



# Aircraft Design and Analysis Education – Academic Deployment of HPCMP CREATE™ Genesis Software Package

# Introductions and Opportunity Description

1. **Create-AV Background**
2. **Motivation for Education Outreach**
3. **Ongoing efforts to distribute Create-Genesis**
4. **Examples**

# U.S. DoD HPCMP CREATE Program

## The CREATE Mandate

Change the paradigm in which the USG acquires military systems through the use of current and next generation HPC systems and multi-disciplinary, physics-based simulation software.

## CREATE Organization Construct and Products

### CREATE-SH (Ships)

- RSDE (Rapid Ship Design Environment)
- NESM (Navy Enhanced Sierra Mechanics)
- NAVYFOAM (Ship hydrodynamics)
- IHDE (Integrated Hydro Design Environment)

### CREATE-AV (Air Vehicles)

- Helios (High-fidelity, full-vehicle, multi-physics analysis tool for rotary-wing aircraft)
- Kestrel (High-fidelity, full-vehicle, multi-physics analysis tool for fixed-wing aircraft)
- Genesis-DESIGN (Rapid aircraft design)
- Genesis-CFD (Reduced capability Kestrel)

### CREATE-RF (Radio Frequency Antenna)

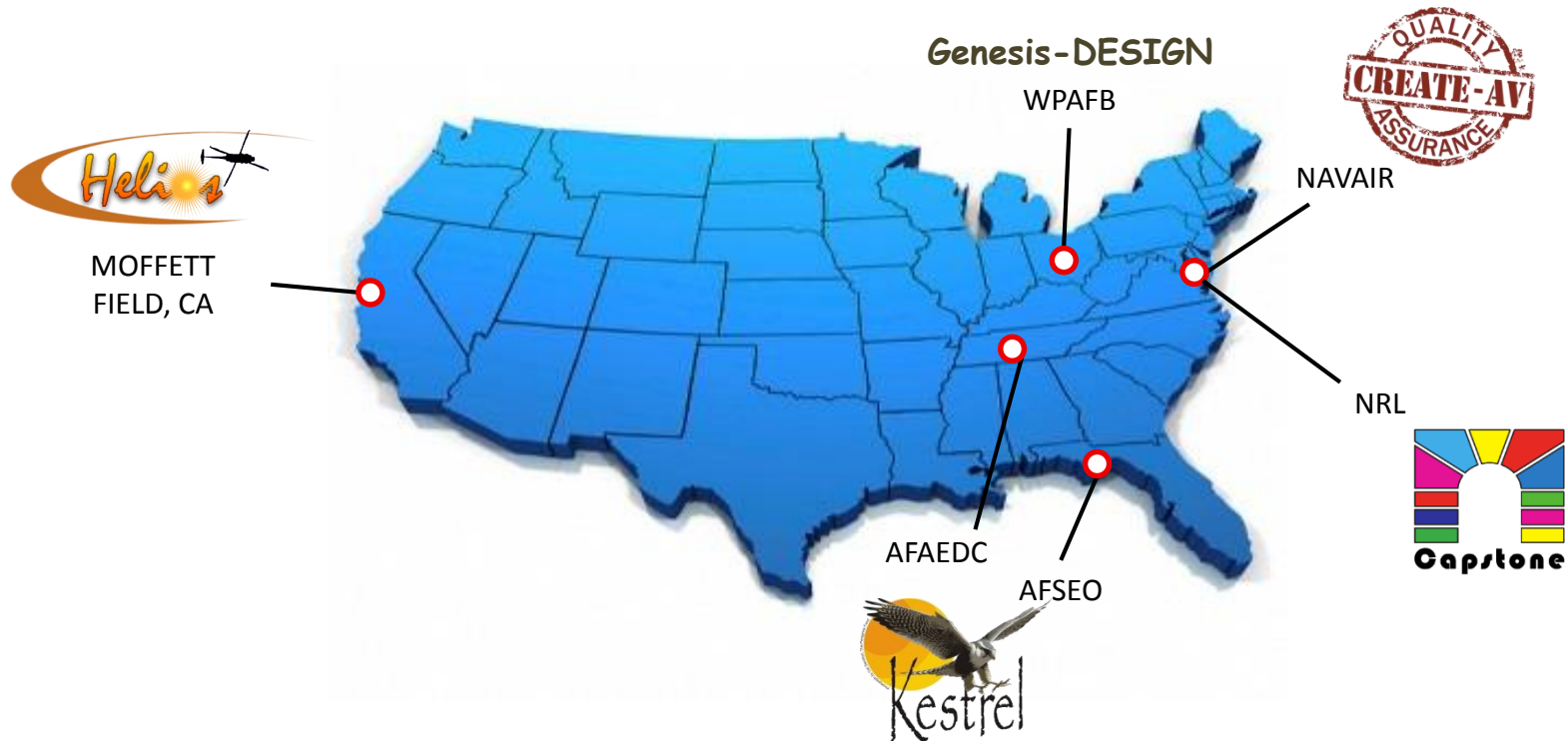
- SENTRI (Electromagnetics antenna design integrated with platforms)

