

2001 Genesis Mission Status Updates: August – December

December 17, 2001

The spacecraft's first station-keeping maneuver was successfully completed on 12/12. The maneuver was a 205-second, small (1.1 m/s) burn with the smaller thrusters, done to keep the spacecraft's orbit around L1 stable. The propellant that Genesis used for maneuver 1A was within a few grams of what we had predicted it would use.

For the maneuver, the team performed science-suspending activities such as putting the collector arrays in the manual position, powering down the concentrator, placing the ion and electron monitors in manual mode, and disabling the WIND algorithm. After a short period for the spacecraft to stop gently rocking, the spacecraft's health was checked.

We had a coronal mass ejection over the weekend and the E array correctly deployed. When the solar wind became "hot," the voltage of the concentrator's rejection grid correctly dropped to zero. The sample return capsule's battery is now at 29 degrees Celsius and increasing a little less than a quarter of a degree Celsius per day, as expected and well within safe limits.

Upcoming events: Barring any unforeseen events, science collection will continue as planned. Happy Holidays!

December 10, 2001

The spacecraft is now in full science collection mode. Though the spacecraft isn't taking a holiday break, the status reports will return in January 2002.

December 3, 2001

Today, the collector arrays were successfully deployed. First, the arrays that sample the bulk, coronal mass ejection, and high-speed solar wind were extended. After waiting 30 minutes for the ion concentrator's temperature to stabilize, the low-speed array was deployed. Then the sample return capsule backshell was closed 1 degree to decrease the spacecraft's wobble. The arrays were then put into autonomous control, allowing the WIND algorithm to control their motion and position.

The canister lid was successfully opened last Friday, November 30. The lock ring and lid mechanisms operated normally. On December 4, the ion concentrator will be turned on, completing the last step in starting Genesis' science.

The solar wind regime had recently changed to a coronal mass ejection, a huge bubble of gas emitted by the Sun. The array that samples coronal mass ejections was correctly moved to face this oncoming solar wind.

Science on Genesis began when the canister lid was opened on November 30. Allowing for down-time for other activities, we will collect solar wind with the concentrator and arrays for about 26 months.

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November 16, 2001

We're there! A flawless 268-second burn was performed today to inject the spacecraft into its Lissajous orbit at Lagrange 1. A quick look of the burn that took us in to orbit insertion shows that the direction was within 1 degree of the plan.

The backshell was successfully closed and science paused on Thursday. The program will hold a Readiness Review on November 20. The review objectives include showing that the project is ready to open the canister and start science, has contingency plans, and operations is ready to implement the plan.

We continue to maintain the sample return capsule's battery at the desired temperature of 23 C with its heater.

The science instruments were successfully taken out of high voltage operation before orbit insertion. The Sun has been quiet for the last few days...

October 22, 2001

Preparations have begun for inserting the spacecraft into orbit about the first Lagrangian point, L1, which will occur on November 16, 2001. The backshell of the sample return capsule, still in the "cracked open" position, will be closed completely in preparation for orbit insertion on November 13. Science will be paused on November 15 and then restarted on November 19.

Recent activities on the spacecraft include continuing to check out the science instruments and the WIND algorithm, which will be used to automatically determine the type of solar wind that is passing by the spacecraft, then extend or stow the appropriate solar wind collector arrays to catch particles in the wind.

A solar shock and coronal mass ejection reached the spacecraft about 16:30 Universal time on October 21. There was a slight noise increase in the electron monitor when the shock came through. LANL reports, "Everything looks hunky-dory."

October 9, 2001

After approximately two days, September 27's solar flare subsided enough for the spacecraft to return to normal --the star tracker was no longer plagued with "sparkles" and the ion and electron monitors were not experiencing command losses. Since then, nothing out of the ordinary has happened on the spacecraft.

The sample return capsule's backshell remains in the "mostly closed" position (10 degrees open). Some "very fast" solar wind has been seen over the last week. The science team is

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trying to reduce the time required for the sample return capsule to outgas before opening the canister.

The task force investigating the unexpectedly high sample return capsule temperatures and its effects continues to work toward a late October recommendation to the project concerning the start of science collection.

Correction: The white paint referred to in the status report is **NOT** itself degrading, but rather is thought to have been contaminated by external sources. This external contamination is believed to have polymerized under the influence of the sun's ultraviolet emission, causing a change in the thermal properties of the radiator to which the paint is applied.

September 27, 2001

The backshell of the sample return capsule has been left in the "mostly closed" position (10 degrees open) for the last 10 days. It will most probably stay in this position for at least another month.

The task force investigating the thermal radiator degradation continues to solidify their plans to perform battery and paint-coupon testing and investigate options for the mission and the spacecraft's systems. The paint may have bonded with a small amount of contamination baked on by ultraviolet light. Talks with lithium battery experts in the industry confirm that the battery will most likely withstand higher temperatures than the current limits.

September 17, 2001

On September 15 at about 6:30 a.m. Pacific Daylight Time, Genesis' sample return capsule backshell was closed almost all the way, leaving an opening of just about 10 degrees. It will remain in this condition for the next few weeks in an attempt to correct an overtemperature condition of the sample return capsule (SRC) battery. In the process of closing the sample return capsule, the science monitors were turned off, but they have now been turned back on and are operating in normal "wind" mode. The spacecraft is healthy except for the SRC battery temperature, and is now pointing 6 degrees off-Sun (normal), precessing at 1 degree/day (normal), spinning at 1.6 revolutions per minute (normal), with the SRC battery heater set at 23 degrees celsius (not normal-bakeout mode), and performing science algorithm checkout.

August 20, 2001

The Genesis spacecraft is performing well. This week, the doors of the Genesis Ion Monitor and Genesis Electron Monitor were successfully opened. After a period of

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outgassing, the GEM and GIM were turned on. Their performance indicates that the door is open. Instrument checkout was also successfully completed. The science algorithm WIND, which will ultimately be used to automatically determine the solar wind regime and deploy or stow the solar wind collector arrays accordingly, was enabled, with stellar results. The algorithm correctly determined a solar wind speed of 380 km/sec, a proton density of $<1/\text{cc}$, and temperature of 90,000 Kelvin (TK Fahrenheit.) The spacecraft's measurements were confirmed by comparison with data from the ACE spacecraft, currently in the vicinity of Genesis' destination, L1. Daily precession maneuvers have been successfully implemented to keep the spacecraft orientation correct with respect to the Sun. This is important because these precession maneuvers continue to validate that the spacecraft is in spin-track mode using star trackers.

August 13, 2001

Genesis has opened its sample return capsule on Friday, August 17, then opened the covers over the ion and electron monitors. Earlier in the week, the Genesis flight team successfully switched the spacecraft from its low gain antennas to the medium gain antenna, and it is now working at a rate of 47,400 bits per second. We then turned on star tracker #1, and initiated the spin track sequence that uses a combination of the star tracker data and sun sensor data to determine the spacecraft's orientation. Spin track is now executing normally.

August 8

After a flawless launch on August 8 at 12:13:40 p.m. EDT, the Genesis spacecraft is on its mission to "catch a piece of the sun." At 64 minutes, 12 seconds into the mission, the Genesis spacecraft separated from the Delta's third stage. Immediately after separation, Genesis' solar arrays unfolded and pointed toward the sun. The spacecraft's signal was successfully acquired by the NASA Deep Space Network complex at Goldstone, CA, 85 minutes after launch.