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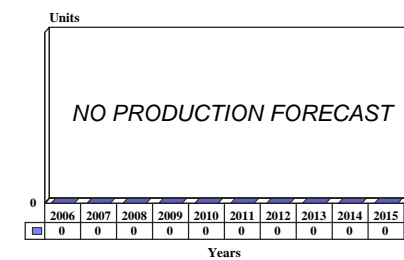
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Commander's Independent Thermal Viewer (CITV) - Archived 5/2007

Outlook

- Only possible production is of replacement units for previously procured vehicles
- New production of the system for M1A2 tank upgrade program has been completed
- Barring any significant news, this report will be archived next year, May 2007

10 Year Unit Production Forecast
2006 - 2015



Orientation

Description. The Commander's Independent Thermal Viewer (CITV) enables tank commanders to search and independently select new targets.

Sponsor

U.S. Army
 Tank & Automotive Development Command
 Warren, Michigan (MI), USA

Total Produced. An estimated 2,142 CITVs were produced through the end of 2005.

Application. Combat vehicles target acquisition and fire control systems.

Price Range. CITV per-unit-cost is estimated to be \$122,500, based on contract cost averaging.

Status. Possible production of spares only.

Contractors

Prime

Raytheon Co	http://www.raytheon.com , 870 Winter St, Waltham, MA 02451-1449 United States, Tel: + 1 (781) 522-3000, Fax: + 1 (781) 860-2520, Prime
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Technical Data

Design Features. CITV is a key element of the Abrams Main Battle Tank (MBT) improvement program. It provides the tank commander with a high quality, adverse-weather viewing capability to search for additional targets while the gunner engages previously identified targets. This "hunter/killer" concept reportedly increases the Abrams' effective fire rate by over 30 percent, thereby providing a considerable force multiplier.

Operational Characteristics

Field of view	
Wide FOV	7.7 deg x 10.4 deg
Narrow FOV	2.6 deg x 3.4 deg
Field of regard	
Azimuth	360 deg continuous
Elevation	+20 to -12 deg
Stabilization jitter (RMS, 1-sigma)	
Azimuth	100 microradians
Elevation	100 microradians
Mean Time Between Failures (MTBF)	720 hr
Minimum resolvable temperature (NFOV)	
At 2.7 cycles	MRAD 0.19°C (typ)
At 5.0 cycles	MRAD 1.42°C (typ)

Additionally, the 360-degree independent rotation permits the commander to search the scene without turret movement, adding to the tank's survivability and providing longer silent watch operations. CITV also functions as a backup gun sight. With the CITV, the tank commander acquires the targets, rapidly relays them to the gunner, and then continues battlefield surveillance for new targets.

Variants/Upgrades

NV-80 B-Kits. The NV-80 B-Kit, formerly designated the Second Generation Tank Sight (SGTS), is an upgrade package for the CITV that incorporates a second-generation, forward-looking infrared radar (FLIR) system. The B-Kit also has enough commonality that it can be integrated not only with the

CITV, but also with the M2A3 Bradley Commander's Independent Viewer (CIV) and Improved Bradley Acquisition System (IBAS), the Long Range Advanced Scout Surveillance Suite (LRAS³), and the M1A2 Gunner's Primary Tank Thermal Sight (GPTTS). Low-rate initial production of the B-Kits began in mid-1997.

Program Review

The U.S. Army decided to install an independent surveillance and targeting system for tank commanders during the M1A1 Block II system upgrade in the late 1980s. A \$12 million contract to design and develop the CITV for the Abrams tank was awarded to Texas Instruments (now Raytheon Systems). The contract was awarded by General Dynamics Land Systems in Warren, Michigan, which produced the Block Improved Abrams tank for the Army. The first CITV prototype was delivered in May 1990 for use in the M1A2 Abrams tank.

In October 1991, after successful testing of the prototype, General Dynamics Land Systems awarded Texas Instruments a \$119 million contract to produce 377 CITVs.

Design and prototype efforts began on a CITV upgrade based on a second-generation FLIR system in 1992.

The system, formerly designated the Second Generation Tank Sight (SGTS), was designed to incorporate a sensor package consisting of a thermal sight, an eye-safe laser rangefinder, and a low-light-level television for imaging during day and night operations and in adverse weather conditions. The first SGTS was prototyped in 1993 and demonstrated in 1994. In 1997, Hughes (now Raytheon) signed a \$111 million contract to provide over 130 SGTS upgrades, now formally designated the Second Generation FLIR NV-80 B-Kit upgrade.

Work Proceeds Despite Initial Budget Constraints

In addition to the improvements being incorporated on the production line, initial plans called for the retrofit of selected Block II improvements (such as the CITV) to some 2,330 M1A1 tanks. Because of budget

constraints, however, only 77 M1A2 tanks had received the Block II improvements by March 1995. (The total procurement of new M1A2 tanks had been reduced to 62, plus 10 developmental tanks and five preproduction tanks, for a grand total of 77 new M1A2s.)

The U.S. Army's plan to field a force of 1,079 M1A2 tanks was expected to be realized by the upgrading of existing M1 and M1A1 tanks. The first phase of this effort called for the upgrading of 202 M1 tanks. The first tanks were fielded in 1995. The overall upgrade was expected to be completed by the end of 2005.

