TTC-39

Source: US Air Force

Variants/Upgrades

TTC-39A. The TTC-39A is a product improvement of the TTC-39. It replaces the existing processor, increases the digital capability, and adds both tech-control and nodal-control functions. The TTC-39A is a four-wire central telephone office supplying automatic switching services for both analog and digital voice and data traffic at all echelons of a theater-level communications system. The switch provides fully automatic tandem and access switching over a maximum of 744 lines in a single S-280 shelter configuration.

The TTC-39A is equipped with one analog and four digital switch matrices. When the switch is equipped with universal line-termination units, it can terminate standard analog and digital interfaces within a digital switching matrix. The TTC-39A's capability also includes analog loops over multiplex transmission groups. These features expand the current analog capability and will accommodate the evolution of today's analog systems to the future's more efficient all-digital equipment.

39A Packet Switch Overlay. The 39A overlay integrates the latest technology in militarized packet networking into the TTC-39A. By overlaying the extensive circuit switched network with a powerful packet switch, near real-time, reliable, interactive transmission of user data is possible between widely distributed points of the modern integrated battlefield. The combination of circuit switching and packet switching results in a robust, survivable, secure transmission path. With the 39A, efficient communications are possible to distributed processing and data bases on the battlefield, with the provision for immediate restoration to near real-time data service for C^2 users. The 39A also allows dynamic interaction with other network users or hosts.

The 39A uses a forward error-correction module (hamming code with time-dispersed coding) and a digital subscriber voice terminal (DSVT) to connect directly into the TTC-39A and is integrated in the TTC-39A shelter. The packet switch overlay provides efficient channel usage, as intelligent routing algorithms are inherent in each packet switch. The 39A's flexibility permits various multi-user configurations that can support from one to eight hosts and one to eight terminal subscribers. A total of 24 packet external and eight packet trunk lines are available.

TTC-39A(V)4. This all-digital adaptation of the TTC-39A supplies fully automatic tandem and access switching over a maximum of 324 lines. It is enclosed in a single Gichner 1316 shelter. This version comes standard with digital line termination units (DLTUs), which allow it to terminate standard analog and digital interfaces within a digital switching matrix. Several different types of interfaces can be accommodated by a single DLTU, including both analog loops and trunks. The system is also available with a routing subsystem that allows it to supply the same subscriber affiliation and flood search routing features available in the

Mobile Subscriber Equipment (MSE) program. The TTC-39A(V)4 weighs less than 3,200 pounds and requires less than 9 kW of power. The TTC-39A(V) is used primarily by the US Air Force.

TTC-39A(V)5 Downsized Circuit Switch. The TTC-39A(V)5 provides the same features as the 744-line TTC-39A, but is mounted in an S-250 shelter, which allows deployment on HMMWV trucks. The TTC-39A(V)5 supplies fully automatic tandem and access switching over a maximum of 324 lines in its single S-250 shelter configuration. The TTC-39A(V)5 comes with universal line-termination units and thus can terminate standard analog and digital interfaces within a digital switching matrix. This variant weighs less than 3,000 pounds and requires less than 10 kW of power. Other features include one local and up to three remote operator positions, as well as analog trunk/line terminators.

TTC-39D. The D version is a 744-line, all-digital version of the TTC-39A. The main difference (aside from the all-digital capability) is the addition of the same subscriber affiliation and flood search routing available in the MSE program. The introduction of the TTC-39D into the tactical network results in enhanced circuit switching capabilities on the modern, fluid battlefield. The new version will enable subscribers to relocate themselves in the network without resorting to the database management updates and telephone directory changes needed for other systems. Also, because this version offers flood search routing, network route management is simplified. Use of DLTUs means that the TTC-39D can accommodate both analog loops and trunks and provide the digital code conversions needed to interface with the switch matrix. Another feature is electronic patching for channel reassignment. The TTC-39D can also accommodate fiber-optic transmission systems.

TTC-39E(V). This version uses the Compact Digital Switch and modified TTC-39A(V)4 software.

SDS. The Small Digital Switch (SDS) is a compact, highly versatile switch designed to meet a variety of applications, including those that require the subscriber affiliation and flood search routing used by the MSE. The switch is contained in an EMI/TEMPEST enclosure designed for 19-inch rack mounting or as a field-portable assembly carried in two transit cases. It occupies less than 4 feet of shelter space.

SDS interfaces are provided in a time-division multiplex format through eight digital transmission group (DTG) ports. In addition, up to 36 local channel terminations can be interfaced directly to the switch. Additional single channels, either analog or digital, loops, or trunks, can access the SDS through the Line Termination Module.

