United States Marine Corps

Operational Maneuver From The Sea

Monty Walker

Maintenance
Planning Manager

EFV Logistics

TOPICS

- Amphibious Vehicle History
- Component Description
- EFV Marines
- Condition Based Maintenance Overview

AAV HISTORY

- 1937 - Don Roebling builds Roebling's Alligator
- 1940 - Crocodile (25 MPH, 7 knots)
- 1941-1945 - LVT-1,LVT-A1, LVT-2, LVT-3, LVT-4, LVTA4, LVTA5
- 1952 - LVTP-5, LVTH-6, LVTR-1
- 1972 - LVT-P7, LVT-C7, LVT-R7
- 1998 - AAV-P7 RAM/RS
- 2015 - EFV
- ????

EFV Development

FY88 - FY95
Concept Exploration

Component Technology Demonstrators

Hydrodynamic and Automotive Test Rigs

FY95 - FY01
Program Development and Risk Reduction

First Generation Prototypes

Integrated Functionality, Full Up System

FY01 – FY12
System Development and Demonstration

Second and Third Generation Prototypes

Mature the Design, Prepare for Production

FY12 - FY15
Production Readiness and Low Rate Initial Production

Low Rate Initial Production Vehicles

Full-Up System Live Fire, Initial Operational Test and Evaluation

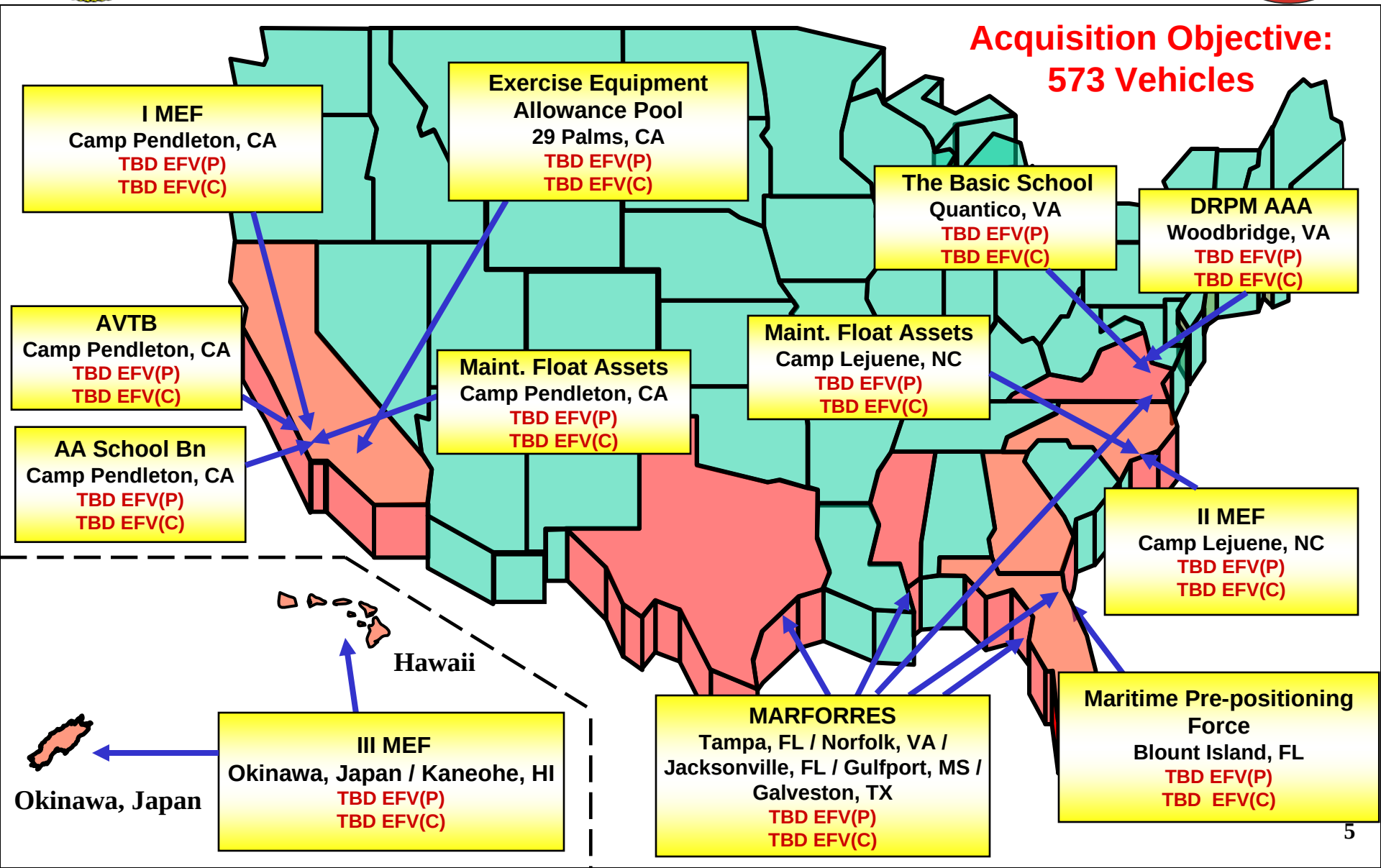
FY16 – FY25
Full Rate Production

Full Rate Production Vehicles

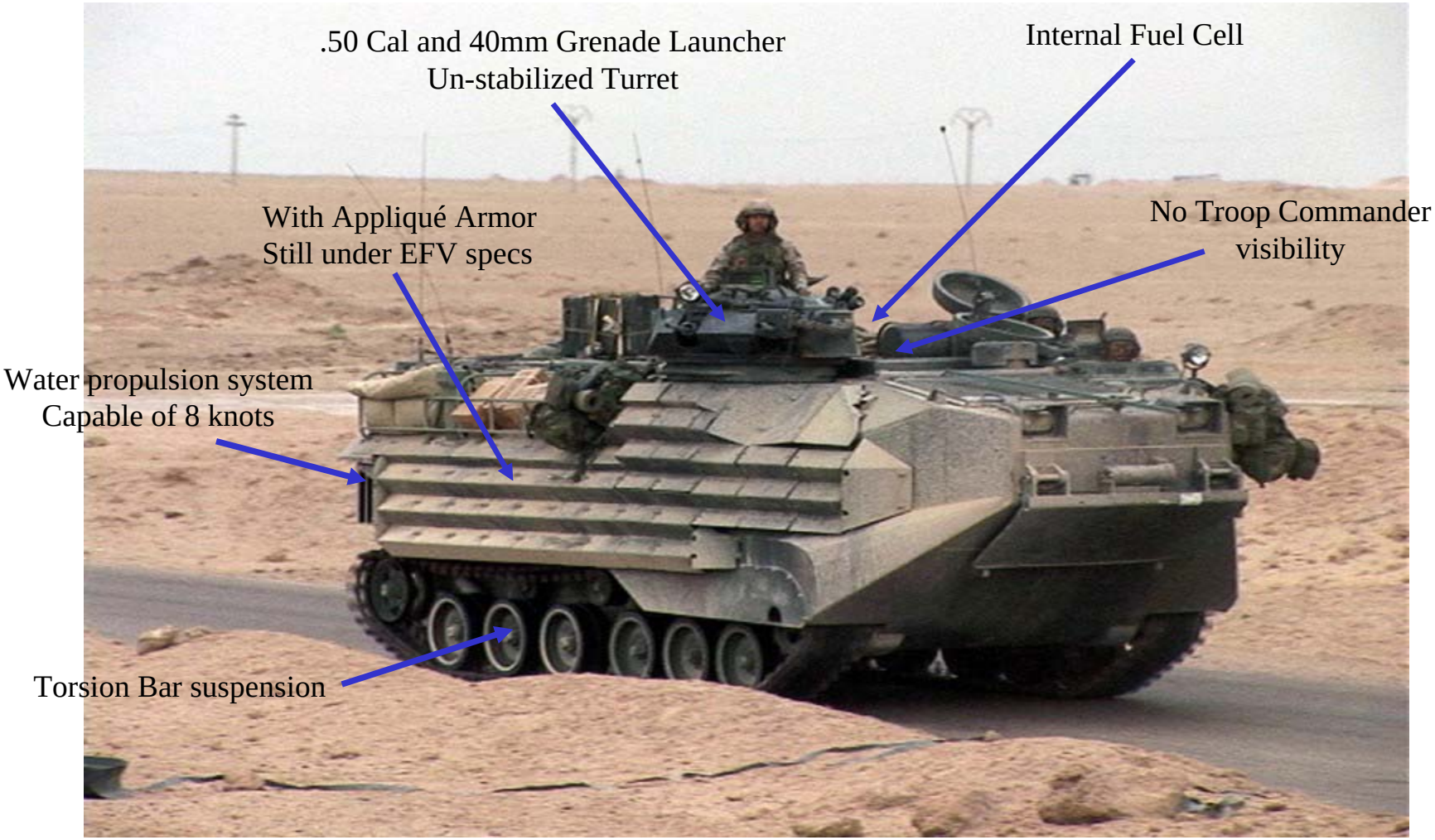
EFV

Design Cycles

EFV ACQUISITION AND FIELDING OBJECTIVE



AAVP7A1

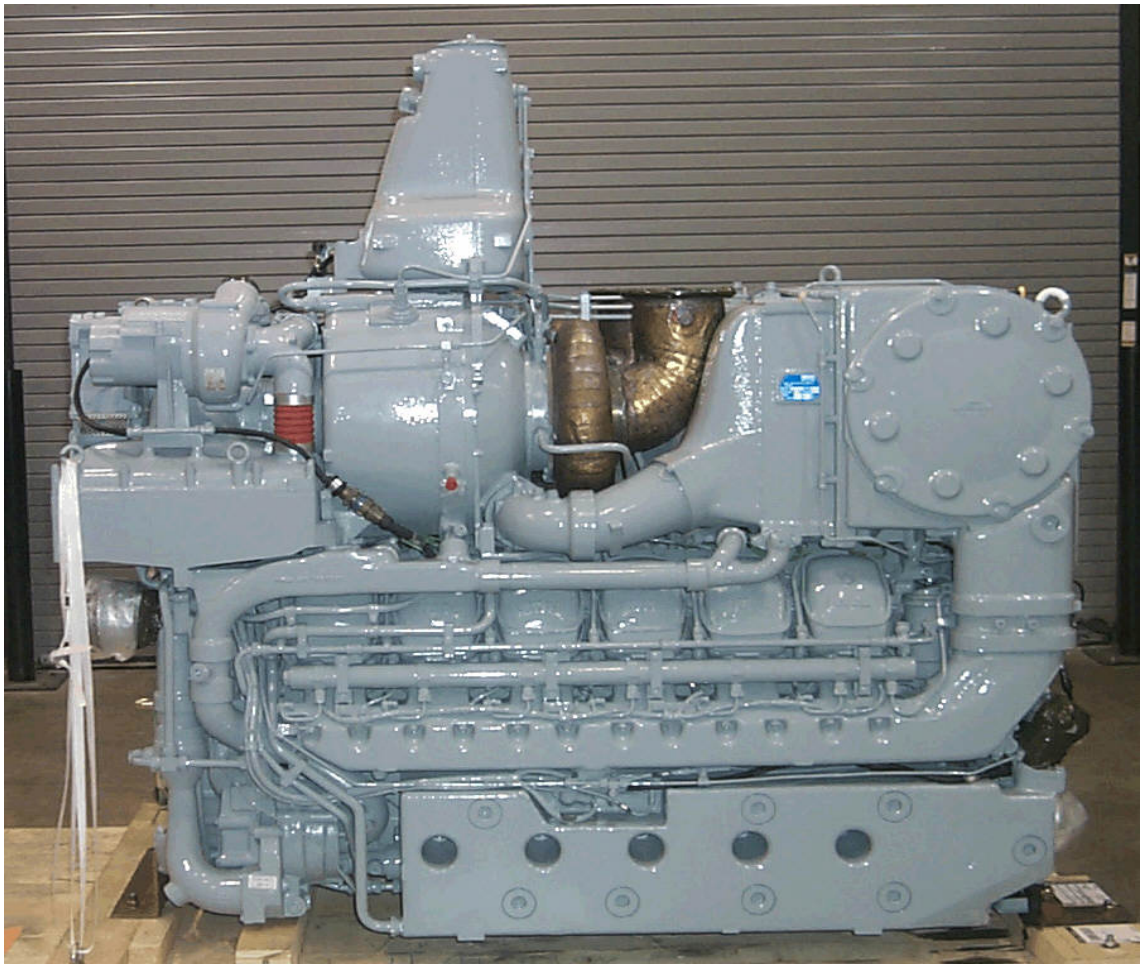