### CREATE-MG (Meshing and Geometry)

- Capstone (Components for generating geometries and meshes needed for analysis)

### CREATE-GV (Ground Vehicles – recently established)

*CREATE-AV Development Groups are co-located within a subset of our Stakeholder organizations. The Capstone (CREATE-MG) development group is also indicated on this chart.*

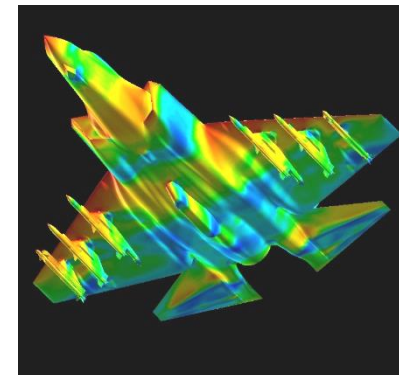
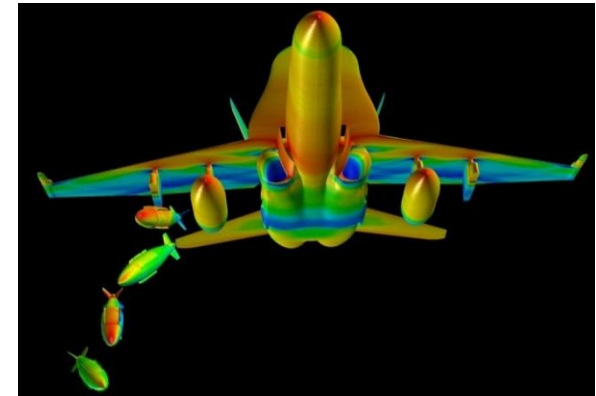
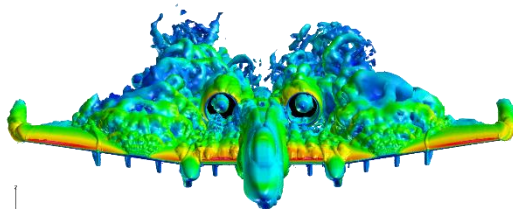
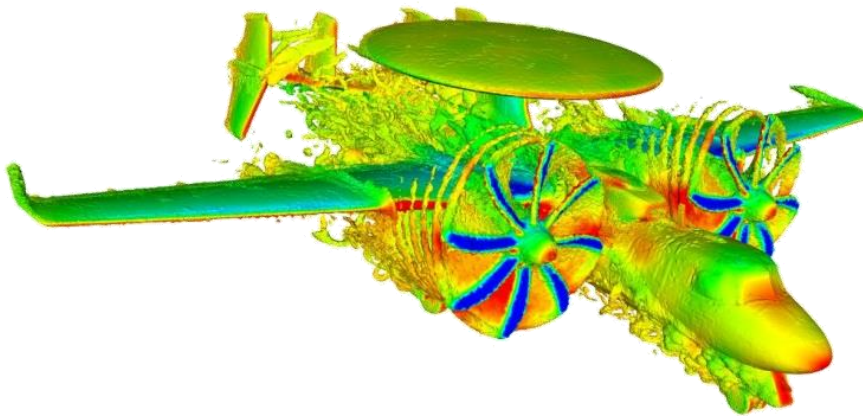


# Products



A multi-disciplinary, physics-based software product developed to enable full aircraft design analysis and testing via high-fidelity virtual tests.

