Satellite Communications Class Project:
Seismic Mission to Venus

ECE 6390 – Summer 2013

Synopsis:

It has been nearly 30 years since mankind sent a lander to the surface of Venus. The lifetimes of previous landers have been limited to only a few hours, since the extraordinarily high temperatures have prohibited conventional electronics from operating on the surface of the planet. Yet there is much we would still like to know about Venus. For starters, we suspect but have never confirmed the degree of the planet's seismic activity.

The *National Aeronautics and Space Administration* (NASA) is selecting competitive proposals for a scientific mission to Venus that lasts for 90 days and streams seismic data back to earth. Your company is planning to submit a mission proposal to NASA, which will select the mission based on a combination of criteria that emphasizes low cost and likelihood of success.

Team-Member Assignments:

I will assign 6 teams with 4-5 members each to constitute a "company". Once formed, the teams must elect a team-leader, choose a company name, and submit an 80 x 80 pixel icon for their web link. I expect everyone to contribute to the final design and documentation and will solicit internal rankings of team-member efforts.

System Components:

Due to the multiplicity of talents within each group and the "systems"-nature of the class, *all* aspects of the mission design should be explored in the final proposal. Communication systems should receive the most design focus, but the final project should address all of the following systems:

- Communication Systems – antennas, RF hardware, modulation, spectral usage, peak data output, bit rate, coding, etc. A key aspect will be demonstrating that the proposed transmission can make it through the atmosphere of Venus for reliable communications.
- Propulsion System – engine type, trajectory, and voyage time, single craft system or additional (and more expensive) relay orbiter
- Power Systems – power source, peak power output, estimated lifetime, etc. Thermal-proofing the power system is critical.
- Resiliency of Electronics – Discuss strategies for space-hardening and heat-hardening the electronics for the duration of the mission. Identify the likely points of failure.

- Budget and Timeline – total research and development costs broken into materials, equipment, supplies, people costs, space resources, and other miscellaneous costs.

This list is not necessarily exhaustive. The level of detail for each system is left up to the groups. However, increased descriptions will enhance the competitiveness of your design. *Verbose* descriptions will degrade the competitiveness of your design.

Deliverables:

You must prepare a concise, well-written technical report detailing your team's mission design. The report should be in html-format with all files submitted in-class on a CD or through e-mail (e-mail submissions are strongly preferred; they must be ZIPped and are only possible for files less than 20 MB total; an externally hosted server for your website is also permissible, but must be "frozen" at the project deadline – extraordinary grade penalties if I detect changes). Projects must be submitted by noon on Friday, 26 July 2013. Late projects will not be accepted.

Grading:

Your final proposal will be graded on the technical criteria listed above. Deductions from these base scores will then be made based on the following areas: Completeness, Technical Writing, Professional Content, Research/References, and Conciseness. Each team member may also receive a small, variable downward adjustment to their individual project scores based on internal rankings of contribution and effort.

Additionally, a portion of the project grade will be based on peer evaluations. The projects will be placed online and each member of the class will submit an evaluation for each project (other than their own). These individual evaluations will be held confidential; they will also count as a homework assignment. Thus, the projects will be posted online over the weekend and evaluations will be submitted electronically during exam week. Look online for the evaluation sheet.