.50 Cal and 40mm Grenade Launcher
Un-stabilized Turret
Internal Fuel Cell
With Appliqué Armor
Still under EFV specs
No Troop Commander
visibility
Water propulsion system
Capable of 8 knots
Torsion Bar suspension

EFV EXTERIOR VIEW

Component Description

Engine:

- 2700 HP, 12 Cylinder, MTU 883 Engine
- Common rail -
  - 30,000 PSI
- Weight:
  6000 Lbs
- 900 Hour Life
  (6 Years)
- Cost: $450,000

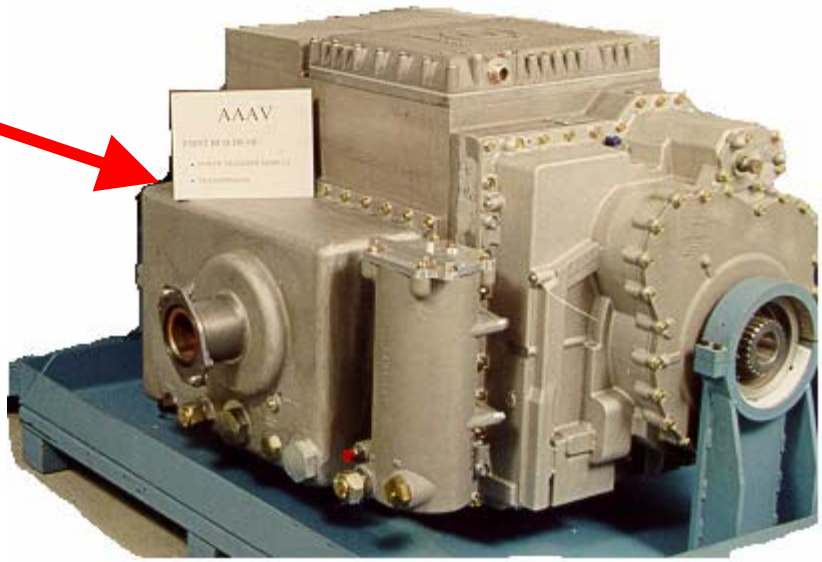


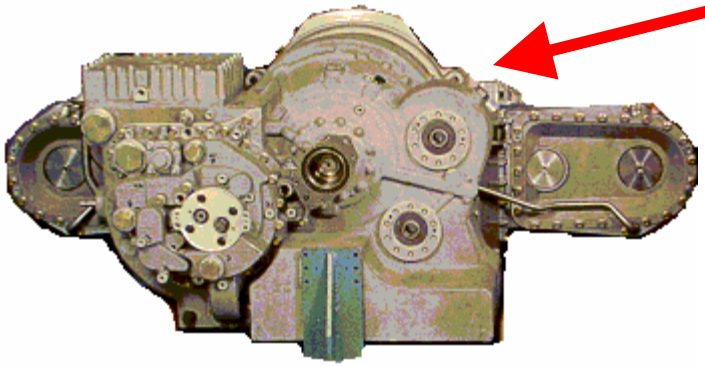
Engine Installation

Component Description

Allison Transmission

- 850 HP Input
- Commercial Range Pack
- 6 Speed Fwd, 2 Reverse
- Commercial WTEC Controller
- Internal HSU





