International Journal of Technology, Science and Engineering **ISSN: 2457-1016**

Vol. 3, Issue II, Jul-Sep, 2020 http://www.bharatpublication.com/journal-detail.php?jID=25/IJTSE

AN OVERVIEW OF CANSAT FIXATION: SURJECTIVE USAGE OF CONCATENATION

Sritha Zith Dey Babu*, Vishali Pathania , Mansi Gupta, Ayush Pal, Ridhi Sharma

*University Institute of Computing, Chandigarh University, Punjab, India**

ABSTRACT:

Once the CanSat project is underway, Dr. Lightsey plans to oversee the construction of a permanent ground station at the W. R. Woolrich Laboratories Building at the University of Texas at Austin. This ground station will include a steerable antenna array on the roof of the building with an observation station in the satellite design lab. Once an inexpensive, compact satellite design is built and tested, the systems developed can be extended to experiments for both the Shuttle Get-Away Special (GAS) program and the Cube-Sat program. These programs allow students to conduct experiments in space and are discussed below. The ultimate goal of UTSDL is to implement student-built spacecraft experiments in Earth orbit. However, a reliable and robust design is required before committing to the expense of launch into space. In order to successfully implement a satellite design in space, thermal control, attitude control, and power generation become major concerns. In all these cases, the spacecraft requires command and control capability for housekeeping purposes such as antenna and solar panel pointing, station-keeping, and power consumption control. Even if the expense associated with launch is subsidized, such as in the GAS program, it is imperative that the communication system onboard the satellite be reliable, robust, and tested so that these minimum control requirements are possible.

Keywords: *Fixation, Fuzzy, Nano-materials, Robust design*

INTRODUCTION:

The Cube-Sat program allows university students to launch satellites with volumes of 10 cm^3 into orbit. The cost of launching a single satellite through this program is $50,000. Currently, UT students have proposed Cube-Sat missions for formation flying and relative navigation experiments as well as experiments in Earth-moon orbits. The CanSat sounding rocket program has been chosen to test the individual subsystems for the above-mentioned eventual spacecraft missions, since the cost of launch is minimal ($600). This test will subject the electronics to loads similar to those for launch into space, and will allow for an extended test at high altitude. The CanSat program was initiated in 1998 to give students hands-on experience in the design of spacecraft and to determine if small satellites can perform useful functions [2]. Several universities have participated in the project since its beginning, including Stanford, the University of Texas at Austin [3], the University of Tokyo, and Tokyo Institute of Technology [4]. The CanSat program allows university students to launch 12-ounce soda-can-sized satellites from a sounding rocket complex in New Mexico with minimal launch costs. This project allows for the design and testing of a compact, inexpensive data telemetry system under extreme launch loads and for conditions near 12,000 feet altitude. This project will provide the first project for UTSDL, but also a platform for the future design and implementation of Earth-orbiting spacecraft at the University of Texas. The CanSat mission objectives are listed below in order of significance:

- Collect and transmit data.
- Demonstrate command and control capability.
- Show that an inexpensive design will survive launch loads.
- Create prototype data telemetry system and signal design for future implementation and improvement.

The main objective of the initial CanSat project is to show that the design of a small, inexpensive data telemetry system is possible. The system will have both receiving and transmitting capabilities and will be incorporated with a complement of basic analog and possibly digital sensors. Although the sensor data is important for verification of the telemetry objectives, achieving individual sensor precision is not a primary goal of this CanSat. The success of this project at UT will hopefully pave the road for the funding of annual CanSat design projects with improved sensor packages and mission objectives. Several universities have completed CanSat projects in the past, each with different missions. The University of Tokyo’s project, Gekka-Bijin, consisted of three CanSats that attempted to rotate a satellite, gather temperature and pressure data, and to use a camera [4]. They have also designed a satellite to test systems that will later be used in a Cube-Sat project. Other universities such as Arizona State University [5] and Kyushu University [6] have designed satellites to test a tracking system and to collect temperature data. Most of these projects are used simply to give students experience in a hands-on project. They must deal with ordering equipment, designing systems, making reports, and working in a group. This will give them an idea of what to expect when they enter the work force. UTSDL has considered some of these previous designs when working on our own project. The structure for our satellite will closely resemble some of the other designs. We are also researching components that other projects have used to determine if any will be appropriate for our satellite design. To handle the workload required for this project, the responsibilities were split between the three group members. Shaun is in charge of programming the chips to work with each other, David is in charge of handling the components (such as the sensors and the circuit board), and Robert is in charge of the structure of the satellite. The members are not restricted to working only in their area, but they specialize in one area and are responsible for making sure that area meets its requirements. The hardware integration and testing will be the responsibility of all group members. In addition, everyone contributes to the written and oral reports.