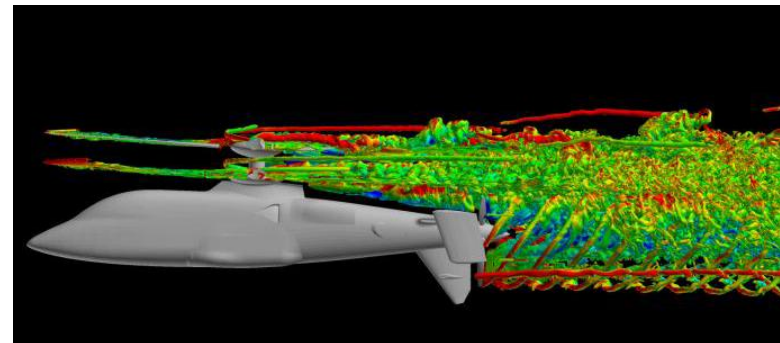
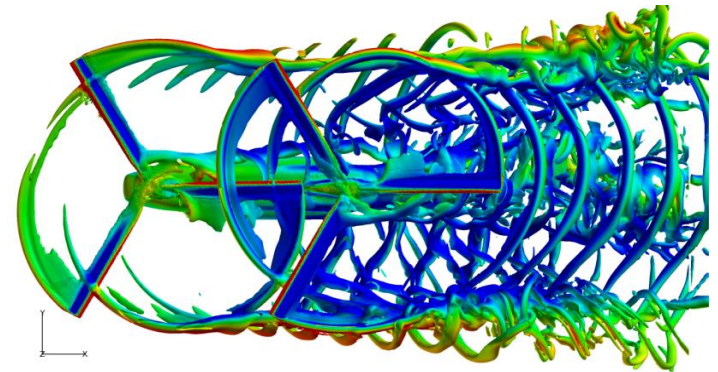
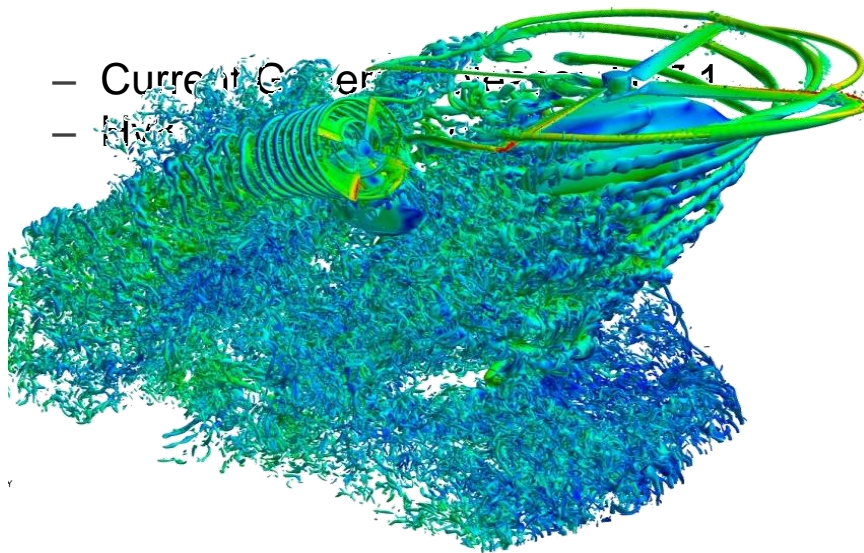
- Current General Release: Kv8.0





A multi-disciplinary, physics-based software product developed to enable rotorcraft design analysis and testing via high-fidelity virtual tests.