Allison Power Transfer Module

- 2700 HP input
- Drives Trans & Propulsors
- Drives 2 main hydraulic pumps

Electrical System

Power Generation and Distribution

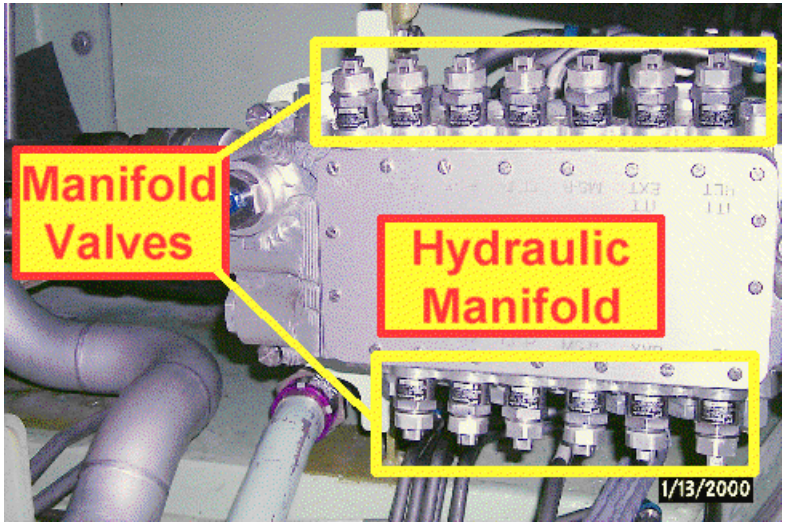
2000 Electrical Circuits

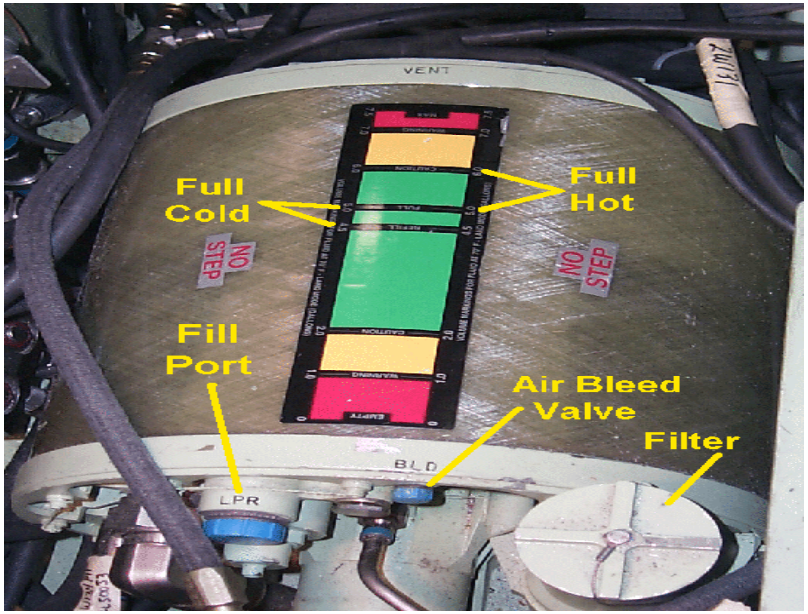
- 24V power, 5 V signal
- 150 Cables
- 3000 Feet of Cable
- 100's of Sensors
- 650 Connectors

