

National Aeronautics and  
Space Administration  
**Headquarters**  
Washington, DC 20546-0001



Reply to Attn of: Science Mission Directorate/PSD

January 8, 2021 (revised)

## **NASA Response to the 2020 Planetary Mission Senior Review**

### **Background**

NASA's Planetary Science Division is currently operating more than a dozen spacecraft across the solar system. Upon completion of their Prime Mission (PM), each of these missions may undergo a Senior Review every three years in order to assess whether operations should continue during an Extended Mission (EM). These extended missions leverage NASA's large investment in order to perform continued science operations at a cost far lower than developing a new mission. In some cases, the extensions allow missions to continue to acquire valuable long-duration datasets, while in other cases, EMs allow missions to visit new targets, with entirely new science goals.

### **2020 Senior Review**

In the fall of 2020, NASA requested an external review of extended mission proposals submitted by the Juno and InSight mission teams. The proposals submitted were reviewed by independent panels of experts, with backgrounds in science, operations, and mission management. The panels reported to a Review Chair, who made recommendations to NASA.

### **Prime Mission Accomplishments**

The review panels found that both the Juno and InSight missions have produced exceptional science and achieved all or most of their original science goals.

The Juno spacecraft and its team have explored the internal structure of Jupiter and its diffuse core, have detected unexpected structure in Jupiter's magnetic field, and have found the planet's atmospheric dynamics to be far more complex than previously thought. The team has been scientifically productive across a broad range of scientific disciplines. The spacecraft remains healthy, with no major hardware or operational issues.

The InSight mission has operated the first seismometer deployed to the surface of an extraterrestrial body since the 1970s. It has searched for and identified Mars quakes, which are allowing the team to begin understanding Mars' crust and mantle, and it has clearly demonstrated that the planet is tectonically active. InSight's supporting payload instruments have provided long-term data on Mars' atmospheric dynamics, paleomagnetism, and interior structure. The InSight team has endeavored to deploy the spacecraft's Heat Probe and Physical Properties instrument (HP3, the 'mole'), but despite these efforts, the mole remains positioned near the surface where it is unable to achieve its science goals.

### **Extended Missions Overviews**

The review panels evaluated in detail both proposed extended missions and found the extensions to be of high scientific value. Based on the findings of the review panels, NASA plans to continue operations of both missions. Summaries of the approved extended missions' plans are as follows.

### **Juno Extended Mission**

#### **PI: Scott Bolton, Southwest Research Institute**

- Juno is approved for an extended mission from August 2021 until September 2025. NASA expects that the mission end-of-life will occur during this period.
- Juno will continue observations of the Jovian system as the spacecraft's periapsis processes northward and to lower altitudes. Juno will utilize additional propulsive maneuvers to perform close flybys of Ganymede, Europa, and Io.
- Juno will continue to explore major scientific questions related to Jupiter's interior, structure, and atmosphere, including the polar vortices, the magnetic 'Great Blue Spot,' water abundances, and the Jovian aurorae, focusing on observations enabled as the periapsis moves northward.
- The EM will add observations of three of Jupiter's large satellites. Measurements by the spacecraft's Microwave Radiometer will explore Europa's ice shell. Observations by Juno will study Ganymede's magnetosphere, and gravitational and magnetic-field observations will probe Io's interior. In situ measurements will characterize the dust populations in Jupiter's ring system.
- The Juno mission will archive EM data from several engineering experiments which have proven useful scientifically during the PM.
- Additionally, the Juno mission has been asked to provide a supplementary proposal to PSD to archive engineering experiment data acquired during the PM that were not originally archived.

## **InSight Extended Mission**

### **PI: Bruce Banerdt, Jet Propulsion Laboratory**

- InSight is approved for a two-year extended mission, running from January 2021 through December 2022.
- The extended mission will focus on producing a long-duration, high quality seismic dataset. Continued operation of the InSight weather station, and accelerated burial of InSight's seismic tether using the spacecraft's Instrument Deployment Arm (IDA), will contribute to acquiring this seismic dataset at the highest quality possible.
- The EM will not prioritize continued deployment of the mole. Some work on the mole deployment may continue, but only to the extent that downward progress is demonstrated in the near term and other mission science or engineering goals are not affected.
- The InSight spacecraft continues to perform well, with the exception of the mole. However, decreasing electrical power available to the spacecraft due to dust on its solar panels is substantially lowering the mission's power margins, and these margins will decrease further in the upcoming Martian winter (Summer 2021). The InSight team will explore operational strategies to improve power margins and extend the spacecraft's life. This may include reducing the use of spacecraft heaters, and mechanical sequences to dislodge dust from the panels.

NASA commends the Juno and InSight teams for their successful operations during their prime missions, and I look forward to more great science at Jupiter and Mars during these extended missions.

---

Lori S. Glaze, Ph.D.  
Director  
Planetary Science Division  
NASA Headquarters

January 8, 2021  
February 11, 2021

Original version  
Revised to properly reflect Juno EM mission observations