



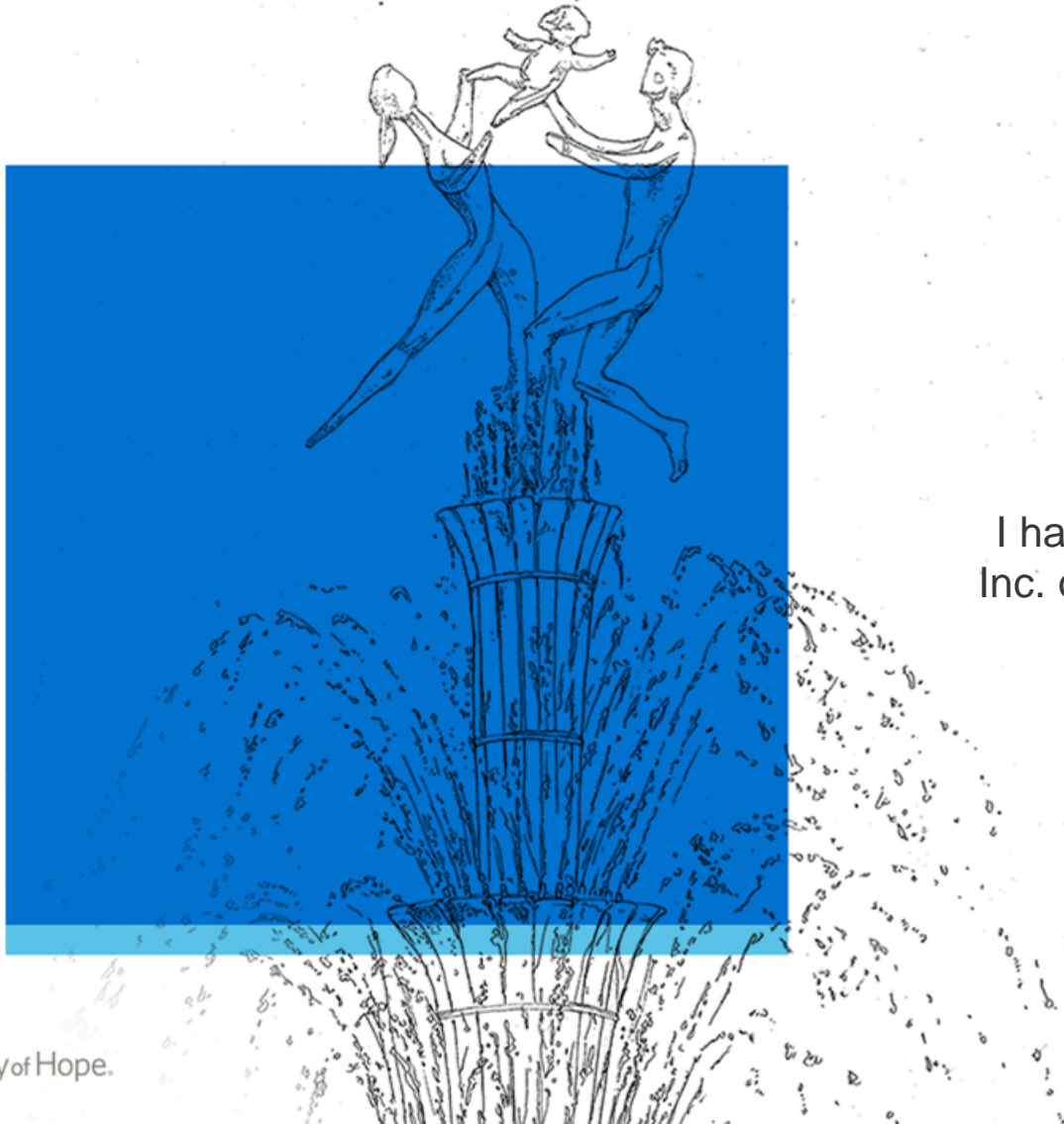
Memorial Spaceflights and Extraterrestrial Burials

