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THE WHITE HOUSE

Office of the Press Secretary

For Immediate Release January 24, 1992

REMARKS BY THE PRESIDENT
TO THE YOUNG ASTRONAUTS COUNCIL

Room 450
Old Executive Office Building

3:00 P.M. EST

THE PRESIDENT: Thank you all very much. Please be seated and thanks for that warm welcome. The Vice President and I are just delighted to be with you. And, of course, I might say I'm so proud of the leadership that the Vice President is giving in this all-out effort to support the space program, strengthen it, build on it. And this is a great day.

Let me say to Wendell Butler, the CEO of Young Astronauts, we appreciate all your good work. I am also so proud that Dick Truly is here -- Admiral Dick Truly, the first astronaut to serve as Administrator of NASA. All told, well, you've seen them, there are 23 veteran astronauts here today. And I'm told this is one of the largest gatherings of space explorers ever at the White House.

Our thoughts also are with seven other astronauts who right now are orbiting the Earth in a space shuttle mission. We're proud of all these men and women. They take risks, they do it with great courage and they do it with great determination and dedication.

I'm also glad to see so many boys and girls here, from kindergarten through 9th, in this Young Astronauts program. And as President, I've set a goal that involved you young people, and my goal is for young Americans like you who are in grade school right now to travel to Mars someday.

New travels in space will give us answers to some of the things that children wonder about -- I might add, many adults who contemplate our great universe wonder about these same things, too. The other day I heard what one five-year-old wonders about. One of my staff members asked his five-year-old kid if we should build new spaceships and send people to the Moon again. And the kid said, yes, of course, we should. His father said, well, why, why should we send them to the Moon? He said, "That's easy," the kid said. "It's to see if there's any Martians there." (Laughter.)

Well, we can chuckle about that, but the kid got it about right. As most of you young astronauts know, we've challenged America to go back to the Moon to stay, and then onward to Mars. And sending people back to the Moon for more experience in an environment different from ours is the first step on the journey to explore the gigantic rift valleys and mountains of Mars.

When we break through barriers of the unknown we not only help ourselves, we learn a lot more about ourselves. And when we reach our goal of sending men and women to Mars we can find out the answer to that little five-year-old's wondering about life on other planets. We can learn whether we can extract air and water from materials on Mars to sustain life. We can look for clues on Mars not only to teach us how the Earth developed, but also about the wellspring of life itself.

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And pushing foward into space already is helping us here and now. More and more the new jobs for people of your parents' generation are being provided by our space programs. Revenues from American commercial space programs alone grew by 14 percent in 1991, and this year they're projected to grow by 20 percent. The commercial space business has grown so far and so fast that it now takes in about as much as money as all the receipts at the movie theatres all over the United States. If this trend continues, the celestial stars will be getting more attention than the Hollywood stars -- (laughter) -- and that might be all right. (Laughter.)

America now exports $1 billion -- $1 billion a year in commercial space goods and services. Those exports alone translate into jobs for 20,000 Americans. Real progress is happening almost faster than we can imagine. Navigation satellites that helped guide our troops in Desert Storm just a year ago now help hikers and fishermen and surveyors and motorists find their way. Personal navigation receivers now help us manage our forests and wetlands, speed the shipment of goods on our own highways.

Ten years from now the older kids here will be finished with college; some of you may be even finished with graduate school. And when that day comes, when you're ready to start careers and families, I hope many of you will be prepared to become the movers and shakers in our space program. It's up to your parents and grandparents and the congressmen they elect to keep us on track for this promising future of space exploration in commercial space enterprises.

To stress how important this is, a few weeks from now I will formally direct the establishment of a new national space exploration office led by NASA and including scientific talent from our Defense and Energy Departments and other agencies as well. Space exploration should be and will be a national effort. And I should again state that Dan Quayle's leadership as Chairman of the National Space Council has been absolutely vital to the renewed focus and momentum of our space programs.

When I send my annual budget -- when I send it up to Congress next week, it is going to mark the third straight year that I've called for a real increase in spending on our civil space program. And this includes full funding for Space Station Freedom, $2.25 billion, an increase of 11 percent. Space Station is back on track and on schedule. Last year we had an honest debate with those in the Congress who wanted to kill Space Station. We won because the American people agree that Space Station Freedom is not only a very valuable scientific program but it is essential to our destiny as a pioneering nation -- a pioneering nation in space.

And I know many are concerned about the balance between science and exploration in our space program, and the budget that I will propose next week will not short-change science. Space science will remain; more than 23 percent of NASA's program will increase by 10 percent over the current year. But America's destiny must include manned exploration. So my budget increases funding for technologies we need to send man beyond Earth's orbit. And that includes propulsion technologies, life support technologies, two new missions to complete the mapping of the Moon. And finally the budget will include a dramatic expansion of two exciting new programs -- $250 million to triple funding for our new launch system to develop a new family of rockets for the 21st century, and $80 million for the National Aerospace Plane which may one day enable direct flights from Earth to orbit.