LITERATURE SURVEY:

The main theoretical background required for the design of the CanSat involves circuit theory. A firm understanding of the relationship between current and voltage and the role of capacitors, resistors, and inductors in circuit design is imperative for the completion of this type of project. The task will also require knowledge of how to convert a radio frequency signal to digital data and programming microchips to carry out those conversions. Programming microchips to handle radio signals necessitates an understanding of how binary data is stored in data registers, the different types of registers, the implementation of interrupt logic, and amateur radio protocol for transmitting data. Most of these topics are more closely related to electrical engineering than aerospace engineering and are thus outside the bounds of an aerospace undergraduate preparation. A large learning curve has been associated with these topics; given below is a brief synopsis of those topics and recommendations as to what future CanSat groups may need to research before attempting to improve on this CanSat design. It is assumed that any student working on the CanSat project has at least a minimal understanding of circuit theory. The circuitry for the satellite will involve inductors, capacitors, resistors, and op-amps, among other electronic components. Each of the sensors require 5 volts (V) to function properly, and therefore a step-down transformer will change the output of 9V batteries to provide the correct amount of voltage to each. For simplicity, the interfacing resistors and capacitors have been omitted. The data sheets for each chip, as well as a complete circuit schematic, are provided in the Appendix. This telemetry system is much like the modem on a computer. The radio signal can be thought of as sound tones from a telephone port. Sound tones are transmitted from the ground and are received by the antenna on the satellite. A decoder chip (CM8870 in this case) converts the sound tones into four-bit binary numbers and sends them to the micro-controller. Pre-programmed definitions for the appropriate command signals will be continually compared against all incoming signals, so that errant signals on the appropriate frequency cannot switch off any of the satellite subsystems. The details of the signal structure will be discussed in the amateur radio protocol and signal structure sections.

