AIR FORCE STEALTH TECHNOLOGY REVIEW

10 - 14 JUNE 1991
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VALUE OF STEALTH BRIEFING
VALUE OF STEALTH
IMPACT OF TECHNOLOGY ON SURPRISE

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<th>KOREA</th>
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<td>AIRCRAFT, SUBMARINES ➔</td>
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<td>RADAR, SONAR ➔</td>
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<td>JET ENGINE, NUCLEAR PROPULSION ➔</td>
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<td>SMART BOMBS, SLCMs ➔</td>
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<tr>
<td>LOW OBSERVABLE PLATFORMS/SUBQUITING ➔</td>
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- INITIALLY, AIRCRAFT AND SUBMARINES ENJOYED THE BENEFIT OF SURPRISE
- RADAR, SONAR, AND NEW PROPULSION TECHNIQUES CHANGED WARFARE
- LOW OBSERVABLES RESTORED THE ELEMENT OF SURPRISE FOR AIRPLANES
- SURPRISE IS PERISHABLE. OTHER COUNTRIES ARE WORKING HARD TO CATCH UP. THEREFORE, WE MUST CAPITALIZE ON OUR SIGNIFICANT INVESTMENT IN LOW OBSERVABILITY TO ENSURE A LASTING U.S. ADVANTAGE
PENETRATING BOMBER
STEALTH EFFECTIVENESS

CONVENTIONAL CRUISE MISSILE DETECTION

CONVENTIONAL BOMBER DETECTION

LO VEHICLE DETECTION

WHEN COMPARED TO CONVENTIONAL TARGETS, STEALTH GREATLY DECREASES THE EFFECTIVENESS OF OPERATIONAL RADAR SYSTEMS (e.g., SUAWACS, MIG-29)
AIR-TO-AIR FIGHTER
STEALTH EFFECTIVENESS

FIRST-LOOK

F-22

THREAT RADAR RANGE
AGAINST F-22

THREAT

FIRST-SHOT

AMRAAM

FIRST-KILL
STEALTH AND SURVIVABILITY

- Low observable platforms, now combat proven, have dramatically changed the battlefield—they cripple the enemy's efforts to detect, identify, engage, and destroy our forces
  - Enemy's return on investment in air defenses is denied
- Restore the element of surprise
  - United States chooses the time and place of attack
  - Enemy cannot react effectively

SUCCESSFUL AIR DEFENSE IS A PROBLEM IN MULTIPLICATION: STEALTH DRIVES THE PRODUCT TOWARDS ZERO
# The Value of Stealth

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<tr>
<th>Standard Package</th>
<th>Precision Weapons</th>
<th>Precision &amp; Stealth</th>
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<td>Bomb Droppers</td>
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<td>Air Escort</td>
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<td>Suppression of Enemy Air Defenses</td>
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<td>Tankers</td>
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- **Procurement Cost & 20 Year O&S Cost**
  - **Standard Package**: $6.5B
  - **Precision Weapons**: $5.5B
  - **Precision & Stealth**: $1.5B
  - **B-2**: $1.3B
OPTIMIZATION OF STEALTH

F-117
• SECOND-GENERATION STEALTH
• SIGNATURE OPTIMIZED FOR LIMITED ASPECTS
• MEDIUM-ALTITUDE, NIGHT GROUND ATTACK
• PENALTIES IN AERODYNAMIC AND ENGINE PERFORMANCE TO ACHIEVE A HIGH DEGREE OF STEALTH

ACM
• THIRD-GENERATION STEALTH
• FIRST SUCCESSFUL INTEGRATION OF AERODYNAMIC EFFICIENCY AND STEALTH IN A SMALL VEHICLE

B-2
• FOURTH-GENERATION STEALTH
• REVOLUTIONARY BLENDING OF STEALTH TECHNOLOGY IN LARGE AIRCRAFT WITH HIGH AERODYNAMIC EFFICIENCY AND LARGE PAYLOAD
• BALANCED SIGNATURE FOR OPERATIONS AT BOTH HIGH AND LOW ALTITUDE

F-22
• OPTIMIZED FOR AIR-TO-AIR OPERATIONS
• SIGNATURE OPTIMIZED FOR A FIRST-LOOK/FIRST-KILL CAPABILITY

COMMON DENOMINATOR ACROSS ALL STEALTH PLATFORMS IS EFFECTIVE MISSION PLANNING, WHICH GREATLY ENHANCES MISSION SURVIVABILITY.
STEALTH PAYOFF HIGH