For you to fulfill your dream in space exploration when you become adults we must make a new public investment in our space program now. And I'm asking Americans to make a farsighted

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commitment, one that looks dozens of years and millions of miles beyond the recession and the other things that tend to preoccupy us today.

And I'm challenging you young people, too: Start your preparations for tomorrow's new age of space exploration right now. Keep that pledge you've made in joining the Young Astronauts Council. Make yourselves better and better students of math and science. Make the USA the leading country in the world in early education for math and science. Make you families proud. Make your teachers proud. Give your very best and America will be better for it.

In doing this, you not only help our space program, you'll also help us meet one of the most demanding goals that I've set for our schools. It aims to involve parents more with our schools, to revolutionize our schools with higher standards and better performance by the start of the new century.

Among the goals of America 2000 is to make America the world leader in math and science education. If we want to reach the Moon and Mars, we've got to aim high. And if you share my aim of making America's students and teachers the best in the world, and if you share my goal of sending American men and women to explore Mars, and if you share my dream of discovering the unknown to make our lives better, you'll see it will require time and effort and study and money.

And it's going to take teamwork across the years. That includes parents -- your parents and then my generation's. Most of all, for a long time to come, it will call for your own best efforts. And I applaud this Council for making a positive different with America's children. The Council is committed to our America 2000 education goals and is playing a true leadership role in our observance of 1992 to celebrate exploration, not only as the 500th anniversary of Christopher Columbus's voyage, but also as International Space Year.

Barbara and I are very proud to serve as honorary cochairmen of the Young Astronauts Council. And it's a pleasure to recognize three dedicated Americans who have been honored as 1992 Young Astronaut Teachers of the Year: Glenda Parker, of Denver, North Carolina, right here. (Applause.) Arthur Perchino -- Arthur, from Norwalk, Connecticut. (Applause.) And Karyn Sotero from right here in Washington, DC. (Applause.)

And now I understand that three young astronauts, Russell Frisby, Rachel Heckmann, and Conner Sabatino, have something they're going to give me. See, this is a very nice ending to this thing. (Laughter.) So you guys come on up here.

(Presentation of gift and representation of NASA/Young Astronaut Council poster contest.)

(Telephone conversation with the Discovery crew.)

THE PRESIDENT: Are we on the air -- I mean, way out there on the air? Colonel Grabe, can you hear me?

COMMANDER GRABE: Yes, sir, Mr. President, we hear you loud and clear.

THE PRESIDENT: What happened? Can you guys here me up there all right?

COMMANDER GRABE: We hear you loud and clear, Mr. President. (Laughter.)

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THE PRESIDENT: Loud and clear. (Applause.) Well, let me just say to Commander Grabe and all the rest of you all, I'm here with a lot of the young astronauts and some of the older astronauts, as a matter of fact -- (laughter) -- four of the crews here in the White House complex. And we just called up to wish you well. The Vice President is with me. Admiral Truly is with me. And we just want to get from you all how it's doing down there.

A lot of these kids want to get going and get out to Mars. Have you got any advice, first of all, for these young guys here -- young kids, boys and girls?

COMMANDER GRABE: Well, certainly, Mr. President. For any young astronauts that want to pursue a career as an astronaut, they ought to be emphasizing math and science in their studies and just doing as well as they can. It's a long, hard road to get there and it takes a little luck along the way as well. But it's certainly worth the effort.

THE PRESIDENT: We've been talking a little bit about the contribution that these journeys make to science. Can you tell us a little bit about the -- in layman's terms, please -- about the experiments that you all are conducting?

COMMANDER GRABE: Let me turn that over to Bob Thagard; he's our payload commander here on my right.

COMMANDER THAGARD: Well, Mr. President, taking the experiments to orbit is an excellent way to do experiments in some areas in science and it makes this whole journey well worthwhile. The two principal things or areas that come to mind are physiology, both plants and animals, and crystal growing and other material science experiments.

And we have some 55 experiments, I think, in the IML complement, most of those are working even as we speak. And it is our plan to do some more TV, some more explanation later on about some more details of that science.

THE PRESIDENT: Well, that is very interesting. Now, if you guys have a couple more minutes -- we don't want to detract you from all this experimentation, but it might be fun if one of these young astronauts, or maybe a couple, would like -- here comes my man. (Laughter.) He's back. This guy just gave a great speech here.

Tell them your name and see if you've got a question for them.

Q My name is Russell Frisby, and here's my question. What's it like in zero gravity?

THE PRESIDENT: Did you get that? He wanted to know what it's like in zero gravity.

