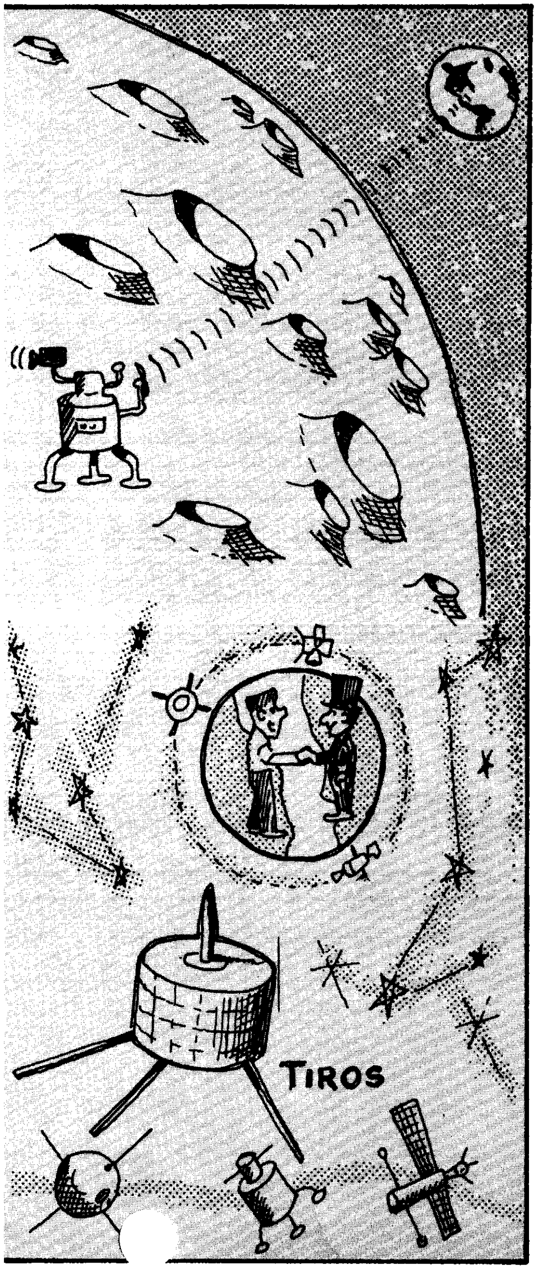
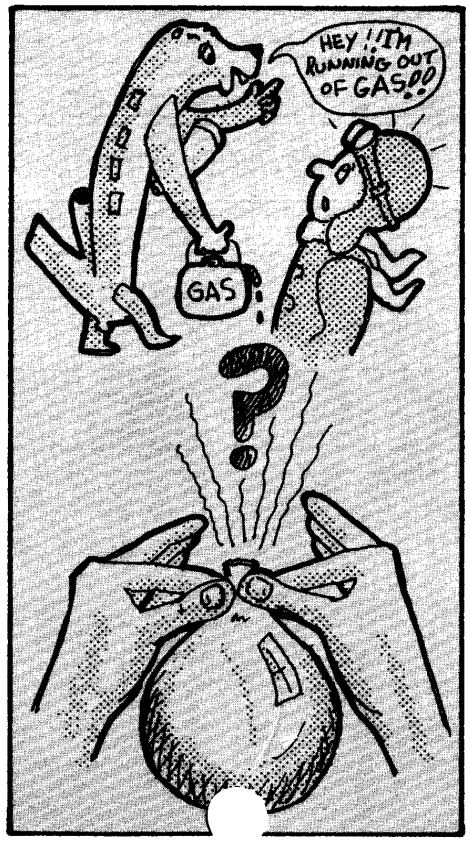
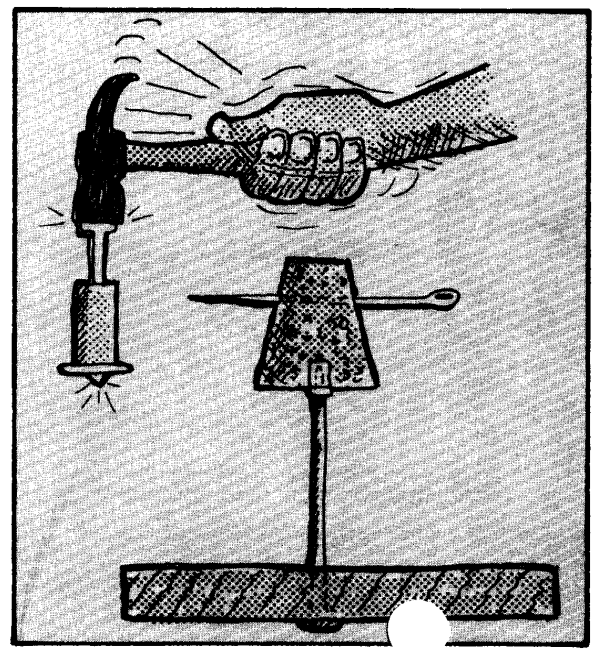


DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION



AVIATION EDUCATION



TEACHER'S INFORMATION

Demonstration Aids for Aviation Education-Volume 11 is a series of simple, concrete Development for the Federal Aviation Administration specifically for upper elementary grades. These activities can be adapted to meet the needs of varied teaching situations and different grade levels.

