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National Environmental Policy Act
Section 102(2)(C)

ENVIRONMENTAL ASSESSMENT

Joint Strike Fighter
United States Navy/United States Marine Corps
Variant Concept Demonstration Phase
Flight Test Program

July 2000

Abstract

This Environmental Assessment (EA) identifies and evaluates the potential for adverse environmental impacts resulting from the proposed Joint Strike Fighter United States Navy and United States Marine Corps Variant Concept Demonstration Phase Flight Test Program. Analysis contained herein is primarily tiered from existing environmental analyses that have established environmental baseline conditions at the preferred test site. This EA assesses the impacts of the Proposed Action's Preferred Alternative, and identifies in-place mitigation measures for reducing potential environmental impacts resulting from implementation of the Preferred Alternative.

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Flight Test Program

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EXECUTIVE SUMMARY

PROPOSED ACTION INTRODUCTION

The Joint Strike Fighter (JSF) Program Office has prepared this Environmental Assessment (EA) to assess the potential environmental effects of performing the JSF United States Navy (USN) / United States Marine Corps (USMC) Variant Concept Demonstration Phase (CDP) Flight Test Program (FTP). Described below are details about the Proposed Action.

The JSF Program is a Major Defense Acquisition Program (MDAP) jointly led by the United States Air Force (USAF), USN, USMC, and the United Kingdom's Ministry of Defense (Royal Navy (RN) and Royal Air Force (RAF)). The JSF aircraft is being designed as an affordable family of strike aircraft able to meet an advanced threat (2010 and beyond), while improving lethality, survivability, supportability, and fulfilling the multi-service role requirements of the participatory services. Two principal contractors (Lockheed Martin Corporation and Boeing Company) are engaged in the competitive development of three uniquely configured JSF experimental (X) aircraft to satisfy the individual service's requirements.

Flight-testing of a weapon system, such as the JSF, is a directed and funded acquisition effort by the Department of Defense (DoD). The acquisition process is designed to provide a new or improved material capability in response to a validated operational need. DoD Directive 5000.1 and DoD Regulation 5000.2-R establish the integrated management framework that supports the acquisition program's various milestones and phases. The Proposed Action is a required Test and Evaluation (T&E) phase within the DoD acquisition process.

PROPOSED ACTION - PURPOSE AND NEED

The purpose of JSF FTP is to demonstrate and evaluate the operational capabilities of the USN and USMC variants, as well as the performance (such as maneuvering abilities, flying qualities, and internal environments) of the X-aircraft. The FTP is needed to demonstrate those critical technologies, processes, and system characteristics necessary as part of the selection process down to one contractor, and for the low risk transition to the next acquisition phase, Engineering and Manufacturing Development (EMD). The result of the demonstrations and subsequent evaluations will help provide determining factors used to select a contractor for development of the Preferred Weapon System Concept (PWSC) design and to proceed to the EMD program phase. The demonstrations will provide for the validation of the JSF USN and USMC variant's operational effectiveness and ability to meet unique service requirements, thereby substantiating those critical technologies, processes, and system characteristics necessary for the low risk transition of the PWSC to EMD.

- **Computer Simulation and Modeling** – The CDP of an acquisition program, such as the JSF, includes numerous laboratory and modeling T&E requirements prior to advancing to actual flight-testing. Extensive JSF CDP Computer Simulation and Modeling has been conducted at participatory contractor facilities, National Aeronautical Space Administration (NASA) Laboratories (e.g., wind tunnel test), and other government and commercial facilities expressly outfitted to accomplish unique T&E requirements. However, Computer Simulation and Modeling, as an alternative to physical flight-testing, has been eliminated as a viable alternative because it does not sufficiently ensure the successful performance and safety of the JSF variant aircraft and systems. Computer simulation and modeling limits the Navy's ability to meet testing and mission requirements as defined in the JSF Operational Requirements Document.

- **No Action Alternative** – The No Action Alternative would continue the execution of existing flight-test programs and other routine air/air support operations at NAS Patuxent River and other considered sites. However, this alternative would not allow for the demonstration of the competitive contractor's experimental JSF aircraft and the verification of the aircraft's ability to perform and meet unique service requirements. Under the No Action Alternative, the JSF Program would be cancelled and operational capability of USN/USMC air strike assets would not remain abreast with future national security threats; a replacement program would still be required. Therefore, the No Action Alternative has been determined to be unacceptable for the JSF Program.

  However, in the NEPA analysis, the No Action Alternative provides the baseline of environmental data (the "as is" condition) for existing manmade and natural environmental parameters with which to compare and contrast the impacts of action alternatives. Therefore, the No Action Alternative is included in this EA to assess the potential impacts from implementing the JSF FTP.

PREFERRED ALTERNATIVE TEST SITE LOCATION

NAS Patuxent River is located in St. Mary's County, MD, on a peninsula between the Patuxent River to the north, and the Chesapeake Bay to the east and south. NAS Patuxent River is located adjacent to the town of Lexington Park, MD, approximately 65 miles southeast of Washington, DC. NAS Patuxent River is the USN's principal Research, Development, Test, and Evaluation, engineering, and fleet support activity for Naval aircraft, engines, avionics, aircraft support systems, and ship/shore/air operations. NAS Patuxent River is a principal site for development T&E, as well as having range facilities, flight-test and ground-test support, technical and engineering support, and base support for Navy users and other DoD and government agencies.

ENVIRONMENTAL IMPACTS OF THE PREFERRED ALTERNATIVE

The analysis shows that all aspects of the JSF FTP fall within the increased flight and related operations analyzed as part of the third operational workload alternative (OWA-III) in the *Final Environmental Impact Statement (FEIS) for Increased Flight and Related Operations in the Patuxent River Complex, Patuxent River, Maryland*, hereafter referred to as the FEIS (USN, 1998). Of all potential environmental impacts considered for the Preferred Alternative, air

RECOMMENDATIONS AND CONCLUSIONS

Based on the scope of the Preferred Alternative, weighed against the existing affected environments/resources present at NAS Patuxent River's region of influence, it has been determined that the environmental consequences of the JSF FTP are not significant. Noise levels and air emissions from the JSF flights will be sporadic and of a short-term duration with no significant contribution to the current conditions at NAS Patuxent River. Impacts to all other environmental resources are not expected by implementation of the Preferred Alternative. In addition, the JSF CDP will use existing NAS Patuxent River facilities and resources, and no new assets are currently required to support the overall JSF FTP. Even though the JSF is a new experimental/demonstrator aircraft, the proposed flight-tests are consistent with and no different from the current mission and ongoing operations conducted at NAS Patuxent River. The overall scope of the JSF CDP FTP is consistent and within the scope of the OWA-III analyzed in the FEIS, which concluded that there would be no significant or cumulative environmental impacts at this operational workload. Therefore, the JSF FTP is not expected to significantly contribute to long-term or cumulative impacts. Based on these conclusions, the JSF Program recommends that a Finding of No Significant Impact be issued for the JSF CDP FTP at NAS Patuxent River.

TABLE OF CONTENTS

FIGURES AND TABLES

LIST OF FIGURES

LIST OF TABLES

Acronyms and Abbreviations

AAW	Anti-Air Warfare
AB	After-Burn
ACLS	Automatic Carrier Landing System
AFB	Air Force Base
AFFTC	Air Force Flight Test Center
AGL	Above Ground Level
AI	Air Interdiction
AICUZ	Air Installation Compatible Use Zone
APZ	Accident Potential Zone
BASH	Bird/Aircraft Strike Hazards
BRAC	Base Realignment and Closure
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CALF	Common Affordable Lightweight Fighter
CDP	Concept Demonstration Phase
CEQ	Council on Environmental Quality
CFC	Chlorofluorocarbon
CFR	Code of Federal Regulations
CO	Commanding Officer
CO	Carbon Monoxide
Complex	NAS Patuxent River Complex
CTR	Chesapeake Test Range
CTOL	Conventional Take-off and Landing
CV	Carrier-Based Variant
CY	Calendar Year
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
DASH	Deer/Aircraft Strike Hazards
dB	Decibel
dBA	A-Weighted Decibel
DELMARVA	Delaware, Maryland, Virginia
DNL	Day-Night Average Sound Level
DoD	Department of Defense
DODD	Department of Defense Directive
DODR	Department of Defense Regulation
DODI	Department of Defense Instruction
EA	Environmental Assessment
EFH	Essential Fish Habitat
EI	Emissions Index
EIS	Environmental Impact Statement
EMD	Engineering and Manufacturing Development
EO	Executive Order
FAA	Federal Aviation Administration

OLF	Outlying Landing Field
OPNAVINST	Office of the Chief of Naval Operations Instruction
ORD	Operational Requirements Document
OSHA	Occupational Safety and Health Administration
OWA-III	Operational Workload Alternative III
O_3	Ozone
Pb	Lead
PM_{10}	Particulate Matter (of 10 microns or less in diameter)
PRC	Patuxent River Complex
PTE	Potential-to-Emit
PWSC	Preferred Weapon System Concept
RAF	Royal Air Force
RDT&E	Research, Development, Test and Evaluation
RECON	Reconnaissance
RN	Royal Navy
RONA	Record of Non-Applicability
SAR	Search and Rescue
SECNAVINST	Secretary of the Navy Instruction
SO_2	Sulfur Dioxide
STOVL	Short Take-Off Vertical Landing
TAP	Toxic Air Pollutant
tpy	Tons Per Year
T&E	Test and Evaluation
UK	United Kingdom
USAF	United States Air Force
USC	United States Code
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USMC	United States Marine Corps
USN	United States Navy
VFR	Visual Flight Rules
VOC	Volatile Organic Compound
X	Experimental
YPG	Yuma Proving Ground

1.0 DESCRIPTION, PURPOSE OF, AND NEED FOR THE PROPOSED ACTION

1.1 ENVIRONMENTAL POLICY

This Environmental Assessment (EA) has been prepared pursuant to the National Environmental Policy Act (NEPA) of 1969 and the Council on Environmental Quality (CEQ) NEPA implementation regulations. In addition, relevant Department of Defense (DoD) instructions have been applied that implement those laws and regulations directing that environmental consequences be considered prior to authorizing or approving a major Federal action. These relevant laws and regulations applicable to this EA are as follows:

