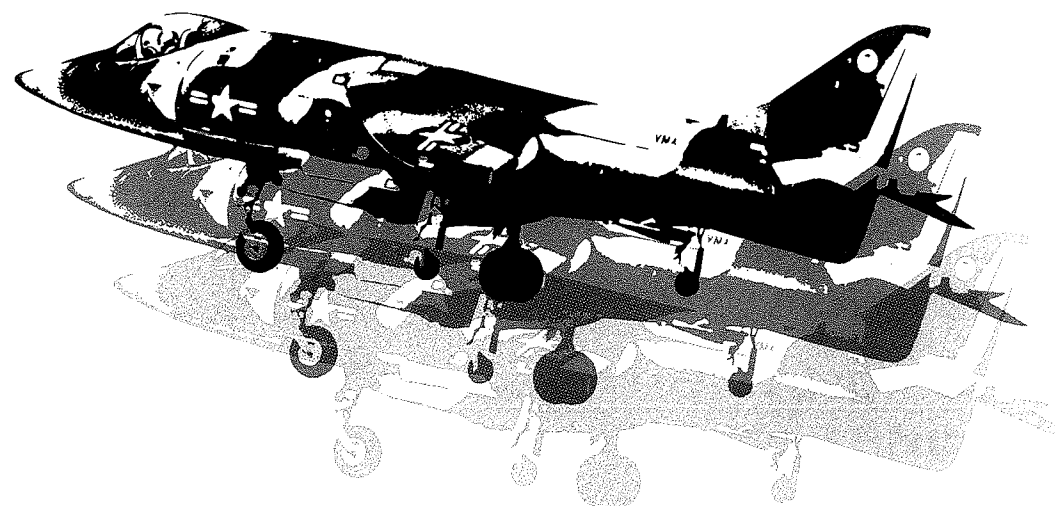


AV-16A / Pegasus 15



cost effective V/STOL evolution

MCDONNELL AIRCRAFT COMPANY

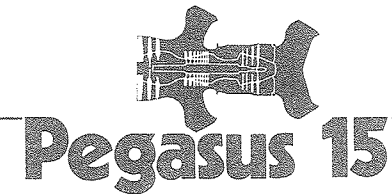
Box 516, Saint Louis, Missouri 63166 - Tel. (314)232-0232

Pratt & Whitney Aircraft DIVISION OF UNITED AIRCRAFT CORPORATION



MCDONNELL DOUGLAS



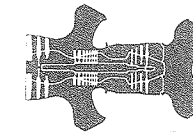


ADVANCED HARRIER CONCEPT

- MEET THE USMC REQUIREMENT FOR SUBSTANTIAL IMPROVEMENT IN V/STOL LIGHT ATTACK CAPABILITY.
- THROUGH EVOLUTIONARY DEVELOPMENT BASED ON THE AV-8A, PROVIDE AN ADVANCED V/STOL AIRCRAFT TO MEET THE NEEDS OF THE USMC, AND USN.
- DEFINE AIRCRAFT CONFIGURATION AND PERFORMANCE AND PROVIDE TEST VERIFICATION OF MINIMUM TECHNICAL RISK.
- ESTABLISH A DEVELOPMENT AND PRODUCTION SCHEDULE, AND ESTIMATE COSTS WHICH CAN BE MET.



AV-16A



Pegasus 15

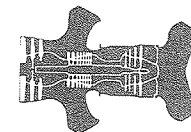
**... "EVOLUTIONARY DEVELOPMENT
BASED ON THE AV-8A" ...**

- UPRATE THE PEGASUS ENGINE
INCREASED THRUST
IMPROVED TECHNOLOGY
- ADVANCED TECHNOLOGY WING
INCREASED RANGE
ADDED INTERNAL FUEL
IMPROVED MANEUVERING
GREATER EXTERNAL LOAD
- AIRCRAFT AND SYSTEMS
ACCOMMODATE WING AND PEGASUS 15
INCORPORATE ADVANCED TECHNOLOGY
PROVIDE FOR ADVANCED MISSION AVIONICS

