

F-35 Joint Strike Fighter Today — Security Tomorrow



F-35 Value

Only Solution To Meet Emerging Threats in the High North Region Tomorrow 2-3
Meeting National and International Commitments
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Quantum Increase in Capability Compared to 4th Generation Fighter Systems:
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Affordability Designed-in Today To Provide Real Life-Cycle Cost Savings Tomorrow
Industrial Participation Opportunities To Secure Norway's Defence Industrial Base Tomorrow
Multinational Common Solution Adaptable To Meet Norway's Unique Requirements
Low Risk,5th Generation Transformational FCA for Norway16

Right System for Efficient, Affordable Operations

Whether providing national sovereign defence, supporting regional operations, or participating in a NATO expeditionary role, the F-35 can perform a wide range of missions with greater efficiencies and a higher degree of survivability than legacy fighters. Long-range persistence, unprecedented situational awareness, interoperability with allied forces, large inventory of internal and external stores, and designed-in affordability and reliability keep the FCA viable and affordable well into the 21st century. Our use of a Performance-Based Logistics (PBL) approach and other innovative sustainment systems enables life-cycle cost approximately 20% less than legacy aircraft.



The Right Solution To Meet National and International Commitments

As a unique symbol of Norway's national sovereignty and national interests, the 5th generation F-35 plays a vital role in regional maritime operations enforcing domestic and international law, contributing substantially to peaceful operations within the Norwegian Economic Zone. It provides the capability of delivering a *measured response* ranging from carrying out full combat operations to surveillance (and fallout intelligence collection capabilities). Through its high degree of interoperability with legacy and future systems, the F-35 easily participates with others in the security of neighboring nations and governments. The continued RNoAF participation in the multinational JSF program further extends and stabilizes strategic cooperation with allies operating common technologies.



F-35 LIGHTNING II TEAM

LOCKHEED MARTIN • NORTHROP GRUMMAN • BAE SYSTEMS • PRATT & WHITNEY • GE ROLLS-ROYCE FIGHTER ENGINE TEAM

The Right Industrial Plan

This \$4.8B world-class industrial plan significantly exceeds the value of traditional offset without the use of multipliers. The plan involves most of the world's top aerospace companies, spans the complete life cycle of the aircraft, and includes the production and sustainment of 3,173 aircraft. It includes 45 opportunities that enhance the competitiveness of Norwegian industry, contribute to the knowledge and technology base, and creates the potential for spinoffs to other sectors – upgrading key industrial skills and contributing to domestic growth for decades to come. Our plan is about industrial relationships that work, are meaningful, produce results, build companies, and draw industries and nations together to produce, maintain, and sustain a transformational aircraft fleet well into the 21st century.



Mrs. Anne-Grete Strøm-Erichsen Minister of Defence The Royal Norwegian Ministry of Defence P.O. Box 8126 Dep. N-0032 Oslo

Dear Mrs. Strøm-Erichsen:

Lockheed Martin is pleased to submit this response to the Norwegian Defence Procurement Division. The revolutionary F-35 5th generation fighter integrates advanced all-aspect stealth into a supersonic, highly agile aircraft with advanced sensor and net-enabled fusion capability and dramatically improved supportability and sustainability. The result is an affordable fighter with unprecedented surveillance, combat effectiveness, and survivability.

As the first fighter in history specifically designed to be a key node in a vast network of communications capabilities, the F-35 gives decision-makers greater latitude and response time to make critical decisions. Its tremendous processing power, powerful sensors, and true information fusion make the F-35 an indispensable tool for future homeland defence and joint/coalition operations scenarios.

The F-35 is the most effective multirole fighter to ensure the sovereignty of the Norwegian homeland – particularly in the High North. Our 5th generation technology allows the Future Combat Aircraft to achieve all multirole requirements defined in the Request for Binding Information. It can be easily integrated into the existing F-16 force structure and will act as a force multiplier, increasing the operational utility of existing forces.

