VETRONICS OVERVIEW

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Abstract

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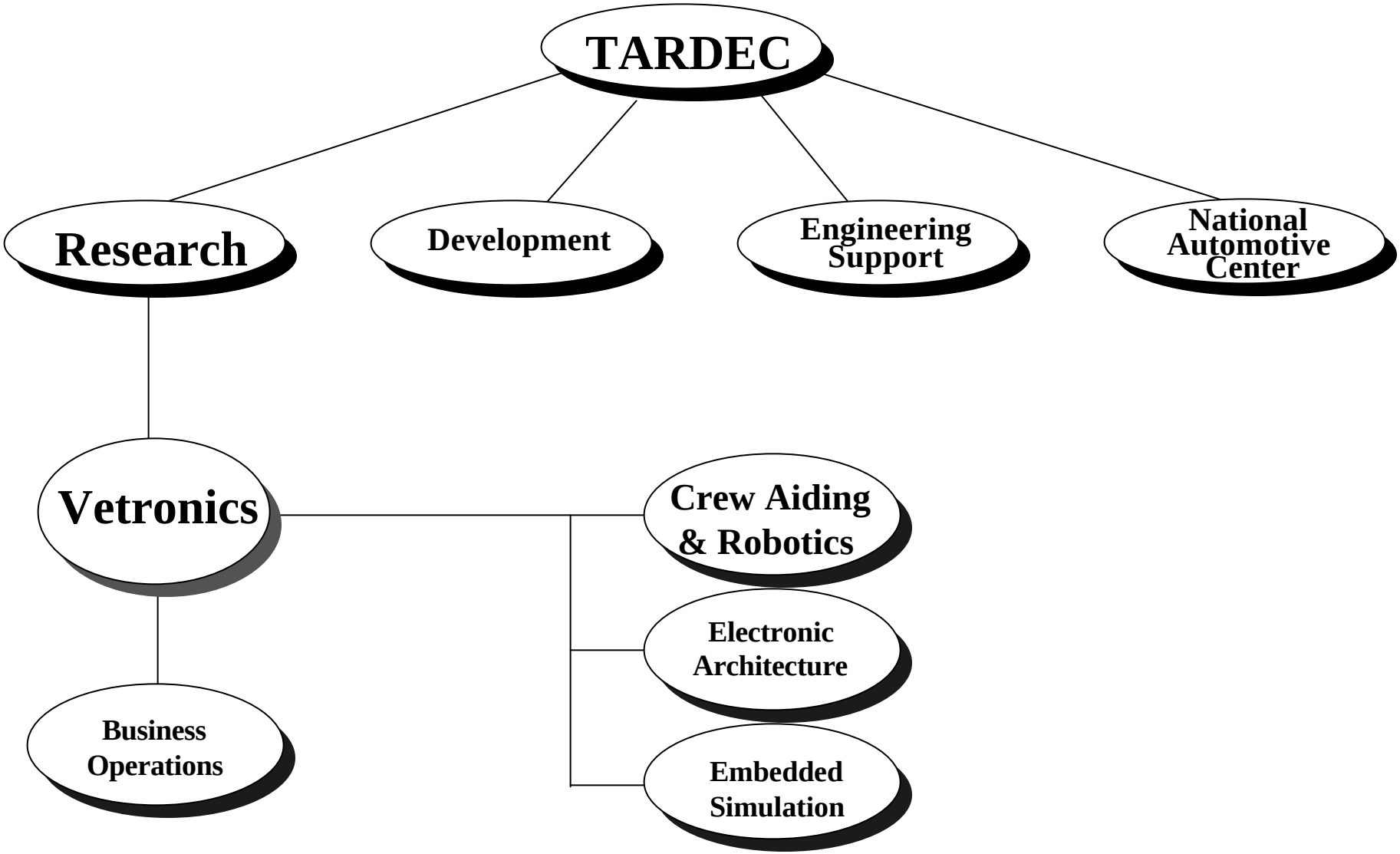
Vetronics Organization