**.... "AND PROVIDE TEST VERIFICATION
OF MINIMUM TECHNICAL RISK" ...**



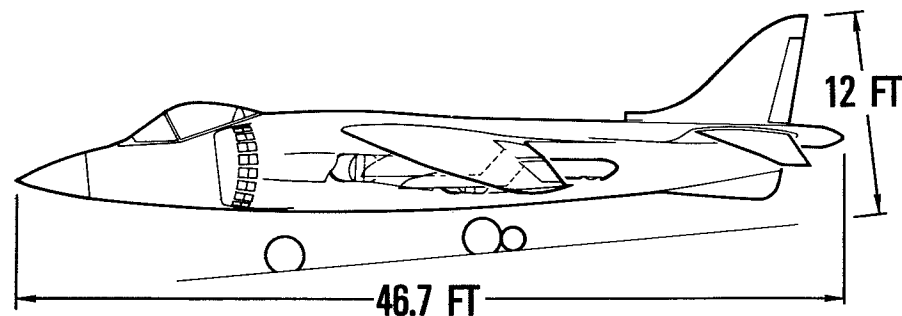
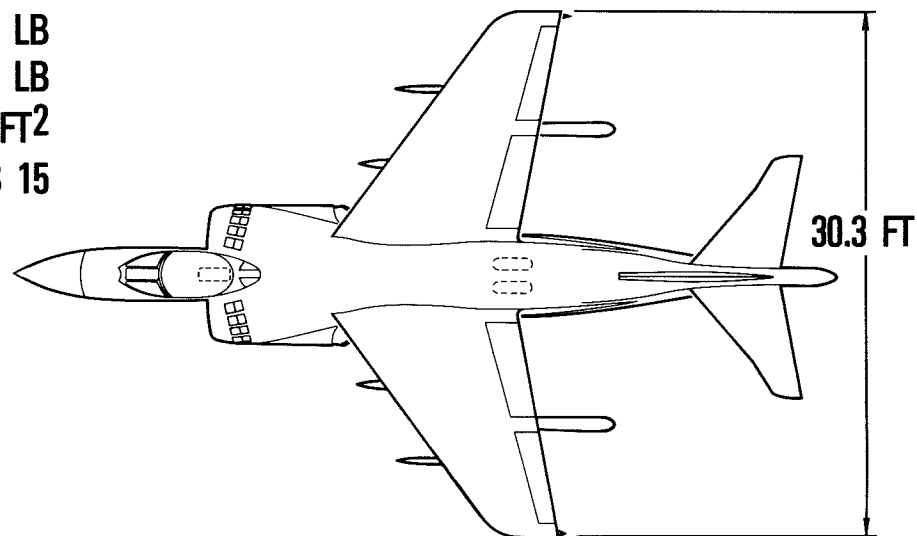
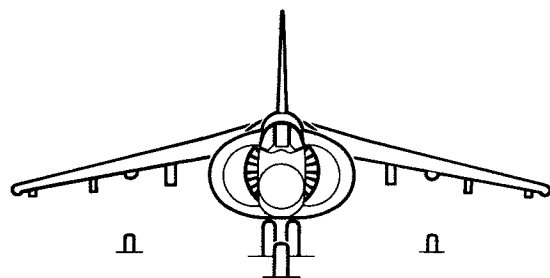
AV-16A