Affordability throughout its service life remains the bedrock of the F-35 program. Rapid day-to-day maintenance response times are provided through a modern global supply-chain management infrastructure. The result: streamlined sustainment with substantial cost savings and greatly improved system availability and flexibility. Anticipated production of more than 3,173 aircraft across all three variants offers greater opportunity to expand global partnerships industrially, politically, and militarily. To date, the JSF Team has identified approximately \$4.8 billion in Industrial Participation opportunities that will directly benefit Norway's defence industry and provide spinoff opportunities to benefit other industrial activities.

We firmly believe our F-35 RBI response demonstrates the revolutionary capability of our newest 5th generation fighter and its transformational support system. I personally commit the resources and executive focus of the entire Lockheed Martin team to ensure success.

Sincerely,

Ralph D. Heath

Executive Vice President, Lockheed Martin Corporation

President, Lockheed Martin Aeronautics Company

Meets National Defence Requirements



Unrivaled System Efficiency

Only Aircraft With Superior Range, Persistence, Sensors, and Advanced Communications To Guarantee Surveillance and Defence of the High North Areas

Extensive Unrefueled Loitering Time

Transformational Capability

- Maritime Surveillance
- Protection of Natural Resources
- Air Interdiction
- Net-Enabled for Participation in Expeditionary Missions

First and Only Coalition Fighter Designed for Net-Centric Warfare

Leverages Unrivaled Situational Awareness From True Multisensor Fusion and Net-Enabled Capability

Designed-In Environmental Soundness

Basing and Mission Flexibility, Growth Potential, Performance, and Mission Effectiveness Not Available in Legacy Fighters

Integrates Advanced Sensors, LPI
Communication Systems, Sensor Fusion,
and Advanced Propulsion on an
All-Aspect VLO Platform To Deliver
21st Century Capabilities



Quantum Leap in Capability Over Previous Fighters

The synergy that results from combining all-aspect very low observability, speed, maneuverability, persistence and range, sensor fusion, improved sustainability, and lean deployment in a single fighter represents a quantum leap in capability, survivability, and maintainability over all previous fighters. The F-35 will deliver game-changing capability for the RNoAF. Technologies inherent in this 5th generation fighter restore the asymmetric advantage.

Transformational Operational Capability for the 21st Century

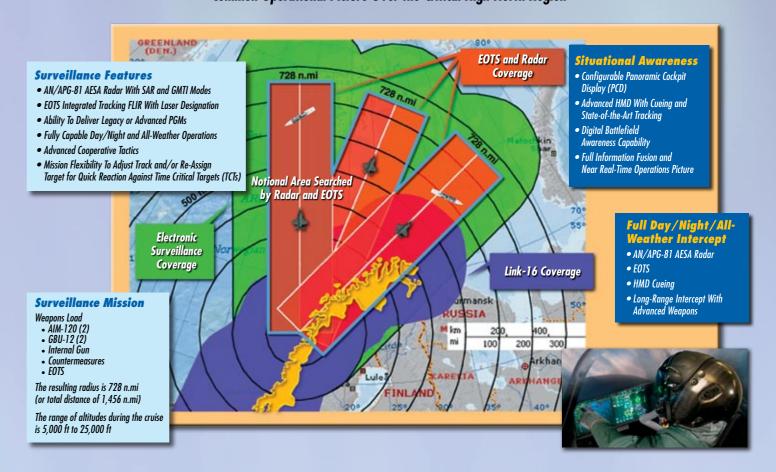
The key feature of 5th generation fighters is Very Low Observable (VLO) stealth. VLO stealth requires internal weapons and sensor carriage. Unlike legacy fighters, weapons may be carried internally to greatly reduce observability and drag for increased range and persistence, leading to longer loiter time without detection – ideal for surveillance in the High North area. The F-35 has a radius of 673 nautical miles on internal fuel alone and 728 nautical miles using external tanks. When stealth is not required or in low-threat situations, additional weapons and fuel of up to 18,000 pounds can be carried on 11 external hardpoints for even greater range and combat efficiencies.

Environmental Considerations

Lockheed Martin is committed to producing the most environmentally sound F-35 system possible while meeting stringent performance requirements. The table below is but one testament to our results to date.