Hydraulic System

200 HP/3750 PSI

- 2 Main Pumps
- 1 Aux Pump
- 17 Linear Cylinders

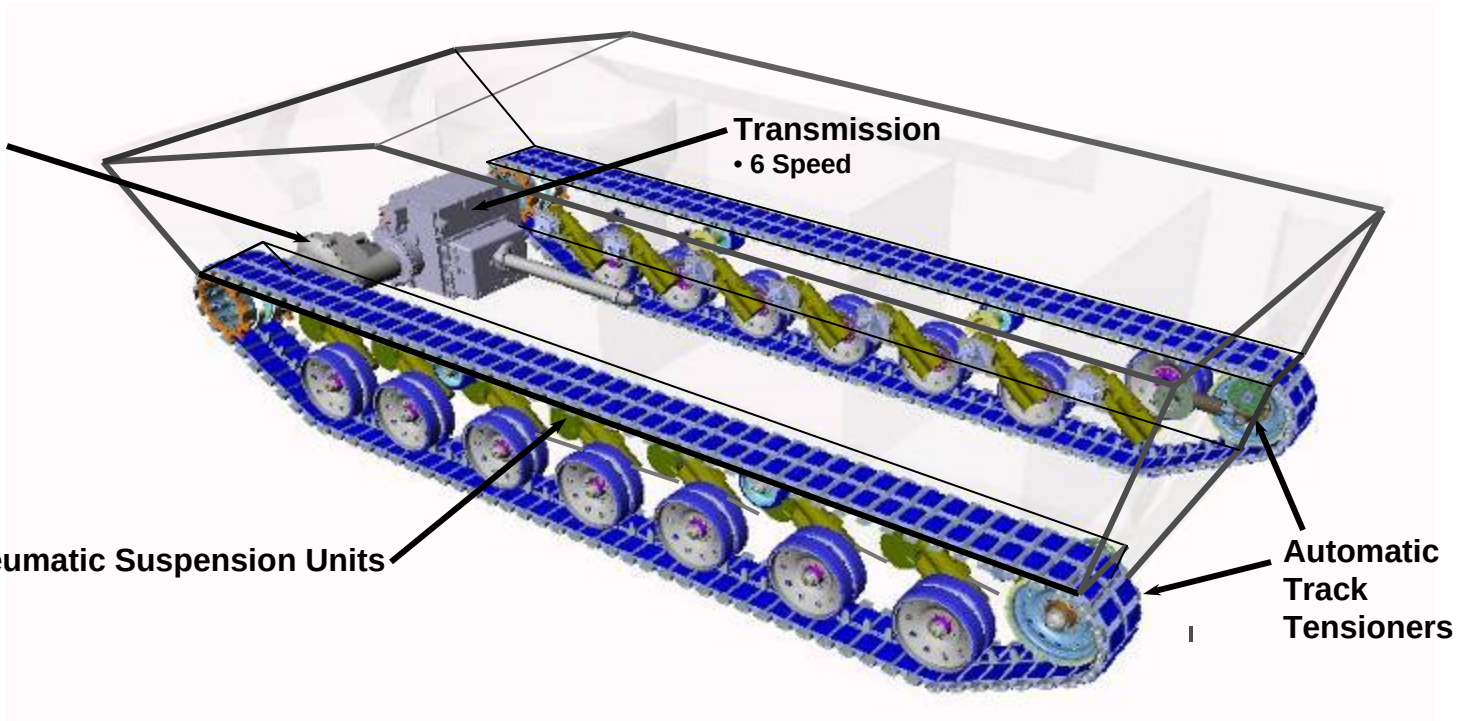




- 8 Rotary Actuators
- 11 Motors
- 2 Reservoirs
- 5 Manifolds
- 900 Feet Tubing
- 80 Feet Flex Lines

EFV Land Mode

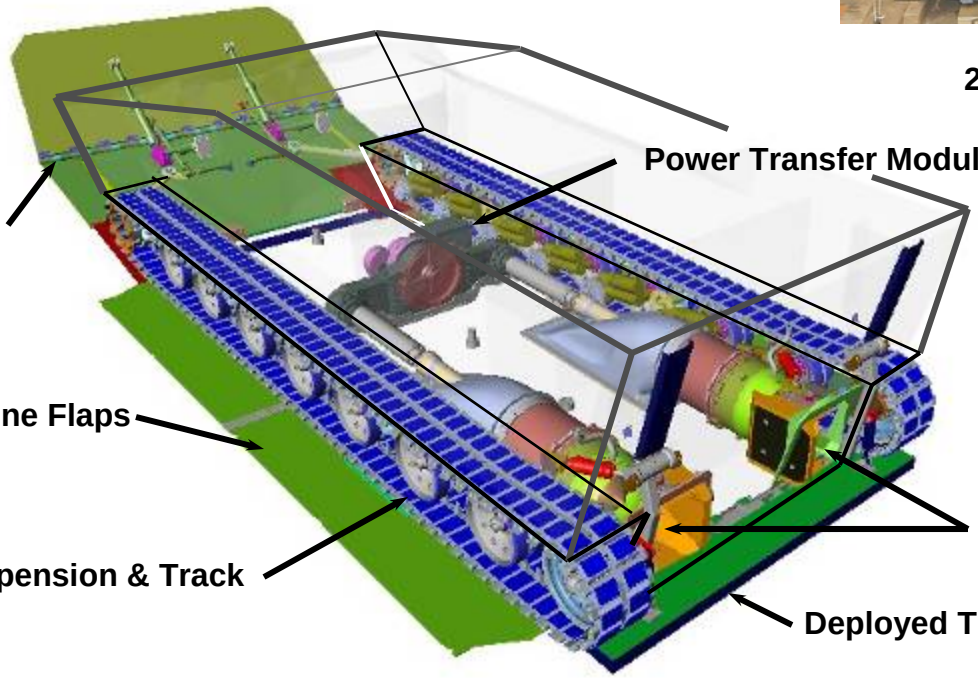
- **Cross-country mobility: >= M1A1**
- **Top speed: 45mph (0-20mph in 7 seconds)**
- **Range: 250 miles after 1-hour (25 nautical miles) high water speed transit or 400 miles (land only)**
- **Obstacle crossing: 8-foot trench span, 3-foot vertical wall**



EFV High-speed Water Mode

- Speed: 20-30 knots
- High speed ops in Sea State 3
- Maintains heading in 10 ft. significant wave height
- High speed turn radius <185 m
- Stop within 75 meters
- Water Range: 65 Nautical Miles (75 statute miles)