Pegasus 15

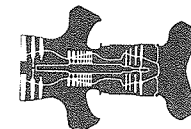
USMC AV-16A

O.W.E. 13,200 LB
 DESIGN TAKEOFF GROSS WEIGHT 28,000 LB
 WING AREA 230 FT²
 ENGINE PEGASUS 15



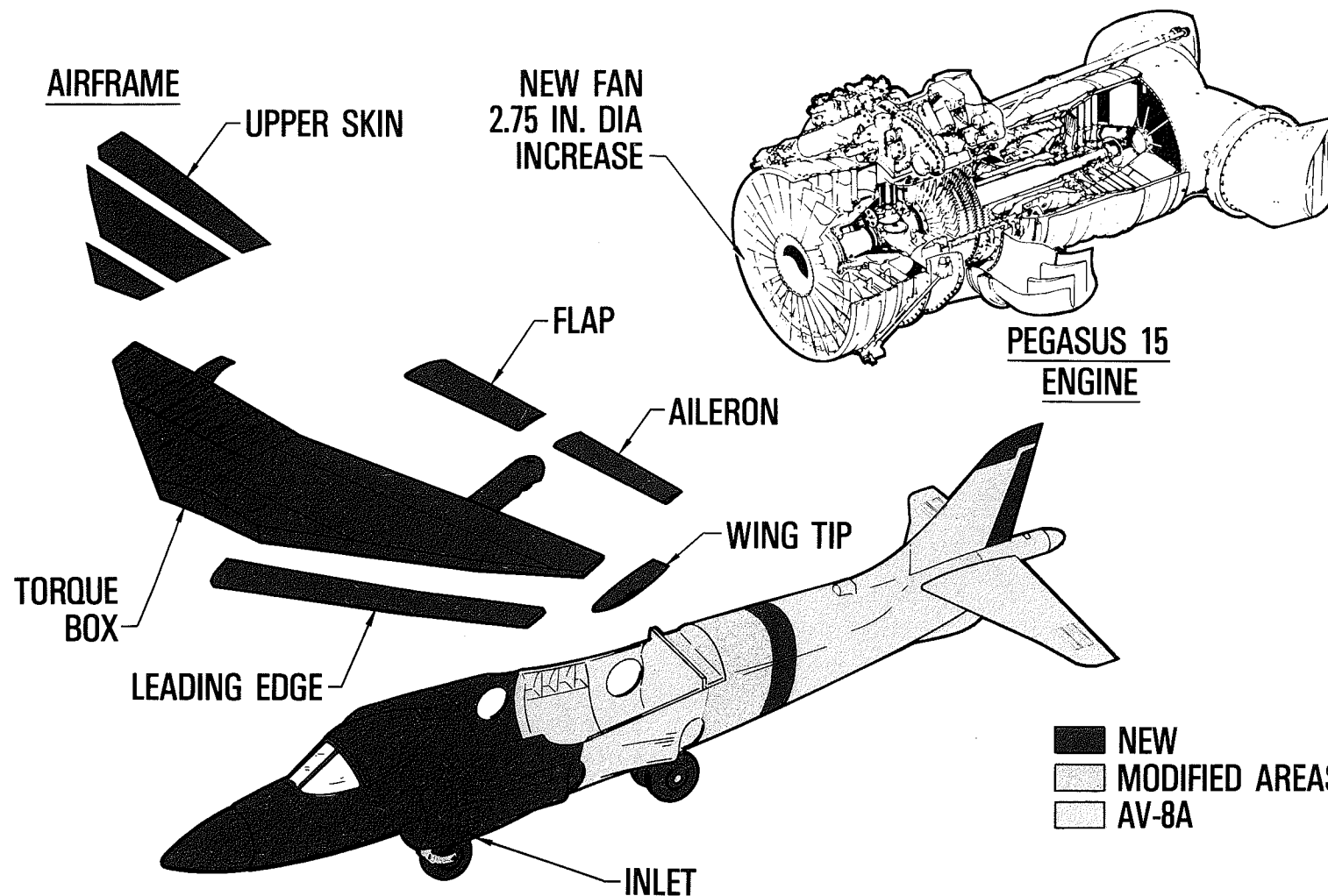


AV-16A



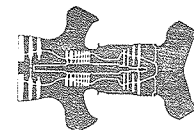
Pegasus 15

AREAS OF CHANGE





AV-16A



Pegasus 15

AV-16A ADVANCED TECHNOLOGY FEATURES

- **SUPERCritical WING**
 - Greater Cruise Efficiency
 - Improved Buffet Boundary for Maneuvering
 - Higher Drag Rise Mach Number
 - Added Internal Fuel Volume

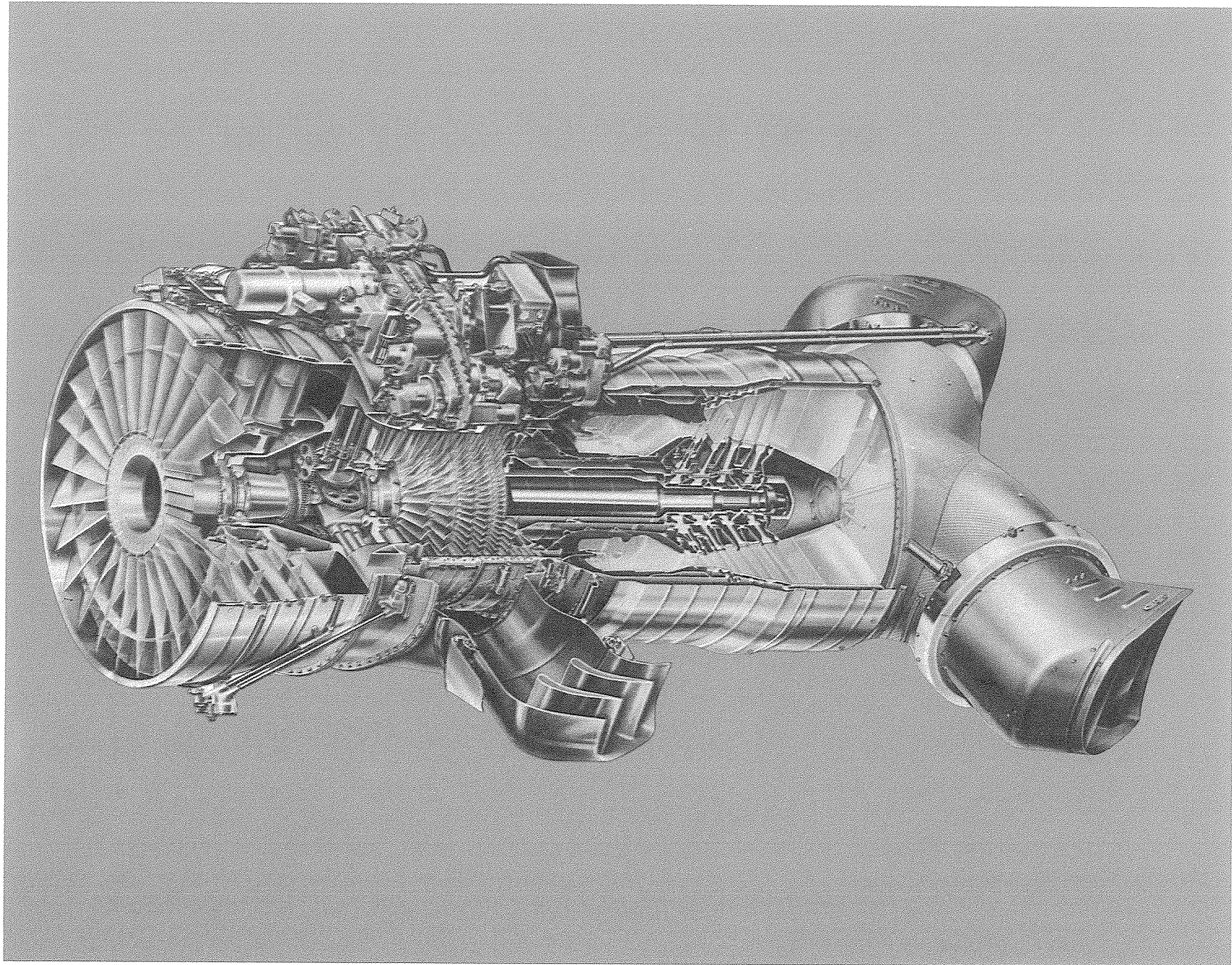
- **WEAPON DELIVERY SYSTEM**

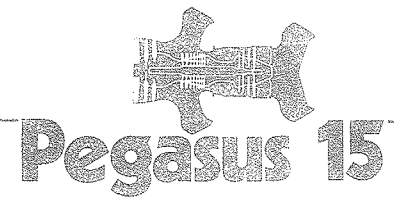
- **LIGHTWEIGHT, RELIABLE ELECTRICAL SYSTEM**
 - Power Generating
 - Wiring

- **STAINLESS STEEL HYDRAULIC/PNEUMATIC TUBING**

- **CARBON WHEEL BRAKES**

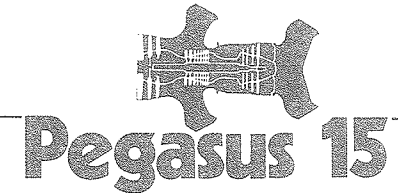
- **MATERIALS**
 - Titanium
 - Composites





