Boeing Employees Model Rocket Club

Sanctioned Section of the National Association of Rocketry (N.A.R.) Number 627

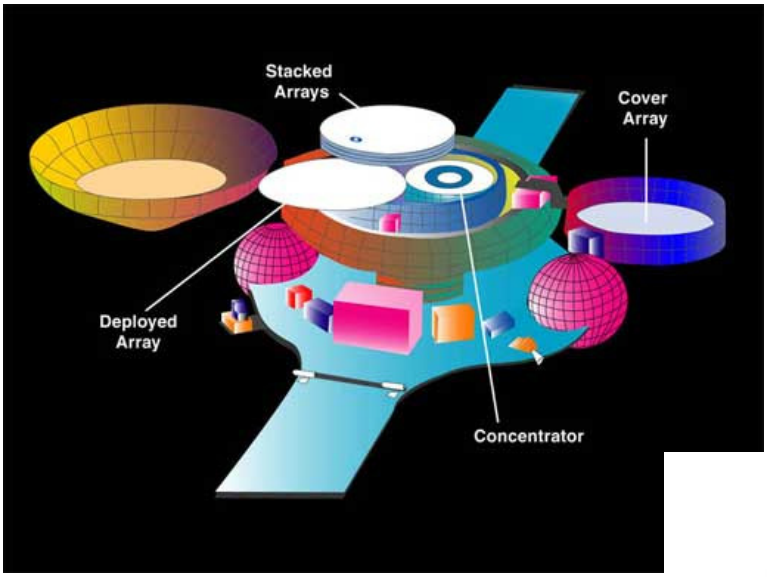
Newsletter for October, 2004

Location: Kent Recreation Center
Time: 2nd Saturday of Every Month
at 10:00 a.m.

President: Bruce Johnson
Vice President: Dave Davis
Secretary / Treasurer: Bob Turner
Librarian: Mark Shelton

News items and editorial comment in this publication do not necessarily reflect the views and opinions of the Boeing Company

---



Genesis Sample return mission landing failure

********** **BEMRC Launch Schedule** **********

October 9th (Saturday)	Kent, WA - Launch Session
November 13th (Saturday)	Kent, WA -Winter Seminar Series Kick-Off
December 11th (Saturday)	Kent, WA - W.S.S. First Build Session
January 8th, 2005 (Saturday)	Kent, WA – W.S.S Second Build Session
February 12th (Saturday)	Kent, WA – W.S.S. Third Build Session
March 12th (Saturday)	Kent, WA – Fourth Build Session
April 9th (Saturday)	Kent WA – Launch Session

********** **On The Cover** **********

In August 2001, the Genesis spacecraft was launched into a solar orbit with a mission to collect particles from the solar wind. Solar wind particles are similar to material from which the planets formed, and are atoms, ions, or high-energy particles. Once in position, the Genesis spacecraft uncovered its collectors, and particles of solar wind were embedded into ultra-pure silicon wafers and other pure materials.

After 29 months in orbit, the sample collectors were re-stowed and returned to Earth .On September 8th, 2004, a mid-air recovery of the sample return capsule was planned to take place over the Dugway Proving Ground in Utah. The Genesis sample return capsule landed well within the projected ellipse path in the Utah Test & Training Range, but its parachutes did not open. It impacted the ground at nearly 320 kilometers per hour (nearly 200 miles per hour)

Even though the capsule was severely damaged, scientists have been able to extract viable samples from the collectors and may still be able to gain usable data. Another aspect of this mission, was to serve as a system pathfinder/demonstrator of the proposed Mars sample return mission.

********** **Quote(s) of the Month** **********

“It appears that the concept of attacking a country *before* it becomes a threat has been adopted by society in general. Yesterday I got an e-mail message from the entire female population of Ohio, requesting that I not ask them for a date. - James Knowles

“In retrospect, I see now that my Silly String ray-gun might've looked a little too real as far as the cops were concerned -- but I honestly thought my tin-foil-and-pie-plate armor would've held up better than it did.” - Matt Moore

“My wife always thinks it's cute when the baby throws up on me. But when it's the other way around, she gets all huffy and accuses me of being drunk.” - Alex Ingraham

********** **Weather Balloon Telemetry** **********

by: Sebastian Zetl

Why Weather Balloons?

Weather forecasting: Despite the many meteorological satellites, only balloon carried instrument packages called radiosondes can measure the atmosphere with sufficient resolution and accuracy on temperature, relative humidity, and barometric pressure. From the monitoring of the flight path of the radiosonde weather balloon, the wind velocities and directions in the respective heights can be measured. This measurement is also not possible by satellite. These radiosondes can also be launched by rockets, or dropped from aircraft. They are then called rocketsondes, or dropsondes.

