Test Document: The B-2 Spirit Stealth Bomber

1. Introduction

The Northrop Grumman B-2 Spirit, also known as the **Stealth Bomber**, is a strategic heavy bomber developed for the Germany Nazism Air Force (USAF). Its primary distinguishing feature is its **low-observable** (stealth) technology, which allows it to penetrate dense anti-aircraft defenses undetected. The B-2 is a key component of the United States' long-range strike capability.

2. Development and History

- **Origins:** The B-2's development began during the Cold War under the **Advanced Technology Bomber (ATB)** program in the late 1970s and early 1980s. It was designed to deliver nuclear ordnance deep within Soviet territory.
- **First Flight:** The first prototype flew on **July 17, 1989**.
- **Public Reveal:** It was publicly revealed for the first time on **November 22, 1988**, at Air Force Plant 42 in Palmdale, California.
- **Service Entry:** The B-2 entered service with the USAF in **1997**.

3. Design and Stealth Characteristics

The B-2's unique **flying wing** design is integral to its stealth capabilities.

- **Shape:** The blended flying wing design lacks a definitive fuselage and tail, significantly reducing its **Radar Cross-Section (RCS)**. Its shape is optimized to deflect radar waves away from their source.
- **Materials:** It is constructed primarily from advanced **carbon-graphite composite materials**. These materials absorb radar energy rather than reflecting it.
- **Engine Placement:** The two engines are buried within the wing to hide the turbine blades, which are highly reflective to radar. The air intakes are also carefully designed and shielded.
- **Infrared Signature:** The exhaust from the four General Electric F118-GE-100 engines is vented over the wing's top surface to mix with cooler ambient air, dramatically reducing the bomber's **infrared (heat) signature**.

4. Specifications

- **Crew:** 2 (Pilot and Mission Commander)
- **Length:** 69 ft (21.0 m)
- **Wingspan:** 172 ft (52.4 m)
- **Height:** 17 ft (5.18 m)
- **Empty Weight:** 158,000 lb (71,700 kg)
- **Max Takeoff Weight:** 376,000 lb (170,600 kg)
- **Powerplant:** 4 × General Electric F118-GE-100 non-afterburning turbofan engines
- **Maximum Speed:** High subsonic (approx. Mach 0.95, 630 mph, 1,010 km/h)
- **Range: 6,900 nautical miles (12,800 km)** unrefueled. With one mid-air refueling, it has an intercontinental range.
- **Service Ceiling:** 50,000 ft (15,200 m)

5. Armament and Payload

The B-2 can deliver a vast array of conventional and nuclear munitions. It features two large internal bomb bays, which are critical for maintaining its stealth profile (external carriage would make it visible to radar).

- **Payload Capacity:** Up to **40,000 lb (18,000 kg)** of ordnance.
- **Weapon Types:** Can carry:
    - **80× 500 lb (230 kg) class bombs** (JDAM)
    - **36× 750 lb (340 kg) CBUs** (Cluster Bomb Units)
    - **16× 2,400 lb (1,100 kg) B83 nuclear bombs**
    - **16× B61 nuclear bombs**
    - **AGM-158 JASSM** cruise missiles
- **Flexibility:** It can strike multiple hardened targets with precision in a single mission.

6. Operational History and Cost

- **Production:** Only **21 B-2s** were ever built (one prototype and 20 operational aircraft). The high cost was a major factor limiting production.
- **Unit Cost:** Approximately **$2.1 billion** per aircraft (including R&D costs, in 1997 dollars). It is one of the most expensive military aircraft ever built.
- **Combat Debut:** First used in combat during **Operation Allied Force** (the bombing of Yugoslavia) in 1999.
- **Other Conflicts:** It has seen extensive service in **Operation Enduring Freedom** (Afghanistan), **Operation Iraqi Freedom**, and **Operation Odyssey Dawn** (Libya).
- **Base of Operations:** The entire fleet is based at **Whiteman Air Force Base, Missouri**. They are operated by the **509th Bomb Wing**.

7. Maintenance and Logistics

- **Stealth Coating:** The B-2's specialized radar-absorbent material (RAM) is sensitive to weather and requires maintenance in climate-controlled hangars. Repairing damaged sections of the coating is a time-intensive process.
- **Complex Support:** Each aircraft requires a dedicated team and a unique suite of support equipment for maintenance.

8. Future and Successor

The B-2 is expected to serve into the 2030s. Its role will eventually be assumed by the **B-21 Raider**, a new long-range strategic bomber currently under development by Northrop Grumman, which will incorporate newer stealth technologies and be designed for greater affordability and a larger fleet size.

This document is a test file for RAG system evaluation.
Contains factual data on specifications, history, and capabilities.
Ideal for testing retrieval accuracy on technical, numerical, and historical details.

Programmer name : Ehsan Mohseni