COMMANDER GRABE: Yes, sir, we understood the question, what's it like in zero gravity. And I'll turn that over to Bill Readdy, who's on Bob's left.

ASTRONAUT READDY: It's great. Just floating around and everything. And a lot of things it just makes a whole lot easier, besides putting your pants on both legs at the same time. (Laughter.) It's easy to translate back and forth. It makes it a whole lot easier to do a lot of the science because any particular orientation you choose works the same as any other. (Laughter.)

THE PRESIDENT: That makes it all very clear. (Laughter.) Thank you.

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Any other -- come on, you come up and ask one. This is a rare opportunity. Fire away.

Q I wanted to know what was your favorite experiment you've taken up so far?

COMMANDER GRABE: That sounds like a good question for Steve Oswald, our pilot, to answer. Steve's over here on Bill's left.

ASTRONAUT OSWALD: Actually, I guess I'm not sure that, being in the front of the bus, we're working the experiments all that hard. But we've got the I-90 camera aboard. And Bill and Ron and I have been having a great time taking those movies that you see on the big screen. And we're taking pictures right now for a movie that will be coming out here within a year or two.

Q I would like to know, which one do you like better --

ASTRONAUT OSWALD: -- to show that to you, how big it is.

ASTRONAUT READDY: You're asking about what's great about zero G. Well, this camera on Earth probably weighs about, oh, 110, 120 pounds. Even a big moose like Os has trouble lifting it. But you can see you can quite easily do it with just fingers.

ASTRONAUT OSWALD: The camera probably weighs as much as Roberta, who's manipulating it right now, and you can see she has no trouble at all with it.

THE PRESIDENT: That's great. Do you have one?

COMMANDER GRABE: Mr. President, the one crew member --

Q Which one do you like better, being in space or being on Earth? (Laughter.)

COMMANDER GRABE: I'd like to introduce our Canadian payload specialist, Roberta Bondar, who will be glad to answer that one. (Laughter.)

DR. BONDAR: Actually living, both in space and on the Earth really makes you appreciate the good and the bad of both. I think right now we're enjoying very much the limited opportunity we've had so far with being up here. We've certainly enjoyed looking back at the Earth during our brief moments when we're not in the lab working the sciences. And we're really looking forward to a return to Earth to bring back all the scientific information and all the enthusiasm and experience that we've gained in this flight.

So, for all of us, I think right now we're just enjoying where we are, and we're going to be enjoying where we're going to be when we come back. And I think it's just great to have had this opportunity to be assigned with this great crew.

THE PRESIDENT: Dr. Bondar, this is not a young astronaut, this is the President speaking now. But I just want to say how pleased we are that you, representing Canada, are a part, a fundamental part of this. I think it's a wonderful thing, and I think in a wonderful way it shows the strength of ties between our two great countries.

So I understand the Prime Minister, my friend, Brian Mulroney, called. Did he actually get through the other day?

DR. BONDAR: That was right about the time we were having a briefing, just near launch time, and instead, I had a lovely telegram from him and he wished us all well and Godspeed.

THE PRESIDENT: Well, keep up the good work. Now, have you got time for one more question? We've got a real eager one right here. Front of the line. Here we go.

Q I wonder how you feel in space.

THE PRESIDENT: They're trying to decide here.

COMMANDER GRABE: The question was, how do we feel in space?

THE PRESIDENT: Yes.

COMMANDER GRABE: Well, in space it takes a little bit of time to get used to it. When you first get up, you might feel just the slightest bit queasy or so. But by about today -- this is our third day in space -- we're beginning to adapt pretty well. I think you can see we all feel pretty comfortable up here. So after you get over the initial adjustment, you can live in space quite well and do things that you do on Earth.

THE PRESIDENT: I have a rather technical question. What happens if you get the flu in space? (Laughter and applause.)

COMMANDER GRABE: Some of the older astronauts -- same enthusiasm a kid has, has got to be a great experience. And I feel like I'm about 12.

Q What planets have you seen?

THE PRESIDENT: What planets have you seen?

COMMANDER GRABE: Well, of course, we've got the world's greatest view of our world. But on some of our night passes we can see Saturn and Jupiter and Mars and Venus. It's really spectacular up here. Hope we can go to Mars here one of these days.

THE PRESIDENT: Well, we're going to keep trying to get this program geared up to do just that. And maybe -- just maybe, Colonel, one of these kids will here today will be a part of that. Maybe sooner, maybe later. But I'll bet one of them will be a part of that mission.

But listen, I'm told we've got to run on. I've got a lot of eager questioners, but unfortunately, I guess we don't have the time. But we certainly want to wish you well. Your fellow astronauts are standing here quietly in the shadows, and I know that they are wishing you well for a successful conclusion of this productive journey.