Environmental monitoring: Weather balloons are more favorable than measuring airplanes for ozone, nitrogen oxides and other pollutants.

When Weather Balloons are Launched

Around 04:45, 10:45, 16:45 and 22:45 UTC the weather balloons are launched by the National Weather Service (NWS) of the National Oceanographic and Atmospheric Administration (NOAA). Around 90 minutes after launch, the balloons reach an altitude close to 100,000 feet were they burst due to the lower external pressure. A small parachute is attached to the instrument package and the descent from this altitude takes over 40 minutes.

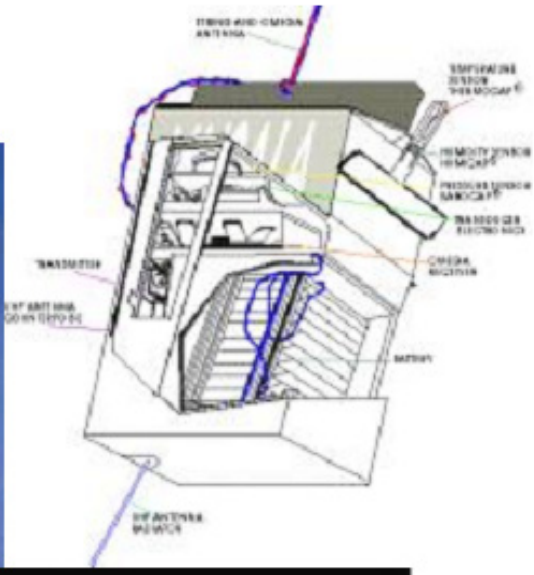
The Technology

One of the most common radiosonde telemetry packages is the Vaisala RS80 from Finland. The eight ounce RS80 has all of the charm of a milk carton and is designed as a single use article. But, it’s capabilities are unique. The RS80 was developed in the 1970’s and introduced in 1980. Despite its age and a technically high-quality successor (RS90), it is the worlds most widely used weather probe with over 100,000 being used in a year worldwide.

The weather data telemetry is broadcast to a ground station using TDM/FM/FM modulation, whose origin is from the 1960's in the rocket programs.

(continued on next page)

The packaging is cardboard and Styrofoam to protect the instrumentation. The transmitter is on the left of the battery box, right at the side the transmitter plate, and below the housing for the sensor electronics including the pressure sensor, and the internal omega receiver used to measure wind speed and direction. The omega navigation system was switched off in September 1997 and is now replaced by LORAN-C or GPS.



.

(continued on next page)

.
Vaisala uses the following standard NF frequency range with the RS80. IRIG of channels 3 and 4 (approx. 700 cycles per second - 1 kHz) for the PTU data (pressure, temperature, humidity) and optionally, IRIG channel 9 (approx. 4 kHz) for the wind speed and direction data.

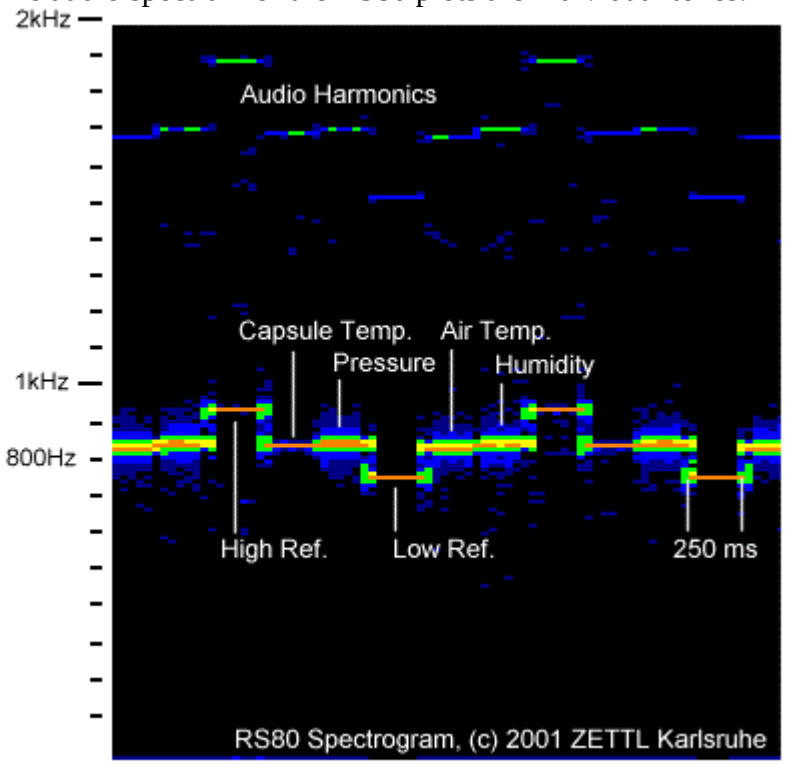
This frequency mixture is produced by a PLL stabilized transmitter with approximately 100 mW power output frequency-modulated (FM) in the 400.15 - 406 MHz the Meteorological AIDS band.

