



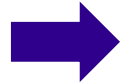
# ***Aerospace Viewer of NASA Project Staffing Data (aView)***

***A Practical Tool for Analyzing Staffing  
Levels and Cost Across Missions***

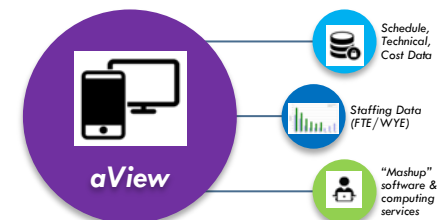
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The Aerospace Corporation***

***April 27, 2022***

# Overview



- Introduction
  - *Purpose*
  - *Timeline*
  - *Data Sources*
- Capabilities and Plot Types
  - *Charting Capabilities*
  - *Mission Fact Sheets*
- Tool Construction and Future Vision
- Summary



# Introduction

## Purpose

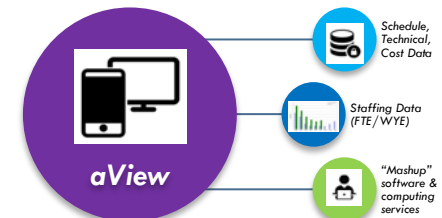
- **aView**, the Aerospace Viewer of NASA historical FTE/WYE data
  - Aerospace built a browser-based tool to archive NASA historical staffing profiles for 27 planetary science missions
  - Supports analysis of mission programmatic data from PDR through decommissioning (Phases C, D, E)
  - Provides comparative analysis across NASA science missions and helps with predictions
  - Illustrates how well projects keep to their original staffing plan and identifies departures from plan
  - Serves as a repository and quick reference for missions' technical parameters and related information

Table 1, NASA SMD missions available in aView

<b>Current Set of Missions</b>		Cassini	Dawn
Deep Impact	Europa Clipper	Genesis	GRAIL
InSight	Juno	Kepler	LADEE
LCROSS	LRO	MESSENGER	MAVEN
MER	MRO	MSL	New Horizons
NuSTAR	OCO	OSIRIS-REx	Phoenix
Spitzer	Stardust	STEREO	WISE

- Sponsored since 2009 by NASA Planetary Missions Program Office (PMPO)

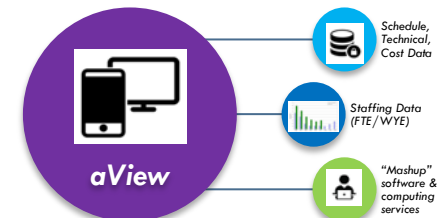
**aView is browser-based and will be available on ONCE**



# Introduction

## Timeline

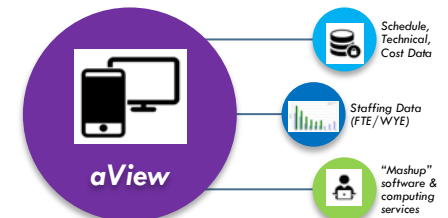
- **2009** – Predecessor to aView, FTE Tool, released
  - *Built on MS Excel with embedded macros*
  - *Grew to contain historical staffing data for 24 planetary science missions*
  - *Presented at the NASA Cost and Schedule Symposium 2014*
- **2019** – aView prototypes created
  - *Based on open-source JavaScript for its front-end and SQLite back-end for the database, prototype versions (alpha/beta) were created for NASA PMPO*
- **2020** – aView 2020 replaces FTE Tool
  - *Based on open-source JavaScript for its front-end and SQLite back-end for the database*
- **2022** – aView 2022 to be accessible via ONCE
  - *Release planned via the Model Portal on ONCE website*
  - *Adding missions Dragonfly, Lucy, NEOSM, and Psyche*
  - *Updates to Insight, Juno, Maven, and OSIRIS-REx*



# Introduction

## Data Sources

- aView is a database of validated staffing and mission data
  - *Aerospace serves as the custodian of the formal data used*
  - *Primarily sources include:*
    - Formally approved reports at major mission milestones from the NASA Cost Analysis Data Requirement (CADRe)
    - Monthly Status Reports (MSRs)
    - Project websites
    - Customer direct requests