2,700 Horsepower Diesel Engine



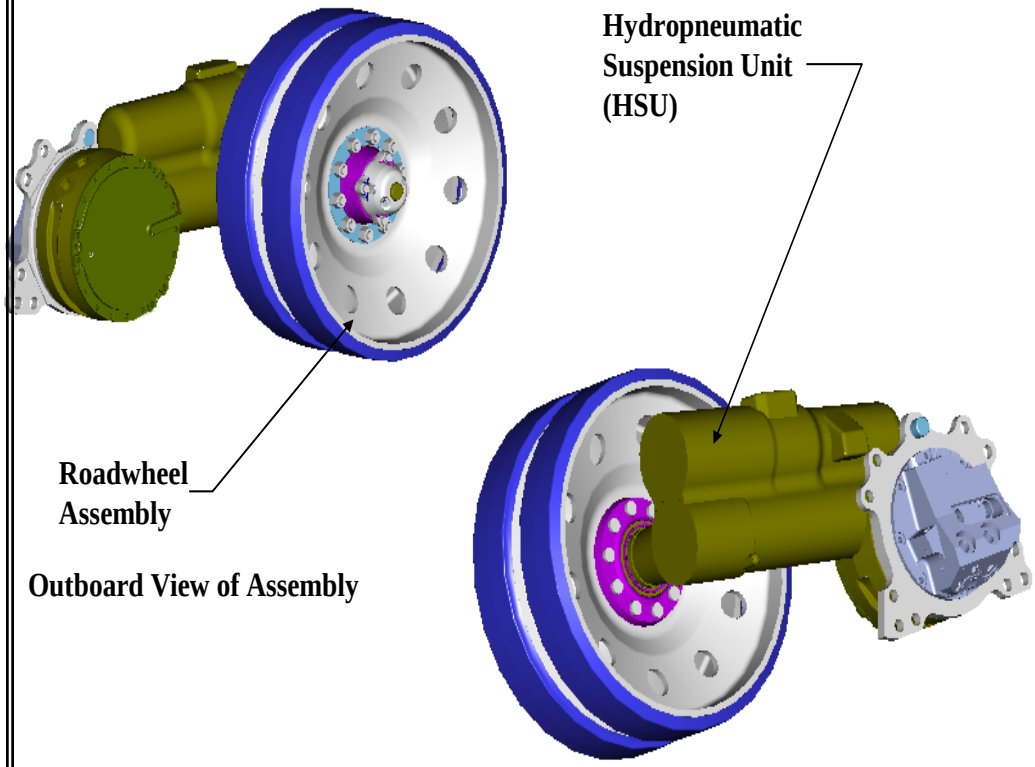
Component Description

Hydro-Pneumatic Suspension Unit

(HSU)

- Nitrogen Over Hydraulic
- 7500 PSI Max Charge
- 35,000 PSI system
- Independent Manage