You have our blessings and our support, and keep up the fine work. You're on the cutting edge and you're setting a great example for the rest of our country, the rest of the world. Congratulations, and thanks for taking the time out. (Applause.)

END 3:27 P.M. EST

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(Duggan/Gershowitz)
January 23, 1992
Draft Five
Astro

PRESIDENTIAL REMARKS: YOUNG ASTRONAUTS COUNCIL
ROOM 450, OEOB
FRIDAY, JANUARY 24, 1992
3:00 p.m.

Thank you for that welcome. Wendell Butler [Young Astronauts' CEO], we appreciate all your good work. And it's great to see Admiral Dick Truly -- the first astronaut to serve as Administrator of NASA. All told, there are 23 veteran astronauts here today -- I'm told this is one of the largest gathering of space explorers ever at the White House. Our thoughts also are with seven other astronauts who right now are orbiting the Earth in a Space Shuttle mission. We're proud of all these men and women. \\

And I'm delighted to be with so many girls and boys -- from Kindergarten through 9th Grade -- in the Young Astronauts Program. As President, I've set a goal that involves you young people. My goal is for young Americans like you who are in grade school right now, to travel to Mars someday.

New travels in space will give us answers to some of the things children wonder about. \ And, I might add, many adults who contemplate our great universe wonder about these same things, too. \\

The other day I heard what one five-year-old wonders. \ One of my staff members asked his five-year-old son if we should build new space ships and send people to the Moon again.

The little boy said, yes, of course we should. Then his father asked him, <u>why</u> should we send people to the Moon?

"That's easy," the little boy said. \ "It's to see if there's Martians." \\

We may chuckle, but that little boy got it just about right. As most of you Young Astronauts know, I've challenged Americans to go back to the Moon to stay, and then onward to Mars. Sending people back to the Moon for more experience in an environment different from ours is the first step on the journey to explore the gigantic rift valleys and mountains of Mars.

When we break through barriers of the unknown, we not only <u>help</u> ourselves, we learn more <u>about</u> ourselves. When we reach our goal of sending men and women to Mars, we can find out the answer to that little five-year-old's wondering about life on other planets. We can learn whether we can extract air and water from materials on Mars to sustain life. We can look for clues <u>on Mars</u> not only to teach us <u>how the Earth developed</u>, but also about the <u>wellspring of life itself</u>.

Pushing forward into space already is helping us here and now. More and more of the new jobs for people of your parents' generation are being provided by our space programs. Revenues from American commercial space programs alone grew by 14 percent in 1991. This year they're projected to grow by 20 percent. The commercial space business has grown so far and so fast that it now takes in about as much money each year as all the receipts at movie theaters in the United States. \\ ((If this trend continues, the celestial stars will be getting more attention than the ones in Hollywood.)) \\ America now exports $1 billion a year in commercial space goods and services. Those exports alone translate into jobs for 20,000 Americans.

Real progress is happening almost faster than we can imagine. Navigation satellites that helped guide our troops in Desert Storm just a year ago now help hikers, fishermen, surveyors and motorists find their way. Personal navigation receivers now help us manage our forests and wetlands. They help speed the shipment of goods on our highways.

Just 10 years from now, the older kids here will be finished with college -- some of you will even be finished with graduate school. When that day comes -- when you're ready to start careers and families -- I hope many of you will be prepared to become the movers and shakers in our space program.

It's up to your parents and grandparents -- and the Congressmen they elect -- to keep us on track for this promising future of space exploration and commercial space enterprises. To stress how important this is, in a few weeks I will formally direct the establishment of a new national space exploration office -- led by NASA and including scientific talent from our Defense Department and other agencies. Space exploration should be -- and will be -- a national effort. I should add that Vice President Quayle's leadership as chairman of the National Space Council has been absolutely vital to the renewed focus and momentum of our space programs.

When I send my annual budget to Congress next week, it will mark the third straight year I've called for a real increase in spending on our civil space program. This includes full funding for Space Station Freedom -- 2.25 billion dollars, an increase of 11 percent. Space Station is back on track and on schedule. Last year, we had an honest debate with those in the Congress who wanted to kill Space Station. We won because the American people agree that Space Station Freedom is not only a valuable scientific program, but it is essential to our destiny as a pioneering nation in space.

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For you to fulfill your dreams of space exploration when you become adults, we must make a new public investment in our space programs now. I'm asking Americans to make a far-sighted commitment -- one that looks dozens of years and millions of miles beyond the recession and the other things that tend to preoccupy us today.