# aView Control Panel

## Charting Capabilities and Fact Sheets



The screenshot shows a web browser window with the URL https://aview.aero.org. The browser's address bar and tabs are visible at the top. The main content area has a dark blue navigation bar with three tabs: "Phase C/D Plot", "Phase E Plot", and "Fact Sheets". Below the navigation bar, there are several control panels. The first panel, "Mission Comparison", has a dropdown menu set to "Select" and a "Generate Plot" button. The second panel, "Planned vs Actual FTE on Annual Basis", has a dropdown menu set to "Select" and a "Plot" button. The third panel, "Dollars vs FTE per Fiscal Year", also has a dropdown menu set to "Select" and a "Plot" button. Below these is a dark blue header for "Cost vs FTE", followed by a "Phase C" section with a dropdown menu set to "Select" and a "Generate Plot" button. The main content area to the right of the navigation bar features a "Select Inflation Year" dropdown menu, the text "aView v2021", and a user profile picture. The central part of the dashboard displays the aView logo (a purple circle with "aView" text) and three smaller colored circles (blue, dark blue, and green) connected by lines. Below the logo, there is a paragraph of text: "aView is a browser-based charting tool for NASA historical programmatic data, FTE and cost. This version is based on mission data from FTE Tool v2018.11 and updates as of April 2021. aView v2021.20.127 was built 3 months ago." Below this text are the names and email address of B. Wright, NASA Marshall, and the names of other contributors: J. McNeill, C. Zhang, T. Tran, A. Zarate, B. Wood, and J. Rice. At the bottom right, there is a "Release Notes" link and the NASA and aView logos.

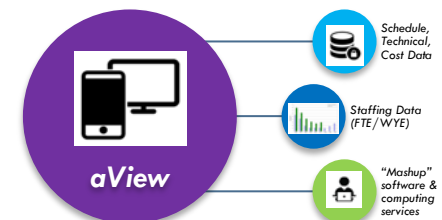
Figure A, "Front page" of aView via web browser



# Charting Capabilities

## Chart Types

- A variety of chart types are available in aView and enable the user to examine programmatic data in different dimensions and ways. Currently, there are four chart types:
  - *FTE Comparison Plots for defined Periods*
  - *Planned and Actual FTE by Mission*
  - *Annual Cost and FTE by Mission*
  - *FTE vs. Cost*
- Each plot can be generated from mission data for Phases C and D or operations Phase E. The user can select the year for inflation to apply to the data