- The NEPA of 1969 establishes national policy, sets goals, and provides the means to prevent or eliminate damage to the environment. The NEPA procedures ensure that information on environmental impacts associated with major Federal actions is made available to public officials and citizens prior to decisions being made. The CEQ regulations, Title 40 Code of Federal Regulations (CFR) Parts 1500-1508, implement the procedural provisions of NEPA.
- Executive Order (EO) 11514, *Protection and Enhancement of Environmental Quality*, as amended by EO 11991, *Relating to Protection and Enhancement of Environmental Quality*, sets the policy for directing the Federal government to provide leadership in protecting and enhancing the quality of the national environment.
- EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations*, directs Federal agencies to prevent disproportionately high and adverse human or environmental impacts, caused by Federal actions, from occurring on the aforementioned populations.
- Title 32 CFR Chapter VI, Part 775, *Navy NEPA Guidelines*, provides a process for making decisions, based on an understanding of potential environmental consequences of proposed actions and alternatives, and gives specific procedural requirements for the implementation of NEPA.
- Department of Defense Instruction (DODI) 4715.9, *Environmental Planning and Analysis*, supplements the NEPA and the CEQ regulations and requires DoD components to implement policy and prescribe procedures specific to their activities and operations.
- Department of Defense Directive (DODD) 5000.1, *Defense Acquisition*, establishes a disciplined management approach for major acquisitions that include environmental management requirements when acquiring systems and material that satisfy the operational user's needs.
- Department of Defense Regulation (DODR) 5000.2-R, *Mandatory Procedures for Major Defense Acquisition Programs (MDAPs) and Major Automated Information Systems (MAIS) Acquisition Programs*, issues mandatory environmental, safety, and health requirements for major acquisition programs, including compliance with regulatory NEPA requirements.

from the need to affordably replace aging strike aircraft assets. A congressional action later combined the Common Affordable Lightweight Fighter (CALF) Program with the JAST Program's structure. The CALF Program was designed to develop technologies and concepts to support Advanced STOVL aircraft for the USMC and the UK's RN. The combination of the JAST and CALF Programs into one JSF Program presents a unique opportunity to solve the joint service's requirement for the next generation of strike weapon systems.

The JSF is being designed to fulfill the multi-service, multi-role (air-to-air/air-to-ground) requirements of the USN, USMC, USAF, and the RN. Three JSF variants are being developed, with each possessing unique configuration characteristics to meet the joint service's requirements. The USAF variant is designated as the Conventional Takeoff and Landing (CTOL) JSF, and will be the Air Force's primary-air-to-ground aircraft to replace the F-16 and A-10. The USN's JSF is designated as the Carrier-Based Variant (CV) variant, and would complement the Navy's F/A-18E/F aircraft. The USMC and RN STOVL JSF variants may be the only fixed-wing aircraft present to support landing forces, or may be used in support of larger joint and combined operations. Lockheed Martin Corporation and the Boeing Company are the two principal contractors engaged in the competitive development of the JSF aircraft. The overall intent of the JSF Program is to design an affordable strike aircraft able to meet an advanced threat (2010 and beyond), while improving lethality, survivability, and supportability.

1.3 PROPOSED ACTION - INTRODUCTION

The JSF Program Office proposes to conduct a Concept Demonstration Phase (CDP) Flight Test Program (FTP) for the JSF aircraft variants. The USN and USMC CDP on the CV and STOVL variant, respectively, is considered the Proposed Action for purposes of this EA. The CDP FTP for the USAF JSF CTOL variant is a separate action being proposed and analyzed by Edwards Air Force Base (AFB) Flight Test Center, Edwards AFB, CA.

Concept demonstration flight-testing of a weapon system, such as the JSF, is a directed and required acquisition effort by the DoD. The acquisition process is designed to provide new or improved material capability in response to a validated operational need. DODD 5000.1 and DODR 5000.2-R establish the integrated management framework that supports the acquisition program's milestone and phase processes. These basic programmatic steps are illustrated in Figure 1.3-1. The bolded figure identifies the milestone phase that the JSF Program is currently in, and shows that CDP flight-testing is a requirement of this phase.

2.0 PROPOSED ACTION AND ALTERNATIVES

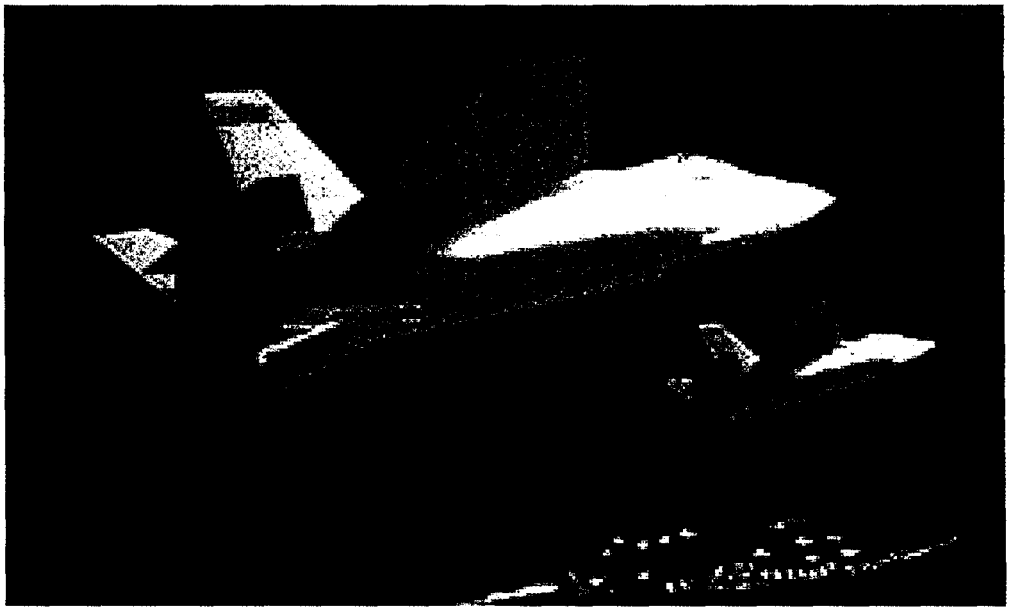
2.1 PROPOSED ACTION

The Proposed Action is to conduct the CDP FTP for the CV and STOVL JSF aircraft. Concept Demonstration Phase flight-testing will be conducted utilizing four JSF aircraft (two X-aircraft per contractor). Two X-aircraft will be configured as CVs, and the other two will be configured as STOVL variants, capable of performing conventional flights as well as STOVL operations, similar to the AV-8B "Harrier" aircraft. Conceptual representations of the contractor's CV and STOVL JSF aircraft are provided in Figures 2.1-1 and 2.1-2. The Contractor's test pilots, as well as USN, USMC, and RN test pilots, will fly the X-aircraft during the CDP. The contractors will begin testing during the 4th quarter Calendar Year (CY) 2000, and will terminate testing in the 2nd quarter CY 2001. However, due to program schedule modifications or circumstances beyond the JSF Program Office's control (e.g., manufacturing delays, extended periods of inclement weather, equipment malfunctions, etc.), flight-testing may continue through the 3rd quarter of CY 2001. Necessary test period extensions will not result in flight hour increases or other increases in CDP FTP events. In addition, if substantial changes occur to the program test parameters, appropriate coordination will be conducted to ensure continued proper environmental compliance. In general, the Proposed Action will enable each of the JSF's competing contractors to demonstrate and evaluate their experimental CV and STOVL JSF aircraft. This demonstration is a required element of the process that aids in determining which contractor will be selected to develop the Preferred Weapon System Concept (PWSC) aircraft and proceed to the JSF's EMD phase.

2.1.1 Concept Demonstration Phase (CDP) Test Flight Descriptions and Objectives

Disclosure of actual JSF performance parameters (e.g., top speed, flight endurance, range, etc.) and aircraft configuration (e.g., gross weight, dimensions, etc.) is classified as "competition sensitive" information by the JSF's contractors. However, general descriptions of aircraft configuration and capabilities are described in the following sections. Four JSF X-aircraft, designated X-32C (CV), X-32B (STOVL), X-35B (STOVL), and X-35C (CV) will be utilized to conduct specific CDP flight-tests. A glossary of flight-test terminology utilized in this section is included in Appendix A. Specific testing of each X-aircraft will be as follows:

- X-32C Flight-Tests. X-32C flight-testing will evaluate low speed carrier approach flying and handling qualities, and weapons bay flight-testing. Specific X-32C tests include simulated carrier approach flying qualities and performance (FQ&P), wave-off and bolter performance, simulated deck handling, and simulated weapons delivery.
- X-32B Flight-Tests. X-32B will evaluate the operability of the integrated STOVL propulsion system and the variant's FQ&P, including short takeoff, vertical landing, hover, and transition evaluations. Specific testing will include envelope expansion, loads, flutter, cruise and maneuvering performance, acceleration, vertical takeoffs, hover and transition FQ&P, vertical landing FQ&P, and wave-off performance.



Lockheed Martin Conceptual JSF USN CV Aircraft

Lockheed Martin Conceptual JSF STOVL Aircraft

Figure 2.1-2: Lockheed Martin Conceptual JSF CV and STOVL Aircraft

- Testing of the STOVL variant's vertical take-off and landing, ground operations, and hover performance at sea level; and
- Testing of the CV and STOVL variant's carrier operational qualities and performance.

In addition to the above requirements, site selection must fit into JSF Program funding constraints. Costs incurred for the deployment of required support personnel and essential equipment are also considered to reduce program costs and maximize test control and data collection.

2.2.1 Facility General Requirements

The general requirements, or capabilities, needed by a facility for CDP flight-test events are to:

- Provide weather monitoring and forecasting capabilities prior to flight-tests.
- Provide adequate facilities to support an aircraft test program. Minimum facility requirements are:
  - Normal aircraft crash, fire, and rescue services to include rescue helicopter and crash boat emergency support;
  - Normal utility services (e.g., phone service, potable water, electrical, sewer, etc.);
  - Procurement, shipping, receiving, and stock control services;
  - Hazardous material/waste storage and disposal;
  - Ground handling equipment;
  - Jet fuel and ground refueling and hot refueling capabilities; and
  - Dedicated hangar, maintenance, supply storage, and office space with adequate environmental controls.

