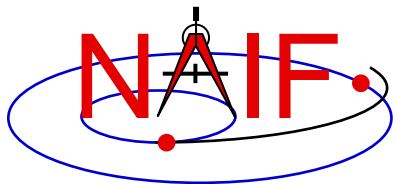


# NAIF Node Report

Addresses both NAIF Node and SPICE Development

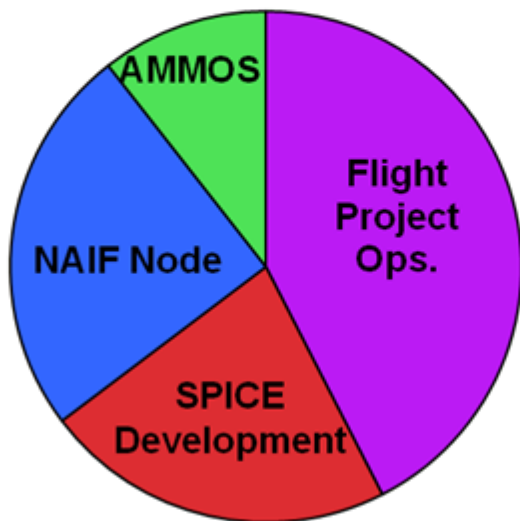
PDSMC  
March 27, 2012



# NAIF Funding Sources for FY12

Navigation and Ancillary Information Facility

NAIF FY12 Funding



## Percent of Total Available Funds

■ Flight Projects 42%

■ NAIF Node 25%

■ SPICE development 22%

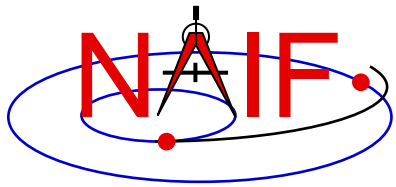
■ AMMOS\* 11%

### The PDS funds:

SPICE Development

NAIF Node

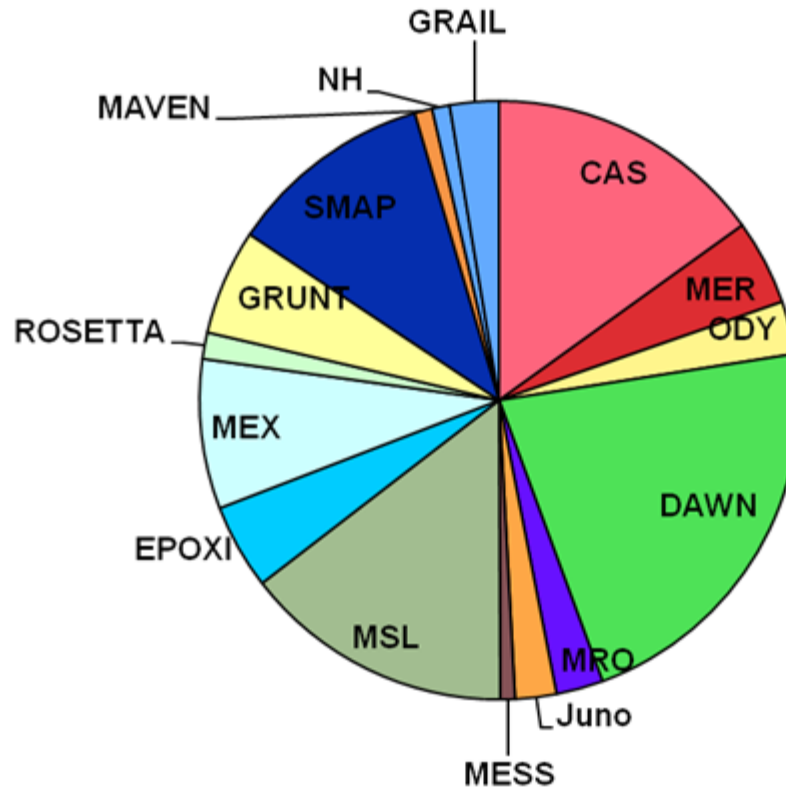
\*Advanced Multi-Mission Operations System