A Selection From *Understanding End of Life Practices*

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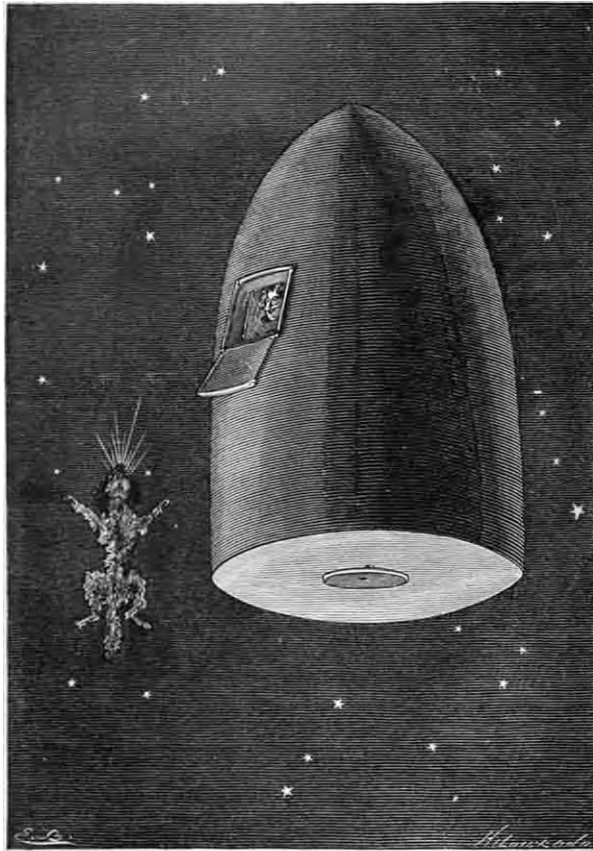
Disclosures



I have nothing to disclose

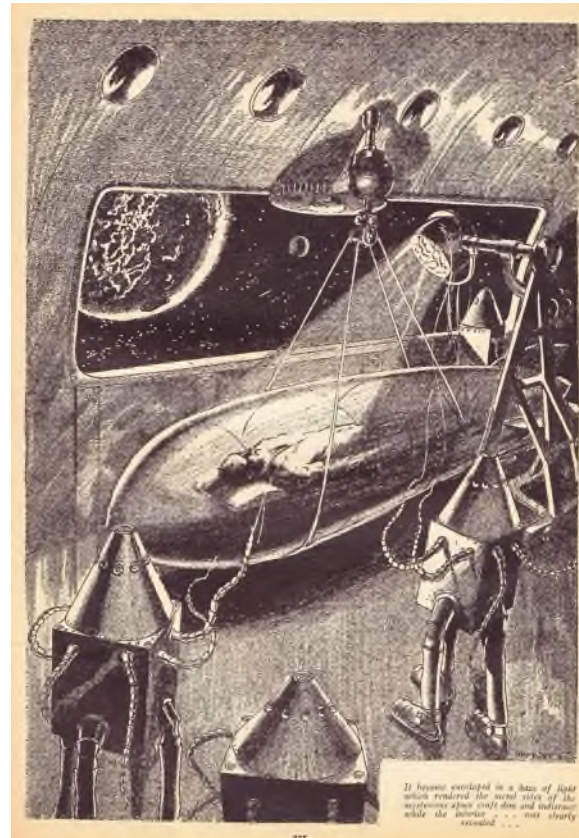
I have no personal or business connection to Celestis, Inc. or Elysium Space, the two corporations permitted to conduct memorial spaceflights in the U.S.

“Space: The Final Frontier”



From the Earth to the Moon, Direct in Ninety-Seven Hours and Twenty Minutes: and a Trip Round It, Jules Verne

<https://www.gutenberg.org/files/44278/44278-h/44278-h.htm>



"The Jameson Satellite", Neil R. Jones, *Amazing Stories*, July 1931



Star Trek II: The Wrath of Khan, Paramount Pictures, June 1982

Ad Astra...per minima capsula



Celestis Flight Capsules. Celestis, Inc.

<https://www.celestis.com/resources/how-it-works/>

- There is no presently available service to have “whole body” interment, either whole or via cremains.
- Both Celestis and Elysium Space, the two private corporations who are permitted to conduct memorial spaceflights in the U.S., limit each participant a “symbolic portion” of cremains about 1 gram in size, though additional “berths” can be purchased for a larger sample or for more than one person to be on the same launch.
- Capsules are considered a “secondary payload”, meaning that they are not the primary reason for a particular rocket launch.