- Current Generation
- High

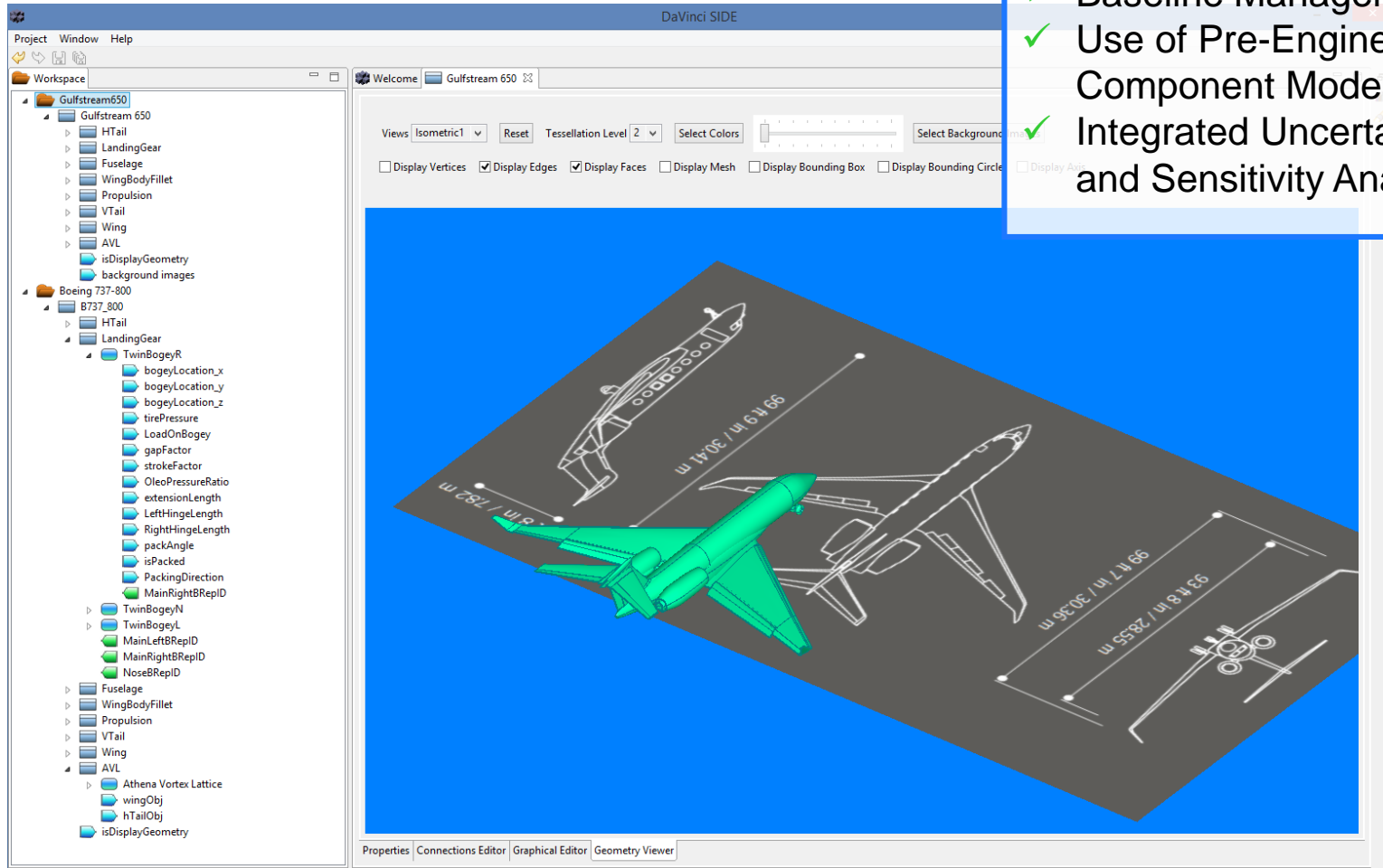




# Genesis-DESIGN

## An Aircraft Design Tool

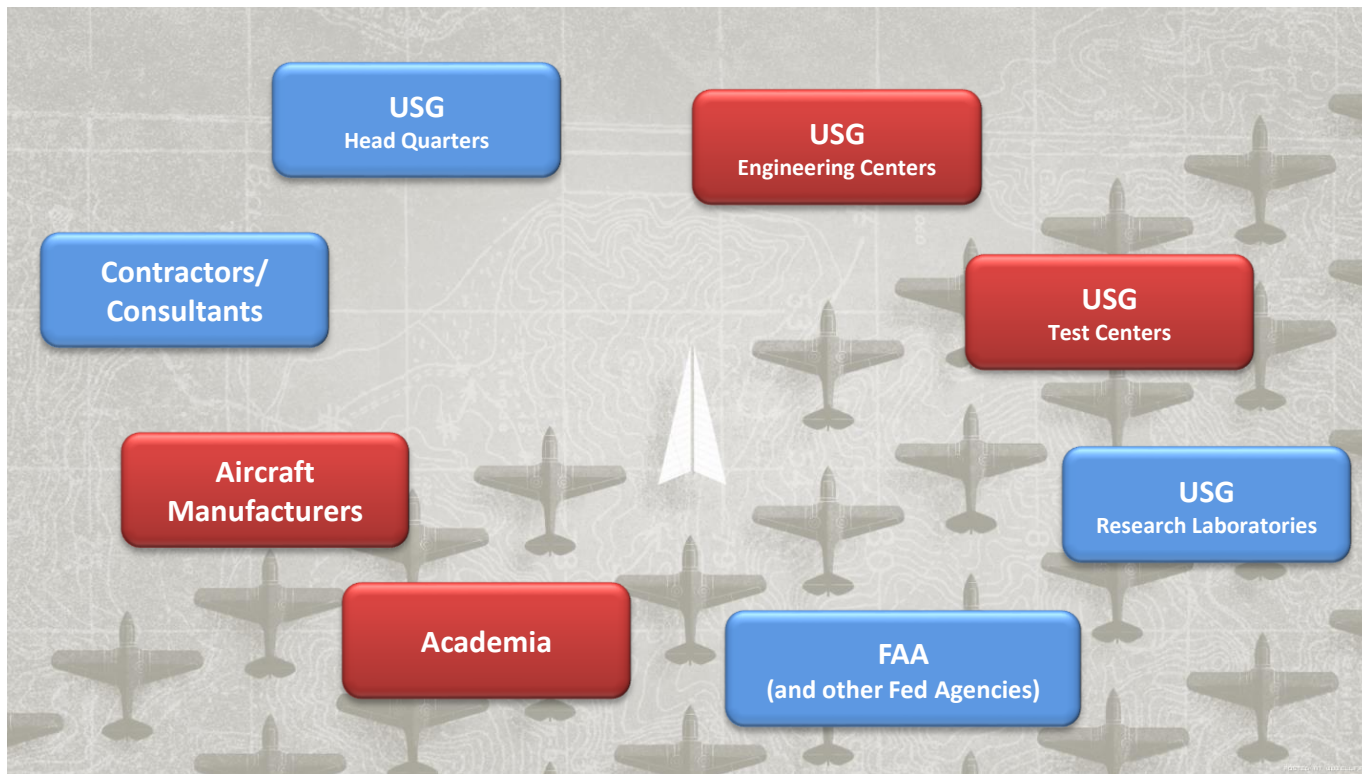
- ✓ Model Centric (including GEOMETRY)
- ✓ Unified System Model Approach
- ✓ Baseline Management
- ✓ Use of Pre-Engineered Component Models
- ✓ Integrated Uncertainty and Sensitivity Analysis