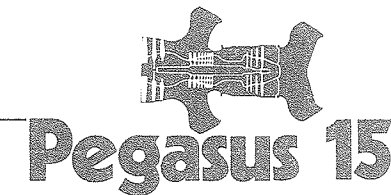
PEGASUS 15 DEVELOPMENT OBJECTIVES

- 15% THRUST INCREASE
- IMPROVE THRUST/WEIGHT RATIO
- LOW COST/LOW RISK COLLABORATIVE PROGRAM

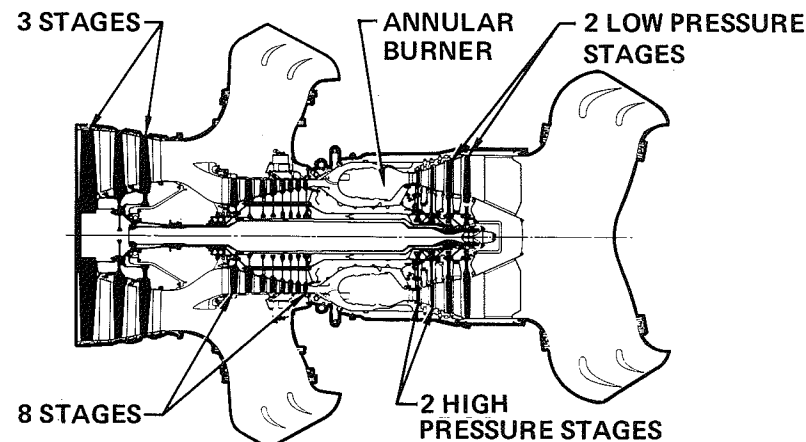


MAJOR COMPONENT IMPROVEMENTS

- FAN — INCREASED AIRFLOW AND EFFICIENCY
- HIGH PRESSURE COMPRESSOR — INCREASED EFFICIENCY THROUGH AERODYNAMIC IMPROVEMENTS
- COMBUSTOR — IMPROVED HEAT RELEASE AND COOLING SCHEMES
- TURBINE — IMPROVED COOLING FOR HIGHER TEMPERATURES
- NOZZLES — FULL ENVELOPE THRUST VECTORING



PEGASUS CHARACTERISTICS



SHORT LIFT WET RATINGS

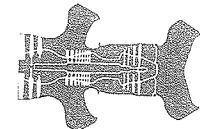
PEG 11

PEG 15

THRUST (LBS).....		+15%
INLET FLANGE DIAMETER.....		+ 2.75 (INCHES)
TOTAL AIRFLOW (LB/SEC)	444	476
BYPASS RATIO.....	1.36	1.36
FAN PRESSURE RATIO.....	2.39	2.54
TURBINE INLET TEMP		+145(°F)
OVERALL COMPRESSION RATIO	14.7	16.5
THRUST/WEIGHT RATIO.....	6.6	6.8



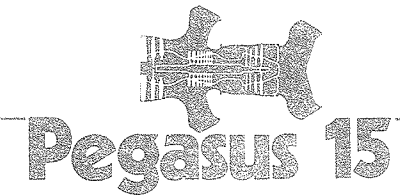
AV-16A



Pegasus 15

DEMONSTRATOR ENGINE TEST

- **PEGASUS 15 SIZED FAN, RESTAGGERED COMPRESSOR, AND SHROUDED LOW PRESSURE TURBINE RUN ON PEGASUS 11 ENGINE**
- **ACHIEVED DESIRED FAN AIRFLOW**
- **DEMONSTRATED 15% THRUST INCREASE AT SEA LEVEL**



PEGASUS 15 DEVELOPMENT SCHEDULE

DEVELOPMENT PROGRAM DESIGN

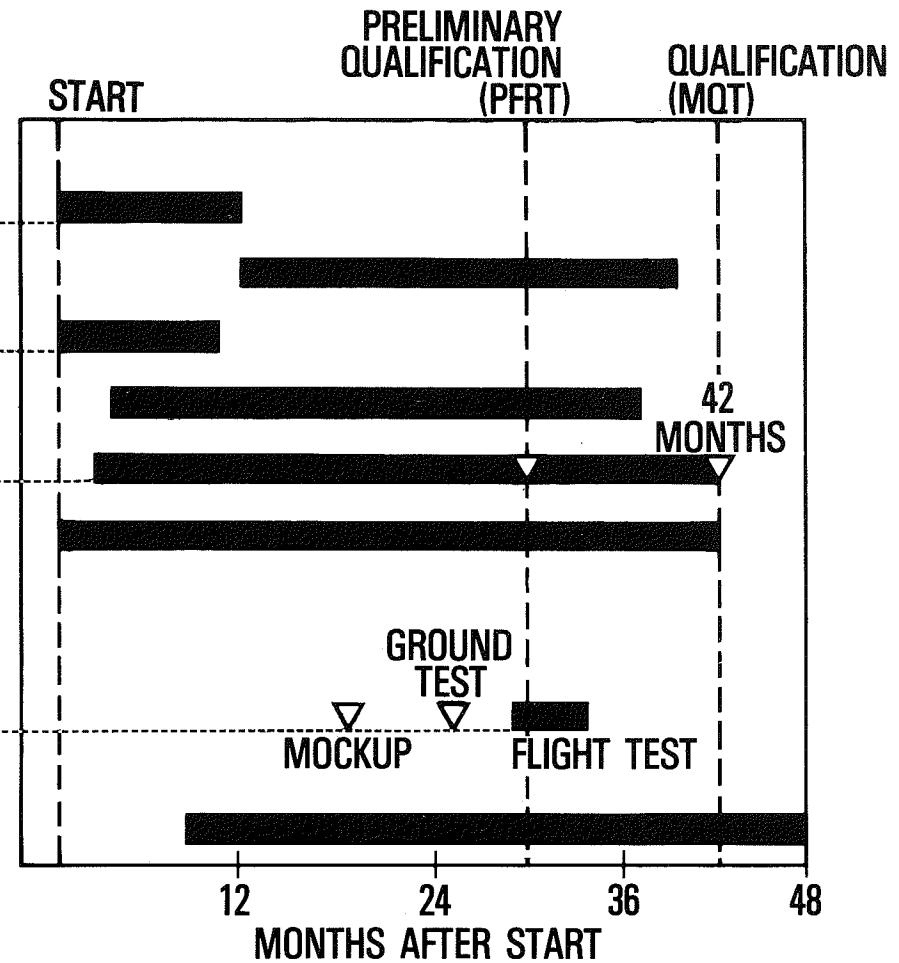
- INITIAL.....
- FOLLOW-ON
- MOCKUP.....
- FABRICATION