These materials are primarily designed as pupil directed experiences. In some instances the teacher may want to further extend the investigations. This series is intended to be a springboard for your own ideas to demonstrate concepts of the Air Age to your students. Young children can learn scientific principles through simple learning activities; older students can benefit from a review using the same activities.

The purpose of this series is to illustrate certain principles related to various concepts of aviation and space. More important, it is an opportunity for you to directly involve students in investigations and in making discoveries on their own.

You needn't be an "expert" in science to use this material. In fact, you shouldn't be expected to have al I the correct answers to the questions presented in the material. Moreover, many of the activities are designed to include interdisciplinary skills and need not be used in sequence.

Each packet in the series forms a coherent program of instruction on a single topic: Non-powered Flight, Aerospace and the Environment, Space Exploration and Communications. Most of the tasks are introduced as a question. In order to answer the question, the students may want to first predict the solution. Then have them follow the activity instructions to arrive at an answer. This kind of student involvement may lead to other related questions generated by the teacher, other students, or suggested on the cards themselves.

Most of the activities utilize materials readily available from any given community and can be completed in the classroom. Others may require that you borrow some equipment from your science resource center or from a junior or senior high school in your district.

Please let us know your reactions to the materials and feel free to ask for more information related to aviation or space. We wish you success and many enjoyable experiences as you use these packets.

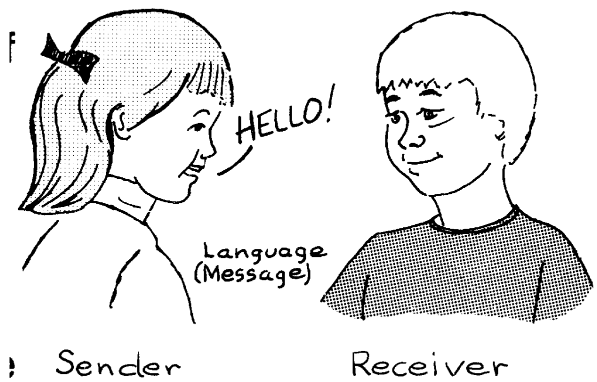
Written by Ms Debbie Williams and Ms Carol Hickson
Editorial Assistance by Mrs. Patricia Smithson
Illustrated by Mr. Harley A. Samford

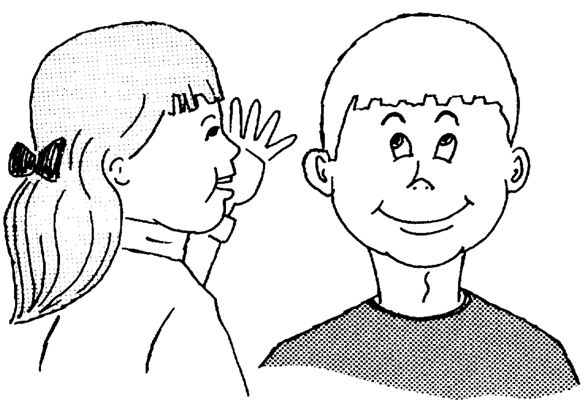
WHAT IS COMMUNICATION?

AC-1

Communication is sharing information. People communicate. Animals communicate. Even machines communicate. Communications consists -of three elements: A sender, a receiver, and a language.When a message goes to a receiver, symbols are being transmitted, not ideas.

When the symbols mean the same to the sender and the receiver, communication takes place**.**

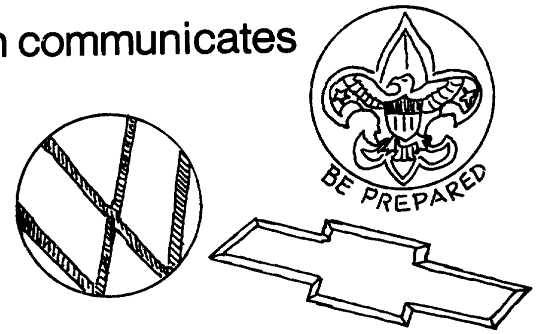




TRY THIS GOSSIP GAME: Have one person start a short phrase to be whispered from person to person. Have the last person receiving the message repeat it aloud. Compare the message with thew original phrase. Did communication take place? Did everyone communicate?

HOW DO WE COMMUNICATE?

Information is a message which communicates knowledge to us. All information is transmitted as symbols such as written words, pictures, dots & dashes, or sounds.



The sets of symbols used to send information is called a code. We receive hundreds of coded messages every day. A special form of code is called a cipher. A cipher involves replacing letters in a message with other letters and is the form of coding most often used in intelligence work. For example:

A=Z	K=P	U=F
B=Y	L=O	V=E
C=X	M=N	W=D
D=W	N=M	X=C
E=V	O=L	Y=B
F=U	P=K	Z=A
G=T	Q=J	
H=S	R=I	
I=R	S=H	
J=Q	T=G	

Decode the following message:
XRKSVI Z HVXIVG
NVHHZTV ULI Z
HKVXRZO UIRVMW.