And I'm challenging you young people, too: \ Start your preparations for tomorrow's new age of space exploration right now. \\ Keep that pledge you've made in joining the Young Astronauts Council. Make yourselves better and better students of math and science. Make the United States of America the leading country in the world in early education for math and science. Make your families proud. Make your teachers proud. Give your very best -- and America will be better for it. \\

In doing this, you'll not only help our space program. You'll also help us meet one of the demanding goals I've set for our schools. With leadership from Secretary Lamar Alexander, who is here today, we're pursuing a strategy we call America 2000. It aims to involve parents more with our schools -- to revolutionize our schools with higher standards and better performance by the start of the new century. Among the goals of America 2000 is to make America the world leader in math and science education. If we want to reach the Moon and Mars, we've got to aim high. \\

If you share my aim of making America's students and teachers the best in the world, if you share my goal of sending

American men and women to explore Mars, if you share my dream of discovering the unknown to make our lives better, you'll see it will require <u>time</u> and <u>effort</u> and <u>study</u> and <u>money</u>. It's going to take teamwork across the years. That includes your parents' and my generations. But most of all, for a long time to come, it will call for your own best efforts. \\

I applaud the Young Astronauts Council for making a positive difference with America's children. The Council is committed to our America 2000 education goals. And it's playing a true leadership role in our observance of 1992 to celebrate exploration -- not only as the 500th anniversary of Christopher Columbus's voyage, but also as International Space Year. Barbara and I are proud to serve as Honorary Co-Chairmen of the Young Astronauts Council.

It's a pleasure to recognize three dedicated Americans who have been honored as 1992 Young Astronaut Teachers of the Year: <u>Glenda Parker</u> of Denver, North Carolina; <u>Arthur Perchino</u> [per-CHEE-no] of Norwalk, Connecticut; and <u>Karyn Sotero</u> [sO-TAIR-oh] from right here in Washington, D.C. Won't you please stand and accept our thanks and applause? \\

I also understand that three Young Astronauts -- <u>Russell Frisby</u>, <u>Rachel Heckmann</u>, and <u>Conner Sabatino</u> -- have something they would like to give me. If they please would come up on stage, I'd like to meet them. \\ [The children present President with a "Mission to Mars" original painting by space artist Robert McCall.]

Thanks again to all of you. May God bless you, and may he help us fulfill our dreams for a better future for the United States.

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(Duggan/Gershowitz)
January 23, 1992
Draft Four
Astro

PRESIDENTIAL REMARKS: YOUNG ASTRONAUTS COUNCIL
ROOM 450, OEOB
FRIDAY, JANUARY 24, 1992
3:00 p.m.

Admiral Richard Truly

[Acknowledgments]

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Project Officer Jim Schaefer

(Duggan/Gershowitz)
January 16, 1992
Draft Three
Astro

PRESIDENTIAL REMARKS: YOUNG ASTRONAUTS COUNCIL
ROOM 450, OEOB
FRIDAY, JANUARY 24, 1992
2:50 p.m.

double check

About 80 kids

[Acknowledgments]

I'm delighted to be with so many girls and boys -- from Kindergarten through 9th Grade -- in the Young Astronauts Council. I want to thank your parents and teachers and other supporters of the Young Astronauts Council for all you've done to bring us together today.

CONFIRM

? Parents may not be at event

Space exploration takes a long time to prepare. We are planning space missions today that won't be launched until you are adults with children of your own. And in fact, as President, I've set a goal that involves you. My goal is for some American girls and boys who are in grade school today, to travel to Mars 20 or 30 years from now. PAGE 643 [5-11-90]; 644

Texas A&I speech 5-11-90

New travels in space will give us answers to some things children wonder about. \ And, I might add, adults who are truly wise wonder about these same things, too. \\

The other day I heard what one five-year-old wonders. \ One of my staff members asked his five-year-old son if we should build new space ships and send people to the Moon again.

The little boy said, yes, of course we should. Then his father asked him, why should we send people to the Moon?

APPROX 171

2702

"That's easy," the little boy said. \ "It's to see if there's Martians." \\

Actually, that little boy got it just about right. As most of you Young Astronauts know, I've challenged Americans to go back to the Moon to stay, and then onward to Mars. Sending people back to the Moon for more experience in an environment different from ours is a key step we must take before sending people on the longer journey to explore Mars.

America's space initiative → pamphlet "the challenge"

When we break through barriers of the unknown, we not only help ourselves, we learn more about ourselves. When we reach our goal of sending men and women to Mars, we can find out the answer to that little five-year-old's wondering. We can see if there are any signs of life on Mars. We can learn whether any plants or animals can live on Mars. We can look for clues on Mars not only to teach us how the Earth developed, but also about the wellspring of life itself.

"Why Mars?" America's space initiative

We know already that such vital things as air and water can be manufactured on Mars. This could be of great value if ever we should need to strengthen our supplies of these resources.