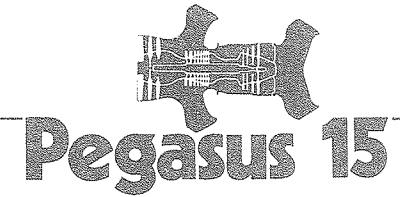
ENGINE TESTING

RIG & COMPONENT TESTING

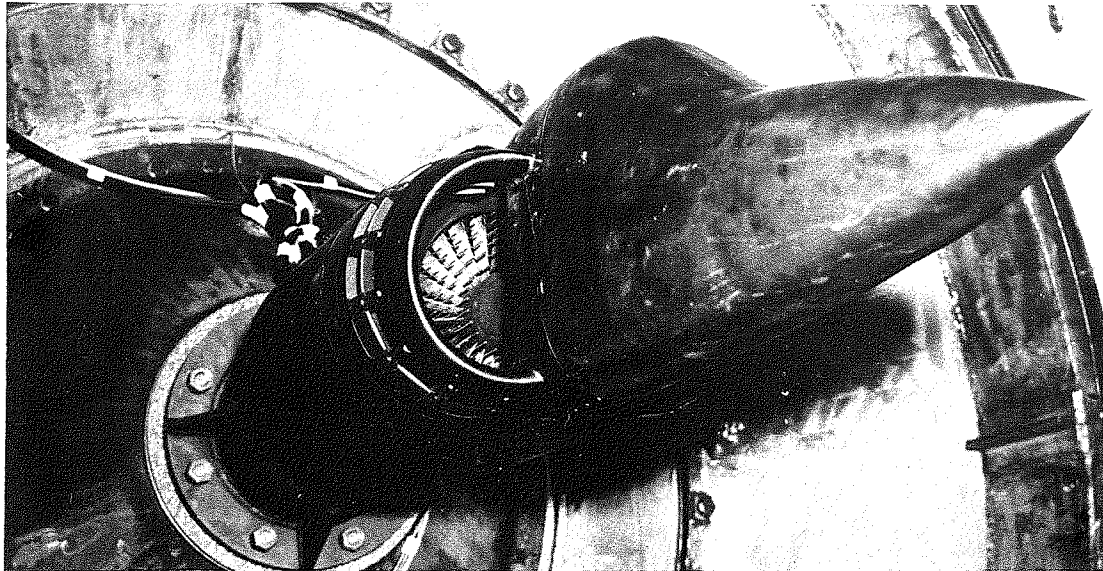
SUPPORTING PROGRAM

- FLIGHT TEST PROGRAM ENGINES.....
- INTEGRATED LOGISTICS SUPPORT PROGRAM





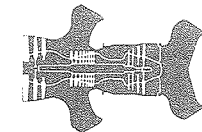
INLET RECOVERY VERIFIED



- **NAVAL AIR PROPULSION TEST CENTER**
- **300 RUNS (270 DATA POINTS PER RUN)**
- **ALL TEST CONFIGURATIONS EXCEEDED THE DESIGN GOAL OF 98% RECOVERY**