SOUND OFF!

When things vibrate
they make sound waves.

MATERIALS:
Pocket comb
Cellophane or
Kitchen plastic wrap

Put the cellophane or kitchen wrap around a clean pocket comb. Place the comb between your lips. Blow on the comb like a harmonica. What happens?

Now, blow and hum, like on a kazoo. What happens?

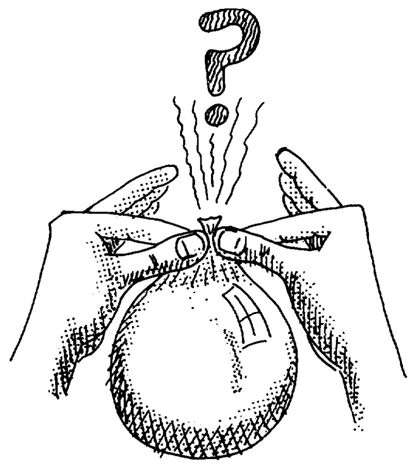
Can you play a tune on your musical comb

Why does the sound tickle your lips?

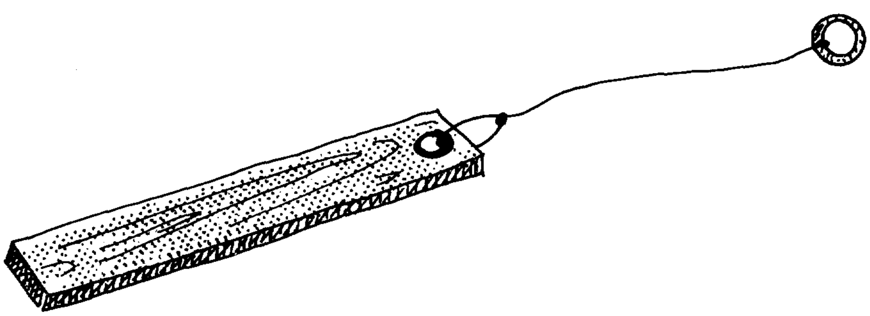
LET'S HEAR IT FOR PITCH!

Sounds differ in many ways. The high or low of a sound is called pitch. The faster things vibrate, the higher the sound, the slower things vibrate, the lower the sound.

Try blowing up a balloon and letting the air out slowly by stretching the opening of the balloon. What happens? How can you change the sound as the air leaves the balloon?



Use this same idea to make a singing stick. You might use a ruler, paint stirrer, or thin piece of wood. Make a hole in one end and tie a piece of string to the stick. Make sure there is space around you and swing the stick overhead in a circle.



What happens when you swing the stick harder? Why?

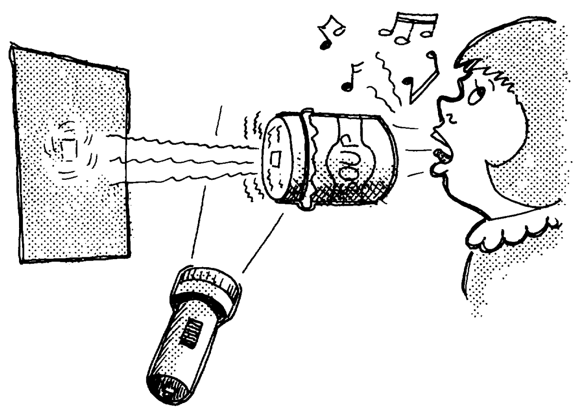
Can you think of other ways to produce different sounds? Can you think of ways to reduce sound in our environment?

VISIBLE VIBRATIONS

MATERIALS:
Empty tin can
Cardboard
Lamp or flashlight
Balloon – Glue
Rubber band
Small piece of mirror

Use a can opener and remove both ends from a clean tin can. Cut the neck off a balloon and stretch the remaining part tightly over one end of the can and hold it in place with a rubber band. Glue the piece of mirror onto the stretched balloon about a third of the way in from the edge of the can -

Shine the light source on the mirror at an angle, and place the cardboard so that it catches the reflection as a spot of light. What happens if you sing or shout into the open end of the tin can. Can you see sound? Can you cause the vibrations to speedup or slow down?



You can see that sound is made of vibrations. As your voice travels through the air, the vibrations are passed along air particles to the stretched balloon, causing the mirror to wiggle.