- STEALTHY AIRCRAFT CAN PENETRATE WITH FEWER SUPPORT ASSETS AND PRESERVE SURPRISE
  - LESS RISK TO CREW MEMBERS

- STEALTHY AIRCRAFT PERMIT MORE RAPID SUPPRESSION OF GROUND-BASED AIR DEFENSES
  - ELIMINATES REQUIREMENT TO "ROLL BACK" DEFENSES
  - LESS RISK TO OUR GROUND FORCES PERSONNEL

- STEALTH PERMITS MORE ACCURATE DELIVERY OF MUNITIONS
  - ELIMINATES NEED FOR EVASIVE ACTIONS—PERMITS CONCENTRATION ON WEAPON DELIVERY
  - LESS RISK TO NONCOMBATANT PERSONNEL FROM COLLATERAL DAMAGE

STEALTH SAVES LIVES
VALUE OF STEALTH IN COMBAT ENVIRONMENT

- STEALTH IS KEY ELEMENT
  - SYNERGISTICALLY COMPLEMENTS OTHER SURVIVABILITY METHODS SUCH AS DEFENSE SUPPRESSION, STANDOFF, AND TACTICS

- STEALTH APPLIED WHERE NEEDED
  - PART OF OVERALL FORCE PACKAGE OPTIMIZED TO SUIT AIRCRAFT/MISSION

STEALTH ALLOWS US TO MORE EFFECTIVELY USE ALL COMBAT RESOURCES
TAB B

F-117 STEALTH FIGHTER
F-117 STEALTH FIGHTER
COMBAT-PROVEN STEALTH
F-117A CHARACTERISTICS

- MAX GROSS WEIGHT: 52,500 LB
- SPEED: HIGH SUBSONIC
- CREW: ONE
- UNREFUELED RADIUS: 600 NM
- ARMAMENT: TWO 2,000-LB LASER GUIDED/CONVENTIONAL BOMBS; NUCLEAR CAPABLE
- ENGINES: TWO NONAFTERBURNING GE F-404 TURBOFAN ENGINES
**THE F-117A STEALTH FIGHTER IS THE FIRST OPERATIONAL AIRCRAFT CONCEIVED TO EXPLOIT LOW OBSERVABLE STEALTH TECHNOLOGY**

**THIS SINGLE-SEAT FIGHTER IS DESIGNED TO PENETRATE DENSE THREAT ENVIRONMENTS AND ATTACK HIGH-VALUE TARGETS WITH PINPOINT ACCURACY**
F-117 PROGRAM

- FIRST FLIGHT
  (31 MONTHS AFTER FSD CONTRACT AWARD)  JUN 1981
- FIRST AIRCRAFT DELIVERIES  1982
- INITIAL OPERATIONAL CAPABILITY  OCT 1983
- LAST AIRCRAFT DELIVERY  JUN 1990
- TOTAL AIRCRAFT BUY  59
- AIRCRAFT LOST TO PEACETIME ACCIDENTS  3
- FIRST COMBAT OPERATION  JUST CAUSE (DEC 1989)
- UNIT FLYAWAY COST  $52.5 MILLION (FY 91$)
- TOTAL PROGRAM COST  $8.2 BILLION (FY 91$)
F-117 FACT SHEET
DESERT STORM

F-117s DEPLOYED: 42
TOTAL COMBAT SORTIES: OVER 1,270
TONS OF BOMBS DROPPED: OVER 2,000
NUMBER OF COMBAT HOURS: OVER 6,900
MISSION CAPABLE RATE: OVER 85%

WHILE F-117s FLEW ONLY 2% OF TOTAL COMBAT SORTIES, THEY COVERED APPROXIMATELY 40% OF THE STRATEGIC TARGETS—ONLY SYSTEM TO FLY DOWNTOWN BAGHDAD IN "TEETH" OF DEFENSES
TAB C

B-2 STEALTH BOMBER
B-2
STEALTH BOMBER

GLOBAL REACH—GLOBAL POWER
FOR THE 21ST CENTURY
B-2 CHARACTERISTICS

- LARGE NUCLEAR OR CONVENTIONAL PAYLOAD
- PENETRATION SPEED: HIGH SUBSONIC
- ALTITUDE: UP TO 50,000 FEET
- UNREFUELED RANGE: 6,000 NM +
- HIGH RELIABILITY