Pushing forward into space already is helping us here and now. More and more of the new jobs for people of your parents' generation are being provided by commercial space programs. Revenues from American commercial space programs grew by 14 percent in 1991. This year they're projected to grow by 20 percent. The commercial space business has grown so far and so fast that it now takes in about as much money each year as all

Jane Freik, Comm

the receipts at movie theaters in the United States. \\ ((If this trend continues, the celestial stars will be getting more attention than the Hollywood stars.)) \\ America now exports $1 billion a year in commercial space goods and services. Those exports alone translate into jobs for 20,000 Americans.

Real progress is happening almost faster than we can imagine. Navigation satellites that helped guide our troops in Desert Storm just a year ago now help hikers, fishermen, surveyors and motorists find their way. Personal navigation receivers now help us manage our forests and wetlands. They help speed the shipment of goods on our highways.

Just 10 years from now, the older boys and girls here will be finished with college -- some of you even finished with graduate school. When that day comes -- when you're ready to start careers and families -- it will be commonplace to find jobs in the commercial space industry.

It's up to your parents and grandparents -- and the Congressmen they elect -- to keep us on track for this promising future of space exploration and commercial space enterprises. To stress how important this is, I am announcing right now the details of the space program proposals that will be in the new Federal budget I'll send to Congress next week:

[Placeholder for details, e.g., Space Station, SEI, upcoming new launches]

For you to fulfill your dreams of space exploration when you become adults, we must make a new public investment in our space programs now. I'm asking Americans to make a far-sighted commitment -- one that looks dozens of years and millions of miles beyond the recession and the other things that tend to preoccupy us today.

And I'm challenging you boys and girls, too: \ Start your preparations for tomorrow's new age of space exploration right now. \\ Keep that pledge you've made in joining the Young Astronauts Council. Make yourselves better and better students of math and science. Make the United States of America the leading country in the world in early education for math and science. Make your families proud. Make your teachers proud. Give your very best -- and America will be better for it. \\

In doing this, you'll not only help our space program. You'll also help us meet one of the demanding goals I've set for our schools. With leadership from Secretary Lamar Alexander, who is here today, we're pursuing a strategy we call America 2000. It aims to involve parents more with our schools -- to revolutionize our schools with higher standards and better performance by the start of the new century. Among the goals of America 2000 is to make America the world leader in math and science education. → Dept of Education, Booklet, "America 2000," Point 4

If you share my aim of making America's students and teachers the best in the world, if you share my goal of sending American men and women to explore Mars, if you share my dream of discovering the unknown to make our lives better, you'll see it will require time and effort and study and money. It's going to

1992 International Space Year

take teamwork across the years. That includes your parents' and my generations. But most of all, for a long time to come, it will call for your own best efforts. \\

Now I take great pleasure in recognizing America's Young Astronaut Student of the Year. [Name to be provided] Congratulations. And our Young Astronaut Teacher of the Year. [name to be provided] Congratulations to you both, and keep up the good work.

Finally, I am pleased to accept on behalf of all Americans a piece of original artwork by Robert McCall. Robert McCall is a man of great imagination and talent. He's the artist responsible for those beautiful murals at the Air and Space Museum. This new painting is entitled, "Mission to Mars: The Journey Begins." Mr. McCall, thank you very much.

Thanks again to all of you. May God bless you, and may he help us fulfill our dreams for a better future for the United States.

# # #

need to brief

Recognize World Wide cooperation

Space Mural: 202-357-1300
Air & Space Museum
A Cosmic View
South ent
75 x 58 ft

Mike Fetters (contact Public Affairs)
357-1663

Young Astronaut Council
Paul Burke: 682-1984

PROPOSED AGENDA
WHITE HOUSE/YOUNG ASTRONAUT COUNCIL EVENT
JANUARY 24, 1992
ROOM 450, OEOB/INDIAN TREATY ROOM
1:30 - 4:30 P.M.

1:30 p.m.	Guests gather in OEOB
2:00 p.m.	Welcome, Introduction of Guests and Background - T. Wendell Butler
2:20 p.m.	Remarks - Secretary Lamar Alexander
2:30 p.m.	• Unveiling of Special ISY Young Astronaut/ McDonald's Science and Math Curriculum Package • Announcement of Space Bill of Rights Contest • Announcement of Young Astronaut/NASA ISY Poster Contest
2:40 p.m.	Remarks - Admiral Richard Truly and NASA Astronauts
2:50 p.m.	Introduction of President Bush
3:10 p.m.	• Presentation of Young Astronaut Teacher and Student of the Year Awards - President Bush • Presentation by Young Astronauts of original artwork by Robert McCall entitled " Mission to Mars: The Journey Begins" to President Bush
3:25 p.m.	Closing Remarks - T. Wendell Butler
3:30 p.m.	Young Astronauts see President Bush off to Camp David
3:30 - 4:30 p.m.	Reception - Indian Treaty Room