# Capabilities – Plot Types

## FTE Comparisons Plot for Defined Periods

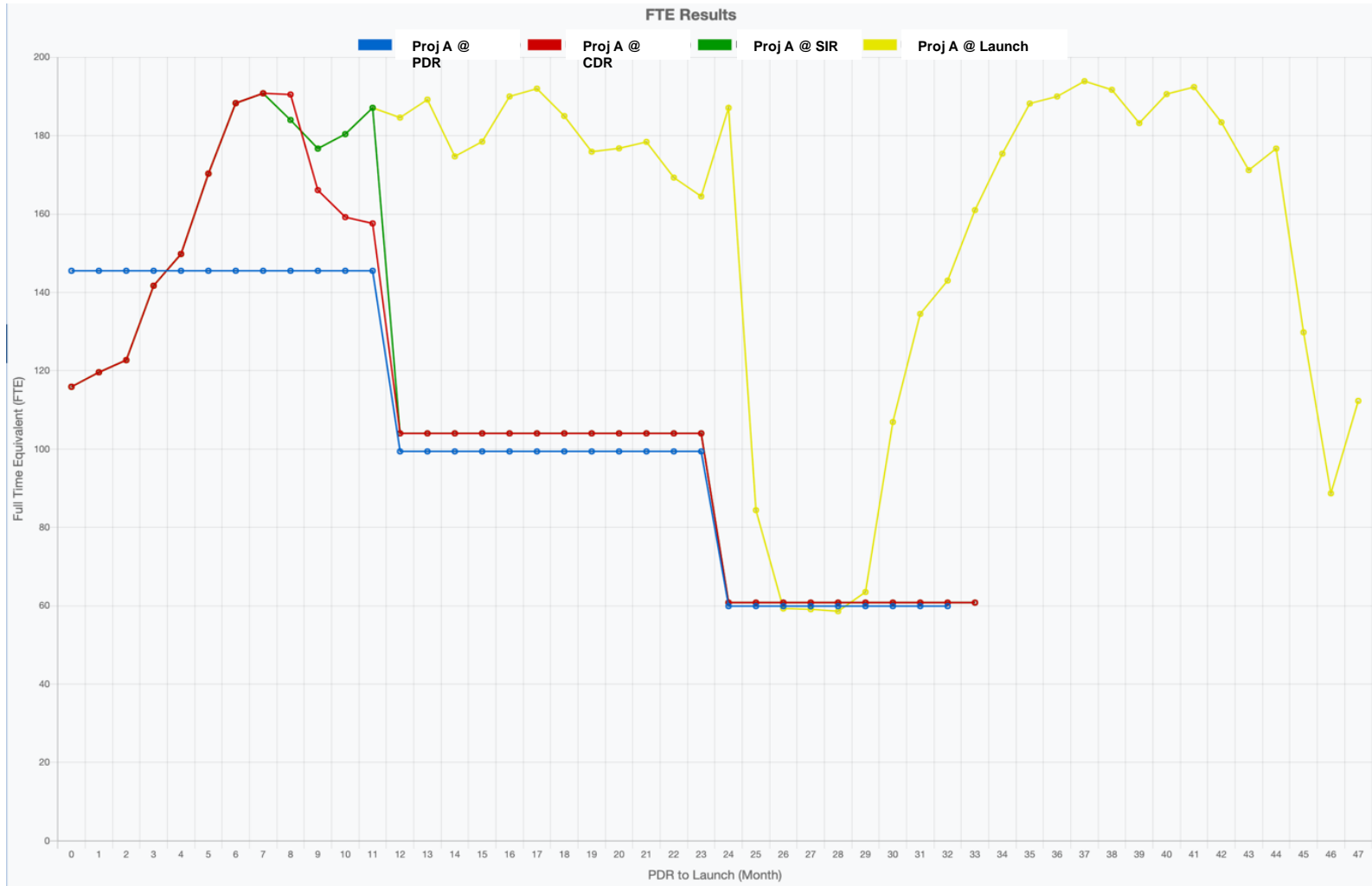


Figure B, Sample of comparative analysis by milestone



# Capabilities – Plot Types

## Planned and Actual FTE by Mission