ROADARM ASSEMBLY



Outboard View of Assembly

Inboard View of Assembly

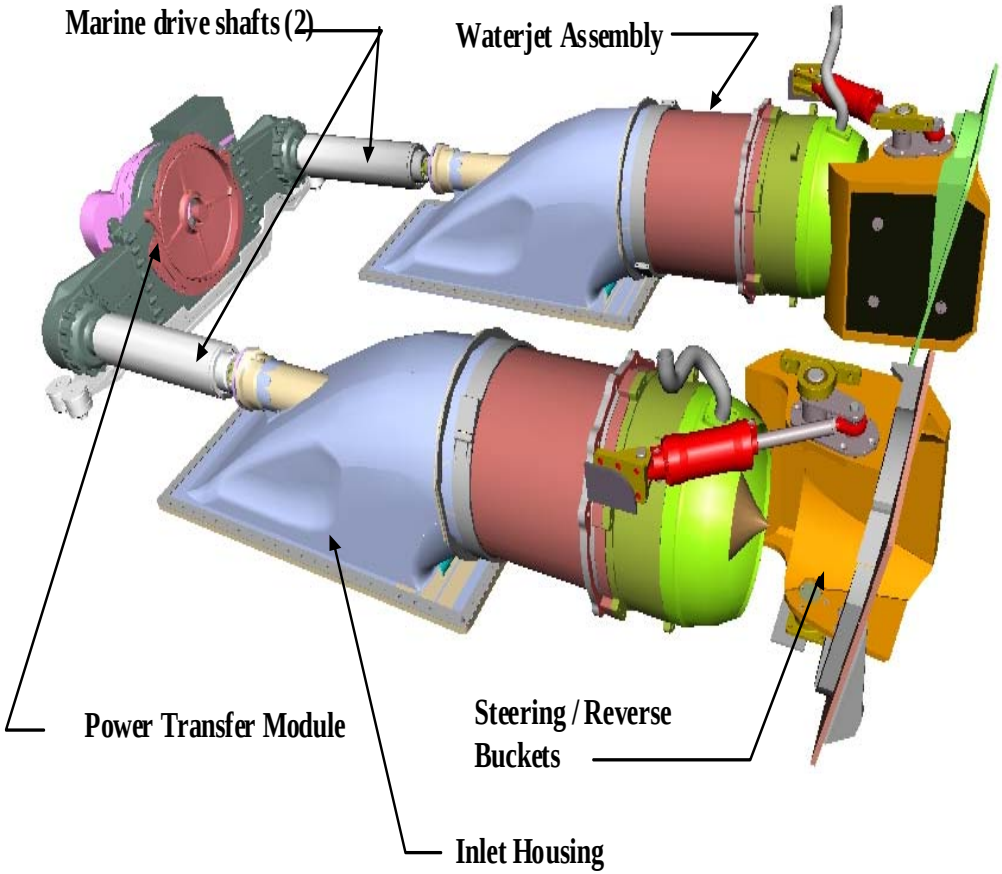
Component Description

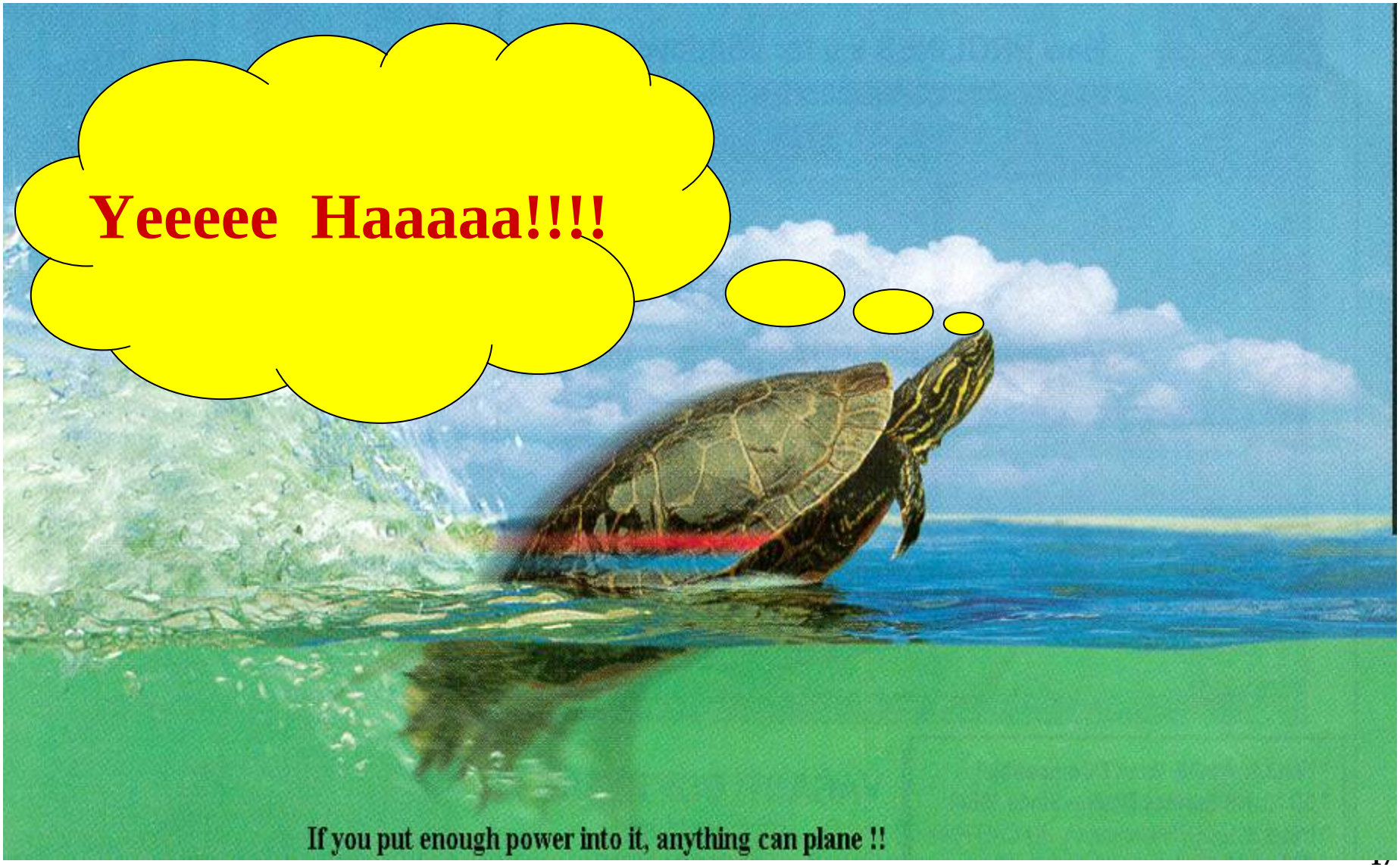
Marine Drive:

Two 23" Counter Rotating Water Jets

- 100,000 GPM Output
- 23,630 Lbs of Thrust.
- 200 GPM to Each Radiator For Cooling

MARINE DRIVE SYSTEM




Yeeeee Haaaaa!!!!
If you put enough power into it, anything can plane !!

1834 - Crew Tasks

- Will conduct 150 Hrs (Approx) Annual Scheduled Maintenance
  - Change All Filters
  - Low Level Fault Isolation, Diagnostics, BIT
  - Remove/Replace Selected LRUs/LRMs
  - BDAR Procedures

2148 Maintenance

- Will Repair ECS (Formerly 1161 Task)
  - Instructors Certified to Teach by APG
  - IMC Students EPA Certified for A/C Systems
- Will Repair/Maintain MK-44 (Formerly 2111 Task)
- Will Perform Basic “Machinist” Tasks (Inserts)
- Requires Increased Understanding of Electrical Theory (Digital Vs Analog)
- Requires Increased Understanding of Hydraulic Theory

“Average EFV Marine”