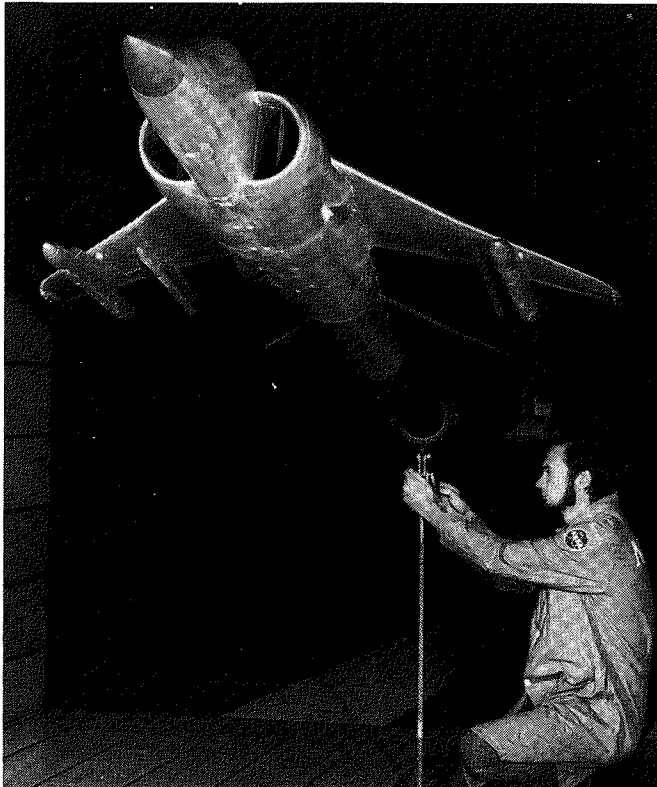


AV-16A



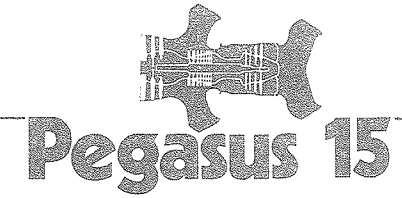
Pegasus 15

MISSION PERFORMANCE VERIFIED

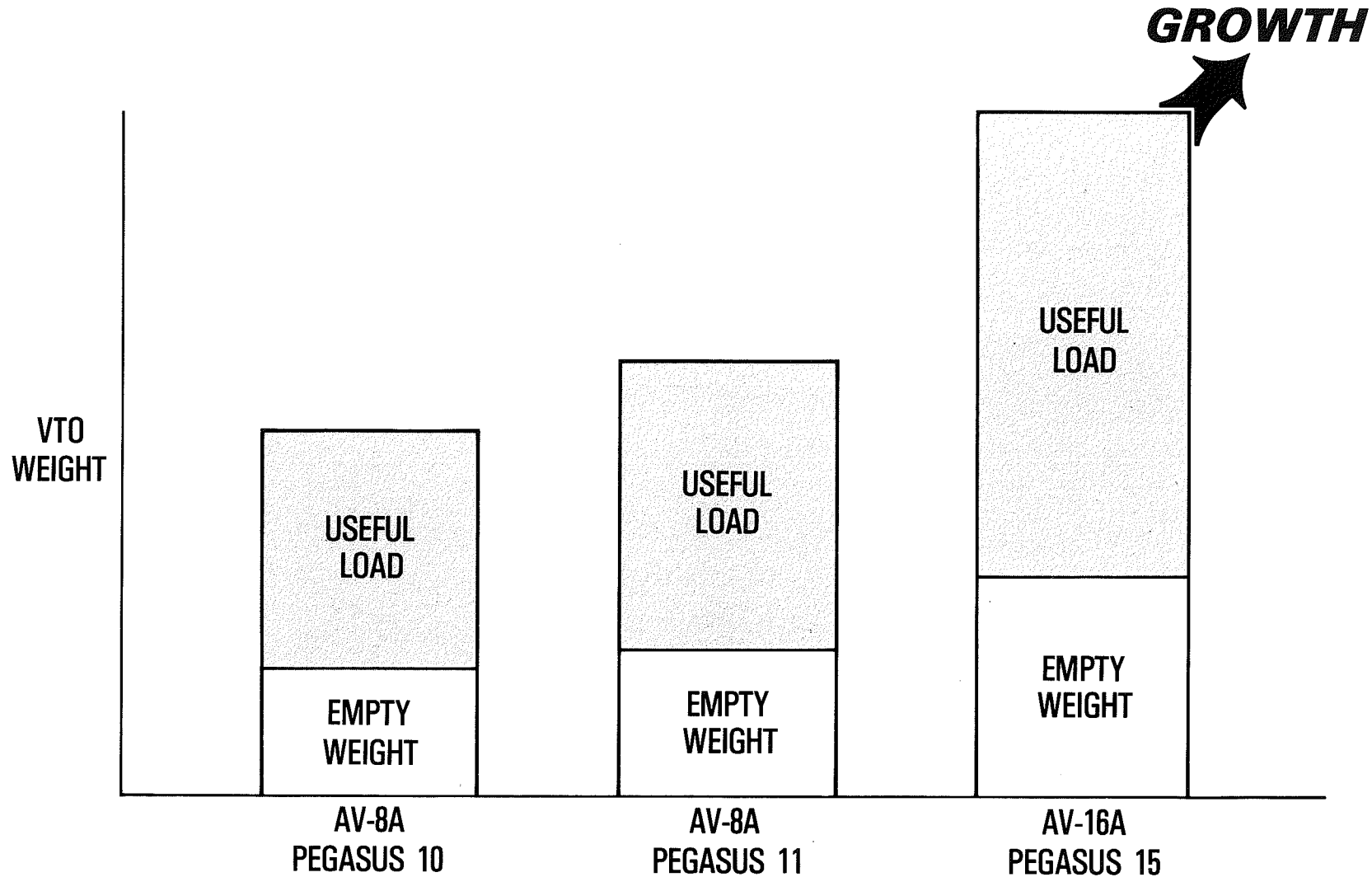


SUMMARY

- NASA AMES 11 FT. UNITARY TUNNEL
- 475 RUNS
- 276 OCCUPANCY HOURS
- THREE CONFIGURATIONS TESTED
AV-8A
AV-16A, W₂
AV-16A, W₃
- EITHER ADVANCED TECHNOLOGY WING WILL MEET REQUIREMENTS.

