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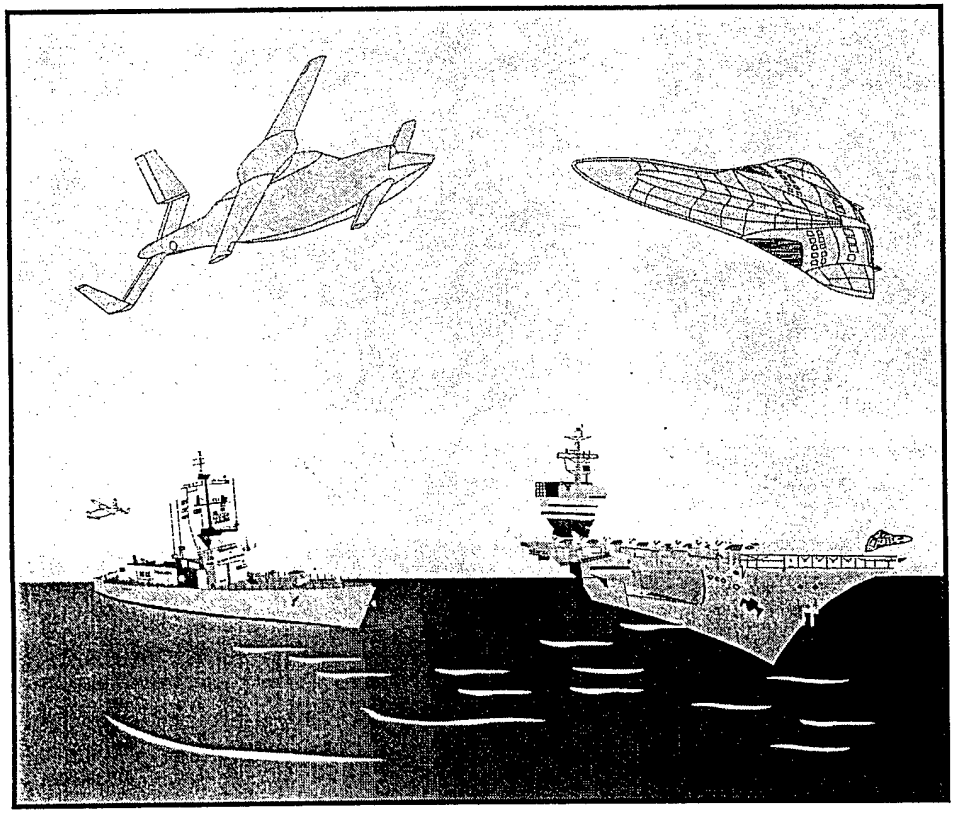

