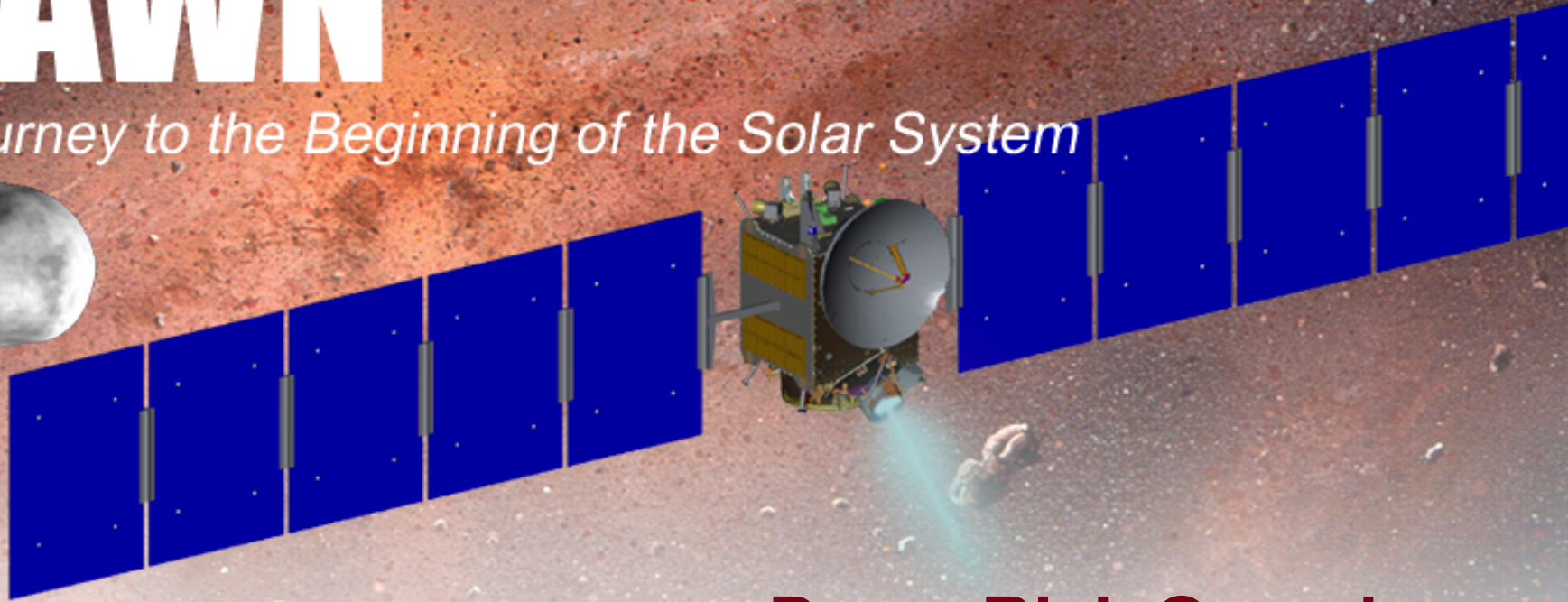
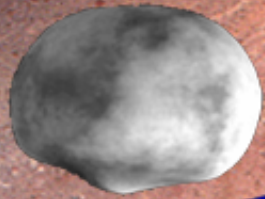