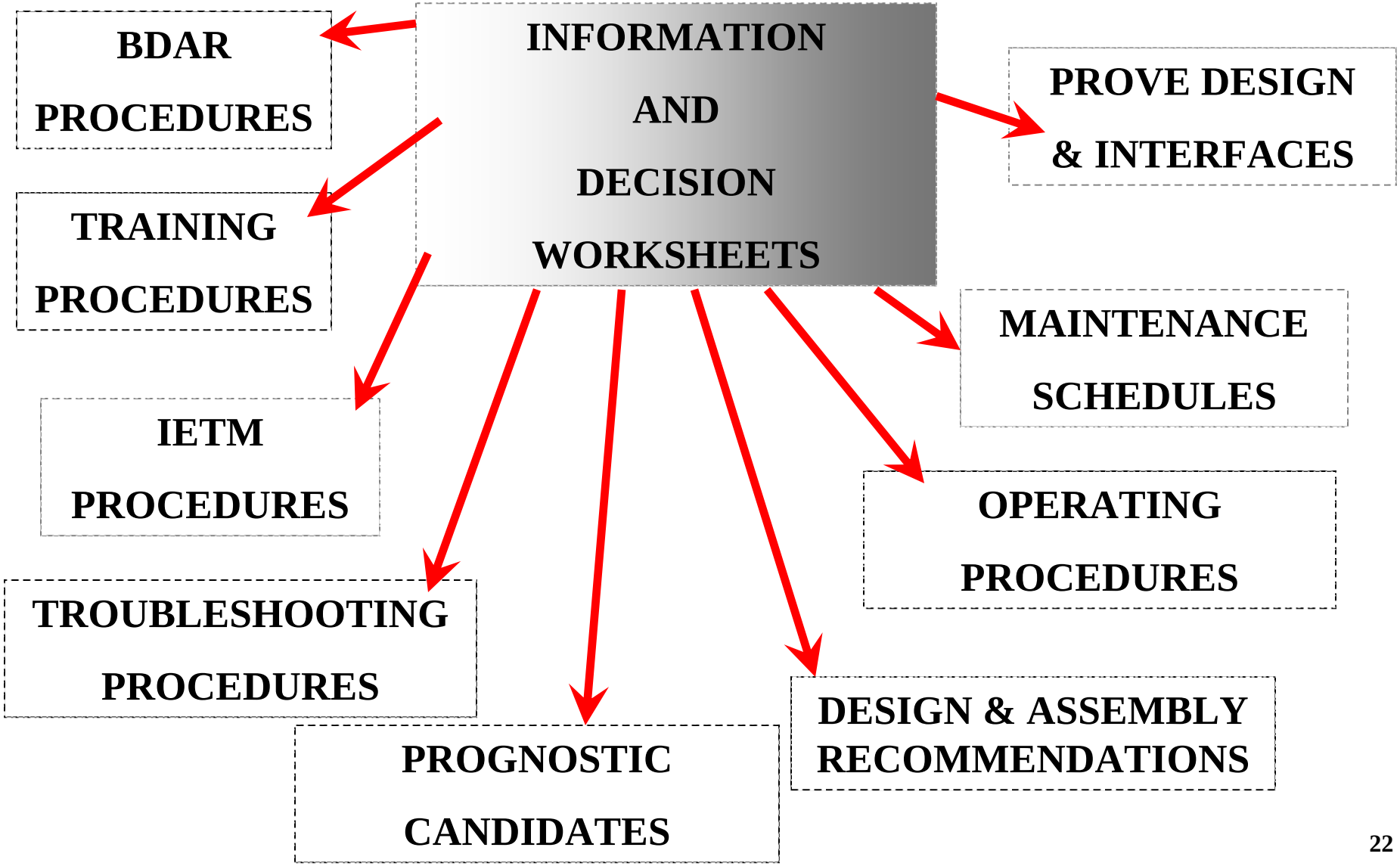
- High School Graduate
- 4 year enlistment
  - –3 months bootcamp
  - –3 months entry level training
- 3 years, 6 months remaining
  - –4 months annual leave
  - –3 1/2 months of weekends
  - –1 month of holidays
- <u>2 years, 9 months effective</u>
- 30% non-EAS attrition
- < 20% re-enlist

These Marines will operate and maintain the EFV!

Condition Based Maintenance

- Reliability Centered Maintenance (RCM)
  - Applying to processes as well as products
  - SAE Standard JA-1011 compliant
    - versus MILSTD 2173, NAVAIR 00-25-403, “Streamlined RCM” or “Back Fit” which are not

The Outputs of RCM



Condition Based Maintenance

- Conditioned Based System Sustainment (CBaSS)
  - Urgent Modifications (U-Mods) –U-Mods occur as required and are not tied to any CBaSS scheduled activities.
  - Software Drops (S/W-Drops) –Software installations are scheduled to occur every 18 months and will take place at the intermediate maintenance level. Estimated duration is 1 to 2 days.
  - Scheduled Maintenance / Systems Upgrades (SM/SU) – includes all scheduled maintenance activities required at 36 months (e.g., service life items, mandatory replacement items, corrosion inspections, and services.) Estimated duration is 7 to 10 days.
  - Vehicle Refurbishment (Refurb) - Vehicle refurbishments are scheduled to occur every 72 months and will take place at the depot maintenance level. Vehicle refurbishments are scheduled to occur every 72 months and will take place at the depot maintenance level. Estimated duration is 35 to 45 days.

Condition Based Maintenance

- Portable Fluid Analyzer (PFA)
  - Gives the user instant feed back
  - Rolls up data for program office use

QUESTIONS??