Young Astronaut Council • 1211 Connecticut Avenue, N.W., Suite 800 • Washington, D.C. 20036 • (202)682-1984

YOUNG ASTRONAUT COUNCIL
FACT SHEET

The Young Astronaut Council offers a national educational enrichment program designed to encourage children in grades K-9 to become more interested and skilled in math, science and technology, using their natural fascination with space as the catalyst. The Program's primary purpose is to raise the proficiency level of American students in these subjects and equip them at an early age with the skills needed to live in the technological world of the 21st Century

Founded by the White House in 1984, the Young Astronaut Council, a non-profit corporation, has become the largest, space-related, educational youth organization in the world, distributing its materials to over 26,000 teachers serving one million students in every state in the union and in over 40 foreign countries.

In 1992, the International Space Year, Young Astronaut curriculum will be delivered to every elementary school in the country under a grant from the Ronald McDonald's Children's Charities.

The Young Astronaut Council has an impressive eight year track record in using aerospace technology and the excitement of space exploration to enhance the science aptitude and overall achievement of students from every geographic, ethnic and economic background. All Young Astronaut materials are designed to enhance the higher-order and analytical thinking skills of children and help them to gain a broader sense of the importance of math, science and technology in their daily lives.

The Council has received numerous awards and recognition for its contributions to math and science education in America including the most prestigious awards from the American Astronautical Association, the American Institute of Aeronautics and Astronautics and the Air Force Association as well as from the Harvard Business School.

Under a grant from the National Science Foundation, the Council has been pioneering the development of two SPACE MAGNET SCHOOLS in Washington, D.C. The project involves the entire faculties, student bodies, parents and community leaders in the development of an innovative curriculum that encompasses mathematics, science, history, geography and language arts. An exciting, high-performing learning environment is being created for all of the children at these two SPACE MAGNET SCHOOLS which will help them to achieve their full academic potential, become better citizens and develop the skills necessary to be productive and successful workers in the global technological society of the 21st Century.

The Young Astronaut Program recognizes that not all communities and school districts are identical, and, therefore, allows flexibility in the implementation of the Program at the local level. The Council sets the standard with its innovative program and curriculum, but allows teachers, parents and school officials to adapt the materials to local curricular requirements, as well as to the learning styles and preferences of their own students.

The Program looks beyond the classroom and recognizes that schools cannot do the job alone. The Program and its teachers rely on the assistance of parents, community leaders, businesses, civic organizations, the PTA and caring volunteers at the local level.

The Council enjoys the support of national corporate sponsors such as McDonald's Corporation, Martin Marietta, Rockwell International and Toys 'R Us, and encourages and assists local Chapters in forming alliances with local and regional businesses and service organizations in their own communities.

The Young Astronaut Council believes that all children should start school ready to learn. To help achieve this end, the Council has created a special pre-school enrichment curriculum which includes both classroom and family activities emphasizing age-appropriate language, math, science, art, nutrition and health concepts.

For more information about the Council, please contact Cecelia Blalock. (202) 682-1984.

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SUGGESTED TALKING POINTS FOR THE CONCLUSION OF THE PRESDENT'S MESSAGE

- I applaud the Young Astronaut Council as a program that is making a positive difference with America's children. It is committed to the goals of America 2000 and is playing a leadership role in the International Year.

- The program is dependent upon the creative work of thousands of committed Young Astronaut teachers all across the nation. Each of them goes the extra mile in opening up new horizons in science, math and technology.

- Therefore, it is a great honor for me to introduce the 1992 Young Astronaut Teachers of the Year. They are: Arthur Perchino of Norwalk, CT; Karyn Sotero of Washington, D.C.; and Glenda Parker of Denver, NC. I am proud to honor these three outstanding educators for their efforts in motivating children. Would you please stand to be recognized by your peers and students.

- I also understand that three Young Astronauts: Russell Frisby, Rachel Heckmann and Conner Sabatino, have something that they want to give to me. I'd like to meet them.

Enter the Space Bill of Rights National Contest To Win an Astronaut Visit to Your School

BACKGROUND

There are so many changes currently sweeping our world—dissolution of the Soviet Union, an economically united Europe, dismantling of apartheid in South Africa. What better time to introduce your students to the *U.S. Bill of Rights*, one of the most important cornerstones of our freedom?

America is celebrating the 200th anniversary of the ratification of the first ten amendments of the *U.S. Constitution*, the *Bill of Rights*. These documents have served as an inspiration to nations all over the world. Many countries have written their constitutions guided by the principles and values contained in our own cherished documents. Among the rights guaranteed in our *Bill of Rights* are the rights to freedom of speech and assembly, the right to practice religion free from governmental regulation, the right to be free from unreasonable searches and seizures, and the right to be tried by a jury of peers when being tried for criminal offenses.

