

# SPACE-ABOVE and BEYOND



THIS IS A COLLECTION OF SAMPLE  
WORKSHEETS FOR THE YOUNGER STUDENTS.

SPACE EDUCATION CAN BE FILLED WITH  
EXCITEMENT AS EACH YEAR MANKIND  
"REACHES FOR THE STARS"

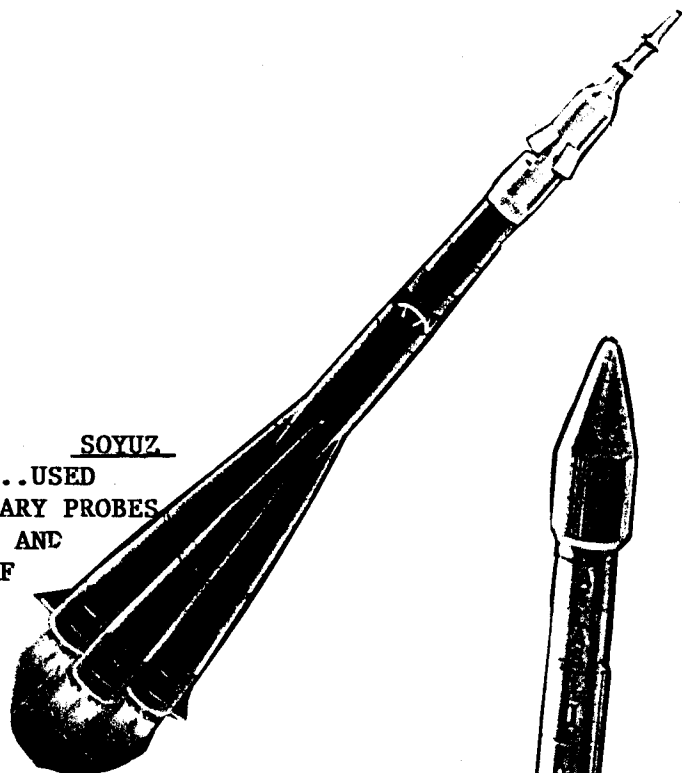
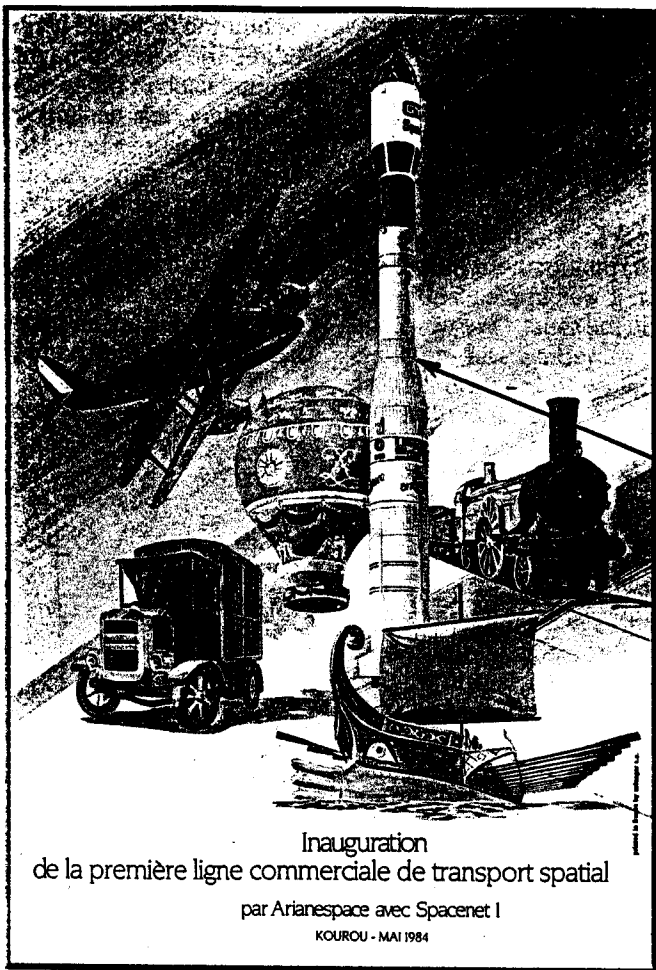
SPACE LAUNCH VEHICLES

ROCKETS USED TO CARRY PAYLOADS INTO SPACE ARE CALLED LAUNCH VEHICLES.

THERE ARE MANY SIZES AND DESIGNS TO MEET THE REQUIREMENTS OF THEIR PAYLOADS WHICH ARE MOST OFTEN SATELLITES BEING CARRIED INTO ORBIT.

