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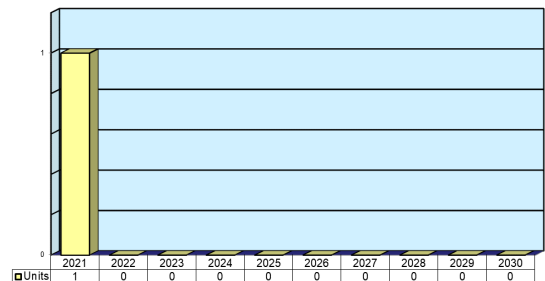
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Standard Terminal Automation Replacement System (STARS)

Outlook

- U.S. FAA continues Terminal Automation Modernization and Replacement Program for ATC upgrades nationwide
- U.S. FAA updates STARS to prepare for integration into NextGen ATC
- Full completion likely pushed into 2021 due to COVID-19 and vulnerabilities found in STARS security controls

Unit Production Forecast
2021-2030



Orientation

Description. The Standard Terminal Automation Replacement System (STARS) is a state-of-the-art air traffic control system for managing terminal area airspace. The STARS is replacing aging computers and air traffic controller displays with modern, reliable equipment. Raytheon Company manufactures the STARS.

Note: *The Standard Terminal Automation Replacement System comprises multiple systems (a "system of systems"). The focus of this report is on the STARS as a whole, rather than the individual systems that comprise it.*

Sponsor

U.S. Federal Aviation Administration (FAA)
Washington, DC
USA

U.S. Department of Defense
Washington, DC
USA

Status. In service and production.

Application. Management of terminal area airspace.

Price Range. In April 2011, Raytheon announced that the FAA had awarded the company a \$177 million contract modification to continue deployment of the STARS. This modification covers production and deployment of 11 STARS. Based on this data, Forecast International estimates that a single STARS likely cost around \$16.09 million in 2011 dollars which, when adjusted for inflation, would be around \$18.92 million in 2021 dollars.

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Contractors

Prime

Raytheon Technologies	http://www.rtx.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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Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 22 Commerce Road, Newtown, CT 06470, USA; rich.pettibone@forecast1.com

Technical Data

The Standard Terminal Automation Replacement System receives radar data and flight plan information. The STARS then presents the information to air traffic controllers on high-resolution, 20x20-inch color displays, allowing controllers to monitor, control, and accept handoff of air traffic. The new color displays have been specially developed for air traffic control and are reported to be exceptionally readable when viewed at close range by the controller. The STARS is also capable of displaying six distinct levels of weather data (identified by different colors) simultaneously with air traffic, allowing controllers to direct aircraft around poor weather.

The STARS' open architecture and built-in expansion capability allows for easy incorporation of new, sophisticated, software-based tools aimed at improving safety and efficiency in the terminal area. The STARS will accommodate projected air traffic growth, and the

introduction of new systems that will contribute to the overall safety and efficiency of the National Airspace System (NAS).

The STARS is able to track up to 1,350 airborne aircraft simultaneously within a terminal area. The system is capable of interfacing with multiple radars (up to 16 radars, both short-range and long-range), 128 controller positions, and 20 remote towers, and provides a 400x400-mile area of coverage.

The STARS Terminal Controller Workstations (TCWs) have been designed to provide position-by-position in-place replacement of failing system displays. They provide up to 14 adaptable data block types and 16 adaptable list types to accommodate current and future display requirements. The TCW provides controllers with preference sets that allow for easy resectorization.

Variants/Upgrades

Raytheon also manufactures a military version of the STARS that is known as the DoD Advanced Automation System (DAAS).



Standard Terminal Automation Replacement System (STARS)

Source: Raytheon

Standard Terminal Automation Replacement System (STARS)



Old Terminal on Left; New STARS on Right

Source: Raytheon

Program Review

In September 1996, the U.S. Federal Aviation Administration (FAA) selected Raytheon Company as the prime contractor to manufacture and deploy the Standard Terminal Automation Replacement System. The FAA commissioned the first "final" version of the STARS at Philadelphia International Airport's terminal radar approach control (TRACON) facility in June 2003. By August 2003, the FAA had installed the STARS at airports in El Paso, Texas; Portland, Oregon; and Miami, Florida.

Raytheon announced in May 2004 that the FAA had commissioned the STARS for Logan International Airport in Boston and Manchester Airport in New Hampshire. The FAA awarded Raytheon a contract option for continued deployment of the STARS in April 2005. The option includes production and deployment of 14 STARS for the FAA and nine for the U.S. Department of Defense. In June 2005, the DoD committed to full production of the STARS for all its remaining ATC facilities worldwide.

In April 2011, the FAA awarded Raytheon a \$177 million contract modification to continue deployment of the STARS under the FAA's Terminal Automation Modernization and Replacement program. This program includes production and deployment of 11 STARS for the FAA's largest TRACON facilities.

Raytheon announced in June 2013 that its Standard Terminal Automation Replacement System had successfully begun continuous operation at Dallas/Fort Worth International Airport.

In November 2015, Raytheon announced it was providing the STARS as part of the FAA's Terminal

Automation Modernization and Replacement contract to the TRACON facility at Hartsfield-Jackson Atlanta International Airport.

