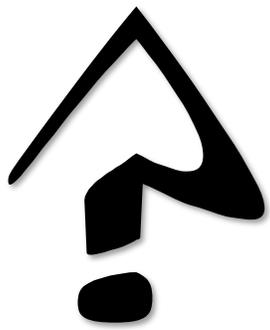




# Balloon Science ?

X-Rays

Dark Matter



Black Hole

Supernova

Astrophysics



Neutrinos

Galaxy

Dark Energy

Cosmic Rays



Payload

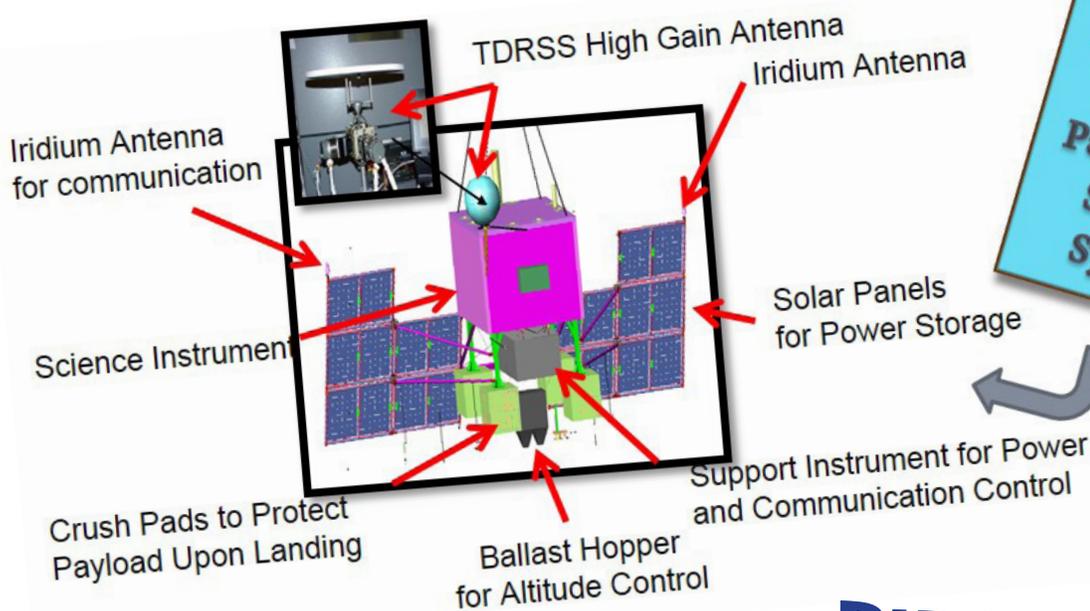
Spectrum

FIND THESE SCIENCE PAYLOAD ACRONYMS  
AND WEB SEARCH FOR THEIR ACTUAL TITLES!

AESOP  
ANITA  
ARCADE  
ATIC  
BEAST  
BLAST  
CREAM  
FIRST  
HASP  
HERO  
HYSICS  
NCT  
PIPER  
SPIDER  
SUNRISE  
TIGER  
TRACER  
WASP

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

SELECT THREE OF THESE PAYLOADS AND  
GO ONLINE TO FIND MORE ABOUT THEIR SCIENCE!