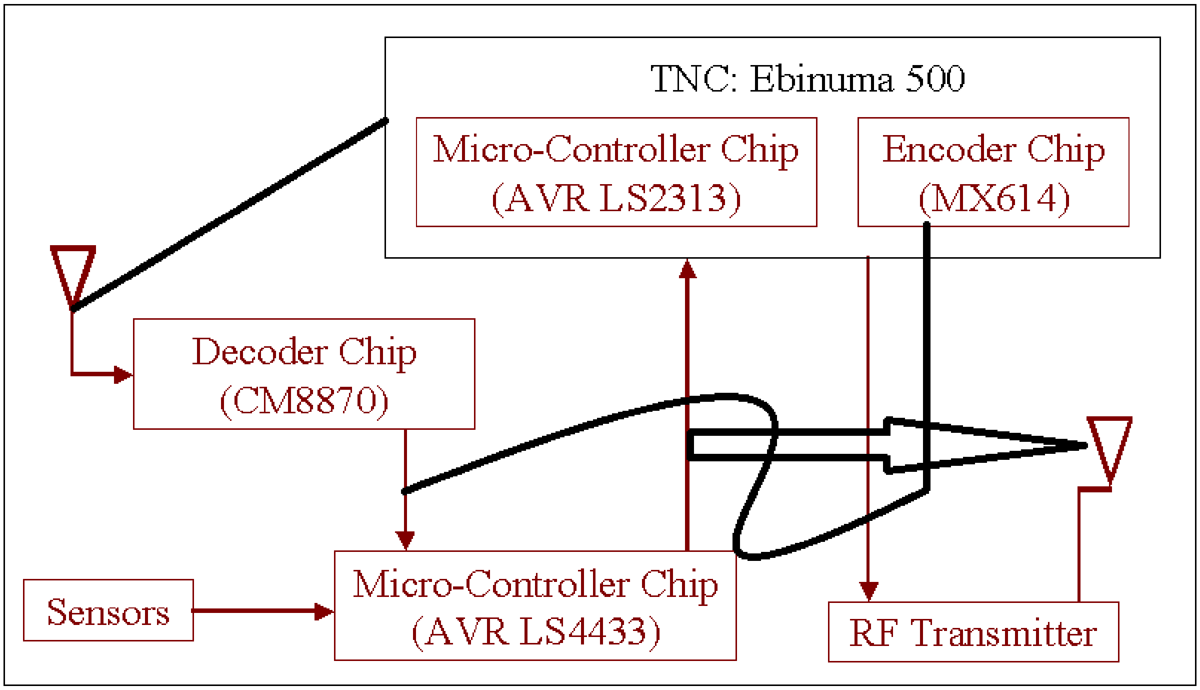
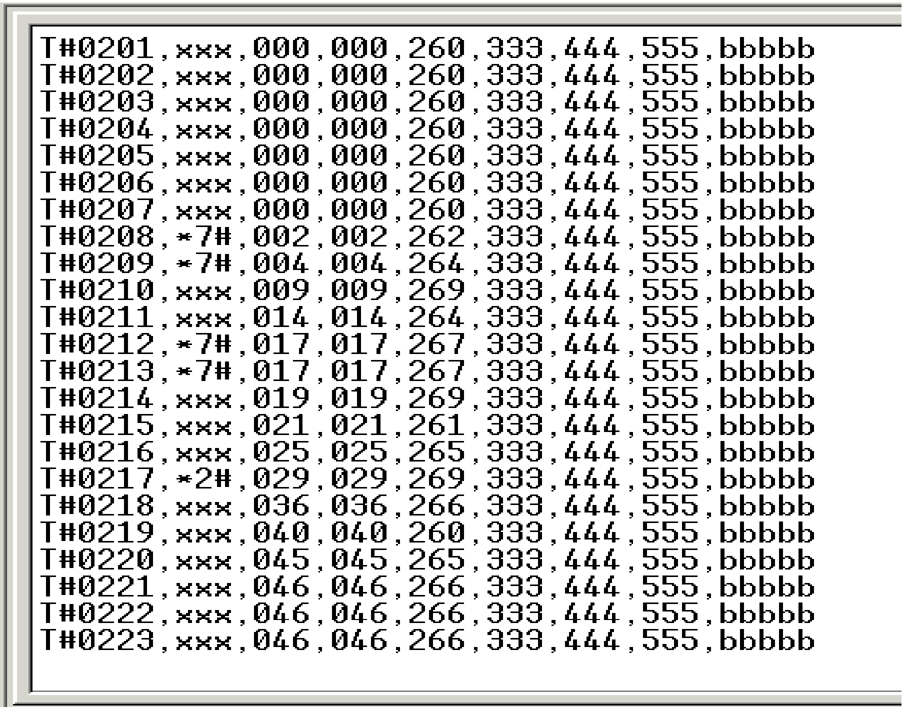


Figure 1: Communication System Schematic

After the micro-controller interprets the signal, it will begin taking sensor data (analog and digital in this case), convert the inputs to 8-bit binary numbers, and record them in a time tagged data string. Figure 2.2 is an example of the data string generated by the CanSat. The first column is a time tag in seconds. The second column is verification that the CanSat received and properly interpreted a command. The third and fourth columns correspond to output voltage from the temperature and pressure sensors. The 5-volt outputs from these sensors are scaled to output values ranging from 0 to 255. The remaining columns are reserved for additional sensors.



```
T#0201,xxx,000,000,260,333,444,555,bbbbb
T#0202,xxx,000,000,260,333,444,555,bbbbb
T#0203,xxx,000,000,260,333,444,555,bbbbb
T#0204,xxx,000,000,260,333,444,555,bbbbb
T#0205,xxx,000,000,260,333,444,555,bbbbb
T#0206,xxx,000,000,260,333,444,555,bbbbb
T#0207,xxx,000,000,260,333,444,555,bbbbb
T#0208,*7#,002,002,262,333,444,555,bbbbb
T#0209,*7#,004,004,264,333,444,555,bbbbb
T#0210,xxx,009,009,269,333,444,555,bbbbb
T#0211,xxx,014,014,264,333,444,555,bbbbb
T#0212,*7#,017,017,267,333,444,555,bbbbb
T#0213,*7#,017,017,267,333,444,555,bbbbb
T#0214,xxx,019,019,269,333,444,555,bbbbb
T#0215,xxx,021,021,261,333,444,555,bbbbb
T#0216,xxx,025,025,265,333,444,555,bbbbb
T#0217,*2#,029,029,269,333,444,555,bbbbb
T#0218,xxx,036,036,266,333,444,555,bbbbb
T#0219,xxx,040,040,260,333,444,555,bbbbb
T#0220,xxx,045,045,265,333,444,555,bbbbb
T#0221,xxx,046,046,266,333,444,555,bbbbb
T#0222,xxx,046,046,266,333,444,555,bbbbb
T#0223,xxx,046,046,266,333,444,555,bbbbb
```

