

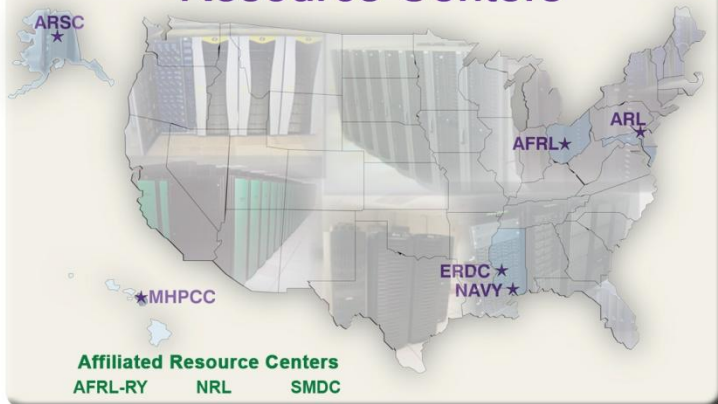
# The DoD Computational Research and Engineering Acquisition Tools and Environments (CREATE) Program



# DoD HPC Modernization Program

## Provide HPC Capabilities for the DoD RDT&E Communities

### DoD Supercomputing Resource Centers



#### Army Participation

ARL & ERDC DSRCs  
1,343 Users/24 Organizations/  
108 Projects  
56 DREN Sites  
15 Challenge Projects/2 DHPs  
5 Institutes

#### Navy Participation

Navy DSRC  
942 Users/16 Organizations/  
197 Projects  
38 DREN Sites  
13 Challenge Projects/2 DHPs  
1 Institute

#### Air Force Participation

AFRL & MHPCC DSRCs  
1,330 Users/25 Organizations/  
199 Projects  
24 DREN Sites  
11 Challenge Projects/3 DHPs  
3 Institutes

#### Defense Agencies Participation

DARPA, DTRA, JNIC, JFCOM,  
MDA, PA&E & OTE  
537 Users/4 Organizations/  
29 Projects  
28 DREN Sites  
2 Challenge Projects/2 DHPs

#### Other

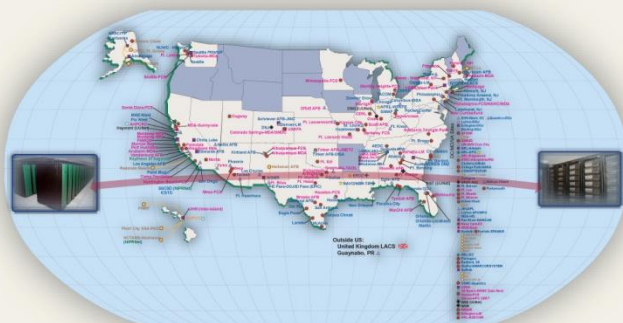
ARSC DSRC  
68 DREN Sites

### Software Applications Support

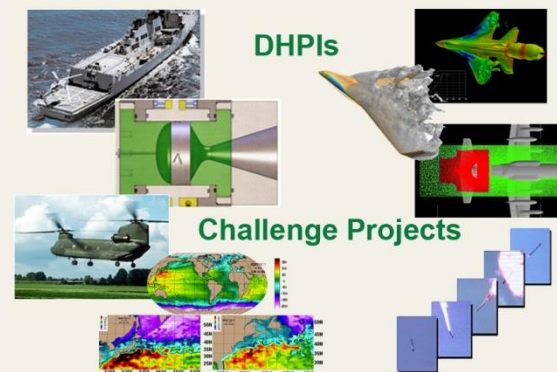
#### Institutes/Portfolios



### Networking Defense Research & Engineering Network



### Resource Management Requirements & Allocations



# CREATE Concept

- Use physics-based software to identify design defects throughout the acquisition process thus substantially reducing acquisition time and cost overruns.

**Identify problems and fix them before metal is cut.**

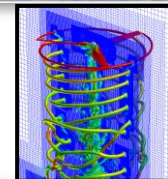
# CREATE Rationale

- **“There is a probability of one that 10 structural failures will be discovered in flight test programs where the cost to rework the defect is maximized.” --**  
Ed Kraft, Chief Technologist, AEDC
- **Present designs are based on semi-empirical extrapolations from existing systems—insufficient for new weapons systems**
- **Building and testing physical prototypes and full systems is expensive and takes a long time**

**Physics-based computational engineering tools allow performance predictions of virtual prototypes from conceptual design through production and sustainment to augment physical testing**

# Focus on Four Project Areas

- **Air Vehicles (AV)—Air Force, Army & Navy**
  - Aerodynamics, structural mechanics, propulsion, control, ...
- **Ships—Navy**
  - Shock vulnerability, hydrodynamics, concept design
- **Radio Frequency (RF) Antennas—Air Force, Army & Navy**
  - RF Antenna electromagnetics and integration with platforms
- **Mesh and Geometry (MG) Generation**
  - Rapid generation of mesh and geometry representations needed by analysis