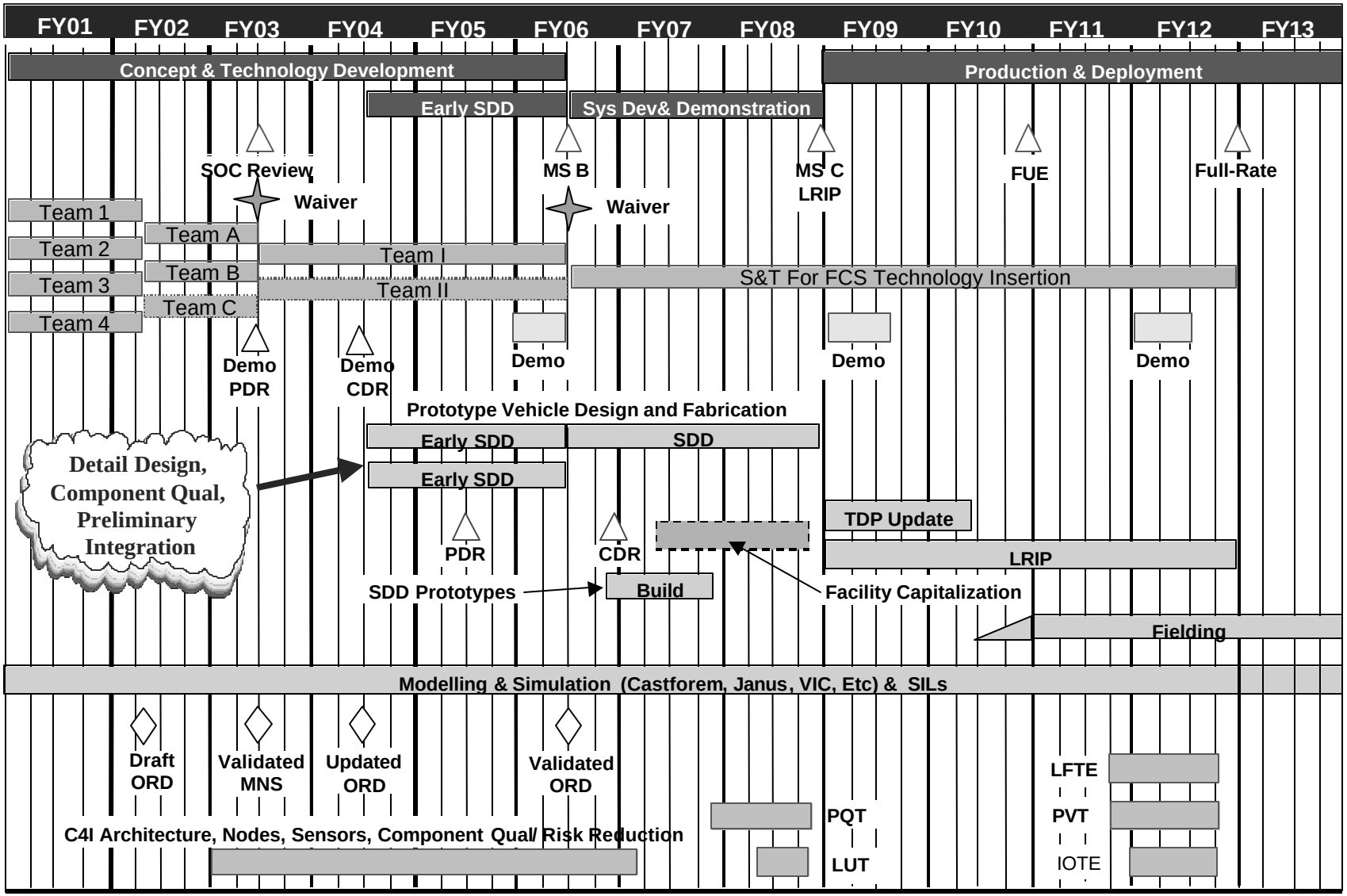


Vetronics Mission

- Support the 6.2 and 6.3 applied technology research and development for the Vetronics *constituent* technologies