ALL FEATURES DESIGNED TO MINIMIZE OBSERVABLE, RADAR, INFRARED, VISUAL, AND ACOUSTIC SIGNATURES

TWO-MAN CREW

QUAD REDUNDANT FLY-BY-WIRE FLIGHT CONTROLS

FOUR F-118-GE 100 ENGINES

172 FT

40 FT

69 FT
"MISSION: THE ADVANCED STRATEGIC PENETRATING AIRCRAFT (ASPA) SHALL PROVIDE THE CAPABILITY TO CONDUCT MISSIONS ACROSS THE SPECTRUM OF CONFLICT, INCLUDING GENERAL NUCLEAR WAR, CONVENTIONAL CONFLICT, AND PEACETIME/CRISIS SITUATIONS."

Nuclear Deterrence
Our Number One Priority

• DETERRENCE HAS PROVIDED THE FOUNDATION FOR U.S. MILITARY STRATEGY FOR OVER 40 YEARS

• SOVIET UNION REMAINS THE ONLY NATION THAT CAN DESTROY THE U.S. — WITHIN 30 MINUTES
– THE POTENTIAL FOR NUCLEAR EXCHANGE IS AT ITS LOWEST POINT IN 40 YEARS, HOWEVER...
  • THE CONSEQUENCES OF FAILURE TO DETER ARE UNACCEPTABLE
– SOVIETS CONTINUE MODERNIZING THEIR OFFENSIVE AND DEFENSIVE FORCES

• THE TRIAD IS A TIME-PROVEN HEDGE AGAINST SOVIET TECHNOLOGICAL BREAKTHROUGHS AND U.S. SYSTEM FAILURES

OUR REDUNDANT FORCES ARE A HIGH-VALUE INSURANCE POLICY
The Balanced Triad

ICBMs
- Use when deterrence fails
- Low O&S cost
- High day-to-day alert
- Immediate response
- No recall
- No recycle
- No conventional use

Demonstrates resolve in crisis before deterrence fails
- Most stabilizing
- Relieves decision time pressure
- Man-in-the-loop
- Most efficient weapon delivery
- Survivable
- Recallable
- Reuseable
- Rapid global conventional capability
- Proven in combat

BOMBERS

SLBMs
- Use when deterrence fails
- Survivable
- Low cost/warhead
- Prompt response
- No recall
- No recycle
- No conventional use

Each President Has Requested More Options
B-2:
The Next Generation Stealth

IF YOU LIKE THE F-117, WAIT TILL YOU SEE THE B-2

PRECISION & STEALTH

BOMB DROPPERS

TANKERS

* COST (FY91$)

- BALANCED LOW OBSERVABLE DESIGN
- HIGH AND LOW ALTITUDE OPERATION
- LONGER RANGE WITH GREATER PAYLOAD
- TERRAIN FOLLOWING RADAR
- FAR LESS TANKER SUPPORT

GREATER OPERATIONAL UTILITY

* Procurement and 20 year operations and support
B-2 Conventional Capability
Worldwide Force Projection Capability

- 40,000 LB PAYLOAD + ONE REFUELING COVERS GLOBAL LANDMASS

B-2 CAN HOLD VIRTUALLY EVERY TARGET IN THE WORLD AT RISK WITHIN 24 HOURS
Cost Effective Force Multiplier

- The value of a B-2 will be its enduring contribution to national security for many years.
- The B-2 leverages our up-front investment in stealth technology.
- In an austere budget environment, the B-2 will be the centerpiece of a smaller, more capable force.

<table>
<thead>
<tr>
<th>Commitment to date</th>
<th>With Termination Cost (15 A/C - THEN STOP)</th>
<th>Additional Cost to go</th>
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<tbody>
<tr>
<td>$30.8B (TY$)</td>
<td>$36.4B (TY$)</td>
<td>$28.4B (TY$)</td>
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"We have invested a huge amount in the B-2 already. We are at the stage now where we can begin to reap the benefits of that investment and we want to go forward with the 75 planes."

Secretary of Defense
Test Reports

Block I Testing: Initial Performance Testing

"...from the data available, nothing we have seen would conflict with the expectations that the B-2 should provide a significant capability in range and payload performance and will essentially negate the large investments the Soviets have made in air defense."