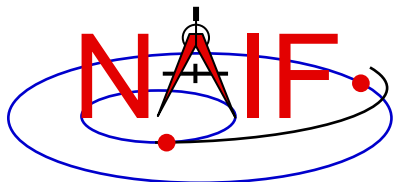


# NAIF Flight Project Funding

Navigation and Ancillary Information Facility

## FY12 Flight Project Contributions





# Archive Status - 1

Navigation and Ancillary Information Facility

Mars Odyssey  
Cassini  
MER Rovers  
MRO  
MESSENGER  
New Horizons  
Mars Express (ESA)  
Venus Express (ESA)  
Rosetta (ESA)  
LRO  
EPOXI  
DAWN  
MSL  
Juno  
GRAIL  
Phobos-Grunt (RSA)  
MAVEN  
OSIRIS-REx

Good shape

## LADEE

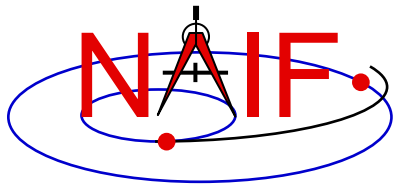
- LADEE says it will deliver a SPICE archive at the end of the mission.

## Magellan

- NAIF can finish this partial, pre-PDS archive; just need to find a bit more time.

## Galileo Phoenix LCROSS

- NAIF can/will finish Galileo at some point.
- NAIF can make a Phoenix archive.
- AMES did not complete its LADEE deliveries; NAIF can patch together enough to complete the job.

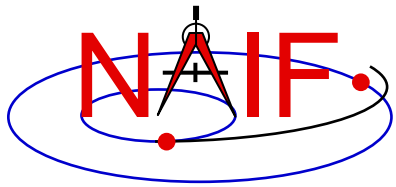


# Archive Status – 2

## Archive sizes and covered time spans

### Navigation and Ancillary Information Facility

<u>Mission</u>	<u>Size</u>	<u>Start</u>	<u>Stop</u>
Mars Reconnaissance Orbiter	94.7	8/12/05	1/1/12
Rosetta	0.3	3/2/04	12/31/11
MESSENGER	15.9	8/3/04	9/17/11
Lunar Reconnaissance Orbiter	71.7	6/18/09	9/14/11
MER (Opportunity)	2.5	7/7/03	8/29/11
Mars Odyssey	12	4/7/01	6/30/11
Stardust	1.9	2/7/99	5/1/11
Cassini Orbiter	39.8	11/6/96	3/31/11
EPOXI	1	8/23/05	3/1/11
Mars Express	1.3	6/2/03	9/30/10
Venus Express	0.4	11/9/05	9/30/10
MER (Spirit)	1.7	6/10/03	5/3/10
Deep Impact	0.7	1/12/05	1/15/09
New Horizons	1	1/19/06	9/7/07
Mars Global Surveyor	15.4	11/6/96	11/2/06
Hayabusa	0.3	9/11/05	11/19/05
Deep Space 1	0.9	10/24/98	12/31/03
Clementine	0.8	1/26/94	5/7/94
Viking Orbiter	0.1	6/1/76	9/1/80

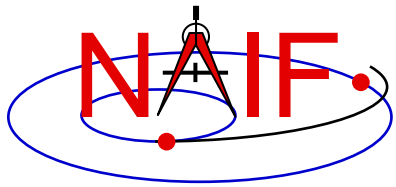


# NAIF Node Summary - 1

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Navigation and Ancillary Information Facility

- **SPICE data archiving is in pretty good shape**
  - Usually encounter problems with archives not produced at JPL
  - Occasionally we find a problem of our own
  - NAIF will shortly transfer the NEAR SPICE archive from SBN
- **Plan to do a major transformation of all archived SPICE data to PDS4 standards when PDS4 is stable and ready for ingest**
  - Will correct a few current issues at the same time
- **User consulting continues to be a big part of NAIF staff daily work**