In addition to the aforementioned minimum facility requirements, it is preferable that the test site offers sea level altitude operating areas for maximum engine thrust performance in STOVL operations.

2.2.2 Testing of the Short Take-Off Vertical Landing (STOVL) Variant's Vertical Take-Off and Landing, Ground Operations, and Hover Performance

The requirements for testing the JSF's vertical takeoff and landing and hover performance are:

- Provide special instrumentation and facilities for monitoring temperatures, pressures, velocities, and acoustics during the STOVL variant's vertical, hover, and ground operations.

Table 2.3-1: Facility/Range Requirement Comparison for JSF CV/STOVL Variant CDP Flight-Tests

Minimum Facility and Range Requirements	NAS Patuxent River Complex, MD	NAWCWD China Lake, CA	Eglin AFB, FL	AFFTC Edwards AFB, CA	MCAS Yuma/YPG, AZ
Adequate facilities to support an aircraft test detachment.	Y	Y	Y	Y	P
Capability to provide simulated carrier flight deck operating environment.	Y	Y	Y	Y	Y
Capability to provide qualified arresting equipment and operators.	Y	Y	Y	Y	Y
Capability to monitor hover and vertical landing and takeoff events.	Y	N	N	P	P
Weather forecasting and monitoring capability.	Y	Y	Y	Y	Y
Regular and sufficiently clear weather to support required tests.	Y	Y	Y	Y	Y
Availability of sea level flight space.	Y	N	Y	N	P

Y = Capability Present • N = Not Present • P = Partially Present

The optimal facility/range combination that best meets the Proposed Action's T&E requirements, and the most cost-efficient alternative, is NAS Patuxent River Complex (referred to in this EA, hereafter, as the NAS Patuxent River).[2] NAS Patuxent River is ideal for performing all CDP test events for the CV and STOVL variant JSF aircraft. NAS Patuxent River is the only range that has the test facility infrastructure to support the JSF STOVL testing and aspects of the carrier suitability tests. NAS Patuxent River is equipped with all the necessary facilities, equipment, and personnel required to conduct the Proposed Action.

In addition, in response to the guidance in Navy Environmental Policy Memorandum 99-01, it has been determined that NAS Patuxent River has a NEPA document which has analyzed potential impacts from aircraft research, development, and evaluation testing and has determined that no significant impacts will occur to the surrounding environment. The analytical results of this EA and the *Final Environmental Impact Statement, Increased Flight and Related Operations in the Patuxent River Complex, Patuxent River, Maryland, December 1998*, further support the decision that NAS Patuxent River is the reasonable location for hosting the JSF CDP, especially from an environmental viewpoint.

[2] NAS Patuxent River Complex, depicted in Figure 2.4-1, includes NAS Patuxent River (shore station) and Outlying Field, Webster Field Annex (with their respective flight and ground test facilities, runways, and associated airspace), and the Chesapeake Test Range over the Chesapeake Bay which includes its supersonic test corridors, associated restricted airspace, aerial and surface firing ranges, and the Hooper, Hannibal, and Tangier Island targets.

examples of RDT&E tests that would be included as part of the JSF CDP FTP are provided in Appendix A.

Flight-test missions are flown within the restricted warning areas of NAS Patuxent River. NAS Patuxent River provides active participation in all phases of the aircraft system life cycle, including support of technology demonstration and validation, EMD, production and deployment, fleet operations, and in-service engineering. NAS Patuxent River has (1) the required test equipment, (2) facilities expressly designed for flight-test support, (3) laboratories, and (4) trained personnel necessary to conduct flight-test operations. NAS Patuxent River is a principal site for development T&E during EMD, having range facilities, flight and ground test support, technical and engineering support, and base support for Navy users and other DoD and government agencies.

Naval Air Warfare Center, Aircraft Division (NAWCAD), a tenant command at NAS Patuxent River, will be the primary responsible test organization for the CV and STOVL JSF CDP FTP. NAWCAD will conduct technical and safety reviews to ensure adequate and safe conduct of all tests for which NAWCAD has mishap reporting responsibility.

CDP flight-tests will be flown with missions controlled from the Chesapeake Test Range (CTR) Control Center, and all flights will be conducted in accordance with existing flight rules (e.g., airspeed, altitudes, patterns) established for operations conducted at NAS Patuxent River. A majority of the CV testing will be performed in the NAS Patuxent River landing pattern consisting of multiple approaches and landings to include simulated wave-offs, and on NAS Patuxent River runways to evaluate bolter performance. Bolter performance measures the ability of an aircraft to safely fly away in the event the tail-hook on the aircraft fails or if the tail-hook misses or breaks the arresting cable during an aircraft carrier landing. Most of the CV suitability tests will occur in the NAS Patuxent River landing pattern, utilizing the NAS Mark-7 Arresting Gear/Catapult Test Facility, Fresnel Lens Optical Landing System; however, some CV handling qualities tests will be conducted outside the immediate airfield. Approach and landing tests will be conducted at various designated runways.

Most STOVL-variant testing at NAS Patuxent River will be accomplished over the NAS airfield with operations centering over one of two facilities. These facilities are considered test stands and include an instrumented STOVL Hover Pad and an instrumented grated Hover Pit specifically designed for vertical test operations. The Hover Pit, located approximately in the center of the airfield and depicted in Figure 2.4-2, would allow the required hover testing of the STOVL variants, with the aircraft remaining out of the effects of its high velocity exhaust while remaining close to the ground for increased safety. The Hover Pit will allow the test teams to conduct engine runs with the aircraft in STOVL modes to visually evaluate system operation and analyze operations with equipment without exposing the aircraft and test maintenance equipment to high velocity and high temperature jet exhaust. The dimensions of the Hover Pit are approximately 153 feet x 97 feet x 10 feet deep (interior dimensions). The pit is constructed with a 24-inch thick reinforced concrete mat foundation with 12-foot high concrete perimeter walls.

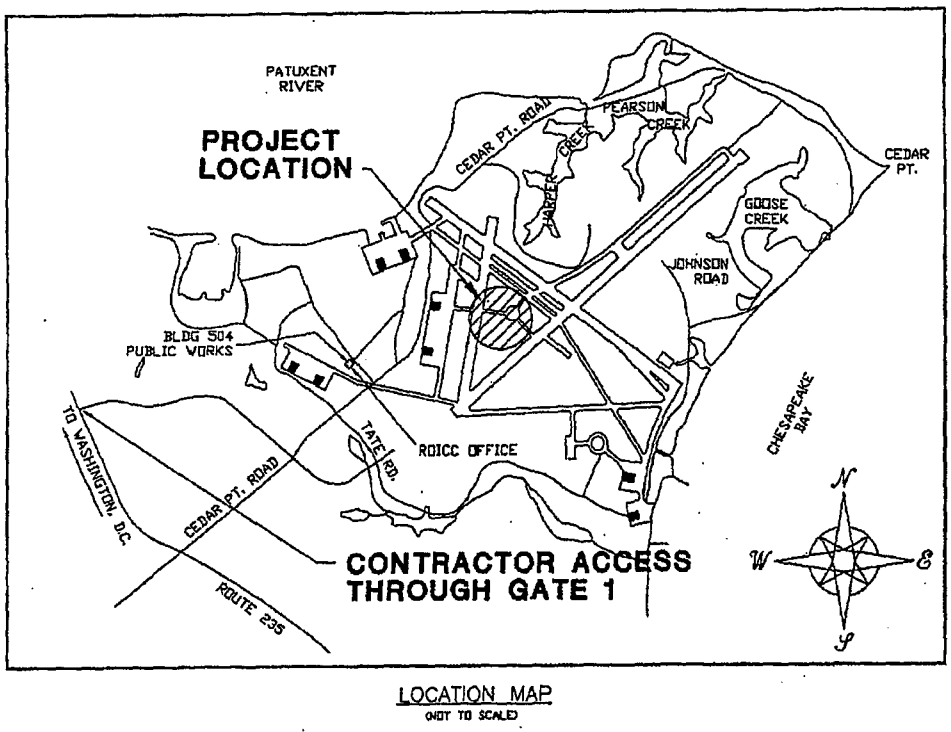


Figure 2.4-2: JSF Hover Pit Location

The STOVL Hover Pad, located adjacent to the Hover Pit, allows for testing the STOVL variants while being exposed to high velocity exhaust near the ground. The Hover Pad consists of a 50 foot radius center pad constructed of AM-2 matting (fabricated aluminum panels) surrounded by an apron of normal load bearing concrete (150 foot radius from the center of the test pad) to minimize the damage potential from blowing debris during vertical test operations.

3.0 ENVIRONMENTAL ANALYSIS

3.1 INTRODUCTION

The environmental impact analysis was initiated by gathering information on potentially affected environmental resources in the NAS Patuxent River region of influence. Using this data, impacts and significance levels associated with the Preferred Alternative were assessed for each resource. Each environmental resource (e.g., air quality, noise, biological, and cultural resources, etc.) potentially affected by the Preferred Alternative was considered with regard to its affected environment, and environmental consequences within that affected environment. Current and potential mitigation measures were also considered. This chapter describes the environmental resources/factors potentially affected, followed by an evaluation of the impact on each respective resource.

3.2 AFFECTED ENVIRONMENTS

The affected environments for NAS Patuxent River are primarily tiered from the *Final Environmental Impact Statement, Increased Flight and Related Operations in the Patuxent River Complex, Patuxent River, Maryland* (USN, 1998). This Final Environmental Impact Statement, referred to in this EA as the "FEIS," describes the current condition of the environmental resources at NAS Patuxent River, and assesses the impacts to those resources as a result of three operational workload alternatives proposed for NAS Patuxent River. Those current conditions and associated impacts in the FEIS are considered, for purposes of this EA, as the No Action Alternative. The three operational workload alternatives proposed various increases in flight and related operations in NAS Patuxent River over the 1996 baseline (i.e., No Action) condition. Descriptions and analyses of the affected environment in this EA are based on the Operational Workload Alternative III (OWA-III) established in the FEIS. This alternative proposed an annual increase of 6,197 flight hours over the no action level of 18,207 flight hours (see Appendix B for operational workload assumptions used for the FEIS). As a result of the FEIS process, the Navy has approved implementation of OWA-III as documented in the FEIS Record of Decision, May 1999.