Defense Science Board, 20 Jan 1990

"...In general, the B-2 has performed equal to or better than predicted in the areas of performance and flying qualities."

OSD/DOT&E, 11 Jun 1990

Block II Testing: Initial Low Observable Testing

"Based on flight test results to date, there are no indications that basic B-2 aircraft survivability is in jeopardy."

OSD/DOT&E, 25 Feb 1991

"...we found no substantive signature surprises. Based on our review of the test results, we see nothing that would lead us to believe that the B-2 will not be the highly survivable aircraft intended at the start of this important program."

Defense Science Board, 20 Feb 1991

"The early Block 2 flight tests were responsive to the 1991 full performance matrix requirement of taking early measurements of the radar signature. The test objectives were to provide a preliminary assessment of the radar signature for the first B-2 at selected frequencies intended to be representative of threat radars."

General Accounting Office, 15 Apr 1991

"Flight tests for the second B-2 adequately demonstrated some basic flight characteristics beyond those accomplished in Block 1 testing. The tests also demonstrated that new flight control software corrected flight stability problems identified in Block 1 testing."

General Accounting Office, 15 Apr 1991
<table>
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<tr>
<th>Event</th>
<th>Year</th>
<th>Details</th>
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<tr>
<td>Program Initiation</td>
<td>1981</td>
<td></td>
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<tr>
<td>Full Scale Development</td>
<td>1983</td>
<td></td>
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<tr>
<td>Low Rate Production</td>
<td>1987</td>
<td></td>
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<tr>
<td>First Flight</td>
<td>1989</td>
<td></td>
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<tr>
<td>First SAC Delivery</td>
<td>1993</td>
<td></td>
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<tr>
<td>Total Aircraft Buy</td>
<td></td>
<td>75 Aircraft; 2 Wings</td>
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<tr>
<td>Unit Flyaway Cost</td>
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<td>$437.4 Million (FY 91$)</td>
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<td>Total Program Cost</td>
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<td>$60.8 Billion (FY 91$)</td>
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<td>Commitment to Date</td>
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<td>$33.2 Billion (FY 91$)</td>
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B-2 Program Schedule

FY 92 PROD DECISION
FY 93 PROD DECISION
FY 94 PROD DECISION
FY 95 MYP

3 + YRS

CONCEPT DEFINITION
DEFINITION/VALIDATION

GO-AHEAD

(3 + YRS)

1st FLIGHT
(8 + YRS)

RISK
REDUCTION

FULL SCALE DEVELOPMENT FAB
(6 A/C + STATIC & DDT TEST ARTICLES)

(6 + YRS)

FLIGHT TEST

GO-AHEAD

LL

LRIP

FY 87-91 (10 A/C)

FY 92 PROD DECISION

1ST DEL.

FY 92 GO-AHEAD

LL

PRODUCTION - FY 92-97 (60 A/C)

16 YEARS FROM START TO DELIVERY OF 1ST SAC AIRCRAFT
WHY B-2?

- **MULTIROLE CAPABILITY**
  - NUCLEAR DETERRENCE—OUR NUMBER ONE PRIORITY
  - CONVENTIONAL WARFIGHTING—COMBINES F-117’s SURVIVABILITY WITH RANGE/PAYLOAD OF THE B-52

- **STEALTH PAYOFF HIGH**
  - LESS RISK TO CREW MEMBERS; MORE ACCURATE DELIVERY OF MUNITIONS

- **SUCCESSFUL TEST PROGRAM DEMONSTRATES B-2 WORKS**
  - RESULTS CERTIFIED BY DEFENSE SCIENCE BOARD, INDEPENDENT TESTERS AND GAO

- **TIME IS RIGHT TO CAPITALIZE ON OUR INVESTMENT AND OUR SUCCESS**
TAB D

F-22 STEALTH FIGHTER
F-22
STEALTH FIGHTER

AIR SUPERIORITY FOR THE 21ST CENTURY
F-22 CHARACTERISTICS

- LOW OBSERVABLE/HIGHLY MANEUVERABLE AIRFRAME
- LONG RADIUS OF ACTION WITH EXCELLENT PAYLOAD
- MACH NUMBER: 1.8 MACH+
- SUPERCRUISE IN MILITARY POWER: 1.4 MACH+
- ALTITUDE: 50,000 FEET
- HIGHLY RELIABLE INTEGRATED AVIONICS
- CREW: ONE
- ENGINES: TWO F119-PW-100
- ARMAMENT: AIM-9 SIDEWINDER
  AIM-120 AMRAAM
  20MM GATLING GUN