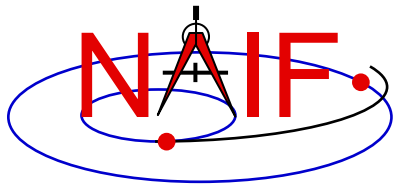


# NAIF Node Summary - 2

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Navigation and Ancillary Information Facility

- **Updates to the SPICE Tutorials were recently completed**
- **SPICE Training**
  - The next SPICE training class will be in April, near Madrid
    - » Around 81 students applied; ESA accepted only 42 due to space limitations
  - The next domestic class will probably be scheduled for later this year
  - Still need to break the curriculum into at least two chunks:
    - » beginner
    - » advanced



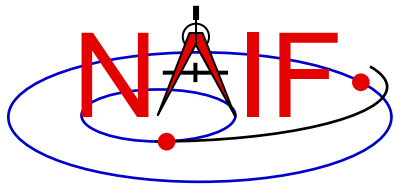
# SPICE Development Summary - 1

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Navigation and Ancillary Information Facility

- **Major recent focus is producing the N65 SPICE Toolkit**
  - Due out in April
  - Contents:
    - » New “geometry finder” functions
    - » New high-level observation geometry routines
    - » Important augmentations to some utility programs
    - » New SPK and CK data types (one of each) to handle eventual problems with some large archive collections
    - » Additional Icy (IDL) and Mice (MATLAB) routines
    - » Lots of smaller items
    - » Some bug fixes
- **After ~three months hiatus WebGeocalc development has been re-initiated**

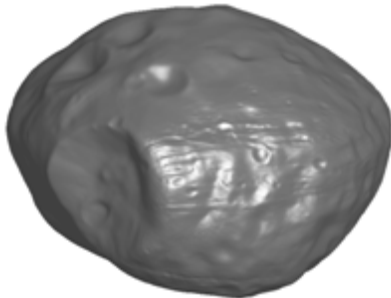




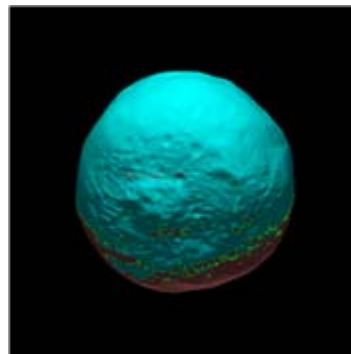
# SPICE Development Summary - 2

Navigation and Ancillary Information Facility

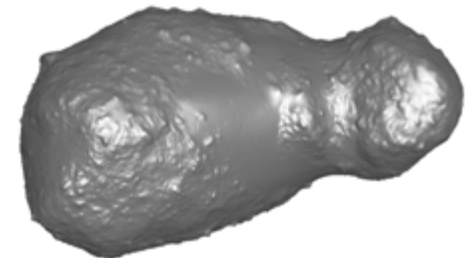
- **Other SPICE development work (on hold in recent months)**
  - **Java Native Interface (JNI) Toolkit**
    - » **Alpha-test version is already being used by several groups**
  - **New shape models**
    - » **Digital terrain model**
    - » **Tessellated plate model**
      - **Already in use on Hayabusa, DAWN, Rosetta, MEX and PhSRM**