An order was placed with Raytheon TI (formerly Texas Instruments) in 1997 for the low-rate initial production of additional CITVs, as well as the Second Generation FLIR NV-80 B-Kit upgrade for the CITV through 2001. At the same time, Hughes was contracted for the delivery of 242 new M1A2 thermal sights, in addition to more than 130 B-Kits from a total order of 376 B-Kits to be split with Raytheon TI.

Eight hundred CITV systems were required after General Dynamics Land Systems signed a multiyear contract in 1997 to upgrade an equal number of M1A1s to the M1A2 SEP configuration.

In mid-1998, General Dynamics Land Systems began marketing an upgraded version of the M60-series tanks, designated the M60-2000. This upgrade included an uprated engine and the placement of an M1A2 turret with the CITV onto the M60 chassis. The M60-2000 program was being aimed particularly at a Turkish requirement for the upgrade of over 1,000 M60s.

At the beginning of 2000, the M60-2000 program was flatlined. The program had generated only limited interest, and there were no known prospects. Turkey could purchase the CITV in the future as a system

upgrade, but even this was considered an outside chance.

In April 2001, two support contracts for CITV-related work were awarded by the U.S. Army to Raytheon and DRS Technologies in the amounts of \$7.2 million and \$6.3 million, respectively.

CITV's Role Grows in Important Tank Upgrade Program

According to U.S. Army RDT&E budget documents for FY02, the M1A2 SEP effort under the Combat Vehicle Improvement Program (PE#020373A) would continue to receive steady funding through 2007 for a number of improvements, including further acquisition of CITV systems. In FY01 alone, the SEP effort was budgeted at \$58.1 million.

In FY03, the budget for the SEP effort was increased to \$99.3 million. This funding was used to conduct live-fire and survivability tests.

A report surfaced in October 2003 of a possible sale that could have significant implications for the CITV program. During that month, the U.S. Defense Security Cooperation Agency reportedly had taken the first steps toward a Foreign Military Sale (FMS) of the M1A1 tank to Egypt. The 125 tanks in question would include the CITV. While this sale has been rumored for some time, this news was seen as a sure sign that the deal was imminent. Since 1988, Egypt has procured around 750 M1A1s; however, it is believed that these older systems do not include the CITV.

Note: *For related information, please refer to the report "Night Vision Advanced Technology Combat Vehicles" in Tab A of this volume.*

Funding

Development and production of the CITV for the M1A2 SEP was funded through the Army's PE#0203735A Combat Vehicle Improvement Program - Project D330 Abrams Improvement.

Timetable

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
Jan	1989	CITV development begins
Oct	1991	CITV production starts
	1992	Prototyping of Second Generation Thermal Sight (SGTS) for retrofit to the CITV
	1994	Final delivery of 315 M1A2 tanks to Saudi Arabia
	1996	Final delivery of 218 M1A2 tanks to Kuwait
	1997	Contracts awarded to upgrade 800 M1A1s to M1A2; upgrade includes the NV-80 B-Kit for retrofit to new CITVs
Feb	2000	\$25.5 million contract awarded to Raytheon TI for CITVs and other components

CITV

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
	2001	Support contracts awarded for related work
Late	2003	Scheduled end of SEP live-fire testing
Feb	2004	U.S. FY05 budget released; includes \$308 million in funding for SEP
	2005	M1 Abrams upgrade scheduled to be completed

Worldwide Distribution / Inventories

The CITV system can be found on M1A2s currently in inventory with the **U.S. Army, Saudi Arabia, and Kuwait**. However, the CITV upgrade program, designated the Second Generation FLIR NV-80 B-Kit, can be found only on **U.S. Army** M1A2s being upgraded via the SEP. Total distribution includes the following:

Egypt. Possible 154 M1A1s

Kuwait. 218 M1A2s

Saudi Arabia. 315 M1A2s

U.S. Army. Over 1,200 current M1A2s.

Forecast Rationale

After a long, healthy run, it now appears that new production of the Commander's Independent Thermal Viewer (CITV) has come to an end. The system for a number of years was part of a critical U.S. Army tank upgrade program that now appears to have reached completion in so far as it involves the CITV. The only possible future production of the system will be for replacement units for previously procured, upgraded, and/or damaged vehicles.

At one time, there was a good possibility that CITV would continue to be picked up by other nations with M1A2 fleets, as it had in years past. However, there has been no firm word on any such activity and with each passing year, it seems less likely to happen. For this reason, the Ten-Year Outlook for both the U.S. and export has been zeroed-out. Barring any new, significant activity, this report will be archived next year, May 2007.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR PRODUCTION

<u>Designation</u>	<u>Application</u>	<u>Thru 05</u>	<u>High Confidence Level</u>				<u>Good Confidence Level</u>				<u>Speculative</u>			<u>Total 06-15</u>	
			<u>06</u>	<u>07</u>	<u>08</u>	<u>09</u>	<u>10</u>	<u>11</u>	<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>			
CITV	Prior Production:	2142	0	0	0	0	0	0	0	0	0	0	0	0	0