# Why are we deploying CREATE Genesis?

**We are trying to change a paradigm and academia plays a critical role.**

Realization of a paradigm change can only take place if the requisite enabling technology exists and is adopted by the participants.



 Adoption by these participants define tipping point of the paradigm.



# Current Holders of CREATE-AV Licenses\*

## Distribution

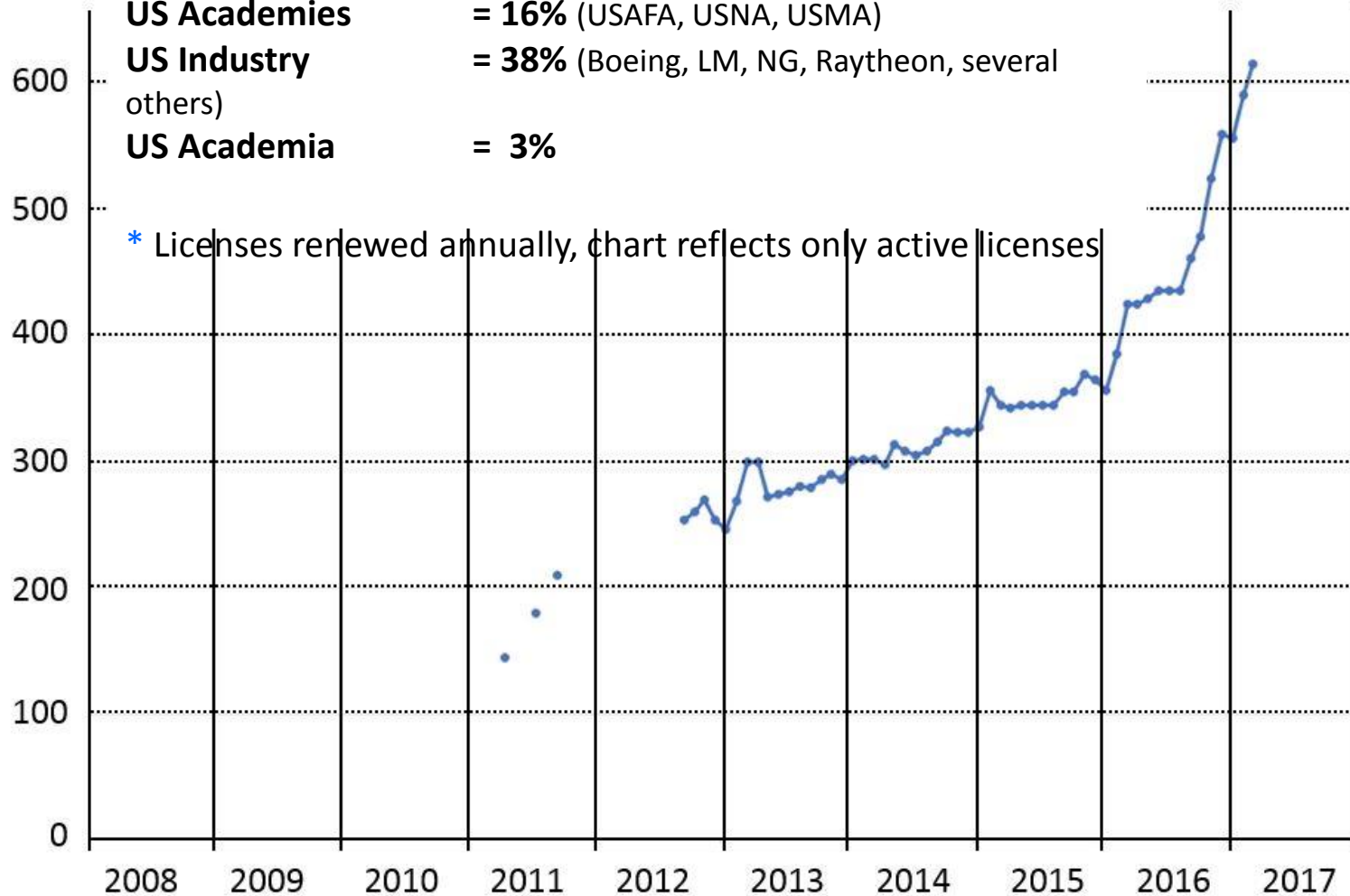
**US DoD** = **36%** (Defense Labs and Engineering Centers)

