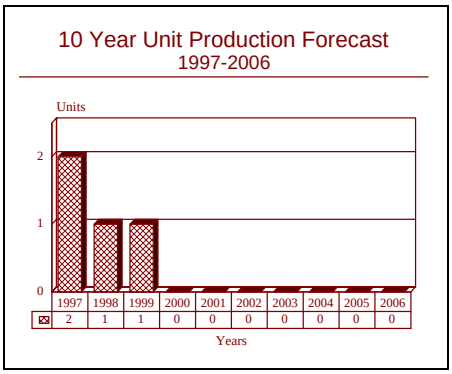
TACS - Archived 9/98

Outlook

- In service
- Production virtually complete
- Further TACS improvements continue to be studied



Orientation

Description. The Theater Air Control System (TACS) is a transportable, modularized, software-intensive, automated tactical air command and control equipment set.

Sponsor

US Air Force
Air Force Materiel Command
Electronic Systems Center
Hanscom AFB, Massachusetts (MA)
USA
(Program Manager)

Air Combat Command
Langley AFB, Virginia (VA)
USA
(Operational Support)

Department of Energy
Idaho National Engineering laboratory
Idaho Falls, Idaho (ID)
USA

Contractors

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USA
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(Prime)

ITT Corp
ITT Gilfillan
7821 Orion Avenue
PO Box 7713
Van Nuys, California (CA) 91409-7713
USA
Tel: +1 818 988 2600
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(ARM Decoy)

MITRE Corp
202 Burlington Road
Bedford, Massachusetts (MA) 01730
USA
Tel: +1 617 271 2000
Fax: +1 617 271 2271
(Systems Engineering)

Northrop Grumman Corp.
(formerly Westinghouse Electric Company)
11 Stanwick Street
Pittsburgh, Pennsylvania (PA) 15222-1384
USA
Tel: +1 412 244 2000
(TPS-43(V)/TPS-75 radar)

GEC plc
GEC-Marconi Electronic Systems Corp
164 Totowa Road
PO Box 975

Wayne, New Jersey (NJ) 07474
USA
Tel: +1 201 633 6000
(JTIDS Class 2/2H/2M terminals)

Status. In service, production nearly complete.

Total Produced. Approximately 103 TYQ-23(V)2 Modular Control Equipment (MCE) complexes, 49 TYQ-23(V)1s and 65 radar Ultra Low Sidelobe Antenna (ULSA) modification kits delivered through 1996.

Application. US Air Force tactical air traffic control.

Price Range. The most recent contract for which a specific number and dollar figure are available indicates a unit price of approximately $US5.7 million (in 1993 dollars) for a TYQ-23(V)2 MCE complex.

Technical Data

Design Specifications. US tactical air forces require a highly survivable, reliable, positive control system to fully exploit the inherent capabilities of tactical air power. TACS provides the means by which the Air Component Commander may exercise control over tactical air power. The TACS Improvement program provides for major improvements to the existing TACS, which was deployed in the 1960s. Program focal points include development of a new transportable, modularized, software-intensive automated air command and control system and a series of electronic countermeasure programs to enhance the survivability and capabilities of the TPS-43E radar. The System Trainer and Exercise Module (STEM), which completed development during the early 1980s, provided a trainer to run scenarios and exercises for components of the TACS.

As discussed in further detail in the **Variants/Upgrades** section which follows, the TACS Improvement program is a multifaceted, multiphase, continuing effort which consists principally of the Modular Controls Equipment (MCE) pre-planned product improvement (P^3I) program, which replaces obsolete equipment in the aging 407L/485L Tactical Air Operations System. Designated the TYQ-23(V)2, the MCE is being deployed in two configurations: at Control and Reporting Centers utilizing four shelters, and at Forward Air Control Posts in a two-shelter arrangement. The equipment set enhances TACS survivability and mobility, and provides the ability to handle the greatly increased C^3 workload required in a modern combat environment. The phased structure of the P^3I improvements will assure that MCE functions will keep pace with the changing Tactical Air Control System environment.