Future Naval UCAV Applications & Enabling Technologies

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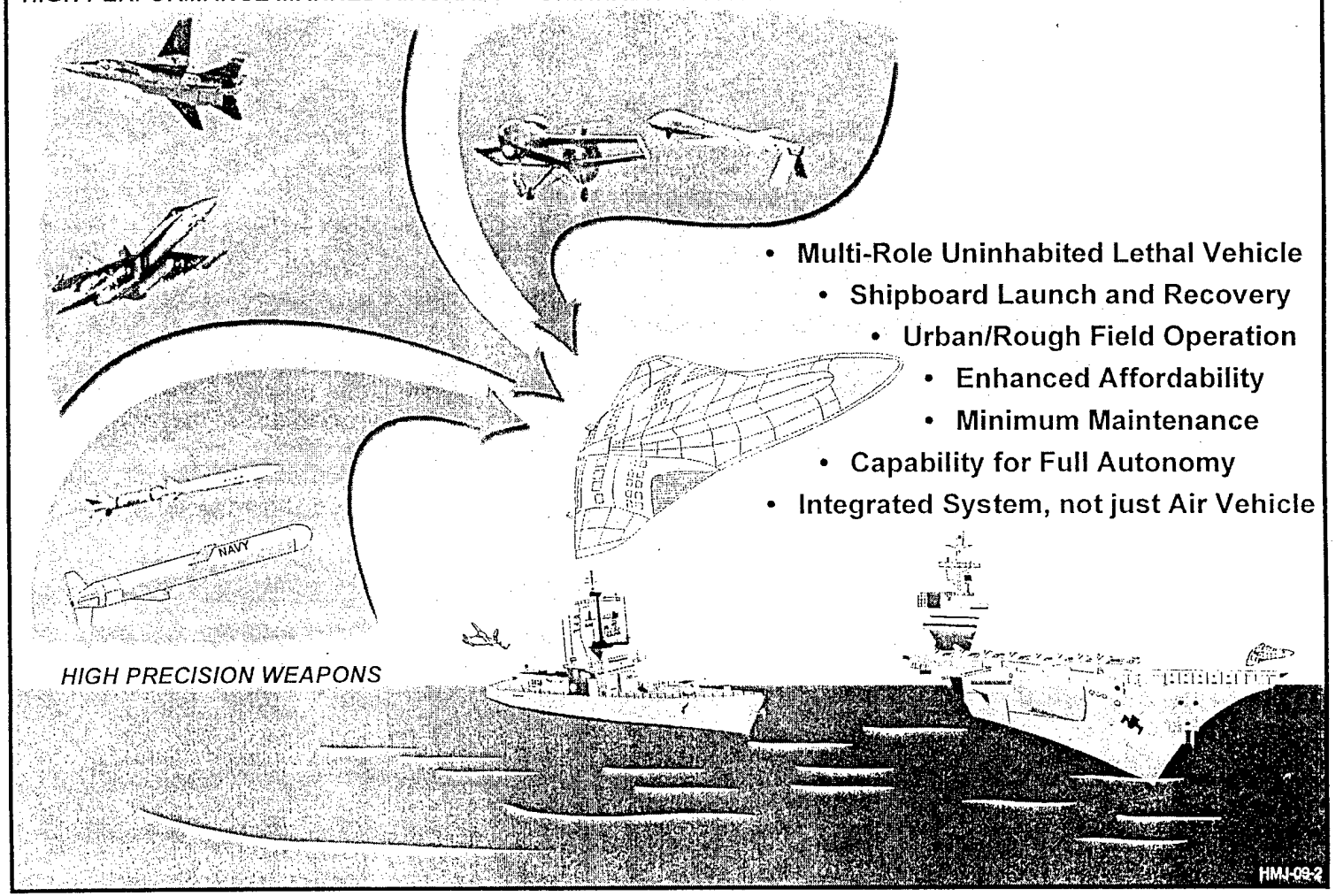
Why Should the Navy Invest In UCAVs?

- Drawdown in its force structure & dollars available
- An affordable alternative in acquisition & O&S costs
- State-of-the-Art computing power and flight control algorithms have us on the brink of this capability
- Potential to revolutionize Naval approach to warfighting by opening the design space:
  - Unusual attitudes & orientation
  - Operational duration & missions
  - Reduce or eliminate maintenance & training req'ts
  - Sustain higher g-forces and onset rates
  - Apply innovative manufacturing concepts
  - Expanded basing options

NAVAL
UNINHABITED COMBAT AIR VEHICLE

NAVAL AVIATION SYSTEMS TEAM



- Multi-Role Uninhabited Lethal Vehicle
- Shipboard Launch and Recovery
- Urban/Rough Field Operation
- Enhanced Affordability
- Minimum Maintenance
- Capability for Full Autonomy
- Integrated System, not just Air Vehicle

Ongoing Programs & Efforts

- Navy - ONR UCAV Iniative
  CNO SSG UAV/UCAV XVI & XVII
  OPNAV UAV Payloads IPT
  DON UAV Workshop
- Marine Corps - Draft MNS for Strike UAVs
- Air Force/DARPA - UCAV ATD
  Phase I contracts awarded in April
  Phase II will build & fly demo UCAV
- Air Force/France - Integrated Tactical A/C Control
  Devel & eval cooperative flight operations
- NASA - Sponsored design studies for UCAV concepts
  Follow-on efforts addressing hyper-agility
- England - Virtual UCAV designs for con-ops development
- TTCP - Workshop "UAV's on the Battlefield 2015"

