

F-35

Lightning II
Program





Photo by USAF Ronald Bradshaw / Released

Our Role

Northrop Grumman is a principal partner and teammate of the Lockheed Martin-led industry team that is developing, producing, and sustaining three variants for the F-35 Lightning II program. The F-35A is the conventional takeoff and landing (CTOL) variant, the F-35B is the short takeoff-vertical landing (STOVL) variant, and the F-35C is the aircraft carrier variant (CV).

Northrop Grumman plays a key role in the development, production, and full lifecycle modernization and sustainment of the F-35. Our team produces the aircraft's low observable technology, center fuselage, wing skins and nacelles.

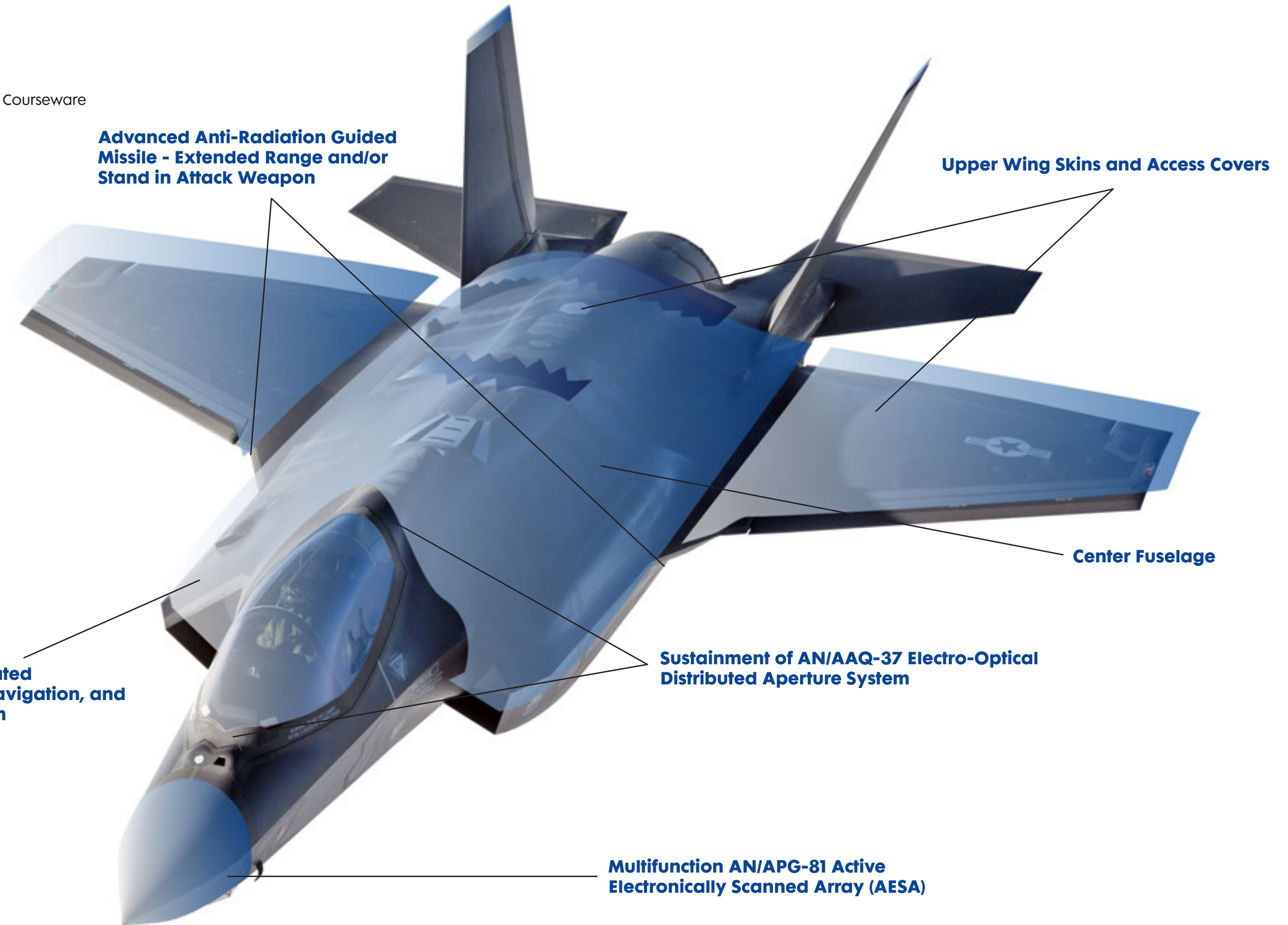
We also design and produce mission-critical subsystems on the platform including radar, electro-optical infrared imagery, and communications, navigation and identification. Additionally, Northrop Grumman develops and manages mission-planning software, pilot and maintainer training systems courseware, product support integration, modification management and electronic warfare simulation test capabilities. The company also plays a significant role in sustaining the F-35 air system.