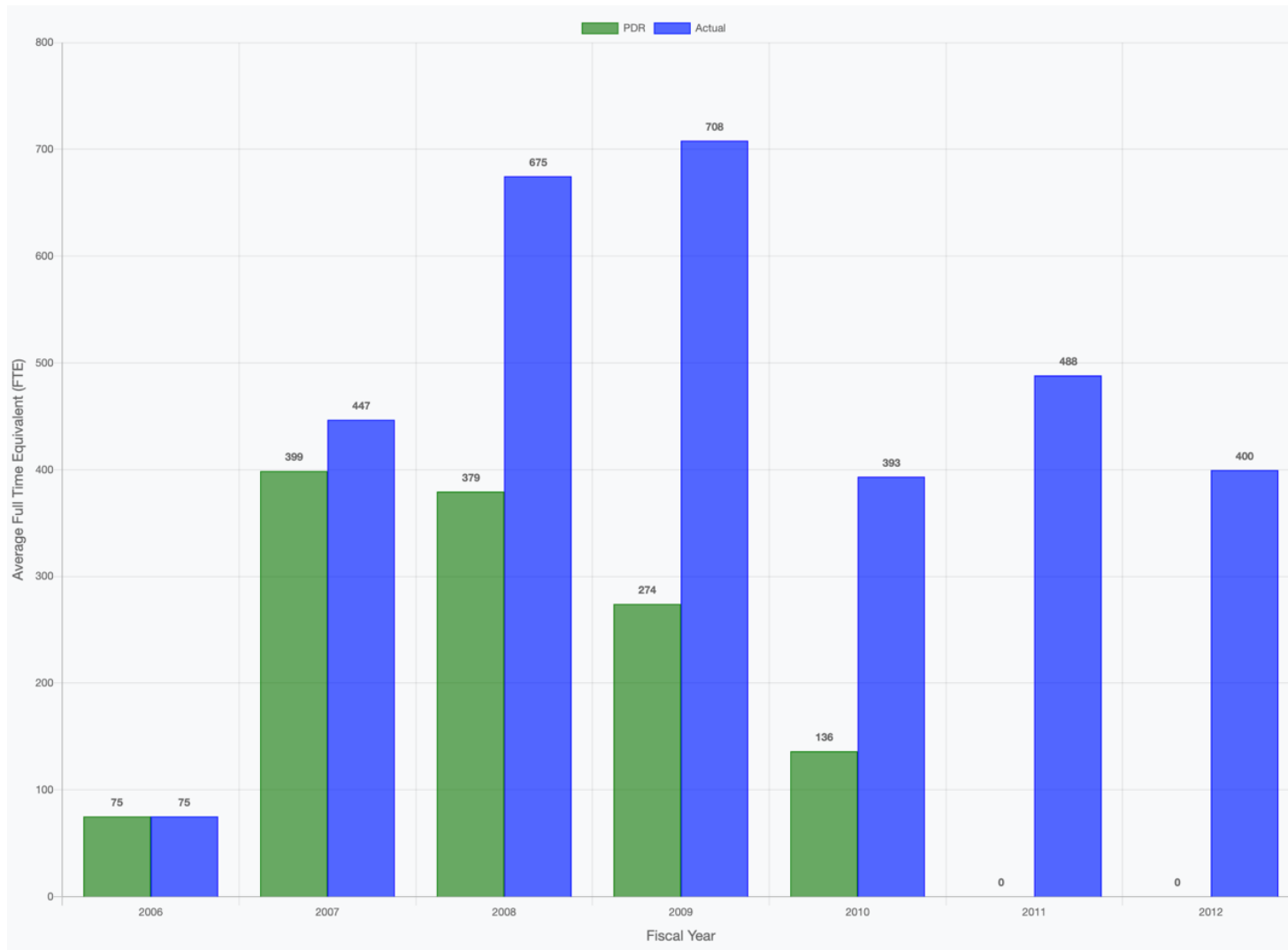


Figure C, Planned at PDR and actuals at end of Phase D

# Capabilities – Plot Types

## Annual Cost and FTE by Mission

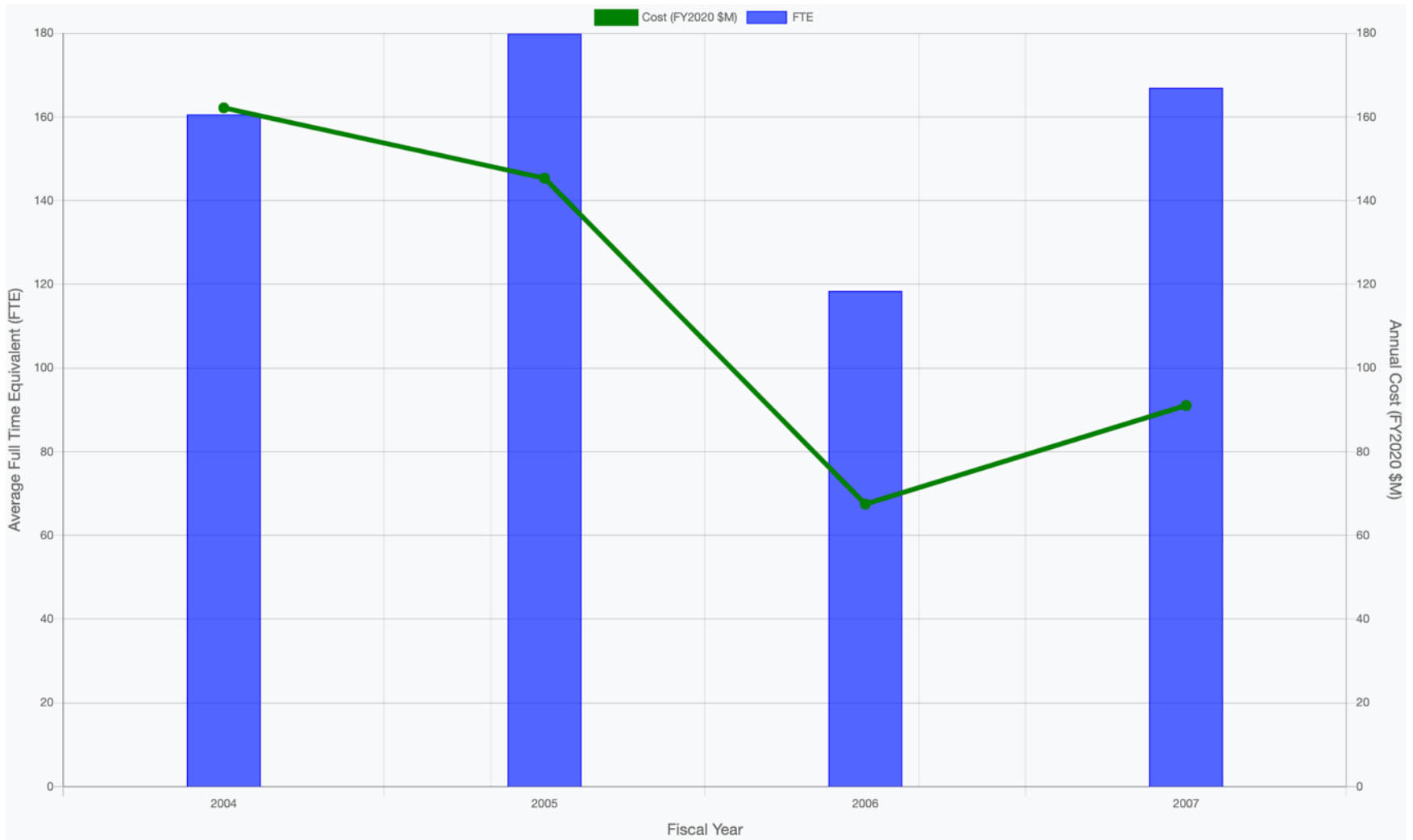
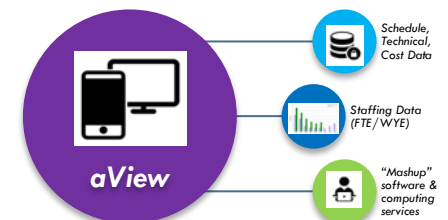