Green Production, Green Operations, Green Support		
Hydrazine	None	
Class I/II ODC	None	
Halon	None	
VOC Emissions	VOC-Exempt Solvents	
Lead and Lead Compounds	Solder Only	
Support Equipment Emissions	25–50% Lower Than F-16	
Engine Air Emissions	50% Less CO, 82% Less VOC Than F-16	
Beryllium	Only in Highly Loaded Busing	
Production	Numerous Awards	
Chromium Primer	None	

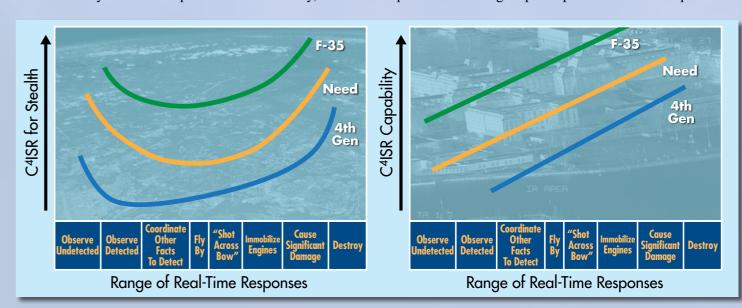
Only Solution With Persistence, Sensors, and Communications Necessary To Develop, Maintain, and Share a
Common Operational Picture Over the Critical High North Region



Valuable Instrument of Norway's Foreign and Domestic Policy

As a symbol of Norway's national sovereignty and national interest, the F-35 is uniquely capable of performing a vital role in Norway's maritime operations. Additionally, the

F-35 contributes substantially to peaceful ops within the Northern Economic Zone (NEZ), and provides numerous options for Norwegian participation in coalition operations.



The Only Solution To M eet Emerging Threats in High North Region Tomorrow

Meeting Both National and International Commitments



Unprecedented Interoperability To Meet Norwegian Requirements and Alliance Obligations

Net-Enabled for Interoperability With Legacy Assets and Alliances

Integrated Into Global Supply Chain

Integrated Common Operational Picture (COP) Among Army, Air Force, and Coast Guard

Capability To Share Precise Targeting and Threat Information With Network Participants Real Time

Common Basing and Training Provides Greater Flexibility and Reduces Cost

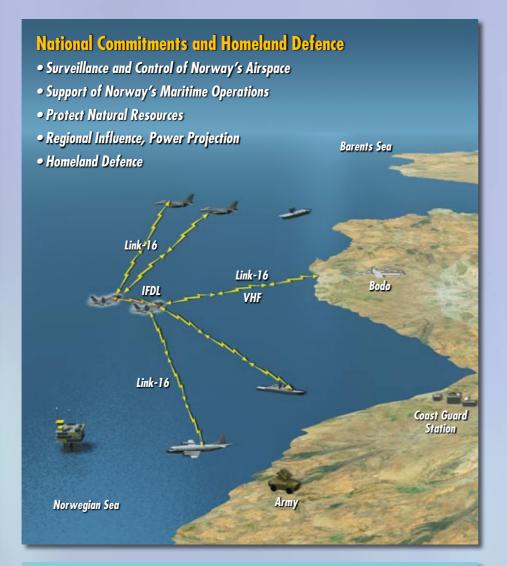
Strengthens Key Military Alliances

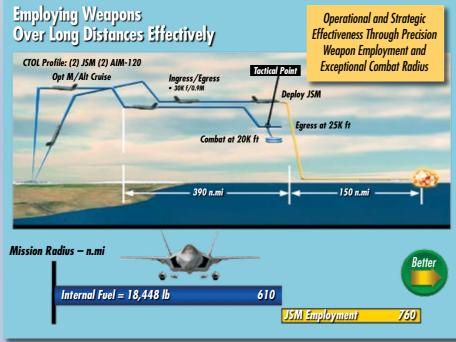
- NATO
- Nordic Balance Agreement Between Denmark, Norway, Sweden, and Finland
- European Union
- UN Peacekeeping (EU) Operations

Expands Global Partnerships

- Political
- Military
- Industrial

Operational Freedom and Flexibility for Norwegian National Leadership





Data Sharing Among F-35s Increases Flexibility

Once targets are detected, located, and identified, and assignments are made within flights, the onboard Electro-Optical Targeting System (EOTS) and Active Electronically Scanned Array (AESA) radar continue to update and refine threat information. This data is shared among F-35s by an intraflight data link (IFDL) and fused by each aircraft computer together with data from off-board sources. The resulting data fusion (i.e., a near complete picture of area of interest) is displayed to each pilot via the large Multifunction Display (MFD). This same information can be shared with other Norwegian agencies and allies who have the same Common Operational Picture (COP) needs.