The TDM pattern (time division multiplex) the RS80 PTU data plans 6 channels with a 250 ms cycle time per channel. Altogether the PTU data transmits over six tones, they are sequentially and constantly repeating. The pitch of the respective channel corresponds to the sensor value. A complete tone sequence lasts therefore 1.5 seconds, i.e. 40 tone sequences (Frames) per minute.

The 6 tone channels of the RS80, in their order and meaning:

- High reference frequency, K1
- Capsule temperature frequency, S
- Pressure frequency, P (D)
- Low reference frequency, K2
- air temperature frequency, T
- Humidity frequency, U

The audio spectrum of the RS80 plots the individual tones:

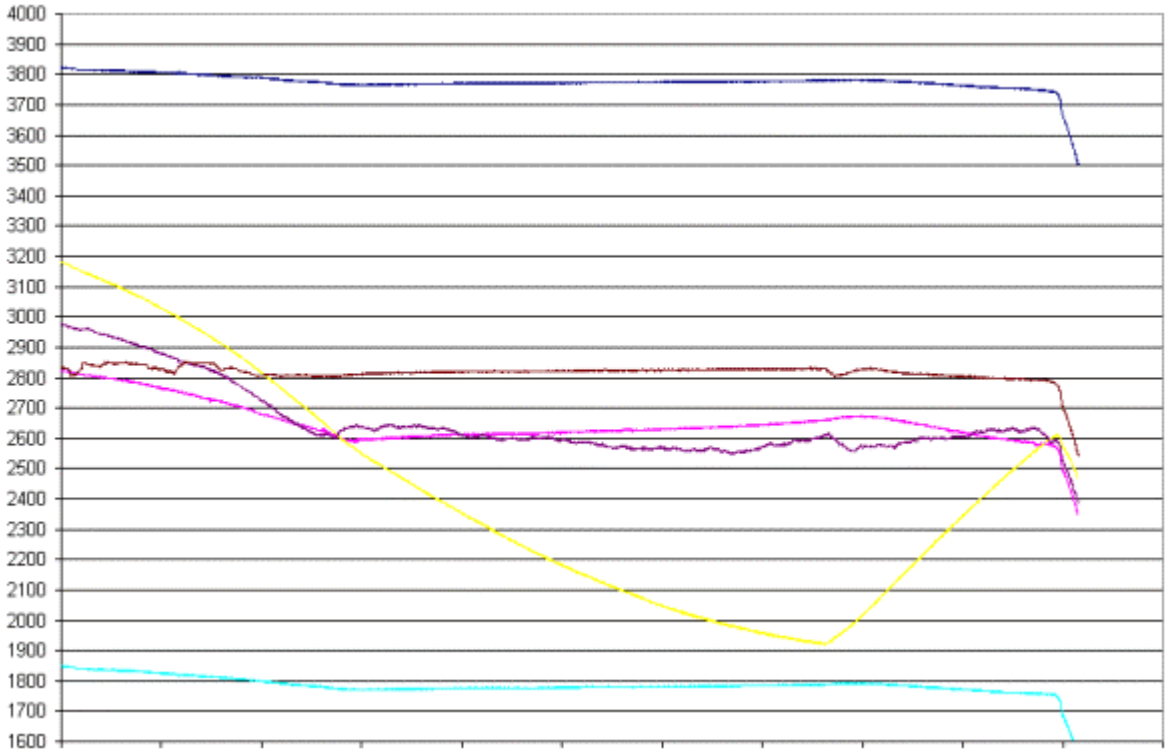


(continued on next page)
(weather balloon telemetry continued)

How does one decode the RS80 PTU data?

This can be done professionally with the Vaisala DSP supported Digicora III Model NW-21 and a PC down stream for data processing. This is a rather expensive solution. Or, one can acquire a separate decoder system for connection to a Wideband FM frequency receiver with RS 232 output to a PC for signal processing.

Post decoding, the 6 raw values in Excel look like the following:



The X-axis is timing over a 5 minute range. In the center of the diagram, from the top above downward are the transmitted numeric values from the sensors during a typical flight: HiRef, humidity, IntTemp, ExtTemp, barometric pressure, and LoRef. By comparing these numeric values to fixed standards, the appropriate weather related values of temperature in degrees, relative humidity in percent, and barometric pressure in millibars or inches of mercury can then be determined.