Figure D, FTE and cost actuals by year

# Capabilities

## Mission Fact Sheets

- Provide a capsule summary of the mission and project, providing some or all of these items
  - *Overview of the science objectives*
  - *Hosted payloads – instruments, sensors*
  - *Mission plan and characteristics*
  - *Project development milestone dates*
  - *Technical performance metrics*
  - *Basic concept-of-operation*
  - *Diagrams depicting the physical layout of components*
- NASA CADRe is the primary source for information given in these fact sheets
- As missions progress, fact sheets are updated with new, pertinent information



# Capabilities

## Mission Fact Sheets



aView
x +

https://aview.aero.org

Access Launchpad   AERO-ORG - NetIQ...   aView

Phase C/D Plot
Phase E Plot
Fact Sheets

Dawn

Deep Impact

Europa Clipper

Genesis

GRAIL

InSight

Juno

Kepler

LADEE

LRO

Lucy

MAVEN

MER

☰

### Juno

**Technical Data**

Program	New Frontiers
Lead Center	JPL
Bus Manufacturer	LM
Mission Class	B
Launch Vehicle	Atlas V 551

Development Time (months) 69

Design Life (months) 75

Destination Jupiter

Max Distance from Sun (AU) 5.2

Satellite Wet Mass (kg) 3,551

Propellant Mass (kg) 1,992

Satellite Dry Mass (kg) 1,559

Spacecraft Bus Dry Mass (kg) 1,388

Payload Mass (kg) 171

Number of Instruments 8

BOL Power (W) 121

Solar Array Mounting Type Deployable

Solar Array Area (m<sup>2</sup>) 60.3

Pointing Control (deg) 0.17

Pointing Knowledge (deg) 0.25

Stabilization Type Spin

Star Tracker? Yes

Mono or Bi-Prop or Ion Dual-Mode

Transmit Power (W) 25

Downlink Datarate (kbps) 18

Communications Band X-band

**Schedule Data**

ATP Start	Nov-05
PDR	May-08
CDR	Apr-09
Start Assembly (SIR)	Mar-10
Start Env. Test (ERR or TRR)	Sep-10
Delivery (PSR)	Mar-11
Launch	Aug-11
End of Primary Mission	Nov-16
End of Mission	Jul-21