The 256 FLT HRs attributable to the JSF FTP will be within the operational threshold of 24,400 FLT HRs per year allowed by OWA-III in the FEIS. This 24,400 FLT HR threshold supports current and future RDT&E and training workloads at NAS Patuxent River, allowing for possible variations in the type of aircraft tested and in the number of FTPs/FLT HRs (see last operational workload assumption listed in Appendix B of this EA).

Proposed JSF FLT HRs will not cause the annual flight and ground operations conducted at NAS Patuxent River to exceed this operational threshold defined in the FEIS. Recent operational data reported in Fiscal Year (FY) 1999 and FY 2000 shows that annual NAS Patuxent River FLT HRs are below 20,000 hours, and this trend is expected to continue during the duration of the JSF CDP (EIS Quarterly Progress Report, 1999 and 2000). In addition, there are ongoing variations in current aircraft FTPs conducted at NAS Patuxent River, which further ensures that the JSF CDP will be comparable to current programs and well within the OWA-III threshold.

3.4 ENVIRONMENTAL RESOURCES THAT WILL NOT BE AFFECTED BY THE PREFERRED ALTERNATIVE

Analysis provided in the FEIS concludes that none of NAS Patuxent River environmental resources are significantly impacted by the operations associated with OWA-III. Because all actions associated with the Preferred Alternative are considered within the scope of OWA-III, no significant environmental impacts are expected from conducting the JSF CDP tests. The two resource areas of the Preferred Alternative that differ from the scenarios analyzed under OWA-III are air quality and noise. This difference occurs because the JSF utilizes a propulsion system unique to the aircraft, versus other aircraft engine systems operating at the NAS Patuxent River and analyzed in the FEIS. Therefore, air and noise environmental consequences are analyzed in detail in Sections 3.5.2 and 3.5.4, while the remaining resources are discussed briefly as follows:

- **Geology and Soils** – Geology and soils at NAS Patuxent River is described in Section 3.10 of the FEIS. The Preferred Alternative will require no disturbance to surface or subsurface soils within NAS Patuxent River.
- **Land Use** – Land use at NAS Patuxent River is described in Section 3.1.1 of the FEIS. Measurable impacts to land use resources are not likely because the Preferred Alternative does not alter the use or designation of the land within the NAS Patuxent River. NAS Patuxent River is an established military complex with land-use programs in effect, specifically designed to minimize potential environmental impacts.
- **Infrastructure/Utilities** – Infrastructure and utilities is described in Section 3.7 of the FEIS. Measurable impacts to the infrastructure are unlikely because the Preferred Alternative does not require alterations to the existing infrastructure or utilities.
- **Transportation** – Transportation resources and usage at NAS Patuxent River is described in Section 3.4 of the FEIS. Measurable impacts to transportation resources are unlikely because of the small number of transient JSF test personnel required to support the CDP FTP. Transportation modes do not require infrastructure upgrades or other changes to accommodate the Preferred Alternative.
- **Water Resources** – Water resources and water quality (hydrologic and aquatic) at NAS Patuxent River is described in Section 3.13 of the FEIS. Measurable impacts to surface water resources are not likely because the Proposed Action's test plan does not identify interaction with surface water resources, nor does it alter or impact current surface water uses, storm water runoff, sewer systems, coastal zones, or the 100-year floodplain.
- **Biological / Natural Resources**
  - **Wildlife** – Section 3.12 of the FEIS provides an in-depth description of wildlife occurring within NAS Patuxent River. It provides discussion on wildlife and ecosystem management policies and programs at NAS Patuxent River; animal disturbances resulting from NAS Patuxent River operations; information on United States Fish and Wildlife Service (USFWS), National Wildlife Refuge, and management area flight restrictions; and areas of high wildlife concentrations. The Proposed Action does not include requirements for weapons/stores separations; therefore, contacts with wildlife and the associated chemical releases are not expected to occur.

- **Cultural Resources** – Section 3.8 of the FEIS provides a historic overview of the cultural resources occurring within NAS Patuxent River, as well as the National Historic Landmarks and archeological resources listed in the National Register of Historic Places. Implementation of OWA-III, which includes operational increases associated with the Preferred Alternative, would maintain existing uses of the culturally significant and historic structures at NAS Patuxent River.

  Aircraft overflights are the only potential source of impact. These potential impacts include noise, vibration, and audio/visual impacts to historic and cultural resource settings. Previous studies on the nature of noise-related vibration damage to structures are presented in Section 4.8 of the FEIS. These studies indicate that high decibel (dB) levels (above 130 dB) must be generated close to a structure (no more than 150 ft) and in a low frequency for a structure to be damaged, including a historic building. The Preferred Alternative is not expected to cause these conditions at NAS Patuxent River. Therefore, noise from JSF overflights is not expected to have a significant impact to historic or cultural resources at NAS Patuxent River.

- **Socioeconomic** – Section 3.2 of the FEIS provides an overview of the socioeconomic baseline (demographics, employment, economy, recreational activities, and housing data) for the entire area encompassed by NAS Patuxent River. Measurable impacts to local economies, schools, population levels, employment, housing availability, and recreational resources will not be significant because the Preferred Alternative is within the scope of OWA-III analyzed in the FEIS.

- **Hazardous Materials (HM)/Hazardous Waste (HW)** – Detailed descriptions of HM/HW at NAS Patuxent River are provided in Section 3.9 of the FEIS; the *Environmental Assessment, F/A-18 E/F Hornet EMD Flight Test Program, Naval Air Warfare Center Aircraft Division, Patuxent River, Maryland* (NAWCAD, 1995a); and the *Environmental Assessment, Test and Evaluation of the V-22 Osprey at NAWCAD Patuxent River, Maryland* (NAWCAD, 1995b). Information provided includes: (a) definitions, (b) inherent dangers associated with exposure, in relation to aircraft operations and support, (c) applicable Federal and State guidelines, (d) NAS Patuxent River Hazardous Material Control and Management (HMC&M) Program Office standard operating procedures, (e) Material Safety Data Sheets (MSDS), (f) Occupational Safety and Health Administration (OSHA) requirements, and (g) "cradle-to-grave" controls (i.e., receiving, storage, issue, and accounting) established for HM and HW at NAS Patuxent River.

  Measurable HM/HW impacts associated with the Preferred Alternative are expected to be insignificant because HM required for the Preferred Alternative will be managed under established Federal, State, USN, and NAS Patuxent River requirements and operating procedures. All HM required for support of the Preferred Alternative will be approved and controlled by NAS Patuxent River's HMC&M Program Office. Hazardous material required for the CDP FTP is already authorized for use at NAS Patuxent River, and any unique HM that may be required will be submitted for approval and inclusion in NAS Patuxent River's authorized use list. JSF aircraft composition and HM used in or to support the JSF aircraft will be coordinated with the NAS Patuxent River Public Safety Officer and Fire Department to ensure that proper emergency response procedures and equipment are available in the event of an incident. In addition to the above management controls, the JSF Program requires the principal contractor to reduce or eliminate, to the maximum extent practicable, many of the HM that are currently associated with existing aircraft programs.

referred to as Navy Occupational Safety and Health (NAVOSH), and include numerous protocols, including:

- Compliance with applicable standards,
- Annual OSHA inspections of all workplaces conducted by qualified safety inspectors,
- Procedures for all personnel to report suspected hazards to their supervisors,
- Prompt abatement of identified hazards,
- Thorough investigations of mishaps,
- Comprehensive occupational health surveillance programs, and
- Integration of various medical and industrial hygiene specialties into a team approach (USN, 1998).

Health and safety impacts are not considered significant due to the JSF CDP's system safety efforts and NAS Patuxent River's adherence to and emphasis on safety policies and procedures. Occupational health impacts associated with noise exposure are discussed in Sections 3.5.3 and 3.5.4.

- **Environmental Justice** – Measurable impacts to minority and low-income populations are unlikely because the Preferred Alternative will use existing test facilities, test ranges, and operating patterns within NAS Patuxent River that have evolved to minimize impacts to safety, health, and the general quality of life of human populations. Since no members of any population would be exposed to substantial impacts, minority and low-income populations would likewise not be exposed.

The JSF Program concludes that the above resources have received the appropriate level of consideration and that no significant impacts are expected to affect any of these resource areas from implementation of the Preferred Alternative.

3.5 ENVIRONMENTAL RESOURCES POTENTIALLY AFFECTED BY THE PREFERRED ALTERNATIVE

Air quality and noise are two resources that could potentially be affected by the Preferred Alternative at NAS Patuxent River. Due to the inherent nature of experimental aircraft, the exact air emissions and noise levels attributable to experimental aircraft cannot be determined until after the engines are developed, manufactured, installed, and operated in conjunction with the airframe. The best available data and engineering analyses for comparable DoD engines and/or aircraft have been used to address air quality and noise impacts, resulting from implementation of the Preferred Alternative.

3.5.1 Air Quality – Affected Environment

Section 3.5 of the FEIS provides an in-depth overview of the regulatory framework governing air quality (e.g., National Ambient Air Quality Standards (NAAQS) and National Emissions Standards for Hazardous Air Pollutants (NESHAPs)), as well as descriptions of air quality regulations and conditions that are pertinent to the entire NAS Patuxent River region of influence. Subsections 3.5.3 through 3.5.6 of the FEIS provide information relative to NAS Patuxent River air emissions sources and a summary of total air emissions levels in NAS Patuxent River. The following paragraphs provide a brief summarization of the discussion provided in the FEIS.

The NAAQS, established by the United States Environmental Protection Agency (USEPA) pursuant to the Clean Air Act (CAA), as amended, define maximum pollutant concentrations for criteria pollutants that may not be exceeded in a given time period in order to protect human health and welfare. These air quality standards include safety factors to address uncertainties in the effects of air pollution and varied human sensitivity to airborne pollutant concentrations. Maximum concentrations for criteria pollutants carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and lead (Pb) may only be exceeded one day per year. Concentrations of criteria pollutants ozone (O_3) and particulate matter of 10 microns or less in diameter (PM_{10}) may only exceed the standards an average of once yearly. Criteria pollutants may originate directly or indirectly from diverse stationary and mobile sources. These criteria pollutants, except for O_3, are produced by NAS Patuxent River sources and directly by industrial processes as primary pollutants. Ozone is a secondary pollutant, which is formed in the atmosphere by chemical interactions among primary pollutants (e.g., volatile organic compounds (VOC) and nitrogen oxides (NO_X)) and normal atmospheric constituents. VOC (coming from mostly stationary sources) and NO_X (produced mainly from mobile sources) are converted to make O_3. Since O_3 is not a primary pollutant, it is very difficult to calculate air emission levels without modeling. However, the amount of O_3 is estimated to be at or below the combined emission levels for VOC and NO_X, since the conversion of VOC and NO_X would not be complete under normal atmospheric conditions. Naturally occurring O_3 in the stratosphere provides a protective layer against the sun's harmful ultraviolet rays, whereas O_3 in the lower atmosphere can pose a health hazard by affecting lung tissue.