Design concept

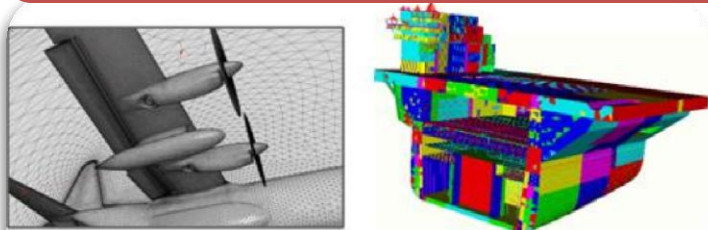


Seakeeping and resistance



Shock vulnerability

*CREATE tools will support all stages of acquisition from rapid early stage design to full life-cycle sustainment*



Aircraft and aircraft carrier meshes



Military platforms with antennas

# CREATE – Four Projects → Ten Products

- **Air Vehicles—CREATE AV**
  - DaVinci - Rapid conceptual design
  - Kestrel - High-fidelity, full vehicle, multi-physics analysis tool for fixed-wing aircraft
  - Helios - High-fidelity, full vehicle, multi-physics analysis tool for rotary-wing aircraft
  - Firebolt - Module for propulsion systems in fixed and rotary-wing air vehicles
- **Ships—CREATE Ships**
  - RDI - Rapid Design and Synthesis Capability
  - NESM - Ship Shock & Damage-prediction of shock and damage effects
  - NAVYFOAM - Ship Hydrodynamics-predict hydrodynamic performance
  - IHDE - Environment to facilitate access to Naval design tools
- **RF Antenna—CREATE RF**
  - SENTRI - Electromagnetics antenna design integrated with platforms
- **Meshing and Geometry—CREATE MG**
  - Capstone - Components for generating geometries and meshes

# DoD Acquisition Process

Concept  
Development



Engineering Development



Production &  
Deployment

- **Concept Development**

- **DaVinci** – AV Rapid conceptual design
- **RDI** – Ship Rapid Design and Synthesis Capability
- **IHDE** – Ship Environment to facilitate access to Naval design tools
- **SENTRI** – RF Antenna Design integrated with platforms—Simple, fast models

- **Engineering Development and Production & Deployment**

- **Kestrel** – AV High-fidelity, full vehicle, multi-physics analysis tool for fixed-wing aircraft
- **Helios** – AV High-fidelity, full vehicle, multi-physics analysis tool for rotary-wing aircraft
- **NESM** – Ships Ship Shock & Damage-prediction of shock and damage effects
- **NAVYFOAM** – Ships Ship Hydrodynamics-predict hydrodynamic performance
- **SENTRI** – RF Antenna Design— Detailed, accurate RF models integrated with platforms

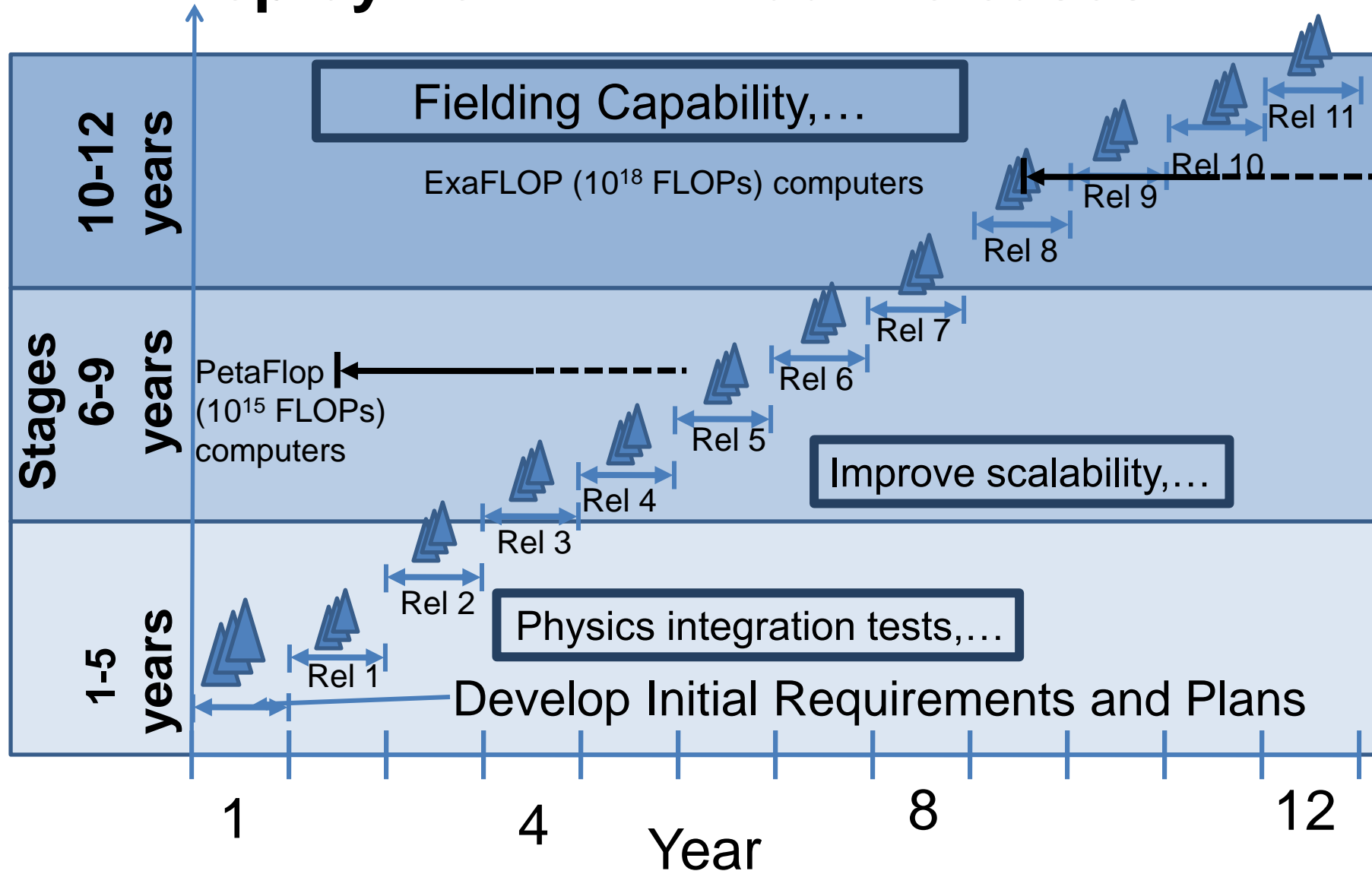
CREATE Addresses All Phases of Acquisition