ONR Programmatic Plan

98	99	00	01	02	03	04	05	06	07	08

Utility & Technology Program Development Studies

- Utility Study
- Navy V/STOL Design Concept
- Ship Integration
- Direct Future Technology Priorities

Tech. Maturation Programs

- Naval overarching issues
- Simulation
- Flight demos

- Embodiment of Naval UCAV
- Demo O&S Reductions
- Demo Shipboard Capability

Naval UCAV Demo

Utility Study

Purpose - Identify Potential Naval UCAV Missions

Basis - Joint Vision 2010 - Navy Unique, First Days of War

Missions Considered -

- SEAD
- Close Air Support
- Mobile/Moving Targets
- ASW
- ISR
- Halt Invasion
- No-Fly Zone
- ASUW
- Mining
- Chemical, Biological, Radiological
- Fixed Targets
- Command & Control Centers
- Information Suppression
- Combat Air Patrol

Navy

AF/DARPA

UNSA Concept Designs

- **Uninhabited Naval Strike Aircraft (UNSA) study comprises 3 tasks:**
  1. Configuration Definition
     - Surface-ship Short TakeOff & Vertical Landing (STOVL)
     - Surface-ship Vertical Attitude TakeOff & Landing (VATOL)
     - Sub-launched VATOL
  2. Vehicle Characteristics and Performance
     - Design layouts, system/subsystem descriptions
     - Weight estimates
     - Aero-performance estimates, mission, point, and VTOL capability
  3. Critical Technology Review
- **Studies Conducted by:**
  - Lockheed Martin
  - Boeing
  - Northrop-Grumman
  - NAWCAD
- **Final oral reports April-Aug 98**

Ship Integration Study

APPROACH

Addressing DDG class ships & rotorcraft air vehicles by:

Developing, Integrating and Validating

- Ship Airwake Models
  - Apply current NASA Model, PENN State Model & Shipboard data
- Air Vehicle Models for Rotorcraft Vehicles
  - Validate with existing vehicles
- Develop a scaling model
  - Apply advanced concept vehicles (Canard Rotor Wing)
- UAV Pilot/Vehicle/TCS Control Req'ts.

TECH CHALLENGES

- Accurately modeling existing system for shipboard environment
- Scaling model to accurately predict ship airwake forces acting on vehicles varying from UAVs to full size manned vehicles

EXIT CRITERIA

- Validation with current rotorcraft flight test data
- Successful simulation of interaction of vehicle in operational environment
- Application & Validation of simulation with Boeing/DARPA CRW flight test data

ONR Programmatic Plan

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Naval UCAV Demo

Tech. Maturation Program

FY00	FY01	FY02	FY03

- **UCAV V/STOL Flight Controls & Autonomous Decision Making**
  - Capability to perform Naval missions such as all-weather shipboard launch and recovery, aerial refueling, target ID, in-flight route planning, self-monitoring, etc.

- **UCAV Affordable Unitized Structures**
  - Leverage concepts from weapon design, but capable for shipboard launch & recovery
- **Compact Virtual UCAV Control Station**
  - Control stations which meet the limited space constraints of a ship or truck
- **V/STOL UCAV Urban Warfare Aerodynamics**
  - Flight requirements for flying between buildings

UCAV SUMMARY

- UCAVs Seen as Future Weapon System for Projection of Long Range, Sustainable, Lethal, Combat Power
  - Greatly reduced acquisition and O&S costs
  - Mix of manned and uninhabited systems envisioned
- Current USAF focus on lethal SEAD and fixed target attack
- Current Naval focus
  - Close Air Support
  - ASW
- Technology requirements continue to be identified
  - Many needs common with manned systems
  - Command and Control is key