Air quality in Maryland is defined and regulated with respect to conformity with the NAAQS. Maryland Ambient Air Quality Standards (MAAQS) are the same as the NAAQS. The

Due to the fact that the CTR covers portions of DE and VA, ambient air quality standards imposed by these states must also be considered with respect to the Proposed Action. Both DE and VA have adopted the USEPA's NAAQS for the six criteria pollutants. Sussex County, DE is in attainment for all criteria pollutants except O_3. In addition to the NAAQS, Delaware has also established primary and secondary standard criteria for hydrocarbons and hydrogen sulfide.

The FEIS discusses National and Delaware, Maryland, and Virginia (DELMARVA) ambient air quality standards and provides tables in Appendix E identifying current NAS Patuxent River emission sources and criteria air pollutant and hazardous air pollutant (HAP) emissions summaries. Table 3.5-1, below, depicts the OWA-III estimated total emissions inventory for NAS Patuxent River.

Table 3.5-1: NAS Patuxent River Total Emissions Inventory (Workload III)

Source Category	Emission Level in Tons Per Year (tpy)				
	NO_X	VOC	CO	PM_{10}	SO_2
Mobile Source					
Aircraft Flight Operation	255.3	128.8	590.6	128.1	10.6
Ozone attainment area	252.9	128.6	588.1	127.1	10.5
Ozone non-attainment area	2.4	0.2	2.5	1.0	0.1
Ground Support Equipment and Auxiliary Power Unit	7.1	0.5	2.6	0.4	0.5
Maintenance and Pre-flight Run-up	62.0	79.9	375.7	38.7	2.7
Mobile Source Subtotal	324.4	209.2	968.9	167.2	13.8
Stationary Source Subtotal [1]	47.0	28.03	32.39	6.15	12.31
Grand Total	**371.4**	**237.2**	**1001.3**	**173.4**	**26.1**
Emissions at NAS Patuxent River for No Action Alternative [2]	306.2	185.4	815.8	135.9	47.8
Total Net Change from No Action Alternative	65.2	51.8	185.5	37.5	-21.7
Washington, DC-MD-VA Ozone Non-attainment Area 1999 Target Emissions [3]	232,542	132,459	-	-	-

Source: 1) Emissions Criteria Report for CY 1999. Prepared by Mary Q. Samuels. NAS Patuxent River, Maryland (updated March 3, 2000).
2) Appendix E of the *Final Environmental Impact Statement for Increased Flight and Related Operations in the Patuxent River Complex.* December 1998.
3) Washington, DC-MD-VA Ozone SIP Revision.

In addition to criteria pollutants identified by the NAAQS, hazardous air pollutants (HAPs) and other toxic air pollutants (TAPs) provide a potential health risk to exposed persons, and are produced by several activities at NAS Patuxent River. The main sources are chemical compounds used in maintenance and operations. Title III of the Clean Air Act Amendments (CAAA) requires the USEPA to develop a set of rules and regulations to implement control

3.5.2 Air Quality – Environmental Consequences

3.5.2.1 National Ambient Air Quality Standards (NAAQS)

The JSF is expected to produce criteria pollutant emissions similar to those produced by other aircraft operating at NAS Patuxent River. This analysis will estimate the direct emissions associated with the operation of the JSF X-aircraft during CDP FTP using the best engineering estimates and data available.

The pollutants analyzed are NO_X, VOCs, and CO. The two pollutants, NO_X and VOC, have been analyzed because they are O_3 precursors, and O_3 is the only criteria pollutant for which any county within the confines of NAS Patuxent River is in non-attainment. Emissions calculations for the JSF have been derived from emissions data produced by the F-119 engine, which is currently installed and operating on the USAF's F-22 Raptor, and from emissions and operations data provided by Boeing, Lockheed Martin, and Pratt & Whitney. The F-119 engine has been used for this analysis because of the similarities between its combustor and the modified F-119 combustor designated for use on the JSF aircraft.

Pollutant emissions from aircraft test operations focus on a vertical column of air extending from the ground surface up to the inversion layer, which marks the top of the ground level mixing layer. It is assumed that the inversion layer is at an altitude of 3,000 feet above ground level (AGL). This column of air is known as the mixing layer, and pollutant emissions within this layer ultimately affect ambient air quality at ground level.

Under the NAAQS, emissions categorized as *de minimis* emissions are set at levels designed to protect personnel, wildlife, and vegetation from harm without further regulatory action. The JSF emissions would be well below *de minimis* amounts. The total increase in emissions from the JSF engine exhaust is less than the projected emissions decrease associated with the F/A-18E/F Program as shown in Table 3.5-3. Estimated total NO_X emissions associated with the Proposed Action is small (8.9 tons), compared to the 1-year rate for NO_X emissions specified in 40 CFR Part 51, Subpart W or Part 93, Subpart B, which has been set at 50 tpy. The VOC emissions (0.16 tons) are considered negligible, when compared to the allowable annual rate of 100 tpy. From a cumulative perspective, JSF will attribute only 2.4 percent of the total NO_X annual allotment and 0.07 percent of the VOC allowable amount. Together, these pollutants are below *de minimis* thresholds. No personnel, wildlife, or vegetation, as a result of these emissions, would be exposed to air that does not meet Federal or State ambient air quality standards. Because a portion of the CTR is located in air quality non-attainment areas, there is a possibility that people, wildlife, or vegetation might be exposed to air that cumulatively does not meet Federal or State ambient air quality standards. However, the majority of the JSF FTP will be conducted within the immediate area of the NAS Patuxent River and predominately in attainment areas.

3.5.2.2 JSF Aircraft Flight Emission Estimates

The JSF FTP emissions resulting directly from the JSF exhaust have been analyzed by considering four components, which include: (1) number and type of operations performed, (2)

- **The fuel flow rate for each power setting.** JSF fuel flow rates have been obtained from simulation runs for the JSF aircraft by each of the aircraft contractors. Once the engine has been built and tested, the fuel flow rates will have to be updated to obtain more accurate emissions estimates.
- **The EI for each power setting.** The exhaust emissions for the F-119 engine derivative installed in the X-aircraft are estimated. The EIs are based on predictive and comparative data. Typically, EIs are determined from source emission testing conducted on the engine by the manufacturer or by the operator. The EIs are usually measured at major power settings. Because the JSF uses a derivative of the F-119, this analysis has relied on F-119 core engine (as used in the F-22 Raptor) NO_X and VOC emissions measurements made at Idle, 40 percent IRP, and 100 percent IRP. To derive the NO_X and VOC EIs for the JSF cycle, Pratt & Whitney corrected the F-119 values using the methodology given in the 1993 International Civil Aviation Organization (ICAO), Annex 16. This adjustment corrects for the differences in pressure and temperature in the cycle from the cycle of a tested engine. Once the corrected values are determined for the three tested power settings, the EIs for other power settings are interpolated based on fuel flow rate. These results, as expressed in grams of pollutant per kilogram of fuel, should be reasonably accurate.

There is also no afterburner emissions data available for the F-119 engine. The EI for afterburner operations depends on the design of the afterburner and can be either higher or lower than IRP EIs. It is difficult to estimate emissions since no version of the F-119 engine has been tested with the afterburner on. It appears that the JSF has enough power so that the afterburner will not be required at takeoff; therefore, lack of afterburner EIs will not impact this analysis.

The JSF FTP NO_X, VOC, and CO exhaust totals are depicted in Table 3.5-2, along with the estimated annual totals associated with the FEIS OWA-III.

Table 3.5-2: Preferred Alternative Emissions Estimates Versus OWA-III Emissions Estimates (tpy)

	NO_X	VOC	CO
JSF Emissions			
STOVL Operations	3.7	0.06	2.3
CV Operations	5.2	0.10	2.5
Total JSF Emissions	**8.9**	**0.16**	**4.8**
Total OWA-III Estimates	371.4	237.2	1001.3
Percentage of OWA-III Emissions Attributable to JSF Operations	2.4 %	0.07 %	0.48%

Notes: (1) Engine power settings and times-in-mode developed utilizing F-119 engine data with flight profiles of similar legacy aircraft.

(2) All flight test activity below 3,000 ft. AGL was considered for the emission roll-up. Estimates for time to climb to 3,000 ft and time to descend below 3,000 ft (prior to landing) were made utilizing legacy aircraft profiles.

(3) Emission indices for most F-119 power settings were used. When exact matches of emission indices and power settings were not possible, the closest reasonable indices were used.

Source: JSF Combustion Systems Team

3.5.2.4 Hazardous Air Pollutants (HAPs)

Aircraft and maintenance operations associated with the Preferred Alternative will release small amounts of HAPs, which can be toxic to personnel involved with, and in close proximity to such operations. The releases of HAPs will be similar to those produced in support of operations and other aircraft test programs at NAS Patuxent River. Exposure is minimized by implementation of applicable Federal, State, and USN regulations to protect the health and safety of personnel.

Based on the scope of the JSF FTP and the associated decrease in the flight-tests planned for the F/A-18E/F, the total HAPs expected to be generated by the JSF FTP falls within the amount analyzed under OWA-III in the FEIS. It was concluded in the FEIS that there is no significant impact to air quality due to HAPs at NAS Patuxent River.