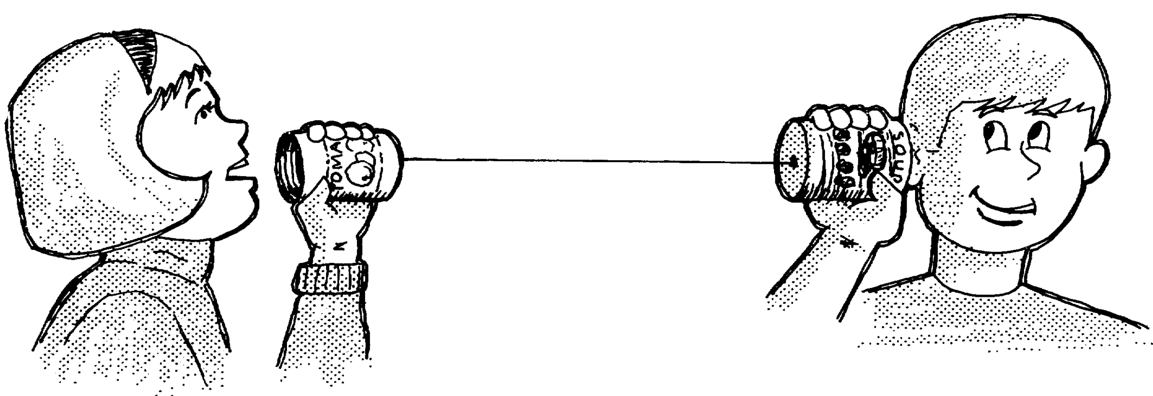
The diaphragm in a telephone receiver changes the sound of your voice into electrical signals just as the stretched balloon and mirror change sound into moving light.

Make a simple communications system with the following materials:

MATERIALS:
2 cans (juice, coke, soup, etc.)

16′ piece string or wire

Cut one end out of the can, punch a small hole in the middle of the other end of the can. Push the string through the holes and knot to secure.



Stretch the string out its full distance, talk into the open end of the can, and listen at the open end of the can. What are the five elements of communication in this system?

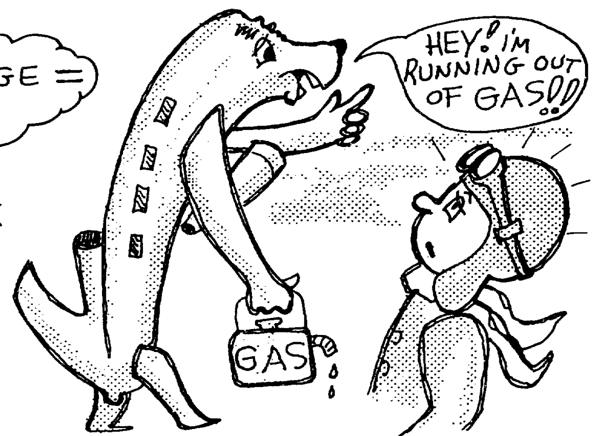
1. Source________°
2. Transmitter________°
3. Channel________°
4. Receiver________°
5. Destination________°

voice, can, string, can, ear

HOW DO AIRPLANES COMMUNICATE WITH THE PILOT?

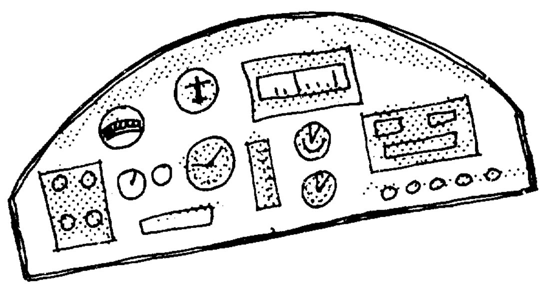
AC-7

SENDER + RECEIVER + LANGUAGE = COMMUNICATION



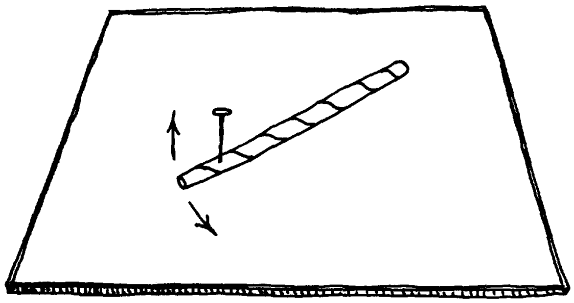
It may seem strange to think of an airplane communicating with a pilot. But remember, for communication you only need three things—A sender (the airplane), a receiver (the pilot) and a language (the aircraft's instruments).

Pilots use instruments to tell him important things about airplanes.



They tell if the plane is climbing, the speed, altitude, direction, etc. Airplane instruments are displayed on a panel and most of them measure by a push or a pull. The force may be very small and must be large enough to be seen. This is done with a lever called linkage.

MATERIALS:
Soda Straw
Straight Pin
Cardboard
Ruler



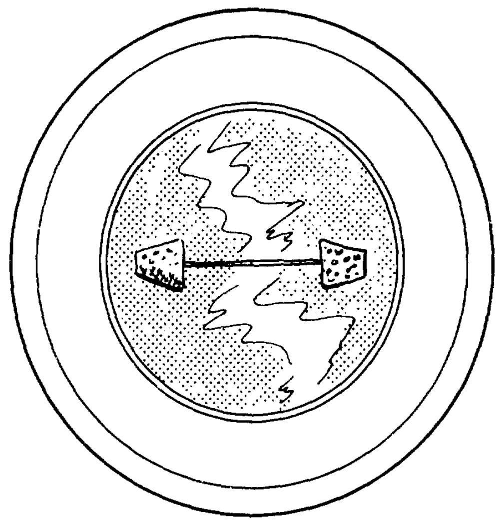
Put the pin through the straw 1 inch from one end.
Insert the pin in the cardboard.
Mark the position of both ends.Move the short end a distance of one inch.
Measure how far the long end moved.