Photo by USAF Staff Sgt. Jensen Stidham / Released

Global Sustainment

- Pilot and Maintenance Training Courseware
- Modification Management
- Product Support Integration
- Field Support
- Component Repair



Our Role on the F-35



Photo by USAF Senior Airman Alexander Cook / Released



In 2020, *Aviation Week* honored Northrop Grumman with the **63rd Annual Laureate Award in Defense Manufacturing** for its advanced digital tooling technology.

The F-35 Lightning II is a stealthy, supersonic, multirole fighter designed as an affordable next generation aircraft that meets the requirements of the United States and allied defense forces worldwide. It will replace a wide range of aging fighter and strike aircraft currently in the inventories of the U.S. Air Force, Navy, Marine Corps and its allies.

The program's hallmarks — lethality, survivability, supportability, and affordability — are achieved with the most modern military aircraft technologies, state-of-the-art production facilities and a high degree of commonality among the three variants. The team uses advanced manufacturing techniques to enable a unique, high-rate production program.



Development Systems Engineering

Northrop Grumman directly supports Capability Test and Integration Planning as well as Integrated Systems Evaluation activities which includes test support, analysis and evaluations at integrated test facilities.

Weapons Integration & Flight Test

Northrop Grumman leads physical design activities for the internal weapon bays and collaborates with Lockheed Martin in functional design activities involving the stores management systems, suspension and release equipment function, electrical interfaces, and logical or software requirements. Additionally, Northrop Grumman supports weapons ground test, flight test, and store certifications.

Vehicle Systems

Northrop Grumman provides development and modification support for the Arresting Gear System, Weapons Bay Door Drive System, Fire Protection System and Integrated Communications, Navigation and Identification System (iCNI).

Software Expertise

Northrop Grumman's F-35 modernization efforts include Mission Systems software

development expertise within domains such as external communications, prognostics health management, mission threat management and mission data collection.

Center Fuselage

Northrop Grumman designs and produces the center fuselage, which is a major airframe component for each of the three F-35 variants. The center fuselage incorporates a bifurcated inlet system and forms a significant portion of the aircraft's internal weapons bay and internal fuel reservoir. The aircraft's inflight operating doors, including the weapons bay doors and door drive systems, are also produced by Northrop Grumman.

The center fuselage edge alignment, coatings and in-flight operating doors are essential elements contributing to the F-35's unique capabilities. Northrop Grumman launched the F-35 Integrated Assembly Line (IAL) in Palmdale, Calif., in March 2011 and delivered its first center fuselage from the IAL to Lockheed Martin in March 2012.

Northrop Grumman is also developing solutions for Block 4 and related capabilities requiring Center Fuselage enhancements or modifications, implementation of new weapons systems, data links and mission systems software.



"Our Integrated Assembly Line has revolutionized how military airframes should be built through our **advanced capabilities and automated technology** that is setting us apart from the competition."

Glenn Masukawa
Vice President and
F-35 Program Manager



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“Our team develops advanced, hardware-enabled, software-defined mission systems on the F-35 program. These capabilities **enhance pilot safety** and provide warfighters with decisive spectrum advantage **to complete successful missions.**”

Michael Corrigan
Vice President, Tactical Fighters

Our Role on the F-35

Center Fuselage Integrated Assembly Line (IAL)

Our award-winning IAL, located in Palmdale, California, is one of the most advanced manufacturing facilities ever assembled to produce military aircraft. The IAL is comprised of over 3,000 parts, scalable to 115 assembly positions and completes one center fuselage every 30 hours. The assembly line features unique manufacturing technologies exclusive to or pioneered by Northrop Grumman.

The IAL maximizes robotics and automation, providing additional capacity and assembly capability to achieve high rates of production, while meeting engineering tolerances not easily achieved manually. The production facility accommodates all three F-35 variants within the same line as well as production flight test articles, unique development test articles and country-specific production configurations.