Operational Flexibility and Interoperability

The F-35 also has extensive interoperability with legacy systems, weapons, and other defence networks within NATO, international coalitions, and other participant countries. The F-35 can communicate with 108 OPFACS. This provides the Norwegian national leadership and combat commanders operational freedom and flexibility not possible with earlier generation aircraft and traditional Intelligence, Surveillance, and Reconnaissance (ISR) assets.

Whether providing national sovereign defence of the homeland, protecting valuable natural resources, supporting regional operations, or a NATO expeditionary role, the F-35 performs a wide range of missions with greater combat effectiveness and efficiency, and with a higher degree of survivability than legacy fighters.



Transformational Capability



Viable and Relevant for 21st Century . . . Not a Compromise Solution Limited by 20th Century Technology

Builds Upon Positive Experience With EPAF Countries on the Lockheed Martin F-16 Program

40 Years of Advanced Technology Available to Norway Now

- Persistent
- Survivable
- Interoperable
- Affordable
- ResponsiveAdaptable
- Lethal
- Sustainable

More Than a Platform — a Global Security Cooperation Program That Provides Flexibility for the Future

- Airmen
- Trainina
- Aircraft
- Airmen Relationships
- Weapons
- Doctrine, Tactics, C⁴ISR

Expands Global Partnerships

- Political
- Military
- Industrial

Unmatched 5th Generation Technology . . . To Match 21st Century Threats

Designed and Integrated Into the Most Technologically Advanced Multirole Fighter

Unrivaled Multirole Fighter Effectiveness

Meeting JSF Key Performance Parameter

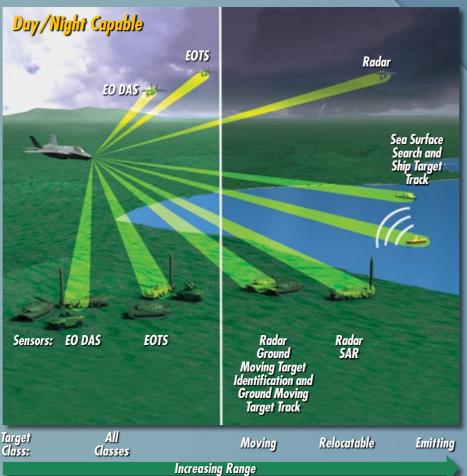
Combat Radius

590 n.mi 610 n.mi

Dominant Missions

Air-to-Air

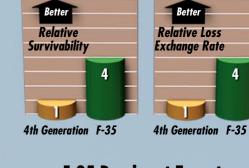
Advanced Avionics and Information Fusion Provide Unmatched Mission Effectiveness



Active Electronically Scanned Radar — Advanced All-Weather Situational Awareness

Electro-Optical Targeting System (EOTS) — Long-Range Day/Night Detection and Precision Locator

> 5th Generation Stealth VLO Ensures Unobserved Surveillance in Highly Defended Areas



Air Defence System

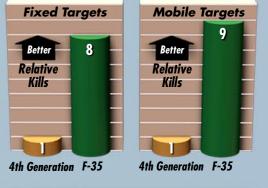
Survivability

CTOL (Config 5)

F-35 Dominant Targets



F-35 Dominant Targets



Improved Combat Efficiency

The F-35 uses its VLO, long-range and loitering capability, advanced sensors, interoperable Low Probability of Intercept (LPI) communications suite, and advanced Electronic Support Measures (ESM) to survey and identify potential threats well before they are aware of its presence. The F-35 can see more areas and achieve deeper track depth than most of today's traditional Intelligence, Surveillance, and Reconnaissance (ISR) assets. This capability sharply contrasts the limitations of legacy fighters that are easily detected long before reaching the optimum surveillance point or have limited range to perform the mission effectively.