Figure 2: Telemetry String

METHODOLOGY:

Shock force survival and Preflight Review testability - Structural analysis and tests are done to ensure structure safety at 30Gs shock and 15Gs acceleration Before the flight, the parachute is inspected for any damage or string breaks upon exerting required force. Extra parachutes are kept as a backup. Container's covering shell is detachable to ensure ease of placing the SV in a compressed state. The shell can be attached after the payload is placed into the container. Component Sizing - The radius of the circular parachute is 50cm. Spill hole radius is 4cm. It is made of ripstop nylon because of its light weight and high drag coefficient. It is attached to the container using 8 nylon strings each 21 inches long. Color Selection - Color is chosen to be Bright orange for the container so that it is easily visible. Design considerations - The size of parachute and spill hole were chosen after continuous drop tests taking into account low descent speed and stability of container without oscillation. Since it is placed at the top of the container structure, it will be deployed passively with airflow immediately after deployment from the rocket payload section. SV Descent Control Hardware Summary Shock force survival and Preflight Review testability - The SV Structural analysis and tests are done to ensure structure safety at 30Gs shock and 15Gs acceleration. Before the flight, SV wings are inspected manually for any damage or breaks. Extra wing sets are kept as a backup. These can be directly attached on top of SV body. Component Sizing - Wing Span is 1088mm and has a length of 290mm. Color Selection - Color of wing and trim control is selected as Red. Design considerations - Ripstop Nylon is used to make wing skin as it is highly flexible so it can compress easily and has high strength. Secondary nylon threads are used to fasten the wings. Umbrella like opening mechanism is used because it expands the wing maximum to 3.7 times its length by use of springs and thin rods. The use of trim provides no need for any batteries or electronics in the container (Self-Actuation via gravity). It is lightweight and provides more space for the payload as it is placed outside. Opening Mechanism - The opening mechanism is inspired by Umbrella. Using the properties of the triangle and simple Four-Bar Mechanism, changes are made to increase the wing span of the glider and reduce the mass of the system. The wings of the Glider are opened by torsional spring present near the top of the SV as depicted.

RESULT:

After getting all of this value we get the final image of Neptune. But, it's very important to set the vector analyzation in case of getting the roaster image of any planet. This image will help peoples to get the latest knowledge about Neptune and to create animation by which others will get the small scenario of this planet. For more than a decade there has been a push in the planetary science community to support interoperable methods for accessing and working with geospatial data"(Hare,2018). In this joint effort co-authored by a landscape architect, a historian of science and a geochemist"(Arènes,2018).

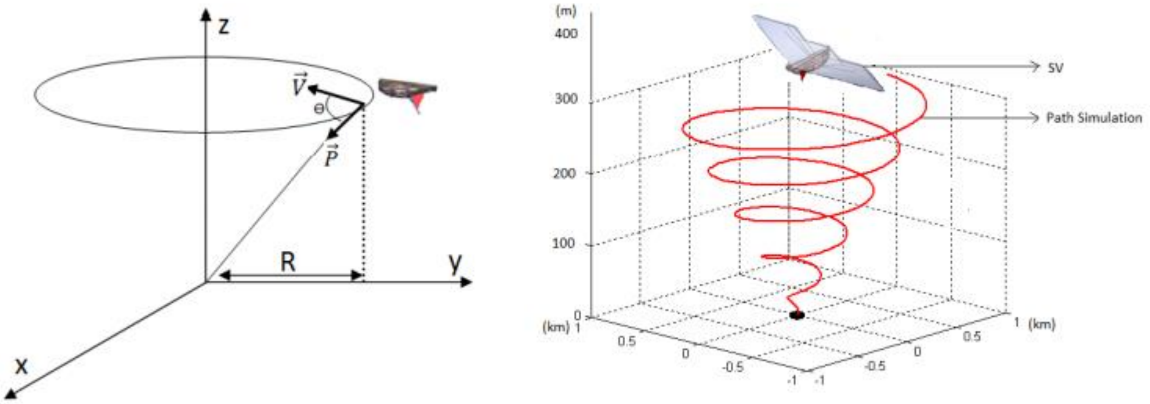


Figure 3: Final output

CONCLUSION:

An overview of a system engineering and planning to develop the first nano-satellite of PEC University of Technology, Chandigarh, India is presented. There is a wide scope of nano-satellites in different fields such as communications, disaster management, weather forecasting, remote sensing etc. To meet these potential applications, various steps were involved in the design process. A Preliminary Design Review (PDR) listed the planned designs and tasks required for the project. It was followed by a Critical Design Review (CDR), which included the final designs for the components, mechanisms and testing phases. Environmental Tests (ET) were done to ensure the integrity and functionality of system under given conditions followed by a Post Flight Review (PFR). Mechanical, electronics and software subsystems involved in the development of a nanosatellite comprising of a planetary re-entry vehicle have been discussed. The SV separation mechanism, wing deployment, and gliding systems are elaborated.

REFERENCES:

1. Aydemir, M. E., Celebi, M., Ay, S., Vivas, E. V., Bustinza, F. C., and Phan, D., “Design and implementation of a rover-back CANSAT,” Recent Advances in Space Technologies (RAST), 2011 5th International Conference on, IEEE, 2011, pp. 800–803.
2. 2. Soyer, S., “Small space can: CanSat,” Recent Advances in Space Technologies (RAST), 2011 5th International Conference on, IEEE, 2011, pp. 789–793.
3. Sachdeva, C., “Advancements made in the Evolution of present Autonomous Unmanned Aerial Vehicles,” International Journal of Engineering and Technical Research, Vol. Vol 2, Issue 12, December 2014, pp. 147–153.
4. Nylund, A. and Antonsen, J., “CANSAT-GENERAL INTRODUCTION AND EDUCATIONAL ADVANTAGES,” Proceedings of the 18th ESA Symposium on European Rocket and Balloon Programmes and Related Research, Visby , 2007.
5. Berman, J., Berman, T., Billheimer, T., Elizabeth, B., Hood, S., and Neas, C., “CanSat Competition: Contributing to the Development of NASA’s Vision for Robotic Space Exploration,” 2007.
6. Chaudhry, V. and Mishra, I., “ZENITH: A Nano-Satellite for Atmospheric Monitoring,” Tech. rep., SAE Technical Paper, 2015.
7. Systemes, D., “SolidWorks 2012,”Ay, S., Ibrahim, M. K., Aydemır, M. E., Bensaada, M., Fernando, L. H. J. D. K., Akiyama, H., Yamaura, S., et al., “Design and navigation control of an advanced level CANSAT,” Recent Advances in Space Technologies (RAST), 2011 5th International Conference on, IEEE, 2011, pp. 752–757.
8. Arduino, L., “Arduino Software IDE,” . 10Faludi, R., Building wireless sensor networks: with ZigBee, XBee, arduino, and processing , ” O’Reilly Media, Inc.”, 2010.

9. Zencik, R. and Kohlhepp, K., “GPS micro navigation and communication system for clusters of micro and nanosatellites,” Aerospace Conference, 2001, IEEE Proceedings., Vol. 5, IEEE, 2001, pp. 2515–2522.
10. Aydemir, M. E., Dursun, R. C., and Pehlevan, M., “Ground station design procedures for CANSAT,” Recent Advances in Space Technologies (RAST), 2013 6th International Conference on, IEEE, 2013, pp. 909–912.
11. Boonsawat, V., Ekchamanonta, J., Bumrungkhet, K., and Kittipiyakul, S., “XBee wireless sensor networks for temperature monitoring,” the second conference on application research and development (ECTI-CARD 2010), Chon Buri, Thailand , 2010.
12. Manual, L. U., “National Instruments,” Austin, TX , 1998.
13. Matunaga, S., Yoshihara, K., Sugiura, Y., Sekiguchi, M., Sawada, H., Tsurumi, S., Nakaya, K., Mori, M., Ui, K., Maeda, N., et al., “Titech micro-satellite model: CanSat for sub-orbital flight,” Aerospace Conference Proceedings, 2000 IEEE, Vol. 7, IEEE, 2000, pp. 135–142.
14. Sachdeva, C., Miglani, J., and Padhee, S., “Stress Development Analysis within Composite Laminate for Different Layup Orientations,” Tech. rep., SAE Technical Paper, 2016.
15. ANSYS, U. M., “Structural analysis guide,” ANSYS Inc, 1998. 18Fluent, A., “12.0 Users guide,” User Inputs for Porous Media, Vol. 6, 2009.