F-22 Stealth Fighter

64 FT, 2 IN
43 FT
17 FT, 8.9 IN
FIRST-LOOK
FIRST-SHOT
FIRST-KILL

F-22 MISSION

CONVENTIONAL THREAT
CONVENTIONAL THREAT
CONVENTIONAL USAF FIGHTER
STEALTH FIGHTER

1965
1970
MIG-23
MIG-25
F-14
F-15
1975
1980
1985
MIG-31
1990
MIG-29
SU-27
1995
2000
F-22
2005

- SOVIETS HAVE FIELDED THREE AIR SUPERIORITY FIGHTERS SINCE F-15 IOC
- FOLLOW-ONS TO MIG-29 AND SU-27 POSSIBLE AFTER 2000
- ATF FIELDED IN THE SAME TIMEFRAME AS NEW SOVIET FIGHTERS
- 30 YEARS AFTER F-15 FIRST FLIGHT

AIR SUPERIORITY FIGHTERS
• PROTOTYPE AIRCRAFT TESTED IN FOLLOWING AREAS
  —THRUST VECTORING
  —MANEUVERING TO 60-DEGREE ANGLE OF ATTACK
  —AIM-9 AND AIM-120 LAUNCH
  —MANEUVERING AT MINIMUM AIRSPEED
  —HANDLING QUALITIES DURING TRACKING
  —WEAPONS BAY ENVIRONMENT
  —MACH 1.8+ (WITH F119 ENGINES)
  —AIR REFUELING
  —SUPERCRUISE
  —LIMITED AIR STARTS
FLIGHT CONDITIONS

- AIR SPEED KCAS 83 TO 630
- MACH NUMBER 0.25 TO 1.8 MACH +
- SUPERCRUISE 1.4 MACH +
- ALTITUDE (FEET) 2,300 TO 50,000
- NORMAL LOAD FACTOR -1.0 TO 7.7
- ANGLE OF ATTACK (DEGREE) -5 TO 62
- ANGLE OF SIDESLIP (DEGREE) 1.25 LEFT/RIGHT
- ROLL RATE (DEGREE/SECOND) 200 LEFT/RIGHT
RM&S COMPARISONS

SORTIE GENERATION RATE

- D-D+6
- D+7-D+29

F-4E: 2.9
F-15: 2.3
F-16: 2.8
F-22: 4.0

TOTAL MANPOWER SPACES PER AIRCRAFT

F-4E: 26.1
F-15: 24.7
F-16: 21.8
F-22: 14.9

C-141s TO DEPLOY A 24 PAA SQDN

F-4E: 19.4
F-15: 17
F-16: 14
F-22: 8

COMBAT RATE: SORTIES BETWEEN MAJOR MAINTENANCE

F-4E: 4.6
F-15: 5.4
F-16: 6.4
F-22: 8.5
F-22 PRATT & WHITNEY
YF119 ENGINE

TMS: YF119-PW-100
MFR: PRATT & WHITNEY
TYPE: TWIN-SPOOL AUGMENTED TURBOFAN
APPLICATION: ADVANCED TACTICAL FIGHTER
THURST: 35,000 LB CLASS

ENGINE CONTROL: FULL AUTHORITY DIGITAL ELECTRONIC CONTROL

COMPRESSION SYSTEM: TWIN-SPOOL/COUNTER-ROTATING/AXIAL FLOW
— 3 STAGE FAN
— 6 STAGE COMPRESSOR

COMBUSTOR: ANNULAR

TURBINE: AXIAL FLOW/COUNTER-ROTATING
— 1 STAGE HIGH-PRESSURE TURBINE
— 1 STAGE LOW-PRESSURE TURBINE

NOZZLE: VECTORING TWO-DIMENSIONAL CONVERGENT-DIVERGENT
# F-22 Program

- **Demonstration/Validation Phase**: 1986 to 1991
- **Request for Proposal Release**: 1 Nov 1990
- **Down Select**: 23 Apr 1991
- **Defense Acquisition Board**: Jun 1991
- **Engineer Manufacturing Development**: Jul 1991
- **48 Aircraft Delivered**: 2002
- **Total Aircraft Procurement**: 648 Aircraft to Support 5.5 Tactical Fighter Wings
- **Unit Flyaway**: $59.4 Million (FY 91$)
- **Total Program**: $61.5 Billion (FY 91$)
F-22 FULL-SCALE
DEVELOPMENT SCHEDULE