Advanced Electronic Warfare System (EWS) and Electro-Optical Distributed Aperture System (EO/DAS) — 360-Degree Multispectral Situational Awareness

Quantum Increase in Capability Compared to Last Century's Fighter Systems



5th Generation Stealth Key to Multirole Combat Effectiveness

Operates in Threat Environment Not Survivable by Legacy Fighters

Very Low Radar Cross Section When Fully Configured for Combat

Can Surveil More Area Longer and See Deeper Track Depth Than Many Traditional ISR Assets

Total Situational Awareness

Higher Effectiveness and Probability of Mission Success

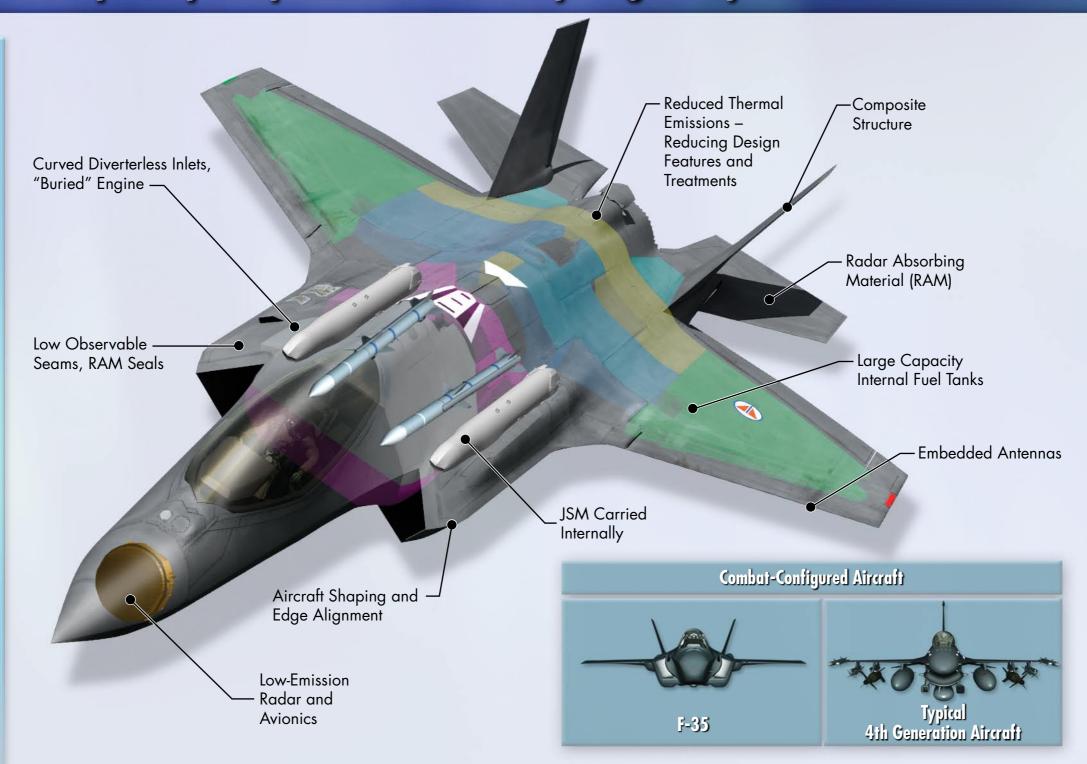
Highly Supportable — 86% Component Removal Accomplished Without Restoration

Total Force Enabler — Interoperable, Lethal, Supportable, Affordable, and Flexible . . . Efficient

Designed for the 21st Century

- All-Aspect VLO
- Fighter Performance
- Integrated Sensor Fusion
- Net-Enabled Ops
- Advanced Sustainment
- Block Improvements

Catalyst for Technological Advancements and Industrial Spinoffs



Overwhelming Multirole Efficiency and Survivability

All-aspect VLO design concept integrates radar, infrared, and visual signature reduction into a low observable, high-performance design. The F-35 provides the RNoAF the most effective counter to a broad range of threat systems and tremendously increases RNoAF combat options in mission planning. All-aspect VLO provides for longer undetected surveillance missions.