# The CREATE Approach

- **Software is being built by government-led teams**
- **Each product is released annually following a roadmap**
  - Each year there is a release of a usable application
  - Each release builds on the previous release and adds the increased capability called for in the roadmap
  - Each release is beta-tested by targeted user communities before a broader release
  - Each release goes through a rigorous V&V process and follows software engineering practices developed specifically for technical software
- **Releases are progressively more scalable for massively parallel computers and responsive to user requirements**
- **CREATE Program is guided by DoD service acquisition engineering organizations and their senior leadership and US defense industry**
- **Most of the CREATE software applications made their second release this calendar year**
  - Many will have a third release by March 30, 2012



# Incremental Development and Deployment in Annual Releases



# Criteria to Gain Access

## Criteria for access:

- **CREATE software is available to industry users if:**
  - It will be used to support a US DoD contract,
  - It is used within the contract scope, and
  - The contract is consistent with the limitations within the CREATE license agreement
- **The software is export controlled; all US export control policies and laws must be followed**

## Process for access:

- **A two-factor authentication (CAC or hToken) is required to use the software**
- **To request access to the software, email [createaccounts@create.hpc.mil](mailto:createaccounts@create.hpc.mil) to begin the approval process**

# Four Project Areas and Computing Access

- **Air Vehicles (AV)—Robert Meakin**
  - Aerodynamics, structural mechanics, propulsion, control, ...
- **Ships—Myles Hurwitz**
  - Shock vulnerability, hydrodynamics, concept design
- **Radio Frequency (RF) Antennas—John D'Angelo**
  - RF Antenna electromagnetics and integration with platforms
- **Mesh and Geometry (MG) Generation—Saikat Dey**
  - Rapid generation of mesh and geometry representations needed by analysis
- **Computers and Portal for Access—David Morton**
- **Discussion and Questions**

# See the CREATE Papers

## Wednesday

- **Track 1 8:00 – 13280 Capstone—Meshing and Geometry**
- **Track 5 8:00 – 13210 Analysis of Severe Dynamic Loading (US Only)**
- **Track 3 8:55 – 13457 Portal for easy access**
- **Track 1 13:30 – 13502 Prediction of Submarine Maneuvers**
- **Track 1 14:25 -- 13503 Surface Ship Performance**
- **Track 2 13:30 – 13274 DaVinci, Conceptual Air Craft Design**
- **Track 2 14:25 -- 13273 Kestrel, Fixed Wing Design and Analysis**
- **Track 2 15:30 -- 13271 Firebolt, Gas Turbine Module**
- **Track 2 16:25 -- 13272 Helios, Rotor Craft Design and Analysis**
- **Track 4 15:30 – 13444 Integrated Hydrodynamic Design Environment**
- **Track 4 16:25 – 13234 Physics-Based Models for Ship Design**

## Thursday

- **Track 9 10:15 – 13518 RF Antenna Modeling**
- **Track 10 8:55 – 13623 Conceptual Ship Design**