The Ultra Low Sidelobe Antenna (ULSA). In order for the TPS-43(V) E/F-band family of radar to be responsive to future US Air Force Tactical Air Command requirements, Westinghouse has continuously upgraded the TPS-43(V) with new technologies and processing techniques. Radar technology advances enabled Westinghouse to replace the TPS-43(V) radar reflector antenna with an advanced slotted wave-guide array antenna (technology originally developed for AWACS), which had been produced for the US Air Force. This modification changed the designation of the TPS-43E to TPS-75 and was intended to allow this 1970s vintage radar to retain its status as the Air Force first-line tactical radar well into the future. The TPS-75 is now out of production in the US, though its service will continue; spare parts, upgrades and refurbishment activities will also continue well past the year 2000.

The ULSA was designed to improve detection in the presence of jamming, enhance survivability and resist electronic countermeasures from belligerent aircraft. ULSA reduces stray energy that forms outside the radar's narrow main beam by more than 50 percent, thereby making it harder for an enemy to detect and jam. ULSA also increases operating range to 260 nautical miles.

To further enhance TPS-75 survivability, lightweight and relatively inexpensive decoys can be deployed. The radar system is rendered virtually undetectable because the low-power sidelobe levels allow decoys to mask actual radar sidelobes. Three versions of a decoy were tested in 1994.

Software developed under the Ground Attack Control Capability (GACC) element of the TACS Improvement program will be hosted in MCE hardware in order to provide TACS with the capability to control air attacks against mobile ground targets. The US Air Force places special emphasis on the ability of control centers to sustain operations despite losses due to hostile action, regardless of reconfiguration and/or redeployment sustained under fire.

Operational Characteristics. The TYQ-23(V) MCE is a transportable, modularized automated command, control and communications system. Each module is housed in a 20 ft (6 m) ANSI ISO shelter which contains all essential mission equipment including computing equipment, operator consoles, digital data links and voice communication links.

The TYQ-23 can be moved by fixed- or rotary-wing aircraft, ship, rail, truck or container transport. Each TYQ-23 can be transported with all operating equipment internally secured, except for external support equipment. Internally, the TYQ-23 contains data processing equipment, operator consoles, crypto gear, and UHF, VHF and HF radios. Antennas for each class of radio are an integral part of the TYQ-23. All equipment, including two environmental control units, can be powered from a single external power source.

Two basic configurations have been developed to satisfy the requirements specified for the Air Force Combat Reporting Center Modular Control Equipment and the US Marine Corps Tactical Air Operations Central (TAOC). These are designated the TYQ-23(V)2 and TYQ-23(V)1, respectively.

Variants/Upgrades

By its nature, the MCE pre-planned product improvement (MCE P^3I) program is designed to produce a temporally phased series of variants/upgrades to update the baseline MCE and to ensure its interoperability with newly fielded systems. Due to funding cuts, the Air Force restructured the MCE P^3I effort into four block upgrades, although the block upgrades no longer appear to be referred to as such.

Block I consisted of secure anti-jam UHF HAVE QUICK II radio integration, an upgrade to the weapons control and Joint Tactical Air Operations (JTAO) data link software, development of a TPS-75 radar interface, and development of a chemical, biological and radiological protection capability. These changes have already been incorporated into the MCE production line.

Block II currently in development includes integration of a JTIDS Tactical Digital Information Link-J (TADIL-J) capability, the integration of an Automated Air Tasking Order (AATO) capability, integration of SINCGARS secure anti-jam VHF communications radios, and upgrades to the Ground Mobile Forces SATCOM digital communications interfaces.

The next planned phase includes a software upgrade to the TADIL-J Reissue 2 baseline, which works toward a Theater Missile Defense capability and the implementation of the Interim JTIDS Message Specification capability.

It should be noted that the US Air Force TACS Improvement program, registered in the DoD budget as an RDT&E program element, includes production funding for JTIDS terminals, JTIDS Modules, JTIDS Interface boxes and Operations Modules Interface Kits, all of which are required to integrate JTIDS communication into the MCE.

Program Review

Background. Work on TACS began in 1965-1968, with the procurement of off-the-shelf equipment to satisfy urgent short-term requirements. Improved equipment was developed and procured during 1969-1972. A third phase was initiated in 1973; equipment developed during this period included the GSQ-119 and GSQ-120 data transfer systems, the TSQ-19 control reporting center, the PRC-85 manpack radio, interface equipment (designated Salty Net) to connect NATO Air Defense Ground Equipment (NADGE) with TACS, the RADEX data extractor, the UGC-41 teletypewriter, a Data Link Adapter and the TSC-60 communications system.