Legacy Aircraft Cannot Be Effectively Retrofitted With 5th Generation Capabilities

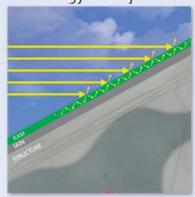
Advanced stealth is designed-in from the beginning and includes features such as internal weapons, internal sensors, engine intake design, and outer mold line features. Low Observable (LO) treatments added after a fighter is designed will never provide the level of survivability designed into 5th generation aircraft, leaving pilots and sovereign nations vulnerable.

Edge on Detection



Radar Return Is Deflected Away From the Aircraft Due To Its Shape and Aligned Edges

Energy Absorption



Radar Energy Is Absorbed and Dissipated by Special Coatings Applied Over the Aircraft Skin

IR Reduction



F-35 Engine Nozzles Employ Specially Designed Shaping, Ceramic Shielding, and Other Coatings To Effectively Reduce IR Emissions

Affordability Designed-in From the Start



Transformational Autonomic Logistics System

Exceeds All JSF Key Performance Parameters

Designed-in Supportability Reduces Manpower and Cost

- 62% Less Manpower for RNoAF-Deployed Scenario
- 10–20% Increase in Aircraft Availability
- No Scheduled Depot Level Maintenance
- 2x Reliability

Optimized Spares and Support Equipment Reduce Life-Cycle Cost (LCC)

- 50% Fewer Spares
- 60% Less Support Equipment

Enhanced Mobility

- 73% Less Logistics Footprint (Volume)
- 43% Fewer Pallets for 30-Day Deployment
- 47% Less Logistics Footprint (Weight)

Better Pilot and Maintainer Training at Lower Cost

- 30% Reduction in Training System LCC Compared to Legacy
- Task Preview/Mission Rehearsal Available Any Time, Anywhere
- 90% Software Reuse Device Concurrency With Aircraft

Business Approach Optimizes
Performance and Affordability —
Performance-Based Logistics (PBL),
Proven To Increase Reliability
and Reduce LCC



Unprecedented Industrial Participation Opportunities



Industrial Opportunities Exist Well Beyond the Norway F-35 Procurement

Leveraging U.S. Government's Largest Multinational Cooperative Defence Program To Secure Norway's Industrial Base for the 21st Century

Norwegian Industries Already
Participating in JSF SDD Program Six
Years Prior to Norwegian Production
Contract and on All Three Variants . . .
Well-Positioned for Production Contracts

Embraces Critical Norwegian Industrial Participation Projects and Cutting-Edge Strategic Projects

- Joint Strike Missile (JSM)
- APEX Ammunition
- Composites Center of Excellence
- PLCS Interfaces With ALIS

Joint Marketing Agreement With KDA To Market Norwegian JSM Worldwide

Technical Assistance and Risk Reduction Efforts in Work To Establish Norwegian Composites Center of Excellence

F-35 PBL Model Uses Civilian Industry Personnel and Strengthens Civilian-Military Partnership

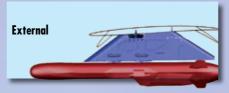
Global Industrial Relationships Producing Meaningful Results While Drawing Industries and Nations Together

Enabling Integration of Norwegian-Developed Technologies Tomorrow

Actively Influencing the Design Today

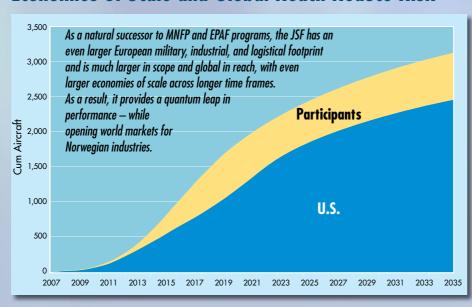
- Joint Strike Missile (JSM) Integration
- Armor-Piercing Explosive (APEX)
 Ammunition Opportunity
- Icy Runway Operations Capability
- Product Life-Cycle Support (PLCS) Interface With Autonomic Logistics Information System (ALIS)
- Membership in Requirements Working Group, Autonomic Logistics Advisory Group, and Operational Advisory Group
- Continued Involvement in Simulation Events and Exercises Such as Agile Endeavor