3.5.2.5 General Conformity

A conformity review is required for any Federal action that may contribute to an increase, above certain applicable emission rates, in a certain pollutant within a designated non-attainment area. As depicted in Figure 3.5-1, small areas underlying NAS Patuxent River are classified as being in non-attainment for O_3. NAS Patuxent River is located in Southern MD on the tip of a peninsula between the Chesapeake Bay and the Patuxent River and includes the CTR, the boundaries of which overlie portions of southern MD, the Eastern Shore in MD, the Northern Neck of VA, and Sussex County, DE. All the counties lying within the footprint of the CTR, except Calvert County in MD and Sussex County in DE, are classified as attainment or unclassifiable/attainment for all six criteria pollutants. For O_3, Calvert County is classified as severe non-attainment and Sussex County is designated as marginal non-attainment. Pursuant to 40 CFR 51, Subpart W, the Proposed Action is subject to an air quality conformity analysis for criteria pollutants both in attainment areas and non-attainment areas. The primary air quality concern would be that the criteria air emissions might exceed the *de minimis* levels designated for specific areas of attainment or non-attainment. Generally, *de minimis* values are set at 100 tpy or less under the NAAQS. NO_X and VOCs are precursors to O_3; therefore, Federal agencies must consider the NO_X and VOC emissions in the conformity review. The emissions of other priority air pollutants (CO, Pb, SO_2, and PM_{10}), would also be considered. The Proposed Action's CO emissions are conservatively estimated at 4.8 tons. The CO emissions are below the established CO emissions rates (100 tpy) under which actions are judged to have no significant air quality impact. There are no JSF emission indices established for SO_2, Pb, and PM_{10} for the Proposed Action. However, these emissions are conservatively estimated to be similar to the emissions produced by JSF legacy aircraft and other aircraft test programs (e.g., F-14, F-18). Previous analyses of the emissions attributable to these aircraft/aircraft programs have determined that the emissions would not trigger a conformity analysis.

Table 3.5-3 shows that the JSF FTP emissions are covered under the OWA-III and that a surplus exists for FLT HRs, as well as allowable amounts of NO_X and VOC. It has been concluded that implementation of OWA-III will not result in significant environmental impacts with respect to air quality (USN, 1998). Therefore, the projected JSF testing will have minor impacts on emissions at NAS Patuxent River. Emissions resulting from the Proposed Action are expected to be below the applicable emission rates for non-attainment areas. The proposed JSF testing has been

3.5.3 Noise – Affected Environment

Noise is defined as unwanted sound that interferes with normal human activities or otherwise diminishes the quality of the environment. Noise is usually the largest and most pervasive environmental problem associated with aircraft operations. Although many other sources of noise are present in the affected communities, aircraft noise is readily identifiable and is often singled out for special attention and criticism. Section 3.6 of the FEIS provides a qualitative discussion on noise description, noise metrics and modeling, and noise levels created by airfield operations at NAS Patuxent River. Measurements and descriptions of noise (i.e., sounds) are usually based on various combinations of the following factors:

- The vibrational frequency characteristics of the sound, measured as sound wave cycles per second (Hz); this determines the pitch of the sound;
- The total sound energy being radiated by a source, usually reported as a sound power level;
- The actual air pressure changes experienced at a particular location, usually measured as a sound pressure level (SPL); the frequency characteristics and sound pressure level combine to determine the "loudness" of a sound at a particular location;
- The duration of a sound; and
- The changes in frequency characteristics or pressure levels through time.

The FEIS also discusses noise types, human perception and response, and current impacts, as well as presenting numerous graphic depictions of current noise contours for the three Operational Workload Alternatives. The following paragraphs provide a brief summarization of the discussion provided in the FEIS.

Noise at NAS Patuxent River is produced by a variety of sources. These sources include aircraft flight, ground tests and operations, vehicle operation, maintenance, and construction activities. The cumulative effect of these noises produces the ambient condition at any time and location. The individual noise sources can produce noises of varying duration and intensity. Noise sources may be of a transient nature, such as aircraft flights and vehicular traffic, or stationary, such as construction activities. Test operations within buildings, ground tests, and maintenance activities may also contribute to ambient noise levels.

Aircraft noise sources vary in sound level and duration due to aircraft type, power level, atmospheric conditions, flight direction, horizontal distance, and altitude relative to the receptor. Noise from individual events, as well as cumulative sound levels, can be important in determining the effects of aircraft noise. For the evaluation of community noise effects, and particularly aircraft noise effects, the Day-Night Average Sound Level (DNL) is used.

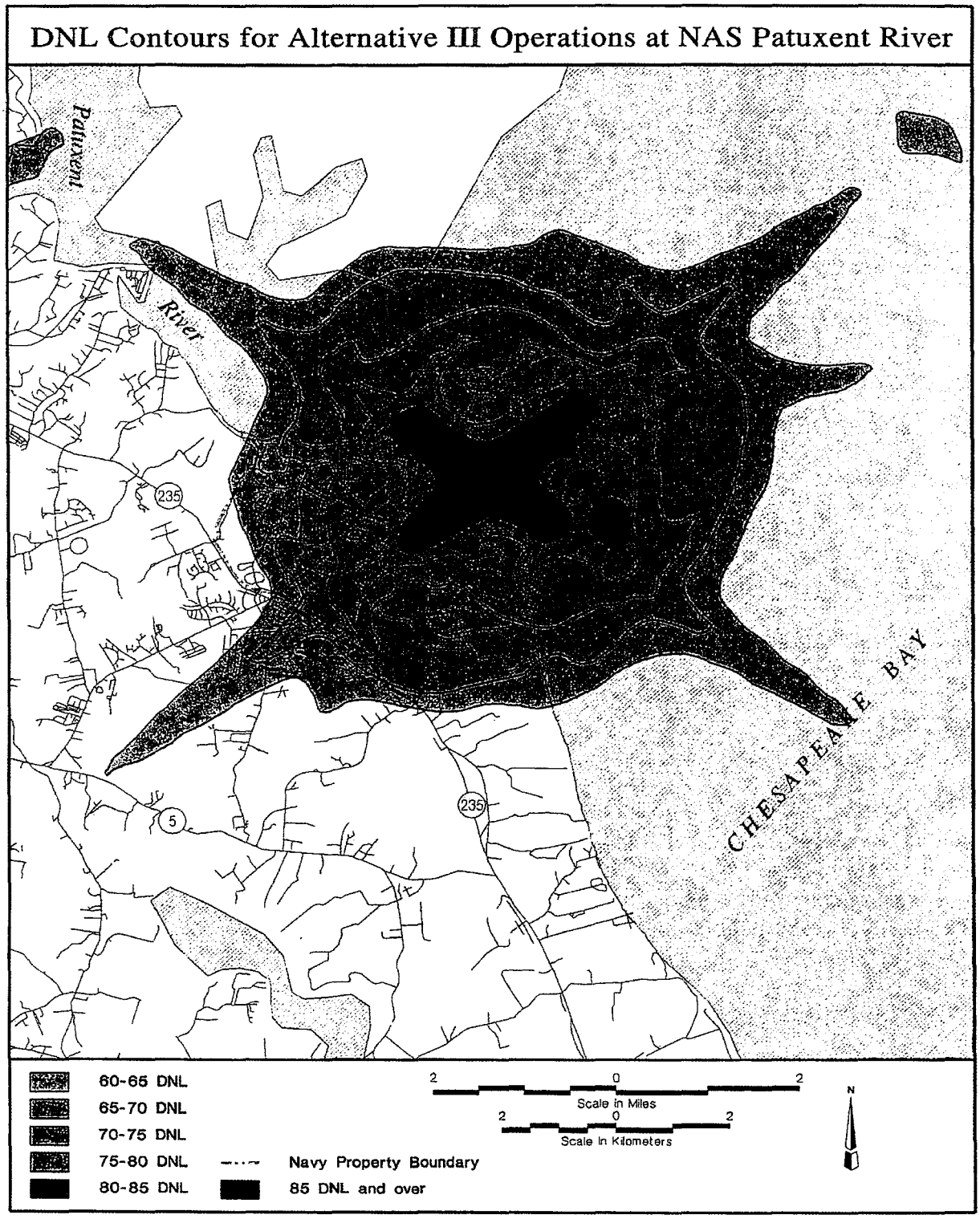


Figure 3.5-2: DNL Contours for OWA-III at NAS Patuxent River

Patuxent River. Some sensitive receptors just outside NAS Patuxent River's boundary include the Carver Elementary School, Lexington Park Elementary School, and the Lexington Park Public Library, while others are on the eastern Shore of the Chesapeake Bay, such as the Blackwater National Wildlife Refuge.

3.5.4 Noise – Environmental Consequences

Noise impacts associated with military aircraft have been analyzed from both physiological and behavioral perspectives, and are described in detail in the FEIS. The analysis includes annoyance, speech interference, sleep disturbance, and effects on domestic animals and wildlife. Aircraft noise, to include sonic booms, are considered potential impacts due to subsonic and supersonic flight testing operations that would be performed as part of the Preferred Alternative.

Noise levels for the JSF used in this document have been extrapolated from other comparative noise data. At present, specific F-119 noise data for the JSF engine variant is not available as the engine variant is a one of a kind powerplant that is not in production. However, current noise data on the F-22 (a twin engine aircraft using the conventional F-119 powerplant) has been collected by the Air Force Bioacoustics Branch at Edwards AFB and the Lockheed Martin Corporation. F-22 noise data from Lockheed Martin have been specifically collected by the F-22 Human Factors Flight Test Requirements Working Group during an approximate 2-year test period and has been documented in a report entitled, *F-22 Near-Field Noise and Air-Borne Vibration Assessment for Ground Personnel.* The report concludes that near-field sound pressure levels produced by the F-22's F-119 engine are similar to other aircraft at various power settings. These data has been used to estimate noise thresholds/emissions for the JSF CDP noise analysis.

The Edwards AFB and Lockheed Martin data and reports used to calculate JSF sound profiles are of limited distribution to specific DoD organizations and DoD contractors to control critical technology addressed in these documents. The release authority for these studies and reports is held by the F-22 System Program Office, not the JSF Program Office. Requests for further information should be directed to the F-22 System Program Office, (ASC/YF), Building 50, 2130 Fifth Street, Wright-Patterson AFB, Ohio 45433-7003. During the CDP, the JSF Program will collect noise data from the F-119 powerplant variant to ensure that the noise extrapolations made for this document are accurate. Appropriate actions to protect human health and the environment will be taken if the estimates herein are found to be below actual measured noise levels.