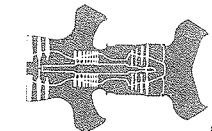


VTO PERFORMANCE EVOLUTION



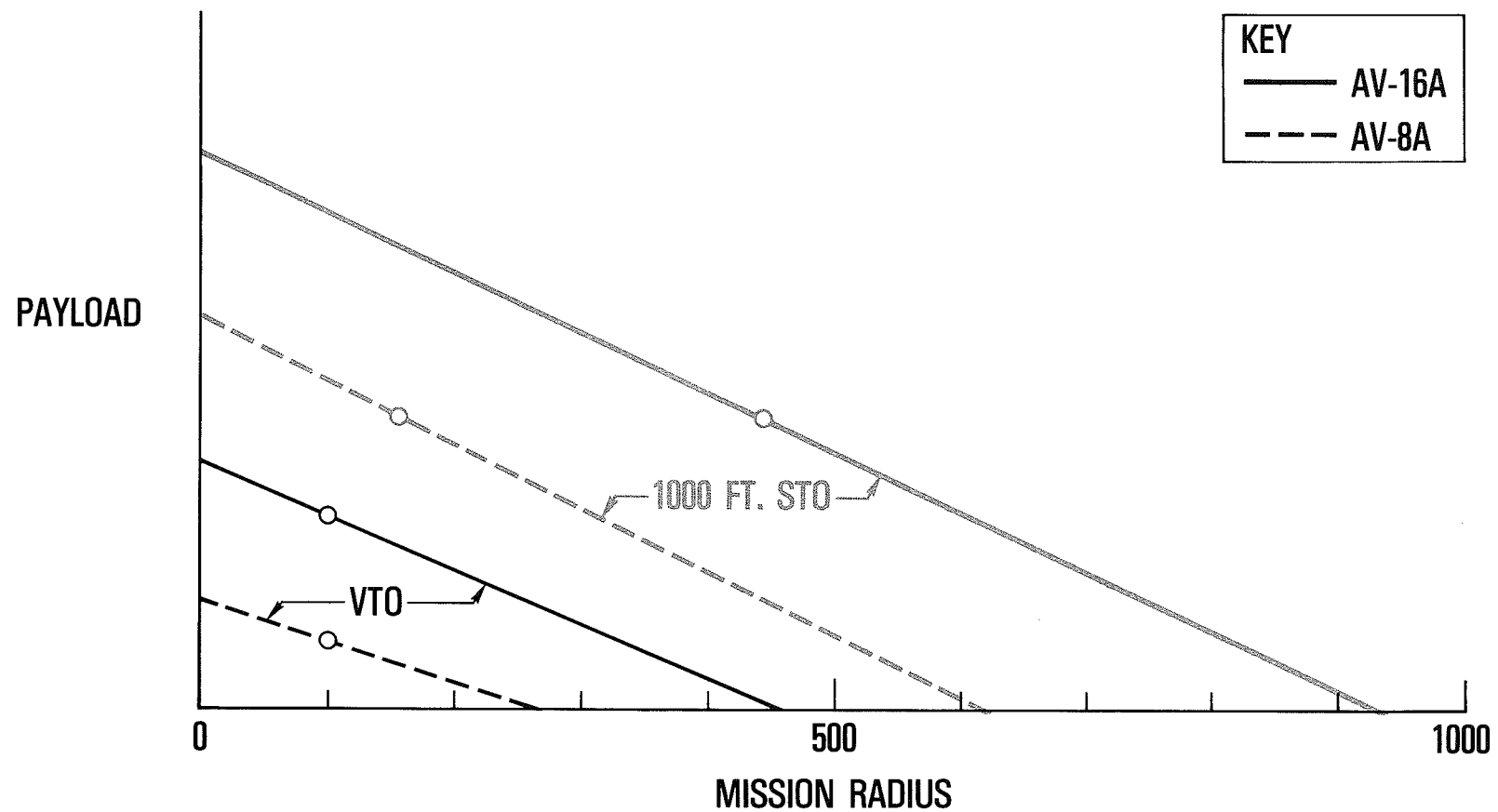


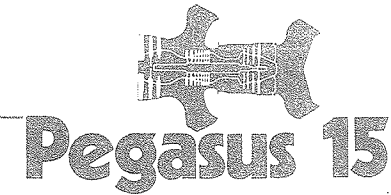
AV-16A



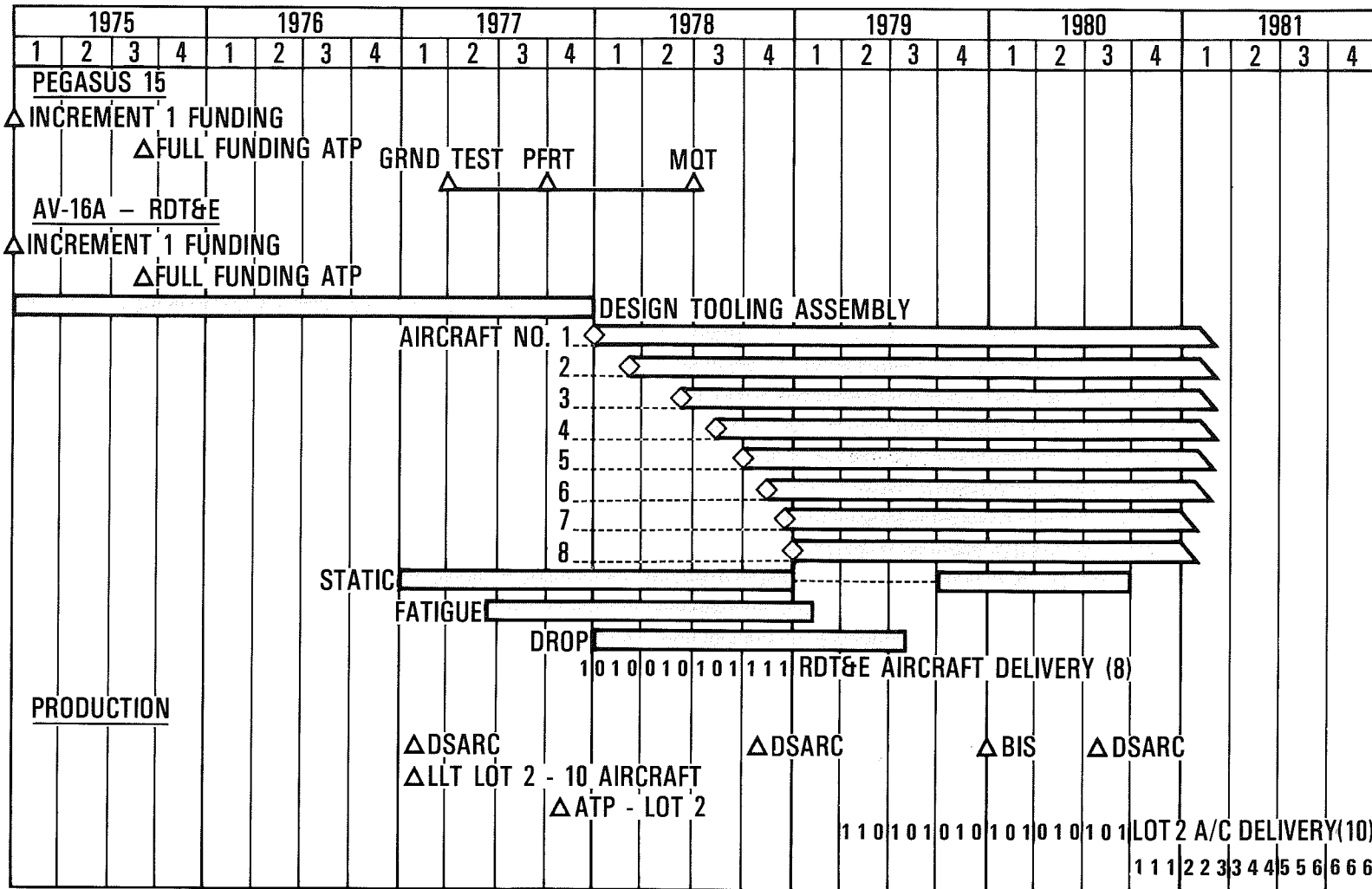
Pegasus 15

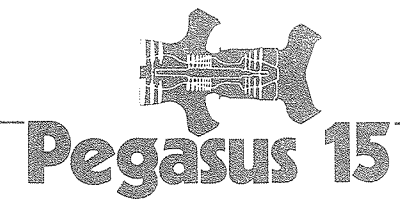
**..... "GREATER THAN 2 TO 1
PERFORMANCE IMPROVEMENT"**





AV-16A DEVELOPMENT AND PRODUCTION





AV-16A PROGRAM PLANNING PRICES

Millions of 1974 Dollars

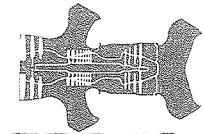
350 Production Aircraft for USMC

AIRFRAME R&D.....	\$260.6
ENGINE DEVELOPMENT TO MQT.....	135.7