WHERE AM I GOING? AC-8

Navigation is very important to a pilot. During a f light a pilot can use landmarks on his map and locate them on the ground as he sees them. At night or when it is cloudy, the pilot must rely on his compass at all times.

Let's make a simple compass.

MATERIALS:
- Magnet
- Sewing needle
- 2 small corks
- Glass container
- Water



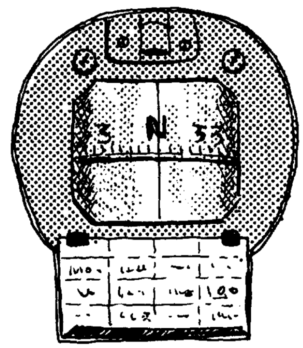
Since a compass is a magnet mounted on a pivot, you will first need to magnetize the needle. This is done by stroking the needle from the center outward in the same direction several times. Then reverse the magnet and the needle and stroke again from the center outward.

*Be sure the container is away from any metal! The needle will line up with the North and South magnetic poles.

FOLLOW THAT COURSE

AC-9

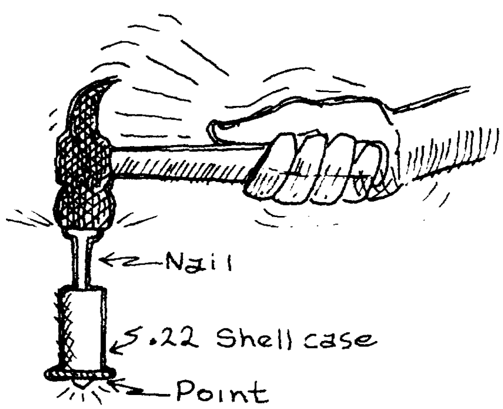
An airplane compass is more complex than the floating compass. To make a compass that can move freely, follow these directions.

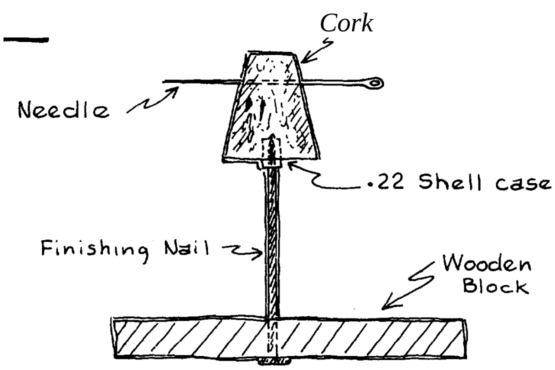


Airplane Compass

MATERIALS:
- Wooden block
- Finishing nail
- Hammer
- Cork
- .22 shell case
- Needle (magnetized)

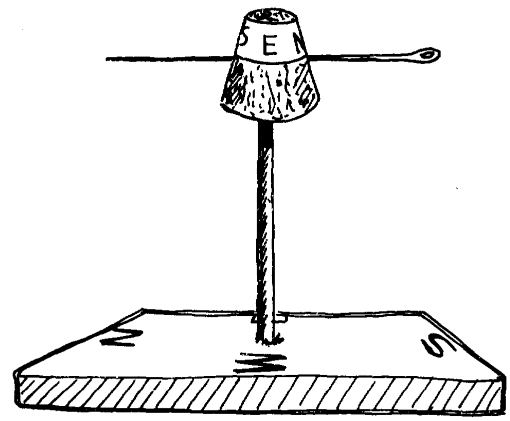
Hammer a point in the end of the shell case with a nail. Then drive the nail through the center of the wooden block.





Put the magnetized needle through the cork. Wrap a band of paper around the top of the cork.

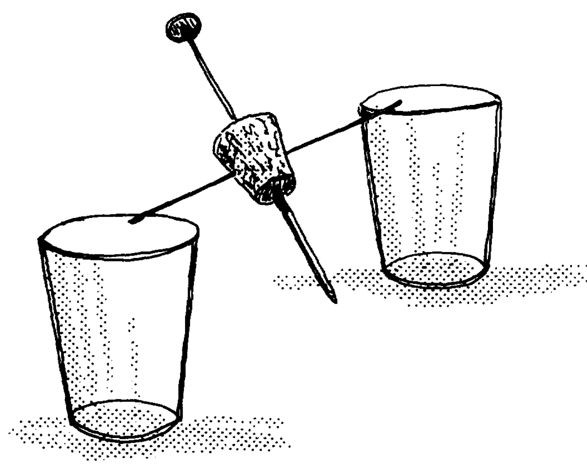
When the needle is balanced, parallel to the board, it will align with the North and South magnetic poles. Mark the major compass points, (N, S, E, W) on the paper band. As you move around your compass, the direction you are facing will be on the band. The compass always points north. As you move around it, you change your direction, just as an airplane changes its direction around the compass.