- Enable the transition of Vetronics technology to ground vehicle systems

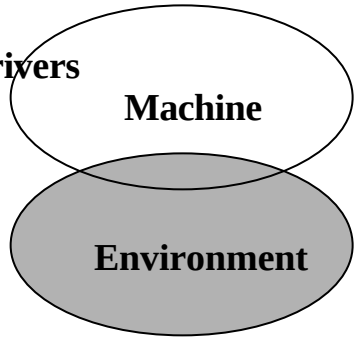
- Current program focus: **FCS**

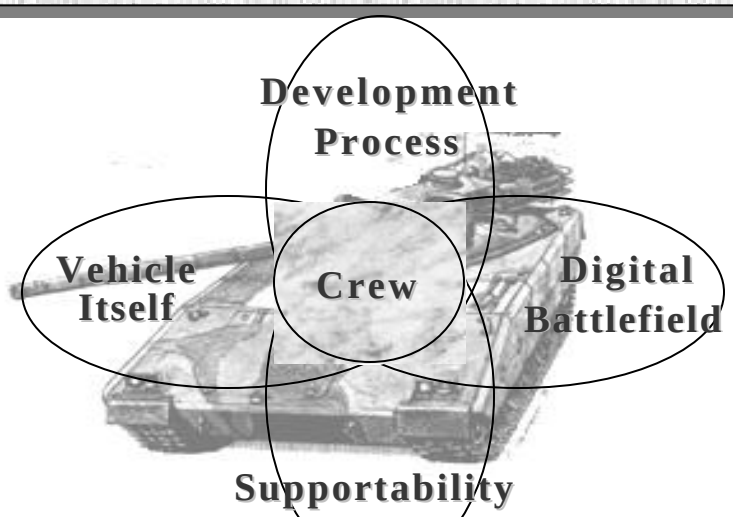

FY01
FY02
FY03
FY04
FY05
FY06
FY07
FY08
FY09
FY10
FY11
FY12
FY13
Concept & Technology Development
Production & Deployment
Early SDD
Sys Dev& Demonstration
SOC Review
MS B
MS C
LRIP
FUE
Full-Rate
Waiver
Waiver
Team 1
Team 2
Team 3
Team 4
Team A
Team B
Team C
Team I
Team II
S&T For FCS Technology Insertion
Demo
PDR
Demo
CDR
Demo
Demo
Demo
Prototype Vehicle Design and Fabrication
Early SDD
SDD
Early SDD
Detail Design, Component Qual, Preliminary Integration
TDP Update
LRIP
PDR
CDR
SDD Prototypes
Build
Facility Capitalization
Fielding
Modelling & Simulation (Castforem, Janus, VIC, Etc) & SILs
Draft ORD
Validated MNS
Updated ORD
Validated ORD
LFTE
PQT
PVT
C4I Architecture, Nodes, Sensors, Component Qual/ Risk Reduction
LUT
IOTE

Why Vetronics?