FLIGHT TEST ENGINES & SUPPORT.....	<u>60.0</u>
TOTAL.....	\$456.3 (1)
 AVERAGE UNIT PRODUCTION.....	 \$3.3

Notes: (1) Excludes Spares, Peculiar Ground Support Equipment and Navy Support Costs.

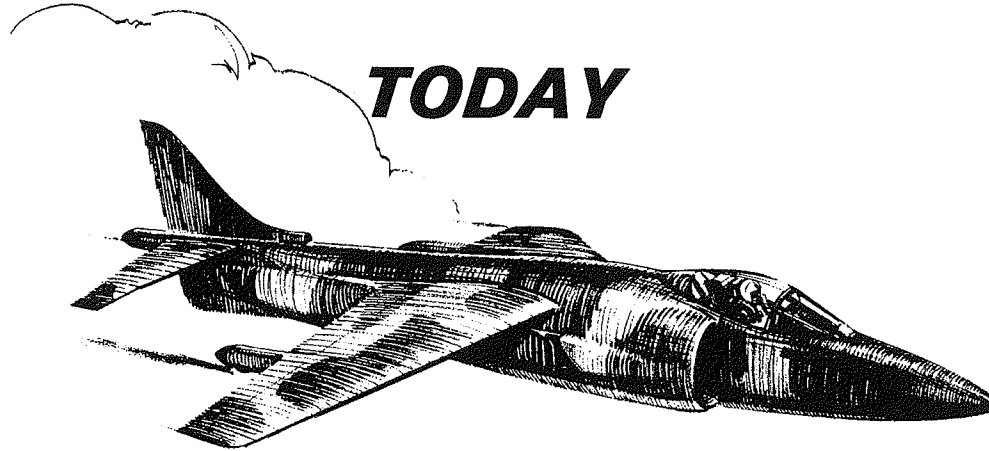


AV-16A



Pegasus 15

TODAY



***..... "A Cost Effective Airplane Which Gives
Substantial Performance Increases
Over the AV-8A at Modest Cost"***

- ON SCHEDULE
- WITHIN COST
- PEGASUS 15 DEFINED
- AIRCRAFT CONFIGURATION ESTABLISHED
- GREATER THAN 2 TO 1 PERFORMANCE IMPROVEMENT VERIFIED