WHICH WAY? AC-10

A pilot or navigator uses special instruments to help him find and maintain his position in relation to the magnetic poles. You can make a compass and use it to do the same thing.

You can make another simple instrument to help you determine the direction of the magnetic lines of force for any place on Earth. It is called a Dipping Needle.

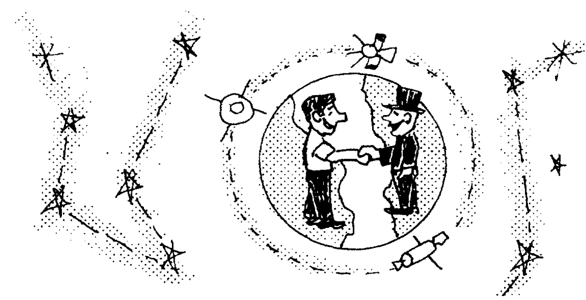


MATERIALS:
Steel knitting needle or wire
2 sewing needles (unmagnetized)
2 water glasses
A cork

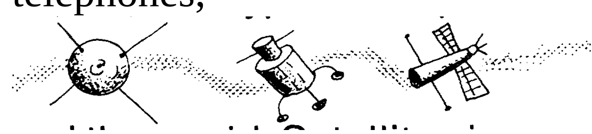
Magnetize the knitting needle by stroking it 20-30 times with a strong magnet. Run the knitting needle through the center of the cork. Press the unmagnetized sewing needles into the sides of the cork. Place the glasses in an east-west position. Balance the sewing needles on the rims of the glasses so that the magnetic knitting needle is in a north-south direction. The magnet should dip in line with the lines of force of Earth’s magnetic field.

Try moving various objects near your Dipping Needle and see how the needle reacts.

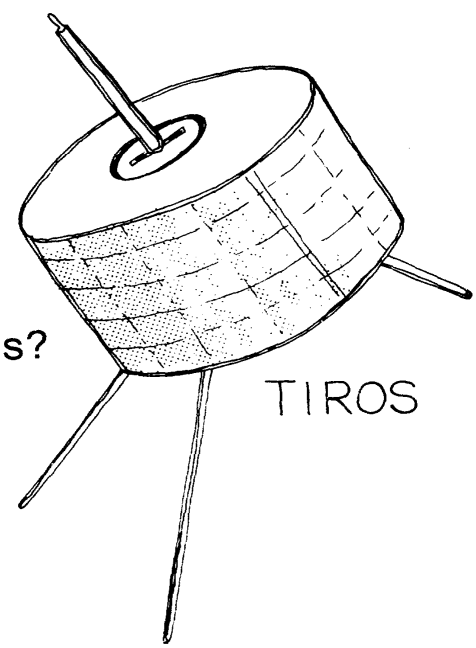
IS OUR WORLD SHRINKING? AC-11



We seem closer to other parts of our world because today we have instant information. We live in a world full of information machines. Radio, TV, teletypes, telephones, and satellites speed messages around the world. Satellites in space communicate with man on earth by electronic means. Weather satellites take pictures which are scanned



by a beam of light and changed into a radio signal. The radio signal is then sent to Earth and converted back into a picture.