Economies of Scale and Global Reach Reduce Risk

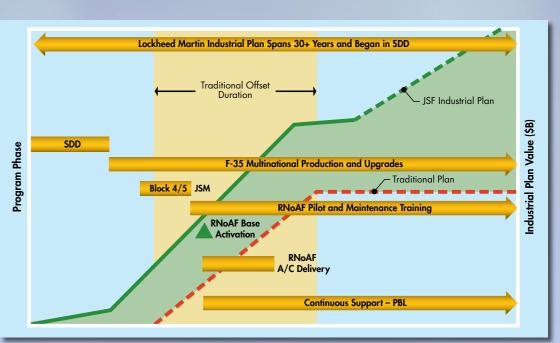


Long Term Industrial Cooperation

Industrial participation between Norway and the joint government-industry team means a partnership that continues through design, development, and sustainment throughout its life cycle. Enhancing the competitiveness of Norwegian industry, its knowledge and technology base, and creating the potential for spinoffs to other sectors are key tenets of our plan. The JSF Team IP is valued at approximately \$4.8B. This represents approximately \$1.0B improvement from our 2006 IP Plan and does not include Propulsion IP.

\$4.8B World-Class Industrial Plan

This plan began with SDD and continues through production, sustainment, and follow-on development for the 30+ year life of the JSF program. We began engaging Norwegian industry six years ago, well in advance of Norway making a production procurement decision. Lockheed Martin has a long history of industrial cooperation in Norway, and we look forward to working with Norwegian industry over the life of the JSF program.



Joint Marketing of JSM

Lockheed Martin and Kongsberg Defence & Aerospace of Norway have entered into a joint marketing agreement to market the Joint Strike Missile (JSM). A conservative market assessment shows a market potential of approximately 790 missiles. The JSM can be carried both internally and externally on the F-35.



Norway's Composites Center of Excellence

The JSF team funded efforts to establish a Composites Center of Excellence for LRIP 3. We provided risk reduction studies and technical consultants to ensure this technology is properly developed and used in the production of F-35 components. This represents a significant expansion of the current composites technology at Kongsberg and forms the basis for a much larger production volume as the F-35 enters full-rate production with planned quantities of 3,100+ aircraft.



Securing Norway's Defence Industrial Base Tomorrow

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Multinational Common Solution



Increasing Operational Capabilities Before FCA IOC

Unparalleled Insight Into Current JSF Program and Opportunities To Influence Future Upgrades for the Common F-35 Fleet

Access To Common Technologies, Weapon System Tactics and Employment Concepts, Supportability Infrastructure, and Training Synergies Through Strategic Defensive Alliances

Diminished Manufacturing Source (DMS) Risk Mitigated by Technology Pull

Advanced Capabilities at Lower Risk and Cost Without Sacrificing Time To Stop Development and Restart a Production Program

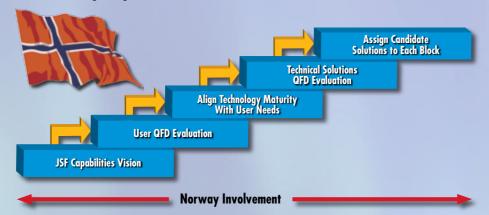
Continuous Assessment of New Technologies for Addressing New and Emerging Threats or Opportunities

Continued Access to a Strategic Defence Alliance With Common Technologies and Synergies

Continued Involvement in Simulation Events and Exercises

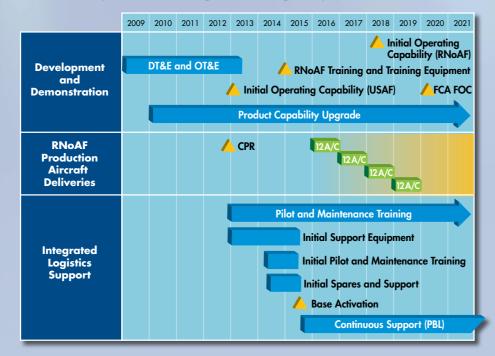
F-35 Spiral Development Approach Beyond 2012