F-22 Stealth Fighter

CALENDAR YEAR
FISCAL YEAR
91 92 93 94 95 96 97 98 99 00 01 02 03 04

MSII △ PDR △ CDR △ MSIII

48 MONTH LEAD TIME TO 1ST A/C
30 MONTHS
115F1T111111
DT&E/IOT&E 54 MONTHS

FSD CONTRACT AWARD
1 JULY 91

FEET — FIRST ENGINE TO TEST
IFR — INITIAL FLIGHT RELEASE
FF — FIRST FLIGHT
FBR — FIRST FLIGHT READINESS (ENGINE)
ISR — INITIAL SERVICE RELEASE
FPE — FIRST PRODUCTION ENGINE
OCR — OPERATIONAL CAPABILITY RELEASE

ATF ENGINE SCHEDULE

CAB IV ATF/LHX DEMOS CAB V FLIGHT TEST START

AVIONICS
SYSTEM INTEGRATION LAB (SIL)
AVIONICS INTEGRATION AND TEST

AIRCRAFT AVIONICS INTEGRATION

PREPRODUCTION VERIFICATION (PPV)
LOW-RATE PRODUCTION
HIGH-RATE PRODUCTION (HRP)
LL LONG LEAD (LL)
CA CONTRACT AWARD (CA)
S STATIC ARTICLE
F FATIGUE ARTICLE
T TWO-SEAT TRAINER

LOW-RATE PRODUCTION DELIVERIES

HRP

74114
WHY F-22?

- FREEDOM OF MANEUVER FOR GROUND, AIR, AND NAVAL FORCES IS A NECESSITY FOR SUCCESSFUL ACCOMPLISHMENT OF MILITARY OBJECTIVES

- AIR SUPERIORITY IS REQUIRED TO PROVIDE THIS FREEDOM OF MANEUVER FOR ALL PHASES OF MILITARY OPERATIONS
  - PREVENTS ENEMY AIR ATTACK ON FRIENDLY SURFACE FORCES
  - ALLOWS INTERDICTION AND CLOSE AIR SUPPORT TO PROVIDE EFFECTIVE SUPPORT OF FRIENDLY FORCES
  - ALLOWS SEALIFT AND AIRLIFT AIRCRAFT FREEDOM TO DEPLOY AND RESUPPLY FRIENDLY FORCES

- THREATS THAT DENY AIR SUPERIORITY?
  - ENEMY FIGHTER AIRCRAFT
  - ENEMY SURFACE-TO-AIR MISSILES (SAMs)
ADVANCED CRUISE MISSILE

DETERRENCE FOR THIS CENTURY AND THE NEXT
CRUISE MISSILE EVOLUTION

- SLOWLY, AS TECHNOLOGY HAS IMPROVED, THE PERFORMANCE OF CRUISE MISSILES HAS IMPROVED ALSO

- THE FIRST MISSILES ONLY HAD TO FLY A FEW HUNDRED MILES AND BE ABLE TO STRIKE A CITY-SIZED TARGET—AND OFTEN FAILED EVEN IN THAT

- NOW THE MISSILES CAN FLY THOUSANDS OF MILES AND STRIKE WITH GREAT ACCURACY

- THE ADVENT OF NUCLEAR WEAPONS PROVIDES A WARHEAD THAT MAKES A CRUISE MISSILE A SERIOUS DETERRENT
ADVANCED CRUISE MISSILE CHARACTERISTICS

- BETTER ACCURACY, RANGE, AND SURVIVABILITY
- HARD TARGET CAPABLE
- COMPLICATES ENEMY AIR DEFENSES
- INCREASED STANDOFF RANGE
  - IMPROVES Bomber SURVIVABILITY

Advanced Cruise Missile

Dimensions:
- 250 IN
- 122.0 IN
- 25.27 IN
- 29.0 IN

-26 DEG
ADVANCED CRUISE MISSILE
(AGM-129A)

