

AOE 2104 Fall 2006
Essay Assignment 2

Due: In class Tuesday 10/17/04. I will not accept late essays. *Begin now.*

Topic: Aerospace Vehicle of your choice.

Requirements:

1. Only use one side of one sheet of paper.
2. Use 12 point Times New Roman font, single-spaced with 1" margins all around.
3. Include your name in *the upper right corner inside the 1" margin* of the essay (typed *and* signed).
4. Your signature represents your assurance that you have written the essay yourself.
5. Select an aerospace vehicle. It can be the one you used for your extra credit assignment if you wish.
6. Find at least two references about the vehicle, preferably *not* internet websites. For example, use *Aerospace America*, *Space News*, *Aviation Week & Space Technology*, or other periodicals. Cite your references appropriately.
7. Describe the vehicle, its mission, its history, its accomplishments, and its current status. Provide some personal insight into the significance of the vehicle.
8. I expect correct grammar and spelling, and logical organization.
9. Make it interesting.

Please see writing guidelines I have posted at:

<http://www.aoe.vt.edu/~cdhall/writingguidelines.pdf>

See attached example of a well-written essay.

Additional "grading" assignment. I will collect these essays in class on the due date. Then, I will

- make copies (with authors' names removed) of the essays
- on Thursday 10/19, give everyone three essays to read and "grade"
- give you guidelines for grading, due on 10/24
- review the comments and grades
- return the graded essays to the authors
- allow you to revise the essay and resubmit

MESSENGER: Retrieving Postcards from a Celestial Neighbor

Although the planet Mercury, named after the Roman “messenger of the gods,” has been recognized for centuries by ancient civilizations (Arnett), Mercury remains one of the most mysterious inner planets. Only one vehicle has ever gone to the planet – a probe launched by NASA in 1973 called Mariner 10. That mission provided information to prove Mercury was a most unique world: it has the most extreme temperature differences in the solar system, a measurable magnetic field (which is somewhat rare for small planets), and an atmosphere made of molecules that “bounce” off the surface of the planet rather than colliding with one another. However, the results of the Mariner 10 probe produced a number of questions that cannot be solved without further exploration. Finally, in June 2001, NASA awarded the John Hopkins University Applied Physics Laboratory a \$256 million contract to develop another spacecraft (Sietzen) – aptly named MESSENGER – to finally seek the answers.

The spacecraft MESSENGER (an acronym for MErcury Surface, Space ENvironment, GEOchemistry, and Ranging) launched from Cape Canaveral on August 3, 2004 on a Delta II rocket. It is currently in route to the closest planet to the sun and has recently completed several successful trajectory adjustments. Once it arrives at Mercury (around 2008), it will perform three fly-bys and finally will settle into an orbit around the planet in March 2011. The craft will then need to maintain a stable elliptical orbit in order to fulfill its scientific objectives (“MESSENGER”). These include recording details about the atmosphere, charting its surface and various land features, discovering clues as to the composition of the core, and gathering data to shed light on its density, magnetic field, and polar ice caps (Sietzen). Once MESSENGER completes its tasks, it will eventually crash into Mercury’s surface.

Because of the demanding goals set forth by the MESSENGER project managers, the spacecraft needed to meet wide range of design constraints. The intense heat so close to the sun was a major issue in the construction of the vehicle. Heat shielding is provided by a large heat-resistance ceramic cloth, which allows the other equipment (behind the shield) to operate in temperatures close to twenty-five degrees Celsius even in orbit around Mercury. Also, in order to prevent debilitating malfunctions, many of the systems are redundant, including the power system, which includes two solar panels and a nickel-hydrogen battery. The vehicle uses two instruments to position itself: cameras that track position relative to the stars and an “Inertial Measurement Unit” with a number of sensors as a backup. Both small thrusters and spinning wheels (called “reaction wheels”) can correct its attitude, although the main propulsion is only provided by “liquid chemicals.” (“MESSENGER”)

As a well-designed craft built with the mission objectives in mind, MESSENGER has shown great potential for achieving its purpose - and by doing so, sending invaluable information about an inadequately understood planet back to eager scientists and enthusiasts alike. This much-anticipated data is significant because, ultimately, comprehending the solar system and all of its components – including Mercury – is one of the most vital steps toward understanding the universe as a whole, and perhaps even a stepping stone to a human space-based civilization.

Arnett, Bill. “Mercury.” Last Updated September 2, 2004. Note: referred to site by a NASA source page.

<<http://www.nineplanets.org/mercury.html>>

“MESSENGER: MErcury Surface, Space ENvironment, GEOchemistry, and Ranging.” John Hopkins University Applied Physics Lab. Last Updated September 24, 2004.

Available at <<http://messenger.jhuapl.edu/index.html>>

Sietzen, Frank. “Messengers to the Inner and Outer Limits.” American Instituted of Aeronautics and Astronautics: Aerospace America. February 2002 edition. P. 36.