International Law for the Commercial Use of Space



- The Outer Space Treaty was first proposed in 1966 and ratified in October 1967. The treaty serves primarily to limit military use of space, including the ban on placement of weapons of mass destruction on or in orbit of any celestial body.
- There are three key principles relevant to the commercial use of space by member States of the United Nations:
 - States shall be responsible for national space activities whether carried out by governmental or non-governmental entities.
 - States shall be liable for damage caused by their space objects.
 - States shall avoid harmful contamination of space and celestial bodies.



UNITED NATIONS
Office for Outer Space Affairs

“Oh! I have slipped the surly bonds of Earth”



Memorial Spaceflights

- Sub-Orbital
 - Reusable rocket stages contain capsules that are recovered as keepsakes
 - Capsules spend about 2 to 3 minutes “in space”, which is defined as ~100 km above sea level. Depending on the destination of the primary payload the capsules may reach an apogee of ~113 km.
- Orbital
 - Earth
 - Capsules may remain in Earth orbit for months to years, depending on the primary payload
 - Solar
 - First mission is scheduled for June 2022
 - Will be the first mission to travel outside the Earth-Luna planetary orbit system, traveling 3 million km.

Extraterrestrial Burials

- To date, only one human has had any portion of their remains intentionally interred on another celestial body.
 - Astrogeologist Eugene Shoemaker, Ph.D, died in an auto accident in 1997. In 1999, a portion of his cremains were included in the *Lunar Prospector* mission, which was intentionally crashed at the end of its mission into the lunar crater Shoemaker, which was named in his honor.
- Both spaceflight agencies plan to make “lunar mausoleum” missions available in the near future.

Science Fiction Made Real



“It’s a unique experience because memorials are for the living and you’re mourning the loss of someone, someone that you cared about a great deal. And yet, when the rocket goes up, as much as you miss them, as much as you loved them, you are so excited, and so happy, and so joyful that you get to experience what they really wanted. And you just know that they are somewhere yelling, ‘Yahoo!’ because they finally made it [...] It’s an unbelievable experience”

--Wende Doohan, wife of James Doohan.



Wende Doohan An Unbelievable Experience. Celestis Inc.

<https://www.youtube.com/watch?v=swkZNMepcoQ&t=51s>

First Flights



- The first memorial spaceflight

- 1992
- In secret by a member of the crew of the Space Shuttle *Columbia*.
- Majel Barret Roddenberry loaned a portion of her husband Gene's ashes so that he was, "[...] able, just once, to go into that great galaxy he dreamed about, where so few men have gone before [...]"

- The first commercial memorial spaceflight

- Founders Flight from Celestis, Inc.
- Launched as a secondary payload to Spain's MINISAT 01 mission on April 21, 1997.
- Pegasus rocket from an Orbital Sciences Corporation Stargazer aircraft.
- orbited the Earth every 96 minutes until it reentered the atmosphere on May 20, 2002.
- Notable individuals on board Founders Flight
 - Gene Rodenberry
 - Physicist Gerard O'Neill
 - Rocket scientists Beauford Franklin and Krafft Ehricke
 - Psychologist Timothy Leary.
 - The remains of 20 other people

A New Industry



- From 1997 to 2019, Celestis, Inc. has conducted
 - 16 memorial flights, including serving as the private sponsor for including Dr. Shoemaker's remains on *Lunar Prospector*.
 - Three of these missions carried the remains of *Star Trek* actor James Doohan and NASA astronaut Gordon Cooper.
 - The most recent of these flights, New Frontier, also carried portions of the remains of 306 other people.
- Another corporation, Elysium Space, intends to offer a service where the remains are contained within a separate "CubeSat" intended to be jettisoned from the launch vehicle and allowed to orbit freely before eventually re-entering the atmosphere and burning up. Elysium also plans to create "lunar mausoleums" using lunar lander technology from Astrobotic

Pricing



Flight Package (Celestis)	Cost (Cremains or DNA)
Sub-Orbital	\$2,495
Orbital	\$4,995
Lunar or Deep Space	\$12,500
Additional 1 g “berths”	\$1,250 (approximate)



FOR MORE INFORMATION

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