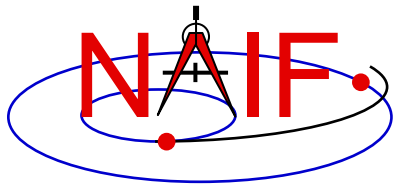
Phobos



Vesta



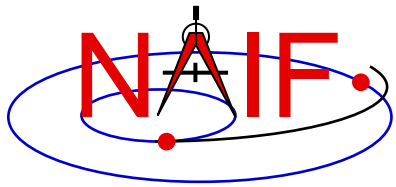
Itokawa



# SPICE Development Summary - 3

Navigation and Ancillary Information Facility

- **The Planetary Ephemeris Working Group of IAU Commission IV has proposed to adopt (and adapt) SPICE as its standard, especially to facilitate comparisons of the planet ephemerides produced by NASA (JPL), France (Observatoire de Paris) and Russian (Institute of Applied Astronomy).**
- **Details to accommodate this are still being worked out, but it now appears this can be done.**
  - Expect a full “Go or no go” vote quite soon
- **There is already some talk of eventually including satellite, comet and asteroid ephemerides.**

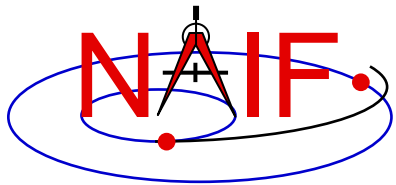


# AMMOS\* Summary

Navigation and Ancillary Information Facility

- **AMMOS funds two NAIF activities:**
  - **“Sustaining”**
    - » Funds used to port the Toolkit to new environments, and to accommodate infrastructure changes
  - **“Repair”**
    - » Funds used to zap bugs
  - **Much of these funds go unused**



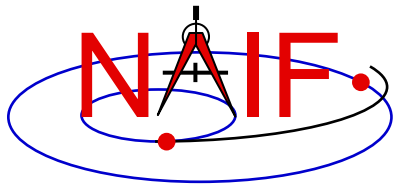


# Flight Projects Summary - 1

Navigation and Ancillary Information Facility

## NASA Flight Projects (not funded by PDS)

- **Ongoing SPICE operations for NASA flight projects are generally going well**
  - Odyssey, MER, MRO, Epoxi, Cassini, Dawn, LRO, Messenger, New Horizons, Juno, MSL, GRAIL
- **Upcoming NASA missions set to use SPICE are:**
  - MAVEN, SMAP (earth science) and OSIRIS-REx
- **LADEE will not use SPICE in ops, but claim they will produce/deliver a SPICE archive**
- **Archive production by missions is generally going well**

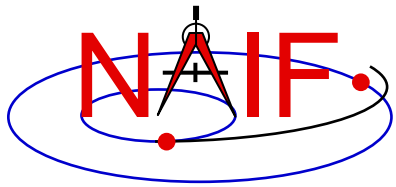


# Flight Projects Summary - 2

Navigation and Ancillary Information Facility

## International Flight Projects (A mixed bag of funding)

- **ESA**
  - MEX, VEX, Rosetta SPICE archives are trickling in
  - BepiColombo and Solar Orbiter seem very likely to use SPICE
  - ExoMars and others are TBD
- **ISRO**
  - Said they want more SPICE training, but no recent dialogue
- **RSA**
  - Cooperation on Phobos Sample Return was good
  - Support for Luna-Resurs (for both RSA and ISRO) will be proposed to NASA, if a SALMON or similar opportunity opens up
- **JAXA**
  - Unclear as to future SPICE use, but some use seems likely given past experience
- **“China”**



# Question for PDSMC ?

Navigation and Ancillary Information Facility

- **Should PDS (and IPDA) strive to have “all” instrument teams create at least a minimal, quasi-standard set of consistent observation geometry parameters\*, to be placed in product labels and extracted into registries?**
  - To be used in PDS4 data searches
  - To support data analysis when user’s don’t want/need to re-compute observation geometry parameters
  - Might be accomplished using something like the “geolib”\* approach used on MEX and VEX
  - One big challenge: some parameters have different meaning, or are simply not applicable, depending on the type of instrument or type of mission

\***geolib computes:** orbit number, solar distance, sub-solar point, s/c-sun distance, s/c-target distance, optic axis surface intercept point, slant distance, phase/incidence/emission angles, local true solar time, pixel scale (size) on surface.