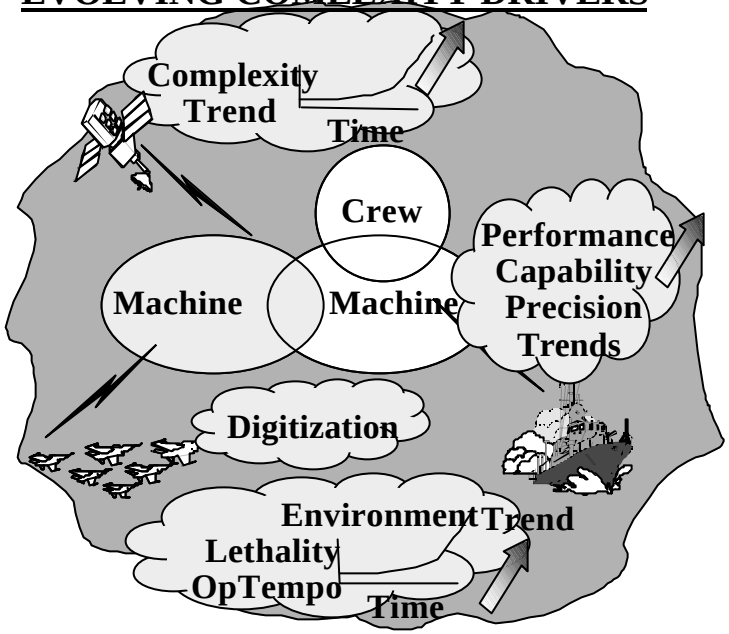
TRADITIONAL S&T DEVELOPMENTS

Environmental Drivers
Space
Weight
Thermal
Shock
Vibration
etc





EVOLVING COMLEXITY DRIVERS

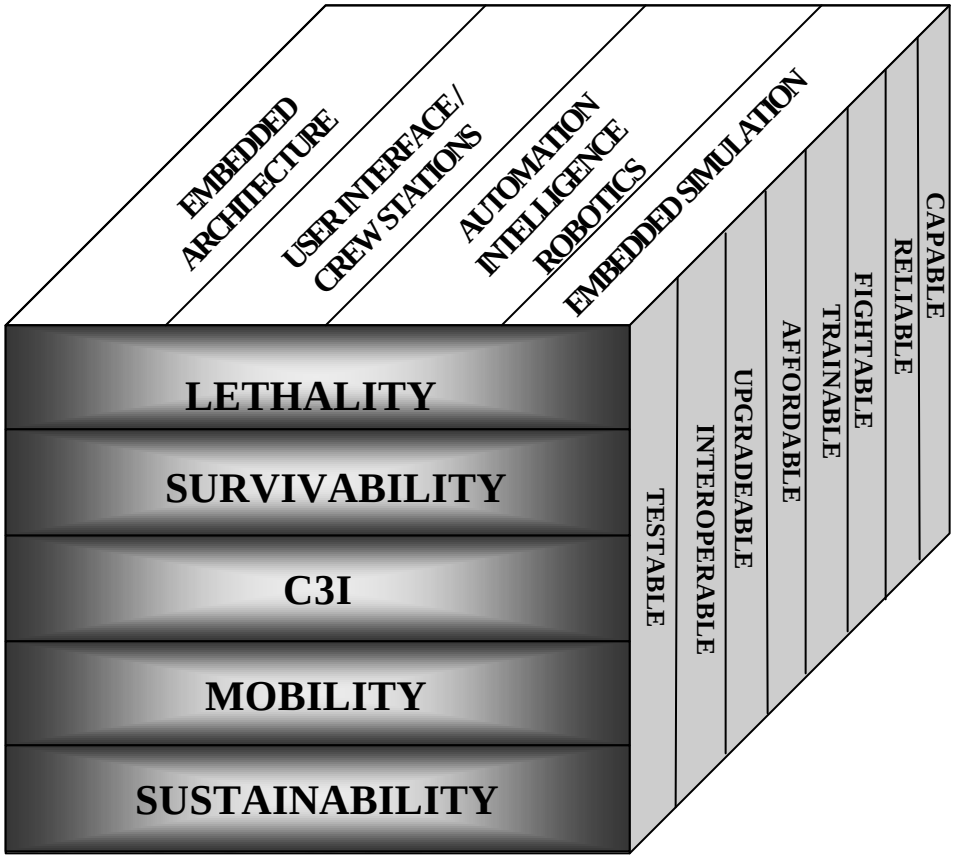


REAL TIME EMBEDDED COMPLEX SYSTEM TECHNOLOGY FOCUS

- **User Interface/Crew Station**
- **Automation/Robotics**
- **Embedded Architecture**
- **Embedded Simulation**