DAWN

A Journey to the Beginning of the Solar System



Dawn Risk Overview

Tom Frascchetti



UCLA

JPL

Orbital



MPS

agenzia spaziale
italiana

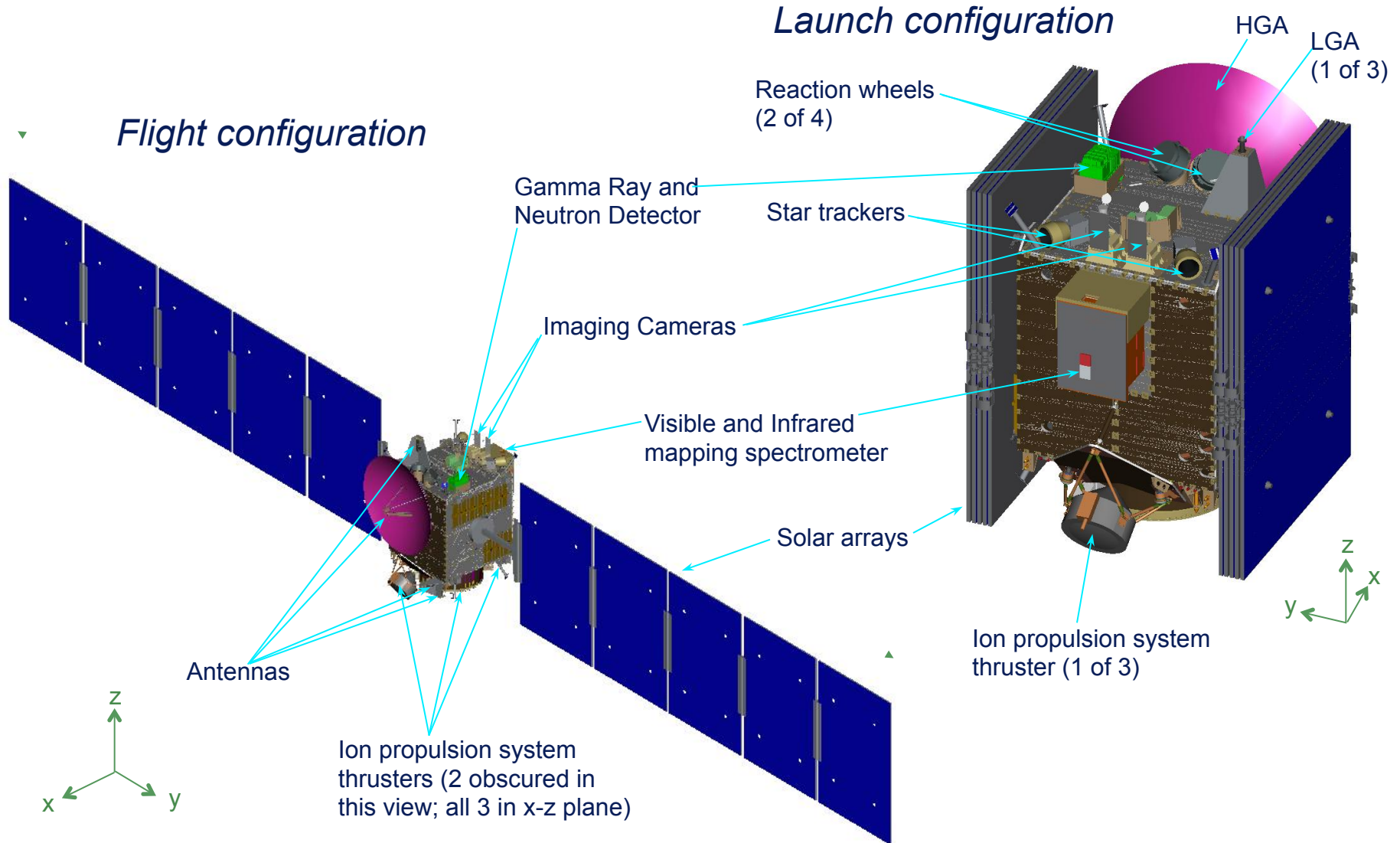


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Project Highlights

- Dawn is the 9th project in NASA's Discovery Program
- The Dawn PI is Professor Chris Russell from UCLA
- The day to day management of Dawn is performed by JPL with Orbital Sciences Corporation as the system contractor
- Objective is to examine the geophysical properties of the two most massive bodies in the main asteroid belt, Vesta and Ceres, to yield insights into important questions about the evolution of the solar system
- Dawn is enabled by Ion Propulsion