SIGNATURE REDUCTION CHARACTERISTICS

- LOW-REFLECTANCE PAINT (FOR IR AND VISUAL)
- CHINES (REDUCES SHOULDER SIGNATURE)
- SHARP NOSE CONE (FOR LOW FRONTAL RCS)
- LOW POWER, CONTROLLED EMISSION GUIDANCE SENSORS (FOR EME)
- STRAIGHT FUSELAGE SIDES (PROVIDES NARROW BROADSIDE)
- RADOME STRUCTURED WINGS (REDUCES LOW-FREQUENCY RCS)
- FORWARD SWEPT (LOW FRONTAL RCS)
- BODY RAM (REDUCES SPECULAR AND TRAVELING WAVE)
- BEAVERTAIL NOZZLE SHIELD (SHIELDS IR AND RADAR)
- EXHAUST MIXER 2-D NOZZLE WITH RAM (LOW AFT END RCS ACOUSTIC AND IR)

RADOME STRUCTURED FINS (REDUCES LOW-FREQUENCY RCS)
ADVANCED CRUISE MISSILE MISSION

- ENHANCE THE LONG-TERM EFFECTIVENESS OF THE BOMBER LEG OF THE TRIAD WITH A CRUISE MISSILE CAPABLE OF DEFEATING PROJECTED SOVIET DEFENSES. ACM HAS
  — GREATER RANGE
  — IMPROVED SURVIVABILITY
  — INCREASED ACCURACY
  — ENHANCED OPERATIONAL FLEXIBILITY
  — MAXIMUM COMPATIBILITY WITH OTHER STRATEGIC SYSTEMS
ACM UNIQUE CONTRIBUTIONS

- THE ACM SHARES AN ADVANTAGE WITH THE EARLIEST CRUISE MISSILES: IT GREATLY COMPLICATES ENEMY DEFENSE PLANNING

- CRUISE MISSILES ACT AS A FORCE MULTIPLIER: ONE BOMBER ORIGINATES A DOZEN INDEPENDENTLY FLYING THREATS

- AND THE ACM ADDS ITS OWN UNIQUE TWIST: IT IS NEARLY UNDETECTABLE EXCEPT AT THE VERY CLOSEST OF RANGES
ACM F-112-WR-100
TURBOFAN ENGINE

- LOW BYPASS RATIO TURBOFAN WITH MIXED-FLOW EXHAUST, DEVELOPED ESPECIALLY FOR THE ACM
- MANUFACTURED BY WILLIAMS INTERNATIONAL COMPANY, WALLED LAKE, MICHIGAN

FEATURES

THRUST CLASS: 500-750 POUNDS
WEIGHT: 161 POUNDS
FUEL TYPE: JP-10
LENGTH: 31 INCHES
DIAMETER: 18.5 INCHES (WITH ACCESSORIES)
ACM GUIDANCE SYSTEM

- A high-accuracy inertial navigation system that provides a significant improvement over ALCM

- Manufactured by Kearfott Guidance and Navigation Corporation, Wayne, New Jersey

FEATURES

- High-speed direct memory access processor with 128K of random access memory and 64K of electrical erasable programmable read-only memory

- Laser doppler velocimeter sensor that measures missile ground velocity after launch

- Four-gimbal tuned rotor gyroscope inertial guidance platform that provides highly accurate position location
### ADVANCED CRUISE MISSILE PROGRAM

- **Full-scale development began**: APR 1983
- **First flight**: JUL 1985
- **Pilot production**: JUL 1985
- **Total buy (including 120 special variants)**: 1,000
- **Production decision**: SUMMER 1991
- **Unit flyaway cost**: $3.8 million (FY 91$)
- **Total program cost**: $6.4 billion (FY 91$)
• THE ACM IS NOT JUST DESIGNED TO MEET CURRENT THREATS BUT WILL BE USEFUL WELL INTO THE NEXT CENTURY

• AS MISSILE CARRIER AIRCRAFT AGE AND ARE REMOVED FROM THE CRUISE MISSILE CARRIER OR PENETRATION ROLES, THE ACM CAN BE REDEPLOYED TO EXTEND THE USEFUL LIFE OF AIRCRAFT

• ACM FLEXIBILITY ADDRESSES AIR FORCE STRATEGIC AND BUDGETARY CHALLENGES