HERE ARE SOME EXAMPLES:

ARIANE V12....USED FOR MANY TYPES OF SATELLITES .....EUROPA (FRANCE)



SOYUZ

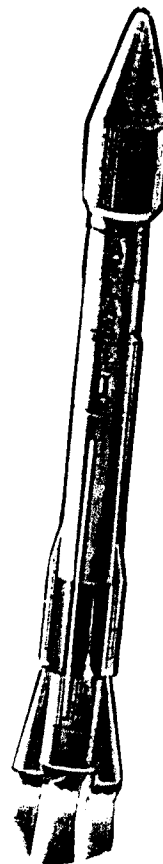
RUSSIA....USED LAUNCH INTERPLANETARY PROBES, MANNED SPACECRAFT, AND MANY OTHER TYPES OF HEAVY PAYLOADS



M-3S11...JAPAN USED FOR SCIENTIFIC SATELLITES AND INTER-PLANETARY PROBES



ISRAEL...SHAVIT... USED FOR SMALL SATELLITES SUCH AS COMMUNICATIONS AND SCIENTIFIC RESEARCH



ATLAS

UNITED STATES... COMMUNICATIONS AND OTHER SATELLITES

# WHY DO ROCKETS FLY?

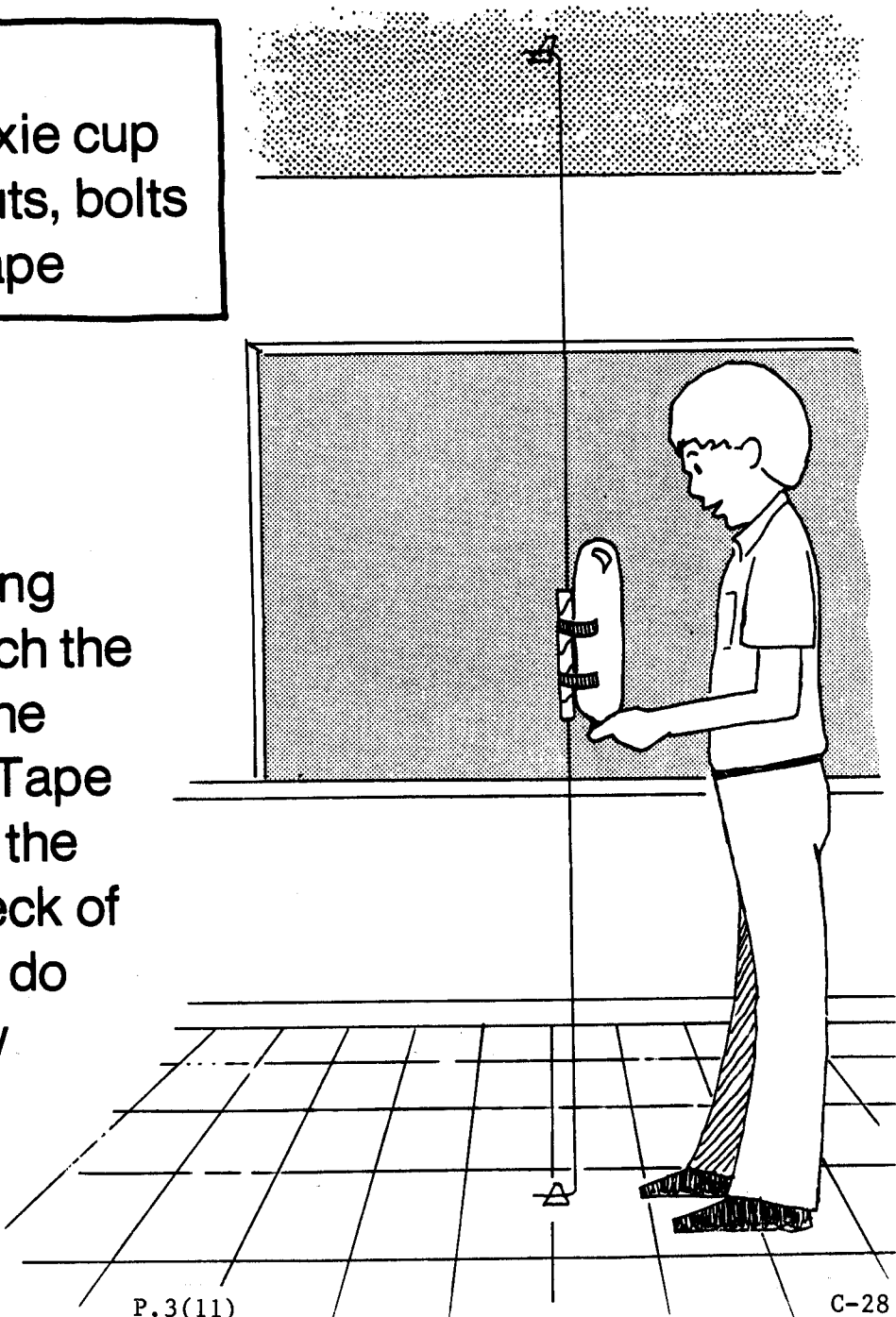
The amount of push that a rocket has is called thrust. The push of a balloon can be measured when the balloon is traveling on a string from floor to ceiling. Nuts, bolts, or washers can be used to measure the push of the balloon.