TOTAL SYSTEM INTEGRATION

VEHICLE ENABLING TECHNOLOGIES

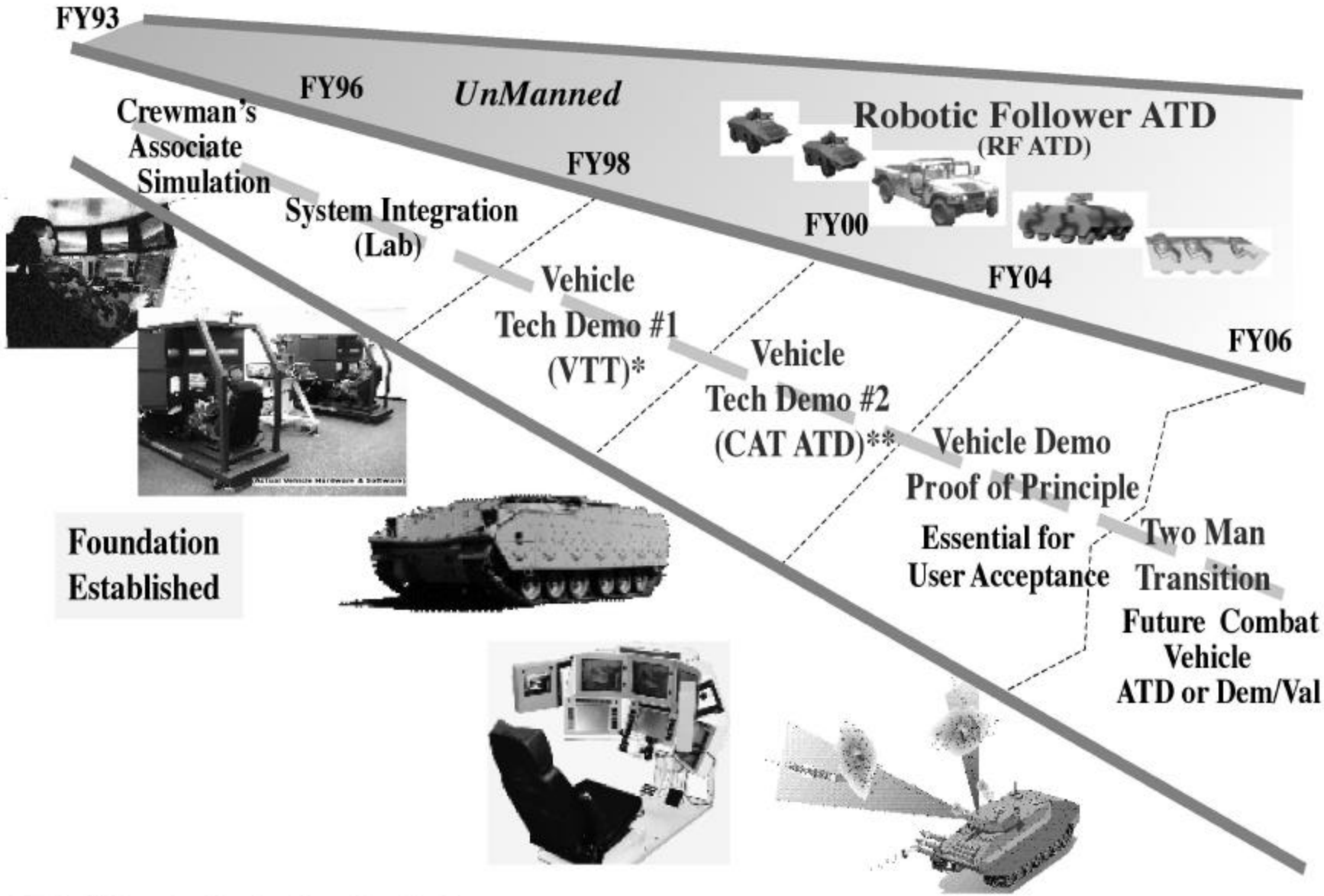


PERFORMANCE OBJECTIVE

SYNERGIZED & SYNCRONIZED CAPABILTY

TOTAL SYSTEM PERFORMANCE & COST DRIVERS

Crew Reduction Progression



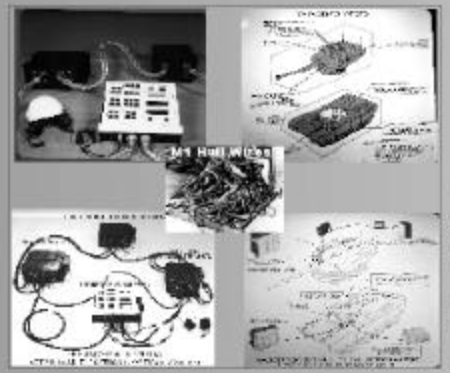
*VTT = Vetronics Technology Testbed
**CAT ATD = Crew integration and Automation Testbed Adv. Tech. Demonstration

VETRONICS EVOLUTION

ATEPS

FOCUS

- Wire Reduction
- Wire Harness Field Replacement
- Gunned Power Distribution & Control
- Multiplexed Data Distribution



VETRONICS

Total System Integration:
- Vehicle Itself (Architecture)
- Vehicle into the Battlefield Force
- Supportability
- Soldier into the Total System

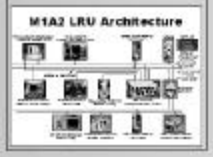
VETRONICS Crew Display Demonstrator (VCDD)

First Ground Vehicle Crew Station Simulator
- Early Soldier Machine Interface definition
- Soldier in the loop simulation
- Detailed battlefield environment
- Interactive threat
- Rapidly reconfigurable displays, controls, and interactive display features