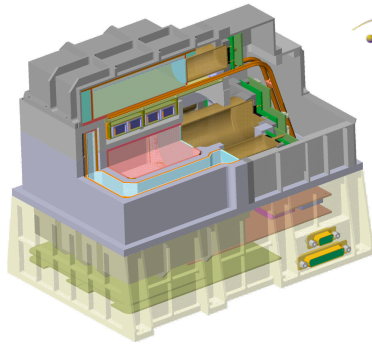
Spacecraft Configuration



Scientific Payload

Gamma-ray and neutron spectrometer

Mapping of elemental abundances

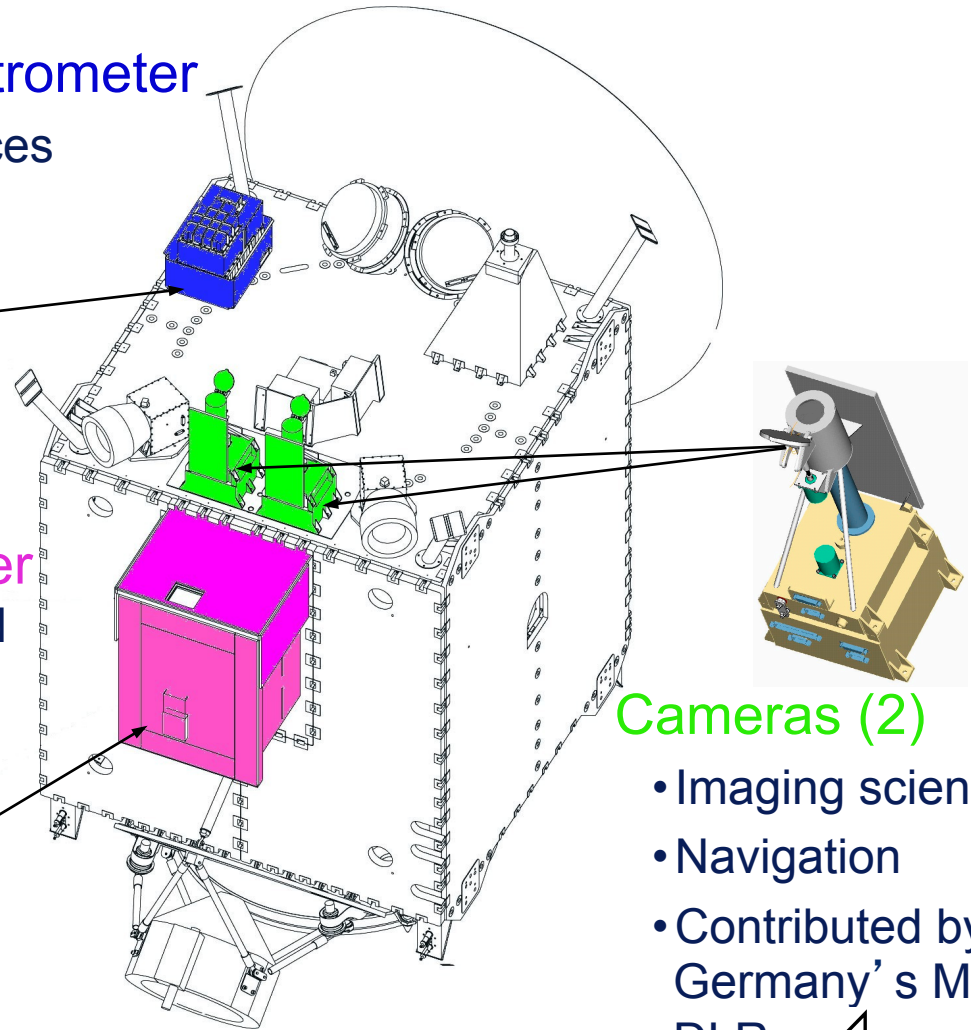
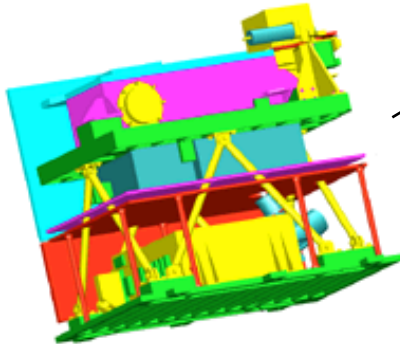


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Visible/IR mapping spectrometer

- High resolution mineralogical and temperature mapping
- Contributed by Italy's ASI

ASI
agenzia spaziale
italiana



Cameras (2)

- Imaging science
- Navigation
- Contributed by Germany's MPS & DLR

DLR MPS

Risk Types

- Development Risks
 - Risks that keep you from meeting cost and schedule
 - Technical
 - Poor management at the subsystem and assembly levels (do not underestimate the impact of this)
 - Project decisions for development risk can and will cause mission risks
- Mission Risks
 - Risks that keep you from meeting your Level 1 science requirements
 - Significant mission risks must have mitigation plans
- Dawn tracked both types of risk on its risk list

Dawn Development Risk (1/5)

- Technical risk #1:
 - Solar array power will not be sufficient for the ion propulsion system to allow orbit of both Vesta and Ceres (this was also a mission risk)
 - During the Dawn proposal work, inadequate margin had been applied to the power, and as a result, it became apparent during development that with the predicted flight system mass and mission timeline, the power margin was insufficient.
 - Dawn's biggest risk at PDR/confirmation
 - Mitigation
 - Identify an option to add additional panels
 - Look at trades between mass, power and mission time line that will allow present power level to work.

Dawn Development Risk (2/5)

– Solution

- The mass for adding additional panels was excessive. US manufacturers did not have a low mass solution.
- Mission trades did not yield an acceptable solution.
- Orbital found a European supplier with a low mass system that cost less than a lower power array from the US

Dawn Development Risk (3/5)

- Technical risk #2:
 - The European instrument providers would not be funded by their respective space agencies
 - Germany is typically rock solid. Italy is typically always an issue (except for Dawn).
 - Mitigation
 - Obtain signed agreements early
 - Look for alternative suppliers

Dawn Development Risk (4/5)

– Solution

- The German space agency decided not to fund the imagers
- The cost for alternate suppliers was more than I could absorb with reserves
- The German Imager PI proposed an interesting solution
.....that worked

Dawn Development Risk (5/5)

- Poor Management:
 - Ion propulsion system (Thrusters & Power Processing Unit)
 - Dawn Funded the supplier one year early as a development risk mitigation
 - Very late delivery of the system cost Dawn between \$10 and \$15M in reserves and over a year in delivery
 - Flight System Harness
 - Very late delivery of the harness cost Dawn between \$8 and \$10M in reserves and ~6 months in delivery
 - Xenon tank interface to S/C structure
 - Poorly defined interfaces cost the project \$2 to \$4M in reserves with minimal impact on schedule
 - The top two issues caused Dawn to miss its launch date