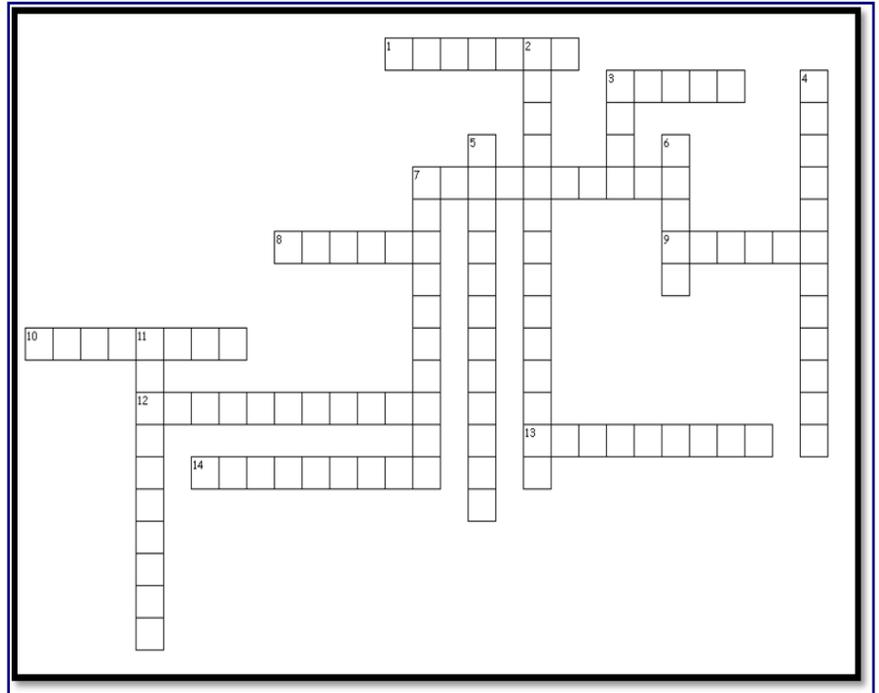
Anatomy of  
a Science  
Payload and  
Support  
Systems

## DID YOU KNOW?

- BALLOON PAYLOADS STUDY THE ORIGINS OF THE UNIVERSE, COSMIC RAYS, SUPERNOVA, BLACK HOLES, DARK MATTER, DARK ENERGY AND OTHER SPACE PHENOMENA. BALLOONS CAN ALSO SUPPORT IN-SITU (SITUATED IN THE ORIGINAL, NATURAL, OR EXISTING PLACE OR POSITION) MEASUREMENTS FOR EARTH AND PLANETARY SCIENCE.
- SINCE THE PAYLOADS ARE TYPICALLY HUNG UNDER THE BALLOON, THE SIZE AND DIMENSIONS ARE NOT TOO CONSTRAINED. THAT IS ONE OF THE ADVANTAGES OF UTILIZING BALLOONS FOR SCIENTIFIC INVESTIGATIONS.
- THE SCIENCE PAYLOAD CAN BE AS HEAVY AS 6000 LBS. (2700 KG).
- BALLOON SCIENCE IS CONDUCTED FROM DIFFERENT PLACES AROUND THE WORLD DEPENDING ON THE TYPE OF DATA TO BE COLLECTED AND THE TIME OF THE YEAR.
- LONG DURATION BALLOON MISSIONS ARE TYPICALLY ACCOMPLISHED FOR MISSIONS LAUNCHED FROM ANTARCTICA DURING THE ANTARCTIC SUMMER. THE SUPER TIGER MISSION LASTED FOR 55 DAYS DURING THE 2012/2013 ANTARCTICA BALLOON CAMPAIGN, A NEW RECORD.

## ACROSS

1. SCIENCE INSTRUMENT
3. WHAT A BALLOON DOES AT MAX ALTITUDE
7. A PERSON WHO STUDIES CELESTIAL BODIES
8. A GAS USED TO PROVIDE LIFT
9. WHAT HAPPENS AFTER LAUNCH
10. UPWARD FORCE THAT CAUSES THE BALLOON TO RISE
12. LOWEST LAYER OF THE ATMOSPHERE
13. STAR EXPLOSION
14. BRINGS BALLOON TO GROUND SAFELY