On June 2, 2016, U.S. Transportation Secretary Anthony Foxx and FAA Deputy Administrator Michael G. Whitaker broke ground for a new 370-foot-tall air traffic control tower and radar approach control at Charlotte Douglas International Airport, the nation's fifth busiest control tower. The new control tower was equipped with a state-of-the-art Next Generation Air Transportation System, including the STARS.

In March 2018, the FAA awarded Raytheon a contract modification worth \$73 million to update existing STARS units in preparation for NextGen ATC integration.

The FAA had originally hoped to complete the STARS program by the end of 2020, but the schedule has likely been impacted by COVID-19. Additionally, a FAA inspector general identified vulnerabilities in 53 of 73 STARS security controls during a March 2019 inspection, and these failed to meet their scheduled "fix" dates. Therefore, full completion has likely been pushed off until sometime in 2021.

Raytheon to Advance the FAA's Air Traffic Terminal Automation System

Raytheon announced in January 2020 that it had been selected by the U.S. FAA to implement changes that will improve the usability of STARS and reduce its operational costs.

Funding

Raytheon funds the production of the Standard Terminal Automation Replacement System.

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Contracts/Orders & Options

<u>Contractor</u>	<u>Award (\$ millions)</u>	<u>Date/Description</u>
Raytheon	177.0	Apr 2011 – Contract modification from the U.S. FAA to continue deployment of the STARS under the FAA's Terminal Automation Modernization and Replacement program. The contract includes production and deployment of 11 systems for the FAA's largest TRACON facilities, located in Northern CA, Southern CA, Dallas-Fort Worth, Atlanta, New York, Potomac, St. Louis, Denver, Minneapolis-St. Paul, Chicago, and Louisville.
Raytheon	73.0	Mar 2018 – Contract modification from the U.S. FAA to update STARS in an effort to facilitate integration of NextGen ATC tools into the STARS infrastructure.

Timetable

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
	1996	STARS contract awarded to Raytheon
	1997	U.S. FAA tests an early version of STARS and raises concerns about the way aircraft data is displayed on radar screens
	1999	FAA recalculates the cost to employ STARS at \$1.4 billion
Mar	2002	FAA lowers its STARS cost estimate to \$1.33 billion and reduces the number of STARS facilities to 74
Jun	2003	FAA commissions the first "final" version of STARS at Philadelphia International Airport
May	2004	FAA commissions STARS for Logan International Airport in Boston and Manchester Airport in New Hampshire
Apr	2005	FAA awards Raytheon a contract option for continued deployment of STARS
Jul	2005	STARS becomes fully operational at 37 FAA and 22 DoD sites
Apr	2011	FAA awards Raytheon a \$177 million contract modification to continue deployment of STARS
Jun	2013	Raytheon announces that STARS has successfully begun continuous operation at Dallas/Fort Worth International Airport
Nov	2015	Raytheon announces that STARS will equip the TRACON facility at Hartsfield-Jackson Atlanta International Airport
Jun	2016	FAA announces that new ATC tower will be installed at Charlotte Douglas International Airport, equipped with STARS
Mar	2018	FAA awards contract to Raytheon for STARS update
Dec	2020	STARS implementation originally scheduled to be completed but likely delayed until 2021 due to COVID-19

Worldwide Distribution/Inventories

Only the U.S. Federal Aviation Administration and U.S. Department of Defense use the Standard Terminal Automation Replacement System.

Forecast Rationale

The U.S. Federal Aviation Administration's Terminal Automation Modernization and Replacement Program has nearly completed upgrading air traffic control systems nationwide with the Standard Terminal Automation Replacement System (STARS). According to the FAA, the STARS replaces the computer system air traffic controllers use with a single, state-of-the-art platform. STARS gives controllers a complete, precise

picture of the airspace, enabling them to manage the aircraft they are tracking with radar or the satellite-based Automatic Dependent Surveillance-Broadcast (ADS-B) system.

The STARS forms part of the foundation of the Next Generation Air Transportation System, or NextGen. The STARS reduces training and maintenance costs, makes new procedures easier to

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introduce, and maintains the highest level of safety and efficiency throughout the National Airspace System. Air traffic controllers use the STARS to provide air traffic control services to pilots in terminal airspace – the airspace immediately surrounding major airports. The STARS receives radar data and flight plan information from more than 255 radar control facilities and hundreds of airport control towers. STARS separates and sequences air traffic and provides conflict and terrain avoidance alerts, weather advisories, and radar vectoring for departing and arriving traffic.

In alignment with the FAA's NextGen modernization initiative, Raytheon's STARS team continues working with the FAA toward a historic first – a single national software and hardware baseline across America.

The FAA had originally hoped to complete the STARS program by the end of 2020, but the schedule has likely been impacted by COVID-19. Additionally, a FAA inspector general identified vulnerabilities in 53 of 73 STARS security controls during a March 2019 inspection, and these failed to meet their scheduled "fix" dates. Therefore, full completion has likely been pushed off until sometime in 2021.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR UNIT PRODUCTION												
Designation or Program		High Confidence				Good Confidence			Speculative			
	Thru 2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
Raytheon Technologies (Prime)												
STARS <> United States <> FAA												
	97	1	0	0	0	0	0	0	0	0	0	1
Total	97	1	0	0	0	0	0	0	0	0	0	1