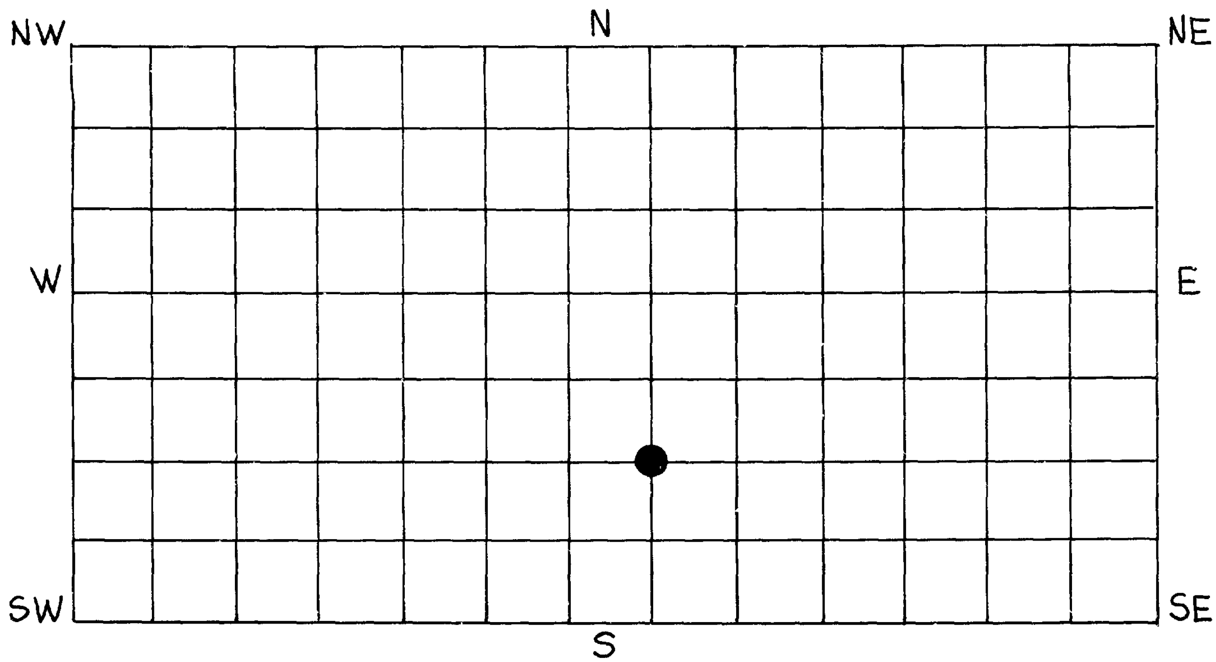


Can you draw a picture with signals?

MATERIALS:
Pencil, Graph paper

Can you draw a picture with signals

Find your starting point 5 squares down and 7 squares from the left.



Move your pencil in the direction and the number of squares indicated.

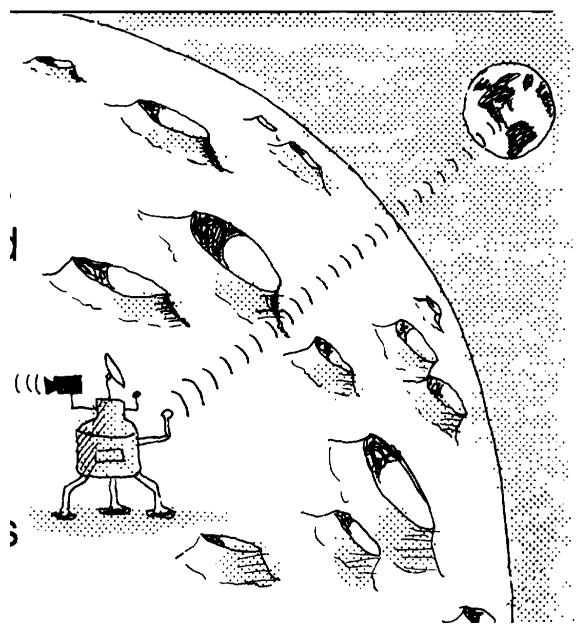
3 W, l NW, 2E, 3N, 2SE,

2 W, l S, 3 E, l SW.

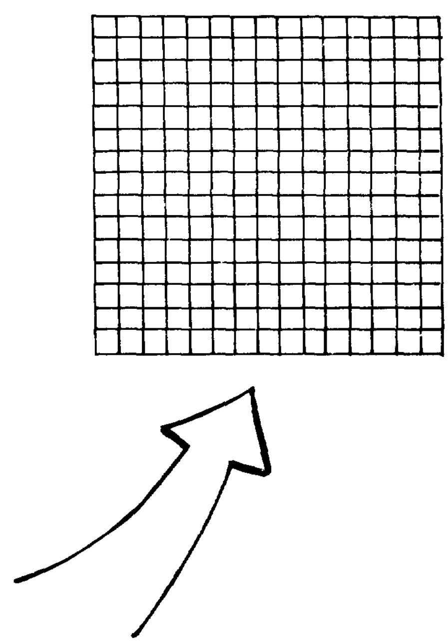
Make up your own picture. Call the signals to a friend.

GET THE MESSAGE? AC-12

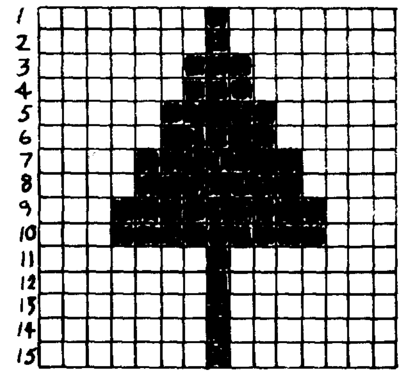
When a spacecraft takes a picture in space, that picture is changed into a radio signal and sent back to Earth. Here on . Earth the signals are changed back into a picture. Let’s try doing this using one student as the satellite, another student as’ the receiving station on Earth and a two number code as the radio signal.



MATERIALS:
2 sheets of graph paper, 2 pencils.



Each picture will be drawn on a block of graph paper 15 squares by 15 squares. Mark off15 x 15 squares on both pieces of graph paper.



The student who is the satellite should draw a picture on his/her piece of graph paper by filling in some of the squares. The satellite scans the picture beginning in the first square (left) in row #1 and proceeding square by square across the row to the last square in row #1 - The scan then moves to the first square (left) in row #2 and scans across that row, etc. As each row is scanned, if the square is empty the satellite says "Zero". If the square is f i I led i n, the satellite says "one". The ground receiving station follows the scan on his/her piece of graph paper and every time he hears the word it one" he f i I Is in that square. At the end of row 15 compare the two pictures. Did you communicate?