********** **2004 / 2005 Winter Seminar Series Returns** **********

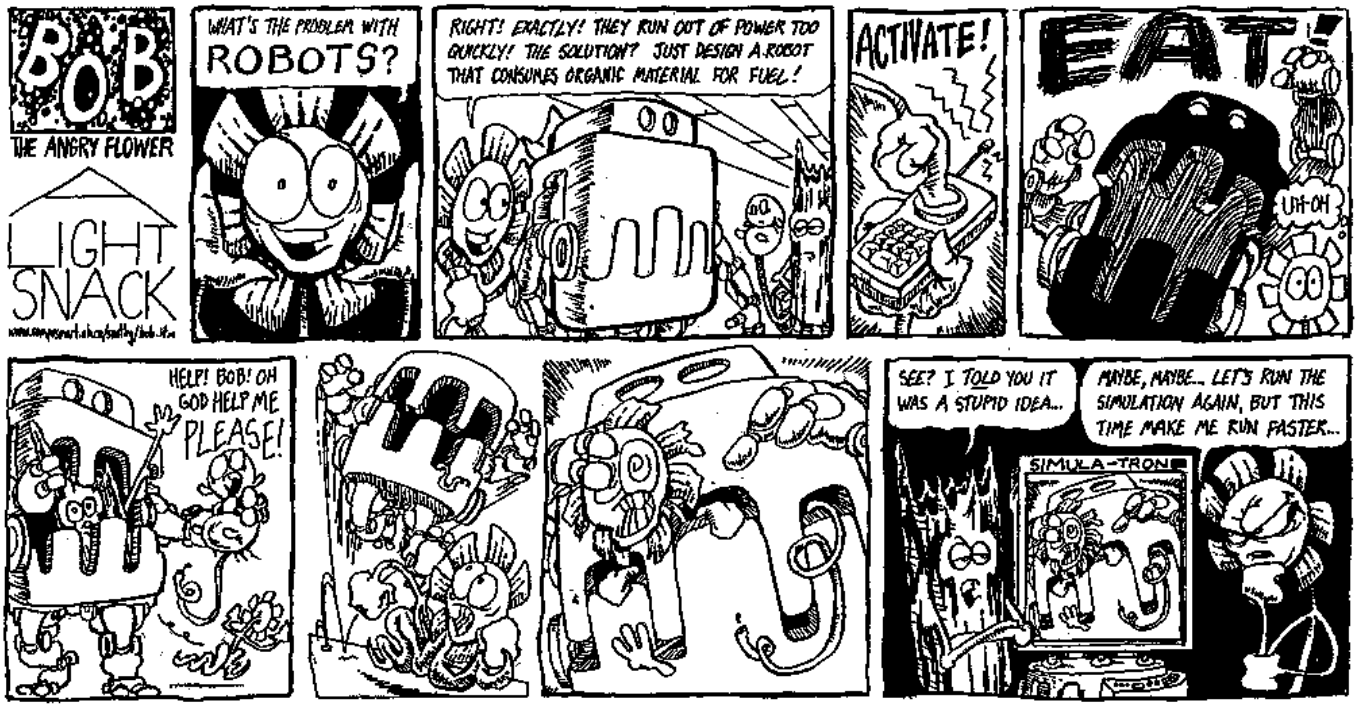
After the success of last years build class, BEMRC will be hosting another Winter Seminar Series this year. BEMRC has been hosting winter classes annually since the 80's, and we're continuing the tradition. The classes kick off on the second Saturday of November at the Kent Recreation complex (7-226 building, at 22649 – 84th Ave S.), starting at 10:00 am. in Meeting Room "C". Examples of the kits to be built in the classes will be shown with an overview of our hobby, the NAR and TRA safety codes and general news and information.

This years series of classes runs from November 2004 to March 2005. Here's the schedule and the types of kits to be built.

November 13th, 2004 Kick-Off
December 11th - First Build Session - Estes Gnome
January 8th, 2005 - Second Build Session - Custom Rocket Company Grab Bag
February 12th - Third Build Session - Multi Stager
March 12th - Edmonds Boost Glider

The classes are open to all past and present Boeing employees, their families, and to the general public. Cost to Boeing employees is $10, which includes 2005 membership dues with BEMRC. The class cost to the general public is $40, which covers the cost of class materials. Class materials include the kits, plus motors, ignitors, and recovery wadding. Weather permitting, BEMRC will host launches after each class at our launch site at the south east corner of the Kent Space Center.

To sign up for the classes, attend the Kick-Off in November, or contact any BEMRC BoD Member. Class size is limited to 12 builders and sign ups are on a first come basis. Precedence will be given to Boeing employees with any remaining openings available to the general public. Door prizes will be handed out during each class session.



********** **Micro Maxx Boost Glider** **********

Ed. Note – Bob Turner sent this to me the other day and just seemed to cool to pass up. The pod tube is easily cloned using LOC Precision ¼ launch lug, and the launch lugs can be made from the ink tube innards from a ball point pen. The nosecone is easily producible from a block of balsa.