3.5.4.1 Near-Field Noise

JSF near-field noise levels are compared to other USN and USAF aircraft in tabular form in Table 3.5-5 and in graphical form in Figure 3.5-3.

and Bioacoustics Branch at AFFTC, Edwards AFB, CA. Even though the JSF near-field noise is expected to be 2-3 dB higher than most of the aircraft operating at NAS Patuxent River, the far-field fly-over noise footprint is estimated to be the same or less than noise from legacy aircraft. For example, noise levels generated by the JSF X-aircraft is estimated to be the same as an EA-6B at military power and less than the noise produced by the F/A-18C Hornet at military power. The reasons the JSF fly-over noise is estimated to be equal to or less than the noise produced by the F/A-18C is based on how the noise associated with each aircraft is propagated. The noise produced by the F/A-18C/D is propagated linearly. The noise produced by the JSF is estimated to propagate non-linearly. The non-linear sound propagation theory predicts a translation of low frequency energy to high frequency energy. Atmospheric absorption of the acoustic energy increases at higher frequencies, therefore more atmospheric attenuation of the JSF noise is expected. This phenomenon is expected to result in reductions of the JSF noise footprint at distances in excess of 1,000 feet. In essence, this means that the noise levels reaching the ground when a JSF is flying over would likely be less than the noise levels reaching the ground that would normally be predicted with the linear models currently being used.

Far-field noise impacts associated with the Preferred Alternative are expected to be insignificant. A total of 24,400 annual FLT HRs were analyzed under OWA-III for legacy aircraft, including the EA-6B and F/A-18 aircraft. This total was based on the NASMOD study as refined in 1998 by Eagan, McAllister Associates, Inc. An analysis of physiological and behavioral effects associated with the noise generated by flight activities at NAS Patuxent River is presented in Section 4.6 of the FEIS. Noise impacts associated with OWA-III were determined to be noticeable, yet insignificant throughout NAS Patuxent River. Current sound ducting practices and other in place mitigation measures (e.g., flight tracks, restricted operating hours, altitude restrictions, etc.) further limit the degree of impact (USN, 1998). As such, the JSF far-field noise is estimated to be equivalent or less that the noise levels analyzed under OWA-III of the FEIS.

3.5.4.3 JSF Noise Measurement Program

The JSF Program also plans to conduct aircraft noise data collection during the JSF FTP. Real time noise data as the JSF is undergoing flight-tests will further define the noise profile of the aircraft and the assessment as to whether or not there are environmental and safety concerns. Based on this collected data and if warranted, the implementation of additional noise mitigation measures, other than those identified in the FEIS, will be implemented during the CDP and subsequent acquisition phase of the JSF Program. The basic components of the JSF noise measurement program are as follows:

- Collect near-field noise and vibration data around the JSF aircraft to verify thorough analysis engineering and flight-test data and to ensure that maintenance personnel, while performing normal JSF concept demonstration aircraft maintenance, servicing, and launch/recovery activities, can be adequately protected from near-field noise and vibration generated by the JSF.

- Measure the far-field noise characteristics of the JSF aircraft for inclusion into the USN/USAF AICUZ Program. Noise data will be acquired at a site within the NAS Patuxent River designated by the JSF Program Office during ground run-up operations at various engine power-setting conditions to provide the database needed by the JSF Program Office.

3.5.4.4 Consequences to Sensitive Receptors

Table 4.6-14 of the FEIS addresses noise impacts at sensitive receptors within the CTR for OWA-III. Generally, the noise levels at some sensitive receptors are slightly higher than the No Action Alternative. But, the impacts would be barely perceptible, and noise levels would be within compatibility guidelines for those sensitive receptor locations. Since the JSF FTP is similar to the flight operations analyzed under OWA-III, impacts to sensitive receptors from the JSF far-field noise levels are expected to be insignificant.

3.5.4.5 Consequences of Sonic Booms

Limited supersonic flight evaluation would likely be required as part of the Preferred Alternative. Established supersonic operating areas in the CTR would be utilized to conduct this requirement. Supersonic operating areas in the CTR are located over sparsely populated areas (primarily water). The discussion contained in referenced NEPA documents, and summarized below, indicates that ground impacts resulting from occasional sonic booms are negligible. Mitigation measures employed (e.g., operational procedures, monitoring, reporting, etc.) greatly decrease the ground effects of sonic booms.

The procedures under which supersonic flights are conducted in the CTR further reduce the potential for ground impacts from sonic booms. Specifically, current NAS Patuxent River requirements for supersonic flights are as follows:

- Supersonic flights in the CTR below 30,000 ft are restricted to essential test flights for weapons separations. JSF CDP test flights do not include a requirement for weapons separation events.
- Above 30,000 ft, supersonic flights in the CTR are restricted to mission critical flights only.
- A sound focusing forecast is required for all supersonic flights in the CTR. Sound focusing, also referred to as sound ducting, is a process used to greatly decrease the ground effects of sonic booms.
- The aircrew must alert Air Traffic Control prior to commencing a supersonic run and file a supersonic report after completion of the flight (USN, 1998).

Potential supersonic operations conducted, as part of the Preferred Alternative, would be restricted to the same supersonic procedures and sound-ducting practices currently employed at NAS Patuxent River, thereby minimizing ground impacts.

3.6 MITIGATION MEASURES

Mitigation measures include actions designed to minimize potential adverse impacts of the Proposed Action, as needed. Mitigation measures might be required if impacts associated with the Proposed Action are found to be significant. Alternatively, recommended mitigation measures would be those not required under NEPA, but which could reduce the impacts associated with the Proposed Action. The need for mitigation measures has been considered for each environmental resource. However, no new mitigation measures are required for the JSF FTP over and above practices already in place at NAS Patuxent River to reduce environmental impacts. As mentioned in Section 3.5.4.3, the JSF Program plans to measure near-field and far-field noise associated with the JSF FTP. If actual measured noise levels exceed those calculated in this document, then potential environmental impacts will be reassessed, and appropriate mitigation measures, if required, will be implemented to minimize impacts. In addition, JSF test personnel and pilots will be pre-briefed, prior to commencement of the JSF FTP, on NAS Patuxent River air operation procedures (e.g. safety of flight, BASH and DASH Programs, supersonic flight requirements, etc.)

3.7 CUMULATIVE IMPACTS

The CEQ's implementing regulations for NEPA define cumulative impacts as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7). A determination of cumulative impacts involves the consideration of both the affected environment and the environmental consequences of the connected actions.

The addition of the Proposed Action, the JSF CDP FTP, to NAS Patuxent River operations may contribute slightly to increased noise and air emission levels. However, the environmental analysis concludes that the Proposed Action would not measurably affect air quality and noise. Noise levels and air emissions from the JSF flights will be sporadic and of a short-term duration with no significant contribution to the current conditions at NAS Patuxent River. Impacts to all other environmental resources are not expected by implementation of the Proposed Action. No significant impacts to the natural and human environment are expected for all of the affected environmental resources based on the results of this EA. Therefore, the contribution of the Proposed Action to long-term or cumulative impacts would also not be significant.

Furthermore, the JSF CDP will use existing NAS Patuxent River facilities and resources, and no new assets are currently required to support the overall JSF FTP. Even though the JSF is a new experimental/demonstrator aircraft, the proposed flight-tests are consistent with and no different than the current mission and ongoing operations conducted at NAS Patuxent River. The Proposed Action is consistent and within the scope of the OWA-III analyzed in the NAS Patuxent River FEIS, which concluded there would be no significant or cumulative environmental impacts at this operational workload.

4.0 REFERENCE DOCUMENTS

This EA summarizes, and incorporates by reference, previous NEPA analyses and other environmental studies, as well as pertinent DoD/USN guidance. Specific material within the body of this EA references the following documents:

29 Code of Federal Regulations (CFR) 1910.120. *Hazardous Waste Operations and Emergency Response*. Occupational Safety and Health Standards. Revised July 1, 1999.

32 CFR Chapter VI, Part 775, *et seq.* 1998. *Procedures for Implementing the National Environmental Policy Act.* National Defense, Department of the Navy. Revised July 1, 1999.

36 CFR Chapter VII, Part 800. *Protection of Historic Properties*. Revised July 1, 1999.

40 CFR 63, Subpart GG. *National Emission Standards for Aerospace Manufacturing and Rework Facilities*. National Emissions Standards for Hazardous Air Pollutants for Source Categories. Protection of the Environment, Council on Environmental Quality. Revised July 1, 1999.

40 CFR 1500-1508. 1978. Council on Environmental Quality NEPA Regulations, 43 FR 55990, November 28, 1978; 44 FR 873, January 3, 1979; 51 FR 15625, April 25, 1986.

16 United States Code (USC) 470-470m, National Historic Preservation Act of 1966, as amended. October 30, 1992.

10 USC 2701 *et seq.*, Defense Environmental Restoration Program.

16 USC 470a-ii, Archeological Resources Protection Act.

16 USC 668, Bald and Golden Eagle Protection Act.

16 USC 1451 *et seq.*, Federal Coastal Zone Management Act of 1972.

16 USC 1531-1544, Endangered Species Act of 1973.

33 USC 1251 *et seq.*, Pub. L. 92-500 and 95-217. Clean Water Act.

42 USC 7401 *et seq.*, Pub. L. 88-206, 89-272, 90-148, and 101-549. Clean Air Act.

42 USC 9601 *et seq.*, Resource Conservation and Recovery Act.

Department of Defense Directive 5000.1, *Defense Acquisition*, March 15, 1996 (Change 1, May 21, 1999).

Department of Defense Instruction 4715.9, *Environmental Planning and Analysis.* May 3, 1996.

United States Navy (USN). 1998. *Final Environmental Impact Statement. Increased Flight and Related Operations in the Patuxent River Complex, Patuxent River, Maryland.* Department of the Navy, Naval Air Warfare Center, Patuxent River, MD. December 1998.

USN. 1999. Department of the Navy, Environmental Policy Memorandum 99-01, *Requirements for Environmental Considerations in Test Site Selection.* May 11, 1999.

USN. 2000. NASPAXRIVINST 3710.5R, *Air Operations Manual Naval Air Station,* February 2000. Department of the Navy.