LTM. The Line Termination Module (LTM) is a 19-inch rack-mountable or field-transportable assembly capable of multiplexing up to 35 single-channel terminations onto a DTG. It can interchange analog or digital terminations, in loops or trunks, to meet a variety of interface requirements. Analog interfaces are accommodated by a DLTU. The LTM can interface with any member of the TTC-39 family, including those used in the MSE system. The LTM can also incorporate a T1 capability for commercial network transmission.

RTSS. The secure communications Red Telephone Switching System (RTSS) is a modification of the TTC-39A with its console, phones and other peripheral equipment, and software. The RTSS is modular and all digital, with all equipment designed to meet EMI/ TEMPEST requirements.

TTC-39(V) CAPACITY COMPARISON

	39A (S-280)	**39D (S-280)**	**39A(V)4 (S-280)**	**39A(V)5 (S-280)**	**SDS (Rack mount or transit case)**
Total external lines	744	708	708	648	162
Analog lines (max)	96	240	240	144	36
Digital lines (max)	648	708	708	648	162
Total analog and digital single channels	240	240	240	144	36
Digital transmission groups	30	30	30	16	8
Voice digitization rates	16/32	16	16/32	16/32	16/32
COMSEC (LKGs)	32	32	32	16	16

Program Review

Background. The TTC-39 circuit switch is designed as the nucleus of the TRI-TAC program. TRI-TAC was established in 1971, by the US Department of Defense (DoD), to develop and field future tactical multichannel, switched communications systems and equipment. These systems were intended to satisfy the US military services' tactical communications requirements by achieving interoperability between US Army and other US DoD telecommunications systems. They were also expected to offer new equipment reflecting the most recent technology, and to eliminate duplication in development among US services and agencies.

These systems provide combat forces with tactical communications equipment to meet the mobility, security, reliability, and availability requirements of the modern battlefield; provide resistance to the intercept and electronic warfare threat of potential enemies; and reduce life-cycle support and personnel costs. TRI-TAC equipment bridges the span from analog equipment to digital systems. Both voice and record traffic switching functions are secure, automated, and processor-controlled.

As evidenced by the diverse variants of the TTC-39(V) offered, several improvements have been made over the course of the program. The TRI-TAC Block III concept, which included the TTC-39D upgrade configuration, was thus launched in order to provide flood search capabilities, making TRI-TAC compatible with the Mobile Subscriber Equipment (MSE) architecture.

In recent years, it appears that a substitute for the TTC-39(V), the TTC-56, has been developed. The TTC-56 is an improved downsized tactical circuit switch designed to provide most of the TTC-39D capabilities. Additionally, the TTC-56 permits secure and non-secure automatic switching and technical control for analog, digital, and mobile subscriber traffic. In 1999 and 2001 two contracts were awarded, for 10 and 85 TTC-56s, respectively.

Funding

Funding for this system is not specified in current budget summaries.

Recent Contracts

Last know contract was issued in 1997.

Timetable

Month	Year	Major Development
	FY 1971	Joint Tactical Communication Office (TRI-TAC) established
	FY 1974	Initial development award for TTC-39 granted to GTE
	FY 1979	Development of TTC-39 completed; production of TTC-39 begun
	FY 1980	Development and initial operational test and evaluation
Jun	1982	Initial Operational Capability for TTC-39 reached
	FY 1984	Control capability added to TTC-39; TTC-39A development contract awarded
Nov	1985	TTC-39A chosen for Mobile Subscriber Equipment (MSE) program
	FY 1986	TTC-39C introduced; 39A packet switch overlay introduced
	FY 1987	GTE introduced TTC-39S and TTC-39A(V3); US Army begins fielding TTC-39A
	FY 1989	TTC-39D tests ended; last US TTC-39As delivered to US Army; TTC-39D production begun
Apr	1993	Fielding of first TTC-39D with packet switching
	FY 1996	TTC-39A fielding completed
	FY 1998	Upgrades of TTC-39D and TTC-39E(V) in progress
	FY 2001	All known contracts dealing with TTC-39(V) to be completed

Worldwide Distribution

The TTC-39(V) appears to be used solely in **US** applications.

Forecast Rationale

The TTC-39D is a modular and transportable nodal control mobile subscriber access circuit switch designed to provide secure and nonsecure automatic switching and technical control for analog, digital, and mobile subscriber traffic for the US Army. The TTC-39, which is an essential part of TRI-TAC, serves as a gateway switch between Mobile Subscriber Equipment (MSE) and other Joint Service switches.

As TRI-TAC is scheduled to come to an end in 2010, the TTC-39 is being phased out of service. Except for software upgrades, larger modifications are not expected to occur, nor will any new systems be produced. The last known contract for the TSC-39 was issued in 1997. A newer automatic switching system, the TTC-56, has recently entered production. Two contracts for a total of 95 TTC-56 systems have been awarded since 1999.

Ten-Year Outlook

Since no further production of the TTC-39(V) is expected, the forecast chart has been omitted.

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