**Instruments**

JADE = Jovian Auroral Distributions Experiment

GRAV = Gravity Science

FGM = Fluxgate Magnetometer

ACS = Advanced Stellar Compass

JEDI = Jupiter Energetic-Particle Detector Instrument

UVS = Ultraviolet Spectrograph

JunoCam

JIRAM = Jovian Infrared Auroral Mapper

MWR = Microwaves Radiometer

Waves

aView v2021

Tilted Ecliptic Pole View, Vernal Equinox Up, Launch at Start of 8/6-26 Launch Period, 30-day Tick Marks

Earth-Jupiter trajectory

**Project Overview**

**Salient Features**

- Category: class 2 category 1, Bold Class: class 2 class 8 mission
- First solar powered mission to the outer planets, high instrument to science payload, rigorous and stringent investigation plus education and public outreach content
- Public release scheduled by August 2011, launch window in August centered on Aug 2011
- Also has completed 21 of 42 science orbits
- Flight operations through Sep 2016, scheduled science mission ends Feb 22
- Planned to fly over Europa and Galileo orbits for science operations support
- Primary: Southwest Research Institute (SWRI), Air Probes/Juno/JEDI, Lockheed Martin (L3Harris), Lockheed Space Program Center (LSPC), Lockheed University of Colorado (UTC), University of New Orleans (UNO), Applied Physics Laboratory (APL), Johns Hopkins University (JHU), Johns Hopkins Applied Physics Laboratory (JHU/APL), Johns Hopkins University (JHU)
- Principal Investigators: Bob Balwin, Bill
- Project Manager: Edward Stone, JPL
- Supporting: Bill Stone, SWRI, JPL, JHU, UTC, JHU/APL, L3Harris, L3Harris

**Science**

To improve our understanding of the origin of our solar system by understanding the formation and evolution of Jupiter, Saturn, Uranus, and Neptune

- Investigate the global circulation patterns in Jupiter's atmosphere
- Measure atmospheric circulation in Jupiter's deep atmosphere, temperature, cloud opacity, and chemistry
- Map Jupiter's magnetic and gravitational fields
- Characterize Jupiter's temperature profile, cloud structure, and composition

**Juno NASA's 2nd orbital mission to Jupiter**

Launch Date: September 8, 2011

Juno will investigate Jupiter's interior structure, deep atmosphere and magnetosphere, measure the abundance of oxygen on the planet, and monitor localized variations in concentrations of water and ammonia caused by meteorological factors. Juno will also investigate the convection that drives general circulation patterns in Jupiter's atmosphere.

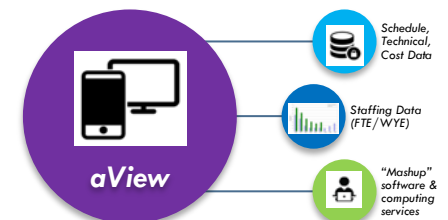
**Project Top Level Schedule**

Figure E, Fact sheet for the Juno mission

# Tool Construction and Future Vision



- aView is based on open-source JavaScript for its front-end and SQLite back-end for the database
- Development team
  - *Sarah Lang and Justin McNeill, Task Leads*
  - *Tommy Tran, Software Technical Lead*
  - *Alexander Zarate Garcia*
  - *J. Drew Rice*
  - *Brian Wood*
  - *C. Jason Zhang*
- Access aView via Model Portal on ONCE website by end of FY22
- Wish to expand the aView to include a broader set of missions in Earth Science, Astrophysics, and Heliophysics
  - *Actively pursuing additional funding*



# Summary

- aView developed to assist users in conducting comparative analysis
- Built on a detailed repository of mission programmatic data, it provides high-level views of the historical data for 27 NASA missions for development Phases C and D as well as the operations Phase E
- Given wealth of mission and project information, both programmatic and technical, cost analysts can leverage the aView's capabilities to answer a variety of questions
  - *Understand what development costs and staffing during Phases C and D for a proposed interplanetary mission based on similar historical missions*
  - *Understand how a proposed operations budget for Phase E compares to previous missions managed by the same Center*
  - *Understand how staffing levels track to development costs between PDR and ARR for a particular project*
- Expect a marked increase in access to aView via NASA ONCE