5.0 LIST OF PREPARERS

This EA has been prepared by the Joint Strike Fighter (JSF) Program Office, with contractual assistance from ISSI Consulting Group, Resource Management Concepts (RMC), and SEMCOR, Incorporated. The following government and contract service staff members have been involved in or contributed to the preparation of this report:

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APPENDIX A

Glossary of Terms

Aeroelastic Stability (Performance): Aerodynamic forces upon an aircraft's surfaces often induce instability (e.g., vibration). Aeroelastic stability performance would be determined by an evaluation of the aircraft's stability under the influence of various aerodynamic forces (see definition for flutter tests).

Bolter Performance: Bolter is a term used to describe an unintentional touch-and-go after a failed carrier arrested landing. Bolter performance evaluates an aircraft's ability to quickly transition from an approach/landing mode back to flight.

Carrier Suitability: Aircraft compatibility with ship-based take-off, approach, and recovery equipment is determined under various environmental conditions. Aircraft carrier launch catapult and recovery systems are built into some runways to simulate shipboard conditions. This equipment is used to determine the handling performance characteristics of an instrumented test aircraft during taxi, take-off, approach, and landing. Only after careful evaluation of data collected at these uniquely configured land-based facilities can the aircraft be cleared for further testing aboard a ship.

Deck Handling (Simulated): Deck handling involves the movement and interface of an aircraft with other aircraft, support equipment, and personnel aboard an aircraft carrier's flight deck. Simulated handling would be performed to evaluate positioning, towing requirements, clearances, and other considerations to ensure personnel safety and to avoid aircraft damage during deck handling evolutions.

Flight Envelope: Flight envelope refers to an aircraft's operational limits (i.e., maximum airspeed at various altitudes, altitude limitations for various weight configurations, maneuverability parameters at particular altitudes and speeds, etc.).

Flutter Tests: Flutter tests are performed to evaluate an aircraft's ability to handle various forces exerted on its control surfaces, and the precise control movements required to compensate for performance deviations/degradations caused by those forces.

Flying Qualities and Performance: Aircraft and their flight control systems are quantitatively and qualitatively evaluated to determine if the aircraft meets safety, performance, growth potential, and mission-technical requirements. Aircraft performance characteristics assessed include operating range, climb rates, etc. A slow, carefully monitored buildup with an instrumented aircraft is conducted to determine the edges of the safe flight envelope. This information is then used to develop a safety buffer, and these performance limits are announced to fleet pilots through the Naval Air Training and Operating Procedure Standardization (NATOPS) Program.

Low Speed Carrier Approach: Evaluations are conducted to determine safe approach airspeed to an aircraft carrier's arresting gear. Low speed approaches are desirable for safety reasons and to minimize structural impact to the aircraft.

Propulsion Evaluation: Engine operating characteristics and performance on the ground and in flight are assessed. Engine characteristics are first evaluated/validated in a ground test cell, then

APPENDIX B

NAS Patuxent River, MD
Operational Workload Assumptions

OPERATIONAL WORKLOAD ASSUMPTIONS IN THE FEIS

- All sorties are assumed to be conducted in the Patuxent River Complex. This assumption was made to provide a more rigorous assessment of any environmental impacts within the Patuxent River Complex.

- Proposed increases in future RDT&E flight operations would be conducted entirely within the Patuxent River Complex. This assumption reflects NAWCAD information that future RDT&E customers may prefer to conduct as many flight-tests as possible within the Patuxent River Complex (instead of accessing the Atlantic Warning Areas) due to the high level of precision measurement and close control that can be achieved in the instrumented CTR. This assumption is considered to be conservative because, in reality, not all future testing could or would be accommodated within the Patuxent River Complex.

- Similar to the assumption on future RDT&E flight operations, proposed future increases in flight operations, associated with support of military training (2,500 additional flight hours), would be conducted entirely within the Patuxent River Complex.

- Increases in the flight operations in the Patuxent River Complex would grow gradually over time, rather than occur abruptly. Therefore, it has been assumed that the proposed increased levels of flight activity for any of the alternatives would be gradually phased in over a 5-year period, beginning in late 1998.

- The existing boundaries of the restricted airspace and restricted surface areas within the CTR would be maintained; proposed future operating hours would be essentially the same as the current operating hours.

- The permanent employment base at NAS Patuxent River or Webster Field would be expected to remain the same as under the current level of operations (e.g., full post-BRAC employment); the number of transient workers that would be associated with specific test programs would also remain the same as described for current operations levels.

- No new facilities, beyond those constructed under BRAC realignment, are part of the scope of this EIS and any new facilities proposed for the complex in the future would require separate environmental documentation.

- The mix of aircraft using the Patuxent River Complex would likely change. This change would be influenced by two primary factors: (1) Navy actions to replace older model aircraft with new acquisitions, both fixed- and rotary-wing; and (2) DoD efforts to increase joint service testing and evaluation, as well as training.

Source: *Final Environmental Impact Statement for Increased Flight and Flight Related Operations in the Patuxent River Complex, Patuxent River, Maryland, December 1998.*

APPENDIX C

Applicability Determination for Conformity at NAS Patuxent River and Record of Non-Applicability (RONA)

Applicability Determination for Conformity for NAS Patuxent River Complex

A conformity review, undertaken to ensure compliance with the Clean Air Act General Conformity Rule, is required for any Federal action that may contribute to an increase, above certain applicable emission rates, of a certain pollutant within a designated non-attainment area. Small areas underlying NAS Patuxent River Complex are classified as being in non-attainment for ozone (O_3). Nitrogen oxides (NO_x) and volatile organic compounds (VOCs) are precursors to O_3; therefore, Federal agencies must consider the NO_x and VOC emissions in the conformity review.

The eleven steps outlined in the Chief of Naval Operations *Draft Interim Guidance on Compliance with the Clean Air Act General Conformity Rule* have been followed to determine the applicability of the General Conformity Rule to the JSF CDP FTP. The eleven steps considered are:

1) **Is the action taking place in a Federal air quality non-attainment or maintenance area?** Yes.

2) **Does the action result in the emission of criteria pollutants for which the area is designated nonattainment?** Portions of the Chesapeake Test Range lie over two counties in non-attainment status. Calvert County, MD, is classified as serious non-attainment and Sussex County, DE, is designated as marginal non-attainment for O_3.

3) **Is the action in a category considered exempt from conformity requirements by the U.S. Environmental protection Agency (EPA)?** No

4) **Is the action presumed to conform?** No. However, the Proposed Action is exempt by the general conformity rules.

5) **Is the direct emissions from the action reasonably foreseeable?** Yes.

6) **Are the indirect emissions from the action reasonably foreseeable?** Yes.

7) **Can the indirect emissions associated with the action be practically controlled due to continuing program responsibility?** Yes, the JSF Program and NAS Patuxent River can practicably maintain control over indirect emissions due to continuing program responsibility.

8) **Determination for total emissions:** The JSF FTP emissions resulting directly from the JSF exhaust have been analyzed by considering four components which include: 1) number and type of operations performed, 2) power settings and time-in-mode for each power setting for each operation, 3) fuel flow rate for each power setting, and 4) Emission Index (EI) for each power setting. These components are discussed in more detail in Section 3.5.2.2 of the EA. Total estimated emissions are concluded to be equal to the direct emissions. Calculated emission estimates for the JSF CDP are presented in the following table.

RECORD OF NON-APPLICABILITY FOR THE JOINT STRIKE FIGHTER UNITED STATES NAVY/UNITED STATES MARINE CORPS VARIANT CONCEPT DEMONSTRATION PHASE FLIGHT TEST PROGRAM AT NAVAL AIR STATION PATUXENT RIVER, MARYLAND

1. A Conformity Determination is required for any Federal action that may contribute to an increase, above certain applicable emission rates, in a certain pollutant within a designated non-attainment area. Section 3.5 of the Environmental Assessment (EA) for the *Joint Strike Fighter (JSF) United States Navy (USN)/United States Marine Corps (USMC) Variant Concept Demonstration Phase (CDP) Flight Test Program (FTP)* (July 2000) describes and depicts the attainment status of the areas potentially affected by the Proposed Action. Two counties immediately surrounding NAS Patuxent River, MD, are classified as non-attainment for ozone (O_3), Calvert County, MD, and Sussex County, DE. Nitrogen oxides (NO_X) and Volatile Organic Compounds (VOCs) are precursors to O_3; therefore, Federal agencies must consider the NO_X and VOC emissions in the conformity review.

2. Total NO_X emissions associated with the JSF during the CDP flight test program are small (8.9 tons) compared to the allowed 1-year rate (50 tons) specified in the Code of Federal Regulations (40 CFR Part 51 Subpart W, or Part 93 Subpart B). The VOC emissions during the Proposed Action are negligible (0.16 tons), compared to the 1-year rate (100 tons per year (tpy)) specified in 40 CFR Part 51 Subpart W or Part 93 Subpart B. Emissions projections for these two O_3 precursors would not trigger a conformity analysis.

3. The emissions of other priority air pollutants (carbon monoxide (CO), lead (Pb), sulfur dioxide (SO_2), and particulate matter of 10 microns or less (PM_{10})), would also be minimal. The Proposed Action's CO emissions are conservatively estimated at 4.8 tons over the JSF CDP. The CO emissions are below the established CO emissions rates (100 tpy), under which actions are judged to have no significant air quality impact. There are no JSF emission indices established for SO_2, Pb, and PM_{10} for the Proposed Action. However, these emissions are conservatively estimated to be similar to the emissions produced by JSF legacy aircraft and other aircraft test programs (e.g., F-14, F-18). Previous analyses of the emissions attributable to these aircraft/aircraft programs have determined that the emissions would not trigger a conformity analysis. In addition, the Final Environmental Impact Statement (FEIS) prepared for *Increased Flight and Related Operations in the Patuxent River Complex, Patuxent River, Maryland* (December, 1998), concluded that criteria pollutant emission rates associated with the increased operations would be less than the General Conformity Rule applicability rates, thereby negating the requirement for a formal conformity analysis. The slight increases associated with the JSF CDP FTP have been determined to fall within the emissions increases analyzed in the FEIS, due to changes in operational workload planning.

4. I have reviewed the air emissions analysis portions of the JSF CDP FTP EA and to the best of my understanding and knowledge the information contained within is true and accurate. The EA's conclusions would indicate that no further conformity analysis is required for the JSF USN/USMC Variant CDP FTP emissions at the Naval Air Station Patuxent River, Maryland.

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