M1A2 Abrams

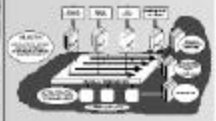
1st Combat Vehicle Application
- Core Architecture
- Multiplexed Data
- Gunned Power Distribution
- Integrated Controls / Displays

M1A2 LRU Architecture



SAVA

Commonality / Modularity
- Distributed Processing
- Common Modules
- Software Modularity



Block III Tank Concept

- SAVA Architecture
- Combat Veh C3 (CVC3)
- Adv Integrated Propulsion Sys (AIPS)
- Veh Integrated Defense Sys

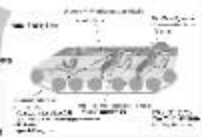
Reduced Crew Simulation

- Crewman's Associate (CA) Simulation Based
- Vetronics Open System Architecture (VOSA)
- Vetronics System Integration Lab (VSIL)
- Application Programmer's Interfaces (API's)

Reduced Crew Vehicle Test Bed

- Vetronics Technology Test Bed (VTB)
- 2 Man Crew
- In-Line Configuration
- Side by Side Configuration
- Embedded Simulation
- Demo I (Aided Driving (1 Man - Commander/Driver)
- Demo II Crew Automation & Integration Test Bed (CAT) (2 Man Cmdr/Driver & Gunner)

- Computer Generated Forces
- Digital Terrain Data
- Simulated Drivers View
- Simulated Sensors



Objectives
- Operational Enhancement
- Training
- Mission Rehearsal

Embedded Simulation

1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000

1977-1985
ADVANCED TECHNOLOGIES FOR ELECTRICAL POWER MANAGEMENT & CONTROL SYSTEMS (ATEPS)

Hull Items:
- 1553B Data Bus
- Power Mgmt Box
- Self Test

Turret Items:
- Maintenance Concept
- Modularity & BIT
- Digitized Stabilization (Performance + M1A1 Analog System)

Technologies Developed / Demonstrated:
- Multiplexed Data Distribution
- Bus Power Distribution
- Hull System: Cable Reduction
- Multifunction Control Display
- Digitization of an Analog System (Stab System)
- Fiber Optic "Test" Developed
- Multiplexed Hull Operation with Fiber Optic Transmission Medium
- Fiber Optic Sipling
- Solid State Power Modules
- Power MOS FET Technology
— BIT/BITE Capability
— 8.00 VDC, 9.15 40 Amp Version
- Digitized Voice Communications
— Mil Std 1553A Compatible

1982
STUDIES

10 Purchase Order Study Contracts

Confirmed Avionic Type Architecture is applicable to Armored Vehicles - Robotics transfer to Vetronics was Mil Std 1553B and Ohio State, Experience / Lessons Learned, Technology, very little hardware per se'.

Contracts:
- GDLS
- Texas Instruments
- Martin-Marietta
- Delmo-Victor
- Rogue State University
- SEMICOR
- Hughes
- Vought
- FMC
- Delco
- RCA
- Emerson
- Honeywell
- Litton

1984-1986
VETRONICS SYSTEM ARCHITECTURE DEMONSTRATOR (VSAD)

Four competitive contracts to demonstrate Vetronics vision with Vetronics System Architectures Demonstrators (VSAD)'s. Contractors:
- GDLS
- FMC
- RCA
- TI

- Demonstrated Broadband Global and fiber-optic Bus
- Generated digital map data/symbology
- Demonstrated electrical power generation and mgmt including 270VDC
- Demonstrated remote solid state switching modules, shared mass memory, & digital radio communication interface
- Hardware & Software Modularity
- Redundancy & Fault Tolerance
- BIT/BITE
- Reconfigurability
- Multifunction Controls & Displays
- Distributed Processing

1986-1988
VETRONICS CREW DISPLAY DEMONSTRATOR (VCDD)

- Two crew stations & a controller station
- Reconfigurable crew stations (physical & functional characteristics)
- Simulated battlefield environment
- Interactive threat
- Soldier in the loop simulation
- Focal point to bring the User and the Development community together early in the development cycle to define Soldier Machine Interface (SMI) functional requirements and performance specs for new developments

1988-1992
M1A2 ABRAMS TANK

General Dynamics Land Systems (GDLS)

- Utility Bus
- 1553B Data Bus
- Distributed Processing
- Integrated Multifunction Controls/Displays
- Inter Vehicular Information System (IVIS)

