

“How Do You Make a Weather Satellite” Guide for the Classroom

By Ed Koenig

Note: This guide was prepared by the engineer who originally wrote the booklet “How Do You Make a Weather Satellite.” From his experiences presenting the material to students and other groups, he developed these notes.

When I wrote the original version of “How Do You Make a Weather Satellite,” I was the System Engineer at ITT Aerospace for the Imager and Sounder instruments on the GOES (Geostationary Operational Environmental Satellites). I developed the booklet in 1988 to help bring some information to young people, who were usually not familiar with weather sensing systems. But I soon found that adults were equally interested. I presented the material to about twenty school classrooms and other audiences. From my experiences, I put together the following notes to help teachers or others present the material to their classes or groups.

PURPOSE OF LESSON:

1. To make students aware of the connection of scientific instruments to weather studies.
2. To teach some concepts basic to satellite and instrument operation.
3. To raise students’ interest in science and encourage them to consider science as a career.

PREPARATION:

The material is suitable for presentation to age groups from 8 to 18. At the lower level, it is a matter of presenting a few basic ideas in an enjoyable way. For the older students it can become a lead into more detailed studies of any portion of the weather instrument field.

I found that the presentation becomes special if the presenter can appear special. I have a NASA t-shirt and a gilded NASA cap. This outfit gets their attention, and when I start pulling things out of my carrying case they are really ready.

I also brought a set of Earth images and images of the pages from the booklet to go along with the presentation. PowerPoint is a convenient medium, if a computer and projector are available.

I contacted the teacher ahead of time, and, after setting up the time and place and number of students, I asked him/her to have some material ready.

- PowerPoint projection system, if available
- Globe
- Six-foot ladder
- Pan of ice and a pan of hot water
- Space on a blackboard to make some images

I came with a golf ball, a balloon, posters from NASA/NOAA relating to weather and the satellites, and copies of the booklet for each student. I also tried to get enough copies of postcard images from the satellites or other material for each student.

It would be good to have placards on strings indicating each function that can be put over the heads of the students during the “role-playing” part of the presentation.

I found that there was generally not enough time to bring many pictures or other items for passing around or to have on show.

PRESENTATION:

After some experience, I found that I needed about 45 minutes to make the presentation without rushing. I found that over 30 students became a burden in reaching everyone, and that students below 4th grade had difficulty keeping interest.

To get things started I have a question-answer period, assuring them that there are no stupid questions. It is important to keep the topic to weather satellites and keep the students enthusiastic. If I didn't know the answer it was a good time to direct them to looking at some of the NASA/NOAA material and telling them the material on weather satellites should have many of the answers or the teacher may make it a topic for future study.

I then show the imagery of Earth from the weather satellite and talk of the preparation of the launch vehicle and satellite, but don't spend much time on details.

I found that the best method of presentation was to have the children totally involved. There are many eager volunteers, so we start off with selecting a weather forecaster and ask the class for suggestions on what information the forecaster needs and the problems involved.

The next person is a golfer. I follow the book and talk about having him/her hit it farther and farther, leading to hitting it into orbit. I use the golf ball as the satellite and the globe to illustrate orbiting. We then discuss getting it into orbit, and why it needs to be so high. I use the golf ball and balloon to demonstrate how air affects flight and the need to be high above the atmosphere to stay in orbit. To do this, I have the golfer consider climbing a ladder to above the clouds and the atmosphere so his/her ball can go all the way around the Earth. (I don't let him/her actually climb the ladder).

Next, I start picking people from the audience. I use one as the sensor and one as the picture-maker. After showing the sensor person how to scan his/her hand back and forth across the ice and heat and say BRR-WOW, I make a three-line dotted pattern and have the person at the blackboard follow the scan and make small and large wiggles for the cold and warm spots. Making more than one scan will generate a crude picture that can be related to passing over the North Pole and a desert.

As I talk about the sensor, I ask about ways to make pictures from space and show the way it is done. I then get different people to be a telescope, mirror, battery, solar panel, transmitter and receiver as we talk about the material on the screen. When we are ready, we start the satellite and everybody acts their part. With the scan mirror moving, the sensor passes across the table and the ground person makes the path on the blackboard. We talk about how the image shows cold and hot regions, just like the satellite image. I also talk about the need for the whole system to work together.

After the students return to their seats, we talk about what we learned, and I make my push for them to realize that it takes individuals like them to develop such a system and to make use of the information.

Depending on the time, we may continue the question-answer session before passing out the books and other material.

I leave copies of the posters, calendars and other prepared material with the teacher and emphasize that there are many resources available for further study.

E. K. 3/23/05