## MATERIALS:

Balloon	Dixie cup
Straw	Nuts, bolts
String	Tape

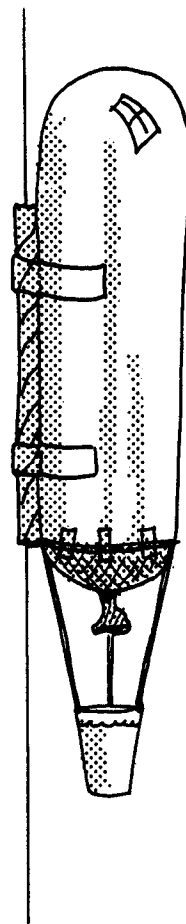
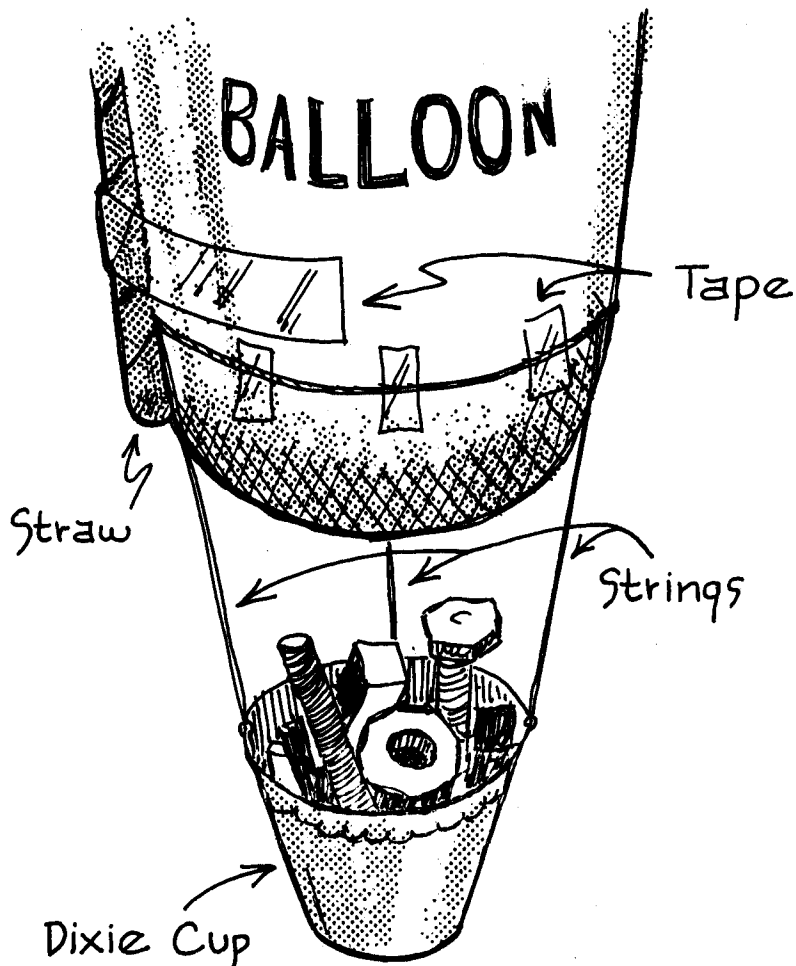
## Experiment 1:

Thread a piece of string through a straw. Attach the ends of the string to the ceiling and the floor. Tape an inflated balloon to the straw. Release the neck of the balloon. How fast do the balloon and straw travel up the string?



**Experiment 2:**

Attach 3 strings to a Dixie cup. Tape the strings to the inflated balloon so that the cup is suspended like a gondola beneath it. Release the neck of the balloon. How fast did the balloon, cup and straw travel up the string?

**Experiment 3:**

Add some weights (nuts, bolts) to the cup and repeat the experiment. How fast did the balloon, cup and straw travel up the string?