1988-1992
STANDARD ARMY VETRONICS ARCHITECTURE (SAVA)

Standard Army Vetronics Architecture (SAVA) Demonstrated:
- Modular reconfigurable design
- Distributed multiprocessing
- Standardized interface
- Common hardware and software modules
- Use of Commercial Standards (backplane, board size)
- Ability to add functionality without major restructuring
- Technology insertion

Key Features:
- Modular "Family of Buses" - High Speed Token Ring Bus, Mil-Std-1553B Bus, Utility Bus, Video Distribution, Network
- High Voltage Power System - 28 & 270 VDC Tree Distribution, 270 VDC Redundant Ring Distribution
- Fault Tolerant Operation - Redundant media for power & data, Automatic Mode Reconfiguration, Support for mission specific reconfiguration

Documentation:
- SOVS Mil-Std-1systems
- Defines Architecture Features, system Bus Protocols, Standard Interface.

1990-1991
COMPONENTS ADVANCED TECHNOLOGY TEST BED(CATTB)

- Overall SAVA Combat Vehicle Integration
- Subsystems Integrated:
- Advanced Integrated Propulsion Systems (AIPS)
- Vehicle Integrated Defense System (VIDS)
- Advanced Task Sensor (ATAC) with Autoloader
- Multisensor Target Acquisition System (MTAS)
- Combat Vehicle Command & Control System (CVCC)
- Automatic Fire Extinguisher System

1991-1994
COMMON CHASSIS ATTD(CCATTD)

Competitive Contract for ATV Common Chassis
- Use of SAVA Principles
- High Speed Data Bus
- EMI - Signature Suppression
- Dynamic reconfigurability
- GSA cost reduction thru standardization
- Allocation of reliability
- BIL for mission modules

1993-1996
CREWMANS ASSOCIATE (CA) ATD

- User approve crew station designs
- 2005 - 2 Man Crew Station
- 1998 - 3-6 Man Crew Station
- Completed M1A2 Baseline experiments at Ft. Knox May/June 1995
- Completed 2005 Crew Station Experts, May 1995
- Completed 1998 Crew Station Experts, Sept/Nov 1995
- Human Computer Interface input to ATA Version 4.x
- Architecture concept Based on Open Systems and Commercial Standards adapted for WSTA domains (ground vehicle, aviation, missile, sealbar)
- Vetronics API's Defined & Developed:
- Vetronics Real Time Operating System (VRTOS)
- Vetronics Graphical Users Interface (VGUI)
- Architecture ATD Subtops defined for:
- Hit Avoidance ATD
- Target Acquisition ATD
- Combined Arms C2 ATD

1997-1998
APPLICATION PROGRAMMERS INTERFACE (API) DEVELOPMENT

- Embedded Map Server 1997.
- Map Editing Station 1997.
- Operating Services API 1998.
- Ballistic Recal API 1998.

Support to Program Managers
- PM M1A2 SEP
- PM Bradley A3
- PM - LAV
- PM Crusader
- PM - Combat Mobility Systems
- PM - FCS
- TSCS Crew Station Simulation

1998 - 2000
VETRONICS TECHNOLOGY TESTBED (VTT)

- Commander/Driver Crew Station
- Gunners Crew Station
- Side by Side and In-Line Testbed Configurations
- Drive-By-Wire
- Robotics Demo II Technologies
- Semi-Autonomous Driving
- Intelligent Driving Aids
- Indirect Viewing
- 3D Audio
- Embedded Simulation
  - Training
  - Mission Rehearsal
  - Combat Enhancement

Support to Program Managers
- Future Scout Combat System (FSCS) MFP. Annex J
- Architectures Requirements
- Crew Station Requirements

2000-2004
CREW INTEGRATION AND AUTOMATION TESTBED (CAT) ATD

- Two Soldier Operation
- Robotic Demo III Semi-Autonomous Driving
- Intelligent Driving Decision Aids
- Speech Recognition
- 3D Audio
- Indirect Vision
- Head Trackers
- Helmet Mounted Displays
- Crewman's Associate Interface
- Advanced Electronic Architecture
- Advanced Network Technology
- Object Oriented Software Modules
- Embedded Simulation
- Embedded Training
- Mission Rehearsal
- Battlefield Visualization
- Command Coordination
- After Action Review