Try this picture

ROW	CODE														
1	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0
2	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0
3	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0
4	0	0	0	0	0	1	0	0	1	1	1	0	0	0	0
5	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0
6	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0
7	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0
8	0	0	0	0	0	0	0	0	1	1	1	0	0	1	0
9	0	0	0	0	0	0	0	0	1	1	1	0	0	1	0
10	0	0	0	0	0	0	0	0	1	1	1	0	0	1	0
11	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0
12	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0
13	0	0	0	0	0	0	0	1	1	0	1	1	0	0	0
14	0	0	0	0	0	0	1	1	0	0	0	1	1	0	0
15	0	0	0	0	0	1	1	0	0	0	0	0	1	1	0

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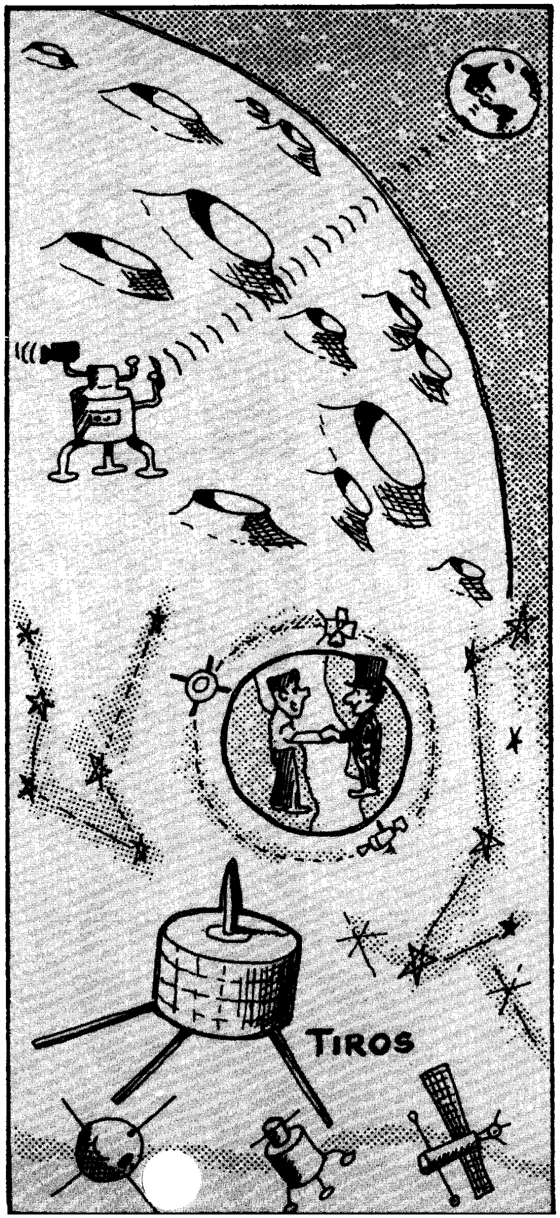

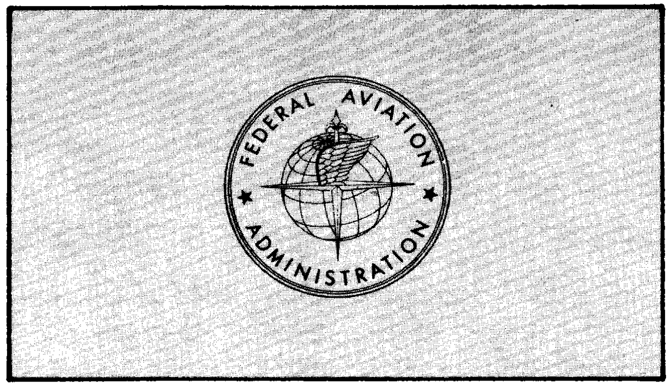

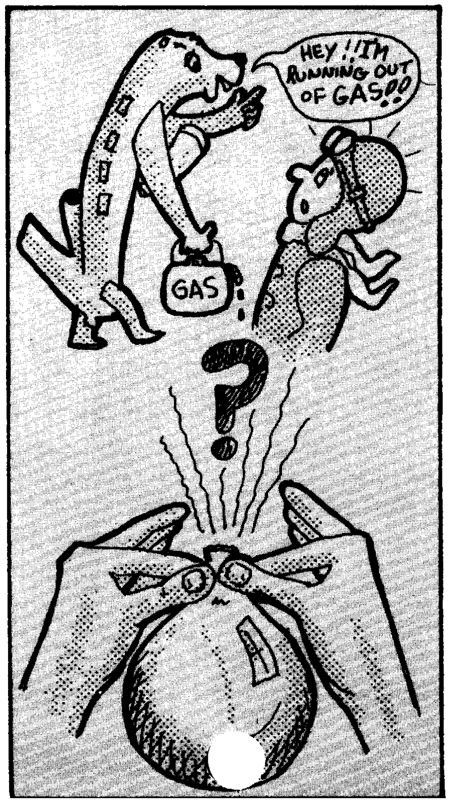

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