**USG (non-DoD)** = **7%** (NASA, DOE)

**US Academies** = **16%** (USAFA, USNA, USMA)

**US Industry** = **38%** (Boeing, LM, NG, Raytheon, several others)

**US Academia** = **3%**



# History of Education Outreach

## 1. **BAA Contract (2015): CREATE-AV Assessment for Academic Use**

We are grateful for recommendations provided by Marilyn Smith, Mary Baren, and others at GaTech, in response to the CY2015 BAA Contract to look at four academic Use Cases of CREATE-AV software.

1) [Undergraduate and Graduate Education](#)

2) Undergraduate and Graduate Research (Applied Aeronautics)

3) Graduate Research (Algorithm Development)

4) Professional Certification

## 2. **Motivation for CREATE Genesis**

CREATE “Genesis” is motivated in part by recommendations from GaTech regarding Use Case-1 (Undergraduate and Graduate Education).

## 3. **GaTech Contract (2017)**

Georgia Tech serving as first group to use Genesis, contract is being finalized, details to follow.

## 4. **Expand Academic Use (2017+)**

Will visit other Academic Institutions with same pitch made to GaTech

# What is CREATE Genesis?

## Genesis is a set of software products developed as part of the HPCMP CREATE Program...

- That provide foundational technology necessary for virtual testing of arbitrary physical systems by numerical process.
- For which access is governed by license agreement, but not subject to export control laws.
- That specifically includes the following products
  - Capstone: a powerful, full featured, mesh generation tool and associated Software Development Kit (SDK).  
Available as **object code** only.
  - Genesis-CFD: a powerful CFD code that enables full aircraft coupled aero-structure interactional analysis. It is a subset of the full-featured Kestrel product.  
Available as **object code** only.
  - Genesis-DESIGN: a model-centric aircraft design tool formerly known as “DaVinci”.  
Available as **source code** and collaborations are welcome.

## CREATE-AV Provides

1. Access to CREATE Genesis, Users Guides, Tutorials, annual updates, timely response to feedback, and training of a Grad Student of University's choice in product use.
2. Funding for 1 Grad Student for 2 years to help University...
  - Year-1: Adapt course material to take advantage of Genesis tools to enhance teaching/learning, develop requisite teaching materials, and interface with CREATE developers to resolve issues that may come up.
  - Year-2: Support University in execution of the course(s) using the Genesis product(s).

## University/Faculty

1. Integrates Genesis products into the course and uses them beginning in year-2 and going forward (well beyond the period of funding).
2. Provides feedback to CREATE-AV QA Group (POC will be provided) on Genesis products. The purpose is to allow us to improve the products and also listen for other capabilities that we may be able to develop and deploy for educational purposes.
3. Return a signed license agreement at the commencement of each academic period (quarter/semester) for classes that use Genesis as part of the class. License will be a use agreement that includes course name and description, Professor/Instructor name, and number of students enrolled.