In FY84, the Air Force awarded the STEM production contract, negotiated the ULSA production contract, started in-plant development, test and evaluation (DT&E) of the MCE program and continued ARM Alarm development efforts.

In FY85, the continuing program chronology saw the Air Force take delivery of the STEM production units; award the ULSA production contract; conduct MCE initial operational test and evaluation (IOT&E), finish basic MCE research and development; prepare for MCE production; conduct ARM Alarm development and evaluation; and start R&D on the ARM Decoy, MCE P^3I and GACC programs. The service also developed specifications and other documentation related to the ARM Decoy needed to prepare the RFP for full-scale development. In the same year, the Air Force finalized MCE P^3I integration plans and developed the documentation required to prepare the RFP to start the hardware and software development efforts. Finally, interface and integration plans, system designs and support documentation were developed to incorporate GACC into the TACS, and the RFP was prepared for full-scale development.

Efforts during FY86 included the signing of the full-scale development contract for the ARM Decoy which was intended to take three contractors – ITT, Aydin and LTV – through IOT&E. Conceptual design work, including GACC and JTIDS integration efforts, continued on the MCE P^3I program. MCE field DT&E was completed, and IOT&E was initiated. A final MCE production RFP was released. (Litton won this major contract in May 1987.)

The ARM Alarm effort completed field development, test and evaluation, but failed to complete in-plant DT&E because of an environmental test failure.

In FY88 Westinghouse produced and stored 19 ULSA antennas, and began retrofitting the first of the US units.

In FY89 the Air Force completed DT&E of the ARM Decoy and solicited a production contract. Modular Control Equipment Block I P^3I development continued through an in-plant brassboard. Preliminary software development also began.

A 1989 GAO report, *Survivability of U.S. Radars Needs More Emphasis*, found that most of the radar used by the Navy and in NATO were at risk from anti-radiation missiles. The TPS-75 was one of the few radars that the GAO found to have a passable program, although the report did note that a third phase of the ARM protection program (ARM Alarm) had been terminated.

In FY90 the Air Force awarded an ARM decoy production contract to ITT Gilfillan. Procurement of up to 65 units (i.e., the full complement of updated TPS-75 radar) is likely. National Guard funding and Army/ Marine interest in an ARM Decoy modified for their radar may boost procurement.

In FY93, activity was focused on completion of hardware testing and the continuation of the development and testing of TACS system software. Work was also begun on the development of the interface equipment, specifically the Operations Modules Interface Kit, needed to establish JTIDS/TACS communication.

In FY94, work continued on the development of the Operations Modules Interface Kit, and development of the JTIDS Interface Box and the JTIDS Module was begun. FY95 work included the completion of the Operations Modules, JTIDS Interface Box and JTIDS Module developments, development of the Automated Air Tasking Order (AATO) and developmental start of interoperability upgrades to the MCE P^3I system.

Program tasks have since continued the MCE P^3I interoperability upgrade efforts, as well as providing general program and test support. These are scheduled through FY99, when full operational capability of MCE P^3I is expected.

Funding

US Air Force development funding for the Modular Control Equipment (MCE) and other TACS related upgrades is provided under PE#0207412F, Tactical Air Control System (TACS) Improvements.

(NOTE: Includes JTIDS interface equipment procurement.)

US FUNDING

	FY97		FY98		FY99		FY00	
	QTY	AMT	QTY	AMT	QTY	AMT	QTY	AMT
RDT&E (US Air Force)								
PE#0207412F Theater Air Control System								
Project 4852 Theater Air Control System Improvements (TACSI)	-	0.59	-	0.39	-	0.44	-	0.49

	FY01		FY02		FY03		FY04	
	QTY	AMT	QTY	AMT	QTY	AMT	QTY	AMT
Project 4852[a]	-	0.47	-	0.46	-	0.45	-	n/a

Procurement (US Air Force)

Theater Air Control System Improvements[b]	FY97		FY98		FY99		FY00	
	QTY	AMT	QTY	AMT	QTY	AMT	QTY	AMT
	-	18.8	-	36.7	-	30.0	-	n/a

All US$ are in millions.

Sources: FY98/99 PEDS, FY99 P-1

[a]Funding information not provided past FY03.