How much weight can the balloon lift?



# MOON FACTS



- \* The Earth has one moon.
- \* The moon travels around the Earth.
- \* The moon is a satellite.
- \* The moon reflects the sun's light. It does not have its own light.
- \* The moon is always round. It does not change.
- \* The moon appears to change to us. The se are lunar phases or the lunar cycle.
- \* The lunar cycle last 29 1/2 days.
- \* The cycle includes the crescent, half, gibbous and full moon.
- \* It takes 27 days for the moon to travel around the Earth.
- \* The moon is about 238,856 miles away.
- \* Lunar gravity is too weak to hold an atmosphere.
- \* The daytime temperature can exceed the boiling point of water. The nighttime temperature drops to 200 degrees F below zero.
- \* No water or life exists on the moon.
- \* The moon's sirface is covered with rocks and dust, flat "seas"(maria), circular craters up to 160 mile across and 5-6 miles deep, mountains over 3 miles high and riverlike rilles.
- \* Neil Armstrong was the first American Astronaut to walk on the moon.
- \* Astronauts have to wear spacesuits while visiting the moon.

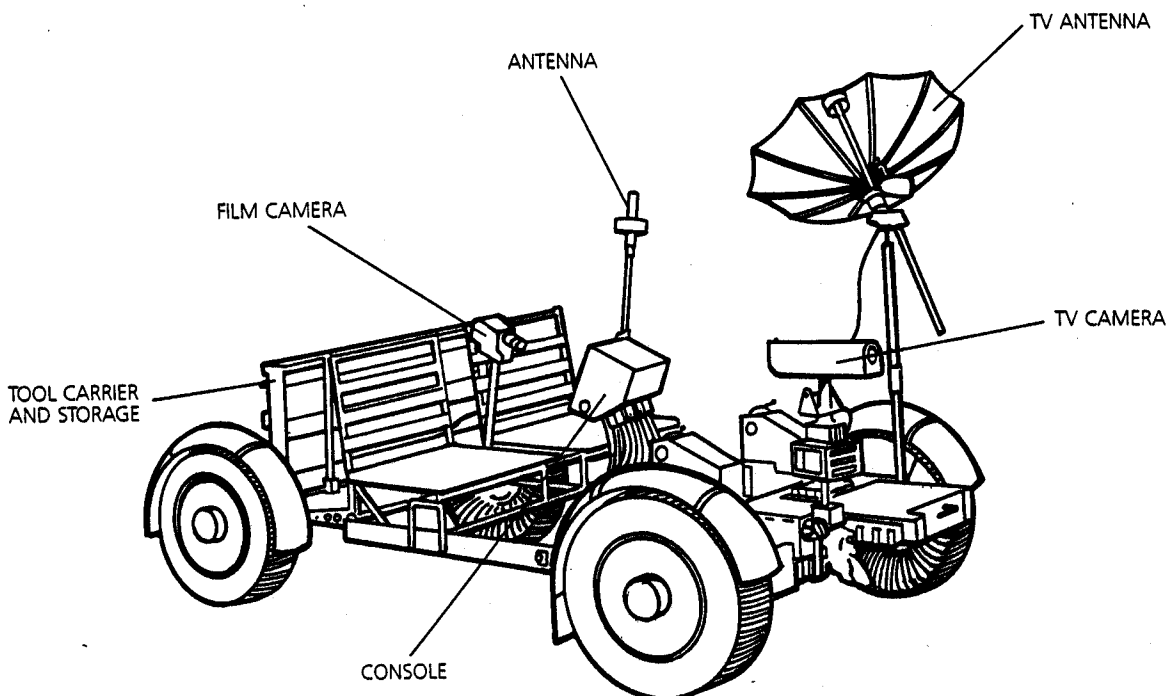


The Lunar Roving Vehicle, or Lunar Rover, was a space "buggy." The astronauts used it to explore their landing sites on the Moon. They gathered Moon rocks and soil, and traveled much farther than they could have on foot. During Apollo 17, the rover traveled 19.3 kilometers (12 miles) on one of its three trips.

The rover was neatly folded up inside the lunar lander during trips to the Moon, but once on the Moon's surface, it unfolded with the help of springs. The Apollo 15, 16, and 17 missions made use of the Lunar Rover.

Because the lunar surface is rugged, the buggy was designed to climb steep slopes, to go over rocks, and to move easily over the sand-like surface. It was able to carry more than twice its own weight in passengers, scientific instruments, and soil samples.

The Marshall Space Flight Center in Huntsville, Alabama, developed the Lunar Roving Vehicle.