The integrated automated technology includes automated guided vehicles, inlet duct robotic drilling, mold in place coatings and automated drilling systems. Additionally, the data-driven analytics, advanced manufacturing and state-of-the-art automation enhances quality control and reduces time and labor of the F-35 center fuselage production.

The IAL is just one of the ways that Northrop Grumman continues to drive down F-35 program costs through refining manufacturing efficiencies.

In 2023, Northrop Grumman, Rheinmetall and Lockheed Martin broke ground for a second center fuselage IAL in Weeze, Germany to help meet growing demand for the F-35 around the world.



AN/APG-81 Radar

The Northrop Grumman AN/APG-81 multifunction sensor is the latest and most capable AESA in the world and acts as the cornerstone to the F-35 Lightning II's advanced sensor suite. It is a combat-proven AESA that provides unparalleled battlespace situational awareness that translates into lethality, aircrew effectiveness and survivability.

The multifunction AN/APG-81 radar has long-range active and passive air-to-air and air-to-ground modes that support a full range of missions, complemented by stealth features, along with significant electronic warfare and intelligence, surveillance and reconnaissance functions.

In air-to-air-combat, the AN/APG-81 provides long range capability allowing the pilot to detect, track, identify and shoot multiple threat aircraft before the adversary detects the F-35. This offers a first look, first shot, and first engagement capability.

In air-to-ground combat, this revolutionary, all-weather, precision targeting AESA provides warfighters with unprecedented situational awareness and detection utilizing its ground and maritime modes.

The AN/APG-81 radar can detect, precisely locate, and with aid of its ultra-high-resolution Synthetic Aperture Radar (SAR) mapping mode, identify and engage military targets with outstanding reliability.

The combat-proven AN/APG-81 epitomizes the F-35's multirole mission requirement, showcasing robust electronic warfare (EW) capabilities and while operating as an EW aperture utilizing the AESA's multifunction array. Fully adept at electronic protection (EP), electronic attack (EA) and electronic support measures (ESM), the AN/APG-81 radar enables the F-35 the unmatched capability to suppress and destroy the most advanced enemy air defenses.

The Department of Defense recognized the EW capabilities of the AN/APG-81 in 2010 by awarding the team with the David Packard Excellence in Acquisition Award for the rapid development and successful demonstration of a quantum leap in EP performance against enemy jammers by a fighter radar.

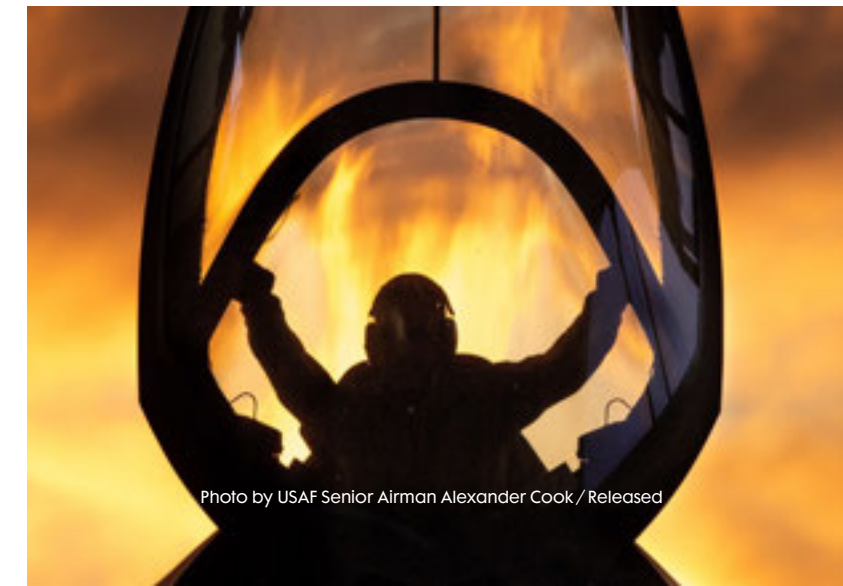
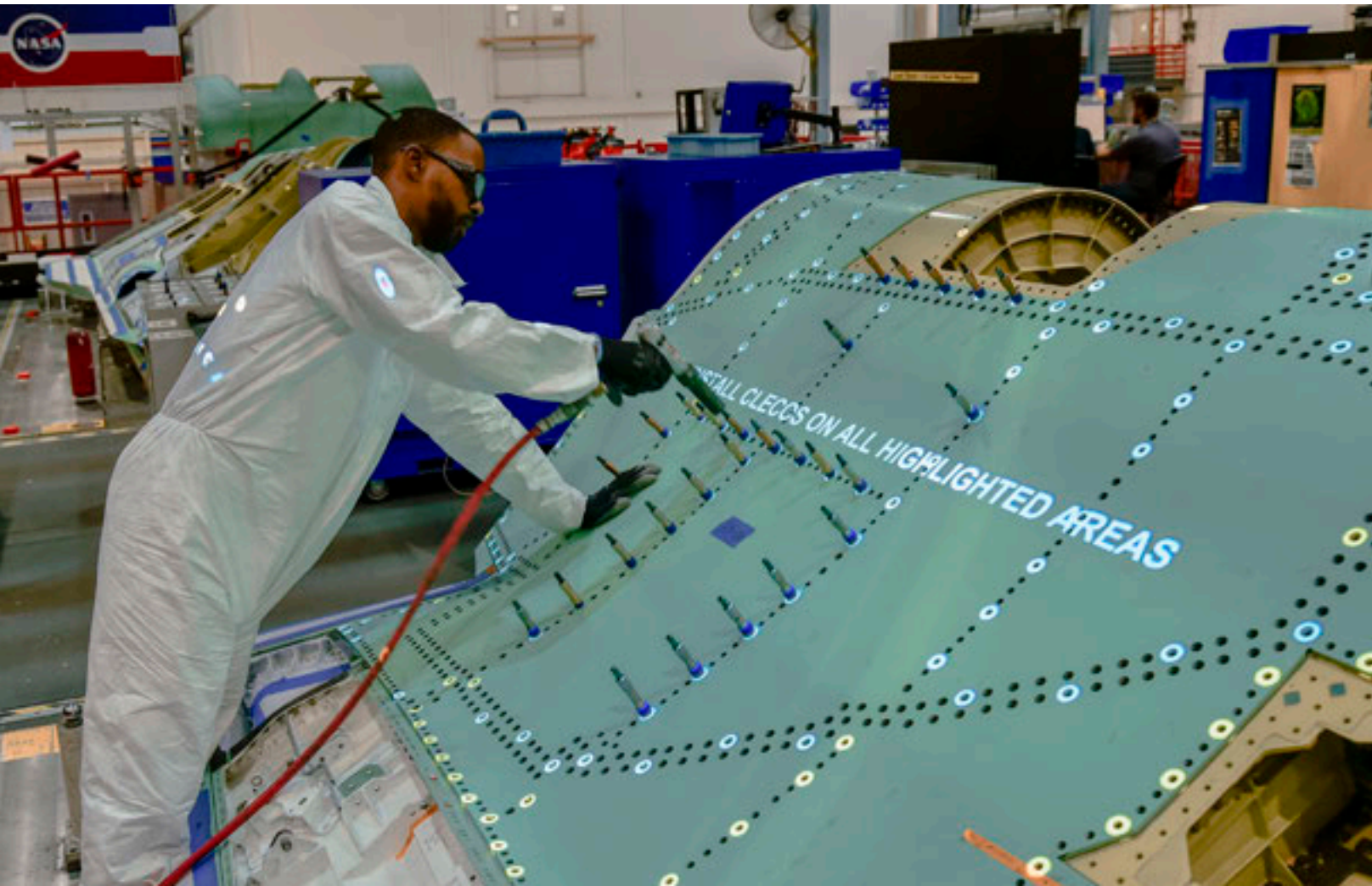


Photo by USAF Senior Airman Alexander Cook / Released



Courtesy Photo by Royal Navy / Released

Electro-Optical Distributed Aperture System (EODAS)

The AN/AAQ-37 EODAS, developed and sustained by Northrop Grumman, brings never-before seen capabilities to the warfighter. The EODAS modes of situational awareness, infrared search and track, missile warning and navigation all operate simultaneously, providing F-35 pilots with a protective 360-degree sphere around the aircraft.

The EODAS detects and tracks aircraft and missiles in every direction while providing imagery to the helmet-mounted display and the panoramic cockpit display for day/night navigation.

Communications, Navigation and Identification System (CNI)

The CNI system, designed and developed by Northrop Grumman for the F-35, is one of the most advanced integrated avionics systems ever engineered to greatly enhance pilot effectiveness.

CNI is built upon software-defined radio technology using reconfigurable radio frequency and digital processing hardware that can be dynamically programmed to perform multiple functions. The system arms the F-35 pilot with multiple mission capabilities engineered for seamless transition from one mission phase to the next.

The integrated CNI avionics suite includes more than 27 avionics functions and advanced capabilities such as ultra-high frequency/very high frequency voice and data, identification friend-or-foe, Link 16, joint precision and approach landing systems, and the cutting-edge Multifunction Advanced Data Link (MADL) for low-observable platforms.

Our Role on the F-35

Vehicle Systems

Approximately one-third of the F-35's mission systems software lines of code are produced by Northrop Grumman software engineers. This code includes capabilities for offboard communications, mission planning and execution, systems prognostic health management and weapons integration.

The mission systems team is responsible for the design and procurement of the Inertial Navigation System, Global Position Systems, navigation antennae and key vehicle systems such as the arresting hook system, the fire suppression system and the weapons bay-door drive system.

Airframe Technologies and Skins

Primed with six decades of composite manufacturing experience, Northrop Grumman provides core technologies key to the F-35's advanced airframe. Our team applies automated fiber placement (AFP) technology to fabricate upper wing skins, lower wing skins,

inlet ducts, and engine nacelles and uses hand layup techniques to produce engine straps, wing-to-body fairings, access panels, bullnoses, blade seals, and vertical seal components for all variants of the F-35.

The Advanced Anti-Radiation Guided Missile – Extended Range (AARGM-ER)

Northrop Grumman's AARGM-ER is a U.S. Navy system upgrade to the air-launched AARGM missile that includes hardware and software modifications designed to improve AARGM's operational capability. Enhancements include a new high-performance air vehicle with upgraded propulsion and an optimized warhead for increased range and increased effectiveness against new and emerging complex threats.

The U.S. Air Force is funding the AARGM-ER F-35A integration, including the Universal Armament Interface (UAI) and development of the new AARGM-ER warhead.



“Our CNI system provides F-35 platforms with more than 27 integrated functions that improve warfighters’ **situational awareness and significantly enhance overall mission effectiveness** through our multilevel security and growth capabilities to adapt to the mission needs of today and tomorrow.”

Gordie Russell
Vice President,
Communications Solutions

Our Role on the F-35

Stand-in Attack Weapon (SiAW)

SiAW gives the U.S. Air Force increased air-to-ground strike capability for the F-35 to rapidly respond to air defenses, ballistic cruise missile launchers and other heavily defended land targets. SiAW builds on the technologies of the high-speed AARGM-ER but is an all-new weapon. SiAW's capabilities are enhanced by stealthy F-35's employing "Stand-in Strikes" where they are able to penetrate enemy defenses and release munitions closer to a target.

Global Sustainment

The goal of sustainment and modernization is affordable readiness and mission effectiveness.

Northrop Grumman delivers technology infused global sustainment and modernization to enable platforms to perform at optimum levels for the long term and to ensure mission readiness is maintained.

Pilot and Maintenance Training Courseware

Northrop Grumman provides development and sustainment of F-35 training courseware that addresses all aspects of pilot and unit-level maintenance, including mission-planning system operations and maintainer use of portable maintenance aids.

Field Support

Northrop Grumman provides Field Support Engineers (FSEs) and Contractor Logistics Support (CLS) personnel at F-35 operational sites. They deliver tip-to-tail expertise, including sustainable low-observable support, to ensure mission readiness.

Modification Management

Northrop Grumman manages the modification of U.S. Navy and U.S. Marine Corps F-35 aircraft. Our field teams perform modifications at operational sites for those aircraft, as well as management of aircraft upgrades at Fleet Readiness Center-East in Cherry Point, North Carolina. Northrop Grumman supports Lockheed Martin in the overall planning and coordination of the F-35 upgrades.

Product Support Integration

Northrop Grumman collaborates with the Joint Program Office (JPO) and Lockheed Martin in managing the F-35 through sustainment analyses, modeling & simulation, and support optimization.

Component Repair

Northrop Grumman is establishing component repair collaborations and ventures with F-35 customers enabling depot activations for its products.

Support Equipment

Northrop Grumman provides support and maintenance for low-observable technologies. As of 2023, the company is responsible for managing and procuring 100% of F-35 aircraft support equipment.

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Northrop Grumman works with customers around the world to **improve mission readiness** for the growing F-35 fleet. Our unique expertise and F-35 experience enable us to **deliver aircraft performance, availability and affordability.**”

Veronica Kepler

Director, F-35 Sustainment,
Global Battle Management
and Readiness

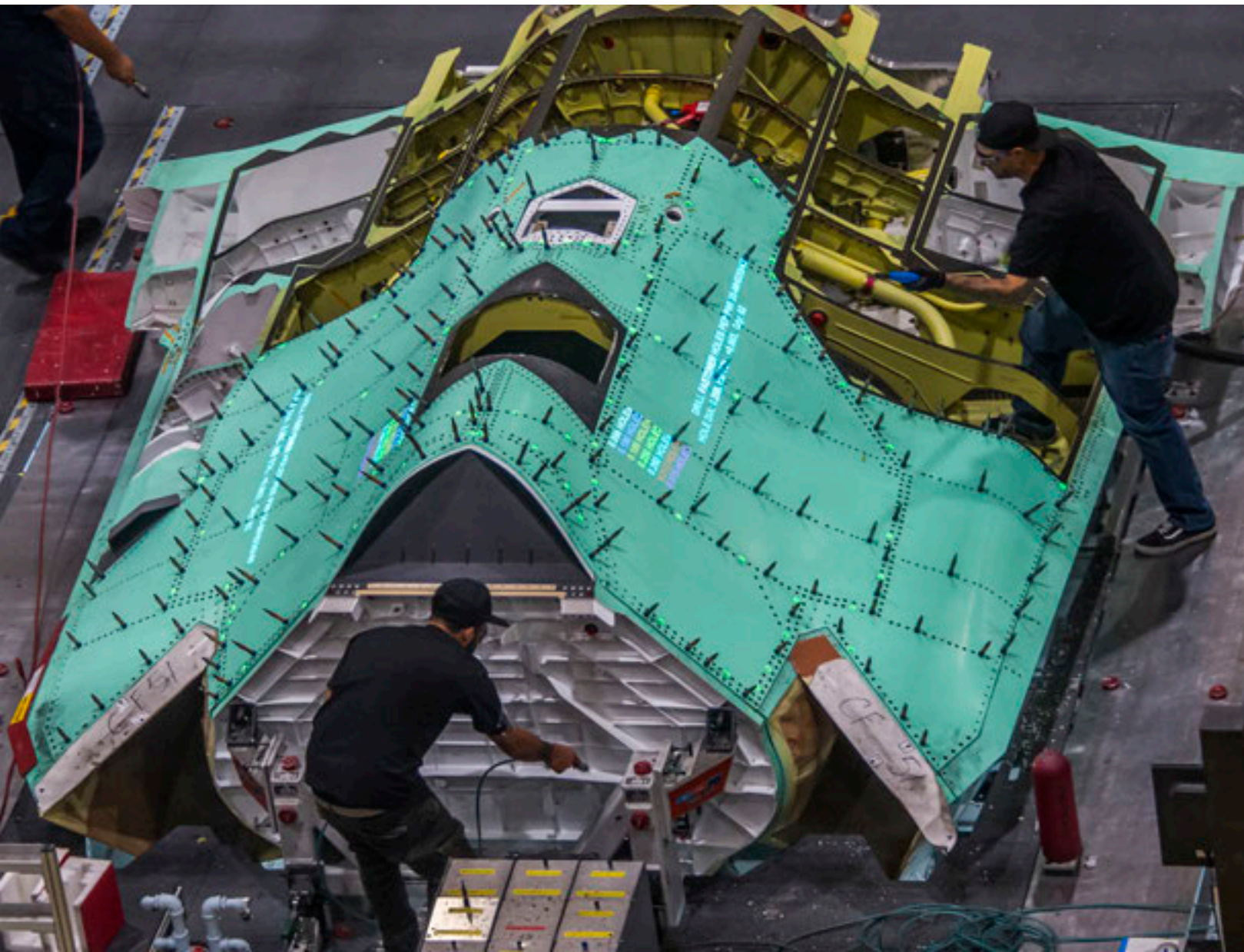


Photo by USAF Airman 1st Class Valerie Seelye / Released