[b]Funding information not provided past FY99.

Recent Contracts

Contractor	Award ($ millions)	Date/Description
GEC-Marconi	25.2	Mar 1995 – FFP contract for JTIDS full-rate production program; includes 24 JTIDS Class 2H Terminals for US Navy E-2C aircraft, two JTIDS Class 2 Submarine Terminals for the Navy, and four JTIDS MCE terminals for the US Air Force. Completion date is Sep 1999. (F19628-95-C-0056)
Westinghouse	9.0	Jun 1995 – FFP contract for four theater missile tracker prototype kits and four correlator prototype kits applicable to the TPS-75 radar system. Completion date was April 1997. (F19628-95-C-0037)
Litton	93.0	Sep 1995 – FFP contract for 142 upgrade kits for MCE field C^3I system. Completion date was Dec 1998. (F04606-95-D-0393)
Litton	10.5	Nov 1996 – Undefinitized modification to previously awarded contract for development of two TYQ-23 JTIDS prototype systems for the US Marine Corps. Completion date was Jun 1997. (M67854-96-C-2018-[M-A-GTF])

Timetable

	1980	ULSA modification program began
	1982	Two ULSA antennas delivered
Jul	1982	MCE R&D Award
	1983	ULSA initial operational tests and evaluation (IOT&E) completed by Air Force
	1983	ARM Alarm R&D Award
	1984	ULSA production contract let
Mid	1986	First ULSA production model delivered
Jun	1986	MCE IOT&E
May	1987	MCE Production Contract Award
Mar	1988	MCE P^3I R&D Award (Block I)
Apr	1989	Follow-on order for ULSA antennas
	FY92	Initiation of MCE P^3I, Block II studies
Mid	1992	MCE P^3I Block I initial operational capability
	FY95	Development of JTIDS digital data bus and fiber optic interfaces
	FY96	Completion of AATO development; commencement of AATO IOC
Thru	FY99	Interoperability upgrade efforts, general program and test support continue

Worldwide Distribution

TACS is a unique tactical air traffic control system application in service with the **US Air Force** and **US Marine Corps**.

Forecast Rationale

The US Air Force originally had a documented requirement for 148 TACS sets, while the Marine Corps was to procure a total of 48. In the original Air Force buy, 10 MCEs were allocated to Air National Guard units. An additional buy of eight systems for the Air National Guard came in 1993. In developing the Block II upgrade, the Air Force added a Mass Memory Controller and a VHSIC upgrade that doubled computer memory size, increased processing speed, improved timing and sizing, and added room for growth reserves. These changes reduced the

overall Air Force requirement for MCE modules to one per fielded site, instead of two per selected field site as originally planned. This, coupled with the downsizing of US force structure, enabled the service to lower its overall procurement quantity.

A basic version of the US Air Force's TYQ-23(V)2 was expected to be approved for selective Foreign Military Sales (FMS) to the air forces of NATO allies, as well as Kuwait, Saudi Arabia and South Korea, among others. MCEs apparently proved quite useful in assisting the UN/NATO Operation Deny Flight activity over Bosnia-Herzegovina, which could have attracted international customers. No such customers have been identified at this point, however.

Judging by reduced contracting activity, production appears to be winding down. All 65 ULSA modification kits have long since been delivered, and only a few MCEs and TYQ-23 systems remain to be shipped. In view of the still rather tight budget environment, there are no extended US sales discerned in the near future. Similarly, potential foreign military sales have not solidified to the point of being confidently included in our forecast. Consequently, only minimal production is forecast to satisfy existing contracts through 1999, although more production cannot be entirely ruled out. For the near term, further TACS improvements are continuing to be studied under RDT&E Program Element 0207412F, and demand for upgrade kits will persist.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR PRODUCTION

			High Confidence Level			Good Confidence Level				Speculative			
Designation	Application	thru 96	97	98	99	00	01	02	03	04	05	06	Total 97-06
TACS	TYQ-23(V)2 MCE (USAF)	103	1	1	1	0	0	0	0	0	0	0	3
TACS	Prior Prod'n:	65	0	0	0	0	0	0	0	0	0	0	0
TAOC	TYQ-23(V)1 MCE (USMC)	49	1	0	0	0	0	0	0	0	0	0	1
Total Production		217	2	1	1	0	0	0	0	0	0	0	4