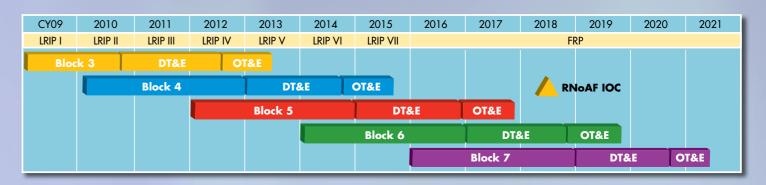
The weapon system in our offering is based on the contracted F-35 System Development and Demonstration (SDD) Block 3 Conventional Takeoff and Landing (CTOL) configuration, plus anticipated Block 4/5 upgrades and any Norwegian Future Combat Aircraft (FCA) requirements. Regular upgrades through a formal Block upgrade program are planned. The Government of Norway has identified 2014 for acquisition with deliveries starting in 2016. As currently assessed, Norway can expect to have Block 4 capability in their early production aircraft and Block 5 capability in the later production aircraft. Retrofit of new Block capabilities in earlier Block aircraft is a key tenet of our spiral plan.



Weapon System Deliveries

In anticipation of an FCA Program Parliament go-ahead in 2010 and an F-35 contract award in 2012, the first F-35 deliveries to the RNoAF start in 2016. The subsequent aircraft delivery rate is two (2) aircraft every other month until the desired delivery is fulfilled. Initial Operating Capability (IOC) is achieved mid-year 2018; Full Operational Capability (FOC) in 2020.





	Notional Block 4/5	Notional Block 6/7	
Basics	 Auto GCAS Crypto Upgrades ICP Upgrade for Increased Communications Power/Thermal Management Improvement Airframe Life Extension Maritime Upgrades Inverse SAR JSM Joint Precision and Landing System (JPALS) 	Range Improvements Propulsion Improvements Improvements	
Air-to-Surface	 JSOW Block 3 Streaming Video/IR Pointer Combat ID – Moving Targets (IRST) Full FOV DIRCM/IR Cooperative EW 	ointer • Full FOV DIRCM/IR Pointer targets • Cooperative EW • Advanced Threats Response	
Air-to-Air	 AIM-9X Block 2 OMS Multiship Route Planner Additional SAR Templates Additional Sensor Integration 	All-Aspect Passive Threat Detect/Response Management	
Interoperability/ ISR/CNI	Link-16 and VMF Updates Advanced Threats Response Wideband COM Phase Infrastructure Wideband COM Phase 2 Implementation Canopy Expansion		
AutoLog/GS	 Super Portable Maintenance Aid (PMA) ALIS Security Implementation Phase III 		
Unique Norwegian Requirements • Icy Runway Capability/Drag Chute Option			

JSF Product Development Planning

Future capabilities are maintained and nurtured with a critical eye toward sustaining the four foundational design pillars of affordability, lethality, survivability, and supportability. Norway and other country-specific improvements are evaluated along with other candidates for potential incorporation and integration into the common configuration. Candidate technologies shown above are part of the draft Development Roadmap and only represent a small segment of those under evaluation for future Blocks.



Continued Participation in Agile Endeavor Type Simulation Events





 Insight on How Capabilities Meet Partner-Specific Warfighting Needs

Adaptable To Meet Norway's Unique Requirements

Low Risk Choice for Norway's FCA



Right Weapon System, Right Industrial Solution and Right Industrial Plan

5th Generation Fighter and Support Systems — Strengthening Homeland Security and Cooperative Support

Leveraging 40-Plus Years of Advanced Technology

Transforming the RNoAF Into a 5th Generation Air Force

JSF Advanced Technologies for Unmatched Multirole Capability With Lowest Ownership Cost

Platform Viability and Relevance Beyond Mid-21st Century

Affordable Recapitalization Worldwide — at Legacy Aircraft Cost

Flexibility To Handle Known and Emerging Threats

Cooperative Avionics Test Bed (CATB)
Flying Today and Reducing Avionics and
Sensor Risk Well Ahead of FCA IOC

The Lockheed Martin JSF Team, Pratt & Whitney, GE Rolls-Royce Fighter Engine Team, and the U.S. Government — Proven Partners for Norway

Leveraging Large Economies of Scale To Keep the F-35 Affordable

The F-35 — Flying Today and in Low-Rate Production







In Production and Flying Today



5th Generation Transformational FCA for Norway