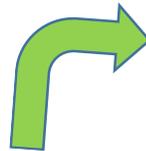


## DOWN

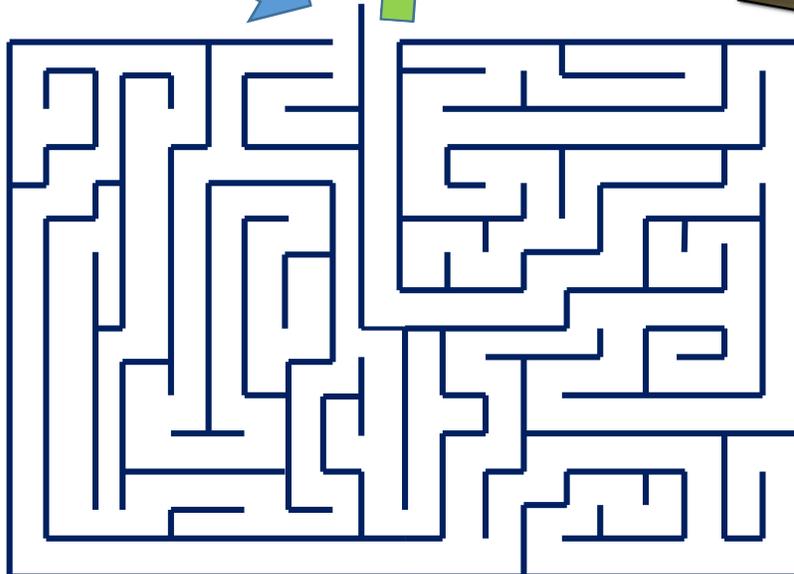
2. A PHYSICIST WHO STUDIES SPACE
3. THIN SHEET OF MATERIAL
4. BALLOON MATERIAL
5. LOCATED ABOVE THE TROPOPAUSE
6. ACRONYM FOR BALLOON INSTRUMENT
7. SURROUNDING THE EARTH
11. ONE OF THE BALLOON LAUNCH LOCATIONS

**FIND AND RECOVER WASP**

**START**



**WASP**





**AFTER A SUCCESSFUL MISSION, WE NEED TO RECOVER THESE PAYLOADS SO THEY CAN BE RE-FURBISHED AND RE-FLOWN. CAN YOU HELP FIND THEM?**

**CAN YOU FIND OUT WHAT THESE PAYLOAD ACRONYMS STAND FOR?**

## Q & A

### Q: WHAT IS A PAYLOAD?

A: A PAYLOAD IS THE SCIENCE INSTRUMENT THAT THE BALLOON LIFTS TO THE STRATOSPHERE. IT COULD BE A TELESCOPE, A PARTICLE DETECTOR, OR OTHER INSTRUMENT.

### Q: WHAT IS THE SUPPORT INSTRUMENT?

A: THE SUPPORT INSTRUMENT IS A CRITICAL PART FOR MISSION SUCCESS; IT HAS MULTIPLE FUNCTIONS. IT PROVIDES POWER TO THE SCIENCE PAYLOAD AND ALL VITAL SYSTEMS, STORES POWER FROM SOLAR PANELS, PROVIDES COMMUNICATION TO/FROM THE GROUND VIA SATELLITES OR LINE OF SIGHT, STORES DATA ON BOARD, AS WELL AS OTHER IMPORTANT FUNCTIONS. THE SUPPORT INSTRUMENT CAN WEIGH AS MUCH AS 2000 LBS. (900 KG).

### Q: WHAT IS A LINE OF SIGHT COMMUNICATION?

A: A LINE OF SIGHT IS A DIRECT COMMUNICATION LINK BETWEEN THE BALLOON SUPPORT INSTRUMENT AND THE GROUND. IT IS AVAILABLE WHEN THE BALLOON IS STILL ABOVE THE HORIZON.

### Q: HOW IS THE MISSION TERMINATED? WHAT HAPPENS TO THE PAYLOAD?

A: WHEN THE MISSION GOALS ARE ACCOMPLISHED, A COMMAND IS SENT FROM THE GROUND TO FIRE A SMALL EXPLOSIVE CALLED A SQUIB TO SEPARATE THE LINK BETWEEN THE PARACHUTE AND THE BALLOON BASE. AS THE PARACHUTE SEPARATES, IT RIPS THE BALLOON OPEN. A RECOVERY TEAM FOLLOWS THE PARACHUTE TO RECOVER THE SCIENCE PAYLOAD TO BE RE-FURBISHED AND RE-FLOWN. THE BALLOON IS ALSO RECOVERED AND RECYCLED.

**WANT TO KNOW MORE OR HAVE DIFFICULTY SOLVING ONE OF THESE PUZZLES? PLEASE VISIT US ON THE WEB AT [HTTP://SITES.WFF.NASA.GOV/CODE820](http://sites.wff.nasa.gov/code820) OR SCAN THE THE QR CODE TO THE RIGHT.**



Sea Level

FEET

150,000

140,000

130,000

120,000

110,000

100,000

90,000

80,000

70,000

60,000

50,000

40,000

30,000

20,000

10,000