# DOWN ON THE MOON

Your crew is lost on the moon. You have a survival kit with the items listed below. Your task is to rank those items in order of their importance in allowing your crew to locate and reach the rendezvous point with the moon base. Place the number "1" by the most important item, the number "2" by the second, and so on through number "15", the least important.

ITEM	YOUR RANK	GROUP RANK	NASA RANK	YOUR ERROR	GROUP ERROR
box of matches					
food concentrate					
15 meters nylon rope					
parachute					
portable heating unit					
.45 caliber pistol					
case dehydrated milk					
(2) 50 kg tanks of O <sub>2</sub>					
moon constellation map					
self-inflating life raft					
magnetic compass					
20 liters of H <sub>2</sub> O					
self-igniting signal flares					
first aid kit with hypodermic needles					
solar powered FM transceiver					
				<b>TOTAL ERROR</b>	

Calculate error points as the absolute difference between the NASA ranking and the individual or group ranking.

**SCORING:** 0 - 26 EXCELLENT

26 - 32 GOOD

33 - 45 AVERAGE

46 - 55 FAIR

56 - 112 STILL LOST ON MOON

## DOWN ON THE MOON RANKINGS

ITEM	NASA RANK	REASON
box of matches	15	no air on the moon so matches will not light
food concentrate	4	efficient means of supplying requirements
15 meters nylon rope	6	useful in scaling cliffs or in case of injury
parachute	8	possible use as a sun shield
portable heater unit	13	not needed unless on dark side
.45 caliber pistol	11	possible means of self propulsion
case of dehydrated milk	12	bulkier duplication of energy source
(2) 50 kg tanks of O <sub>2</sub>	1	the most pressing survival requirement
moon constellation map	3	primary means of navigation to the moon base
self-inflating life raft	9	CO <sub>2</sub> bottle in raft might be used as a propulsion source
magnetic compass	14	magnetic fields of moon are not polarized so compass is useless
20 liters of H <sub>2</sub> O	2	replacement of tremendous liquid loss on lighted side of moon
self-igniting signal flares	10	distress signal when moon base is sighted
first aid kit with hypodermic needles	7	needles for medicine and vitamins fit special suit aperture
solar powered FM transceiver	5	for communication with moon base in line of sight

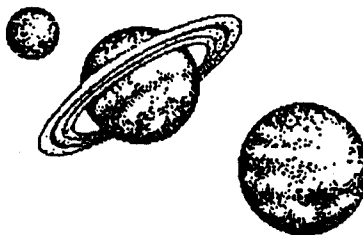




# SUN and STAR FACTS

- \*Stars are made of gases. Stars make heat and light from the gases.
- \*In space, there are huge groups of stars called galaxies.
- \*The Milky Way is our galaxy. It has about 1 trillion stars.
- \*Stars are round. They look star-shaped or pointed because from the Earth the light from the stars passes through layers of moving air causing the light to "twinkle."
- \*There are patterns of stars in the sky called constellations.
- \*Our sun is a star. It is the only star close enough for us to feel its heat.
- \*The temperature in the middle of the sun is about 27 million degrees F.
- \*The sun is 93 million miles from the Earth.
- \*Sometimes on the face of the sun there are dark patches called sunspots. These spots are cooler.
- \*The sun is so big that if it were hollow it would hold 1 million Earths.
- \*Without the sun's light and heat, nothing could survive.

# CLASSROOM ACTIVITY



## WHAT'S YOUR WEIGHT?

**SUBJECT:** Solar System

**TOPIC:** Gravitational Comparisons of the Planets

**DESCRIPTION:** Determining Your "Weight" on Other Planets

**OBJECTIVE:** Students will utilize and reinforce their mathematics skills by calculating their weight on other planets in our solar system.

**ACTIVITY:** Using the given data, calculate your "weight" on other planets in our solar system.

Example: Mars' gravity is 0.38 times that of the earth. If you weighed 50 lbs. on the earth, how much would you weigh on Mars?

Solution: 50 lbs. X 0.38 = 19 lbs.

<u>PLANETS</u>	<u>SURFACE GRAVITY</u>
Mercury	0.18
Venus	0.91
Earth	1.00
Moon	0.16
Mars	0.38
*Jupiter	2.34
*Saturn	0.93
*Uranus	0.85
*Neptune	1.14
Pluto	0.04

(\* at cloud tops)

### SUGGESTIONS:

- List the planets in order of least to greatest gravity.
- Redesign a bathroom scale to measure your weight on the other planets.
- Discuss other comparisons of the planets:

