Landing Curiosity on Mars with Flight Director Keith Comeaux

ABSTRACT

The Mars Science Laboratory (MSL) carries the most advanced payload of scientific gear ever used on Mars' surface, a payload more than 10 times as massive as those of earlier Mars rovers. Its mission includes investigating whether conditions have been favorable for microbial life and for preserving clues in the rocks about possible past life.

The intense period called the entry, descent and landing (EDL) phase of the mission, otherwise known as the "seven minutes of terror," spans the trajectory from the top of the Martian atmosphere, traveling at about 13,200 miles per hour (5,900 meters per second) to about seven minutes later when Curiosity is stationary on the surface. From just before jettison of the cruise stage, 10 minutes before entry, to the cutting of the sky crane bridle, the spacecraft goes through six different vehicle configurations and fires 76 pyrotechnic devices, such as releases for parts to be separated or deployed. In addition to using guided entry to land more precisely than ever before, MSL employs the largest supersonic parachute ever used at Mars, and relies on the novel Sky Crane architecture to land Curiosity using its mobility system as natural landing gear.

Curiosity began surface operations soon after landing in Gale Crater on 6 August, 2012, and will continue for at least one Mars year (approximately two Earth years). The overall scientific goal of the mission is to explore and quantitatively assess a local region on Mars' surface as a potential habitat for life, past or present. Curiosity is designed to carry ten scientific instruments and a sample acquisition, processing, and distribution system. The various payload elements will work together to detect and study potential sampling targets with remote and in situ measurements; to acquire samples of rock, soil, and atmosphere and analyze them in onboard analytical instruments; and to observe the environment around the rover.

Keith Comeaux, PhD, flight director during Curiosity's landing, will describe the mission's objectives, its science payload suite, the landing sequence and first 50 sols of operations on Mars.

BIO

Keith Comeaux joined NASA's Jet Propulsion Laboratory in 2006 to lead Curiosity's entry, descent and landing validation effort. In 2008, he transitioned to the assembly, integration and test team as the deputy systems manager and was responsible for leading the Curiosity's system test activities during its two year construction through launch at Cape Canaveral in November, 2011. Following launch, Keith served as the Cruise engineering operations team chief. In this role, he led the engineering team responsible for operating Curiosity during its eight and a half month cruise to Mars, culminating with its landing on the night of August 5, with Keith serving as flight director. Presently, Keith is one of several mission managers, working on "Mars time," responsible for the safe operation of Curiosity as it begins its journey of discovery on the Martian surface.

Before arriving at JPL, Keith worked for Boeing's Satellite Development Center (formerly Hughes Space & Communications) for eleven years in varying roles of increasing responsibility. While at Boeing, he received the AIAA Lawrence Sperry Award which recognizes contributions made by aerospace professionals early in their careers. Keith graduated from LSU in Mechanical Engineering and Physics and completed Masters and Ph.D. degrees in Aeronautics and Astronautics at Stanford University where his research focused on hypersonic aerothermodynamics and computational fluid dynamics. A native of Baton Rouge, Keith and his wife, Cecilia, and their children, Evie and Max, live in Redondo Beach, California.