In addition to these fundamental rights, the constitutions of many countries of the world (and some of our states which also have their own constitutions) contain provisions which guarantee individuals a quality education, employment, fresh air and sunshine and also call for world peace.

This contest challenges you to create a Space Bill of Rights for people who will be involved in the exploration and inevitable settlement of Outer Space. The document should clearly explain to individuals all of their guaranteed rights as well as their obligations, keeping in mind the unique environment of Outer Space. In choosing the types of provisions to include in your Space Bill of Rights, you should remember that Space will be inhabited by people from many nations, cultures and backgrounds.

When encouraging your students to draft their Space Bill of Rights, consider whether the fundamental values embodied in the U.S. Constitution shall apply to all individuals living in Outer Space. Do you wish to incorporate some of the provisions contained in the constitutions of other countries? What is the best way to harmonize any differences in values? How can you provide for community safety and individual survival in the hostile environment of space without infringing on individual rights? What contraints should there be on governing authority? Should there be a system of checks and balances similar to ours?

Remember that our Bill of Rights has lasted 200 years. Yours, too, must be relevant today and also flexible enough to meet the challenges of the future.

CONTEST RULES

This contest is open only to students in grades K-9. Schools may hold competitions at different levels within the school, but there can only be **ONE ENTRY PER LEVEL PER SCHOOL.**

The Space Bill of Rights must contain no more than 10 amendments and no more than 500 words. (Approximately 50 words per amendment.)

An important part of drafting your Bill of Rights is the process by which it was developed. Each contest entry must include a one-page, single-spaced letter, written by the classroom teacher, that explains the process by which the document was developed by your students, and how they decided which rights to guarantee citizens. Please list the procedure steps numerically.

Entries must be postmarked no later than midnight, **April 1, 1992.**

Entries will be judged by a panel including representatives of the Young Astronaut Council, NASA, a constitutions law scholar, space law practitioner, and a federal judge. Criteria include thoroughness of ideas and presentation, the universal nature of the rights and appropriateness to the Outer Space environment. Writing, spelling and punctuation also will be considered.

There will be 63 winners selected from each of the three levels—K-3, 4-6, 7-9. There will be three (3) grand-prize winners, ten (10) second-place winners, and fifty (50) third-place winners. Entries will be judged only against those in the same grade level. One astronaut visit will be awarded to the school attended by each of the nine grand-prize winners. Astronaut visits will be conducted during the 1992 school year. Plaques will be awarded to second-place winners, and third-place winners will receive certificates. Winners will be notified by mail prior to April 15, 1992, and Certificates of Participation will be sent to all entrants as submissions are received.

Entries should be submitted to: **The Young Astronaut Council, "Space Bill of Rights Contest," P.O. Box 65432, Washington, D.C. 20036.**

Ronald McDonald Children's Charities®
Established in memory of Ray A. Kroc

McDonald's®

Young Astronauts™

The United States Bill of Rights

The Bill of Rights are comprised of the first ten amendments to the U.S. Constitution, ratified in 1791.

Amendment I

Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof; or abridging the freedom of speech, or of the press, or the right of the people peaceably to assemble, and to petition the Government for a redress of grievances.

Amendment II

A well regulated Militia, being necessary to the security of a free State, the right of the people to keep and bear Arms, shall not be infringed.

Amendment III

No Soldier shall, in time of peace be quartered in any house, without the consent of the Owner, nor in time of war, but in a manner to be prescribed by law.

Amendment IV

The right of the people to be secure in their persons, houses, papers, and effects, against unreasonable searches and seizures, shall not be violated, and no Warrants shall issue, but upon probable cause, supported by Oath or affirmation, and particularly describing the place to be searched, and the persons or things to be seized.

Amendment V

No person shall be held to answer for a capital, or otherwise infamous crime, unless on a presentment or indictment of a Grand Jury, except in cases arising in the land or naval forces, or in the Militia, when in actual service in time of War or public danger; nor shall any person be subject for the same offence to be twice put in jeopardy of life or limb, nor shall be compelled in any criminal case to be a witness against himself, nor be deprived of life, liberty, or property, without due process of law; nor shall private property be taken for public use without just compensation.

Amendment VI

In all criminal prosecutions, the accused shall enjoy the right to a speedy and public trial, by an impartial jury of the State and district wherein the crime shall have been commmitted; which district shall have been previously ascertained by law, and to be informed of the nature and cause of the accusation; to be confronted with the witnesses against him; to have compulsory process for obtaining witnesses in his favor, and to have the assistance of counsel for his defense.

Amendment VII

In Suits at common law, share the value in controversy shall exceed twenty dollars, the right of trial by jury shall be preserved, and no fact tried by a jury shall be otherwise re-examined in any Court of the United States, than according to the rules of the common law.

Amendment VIII

Excessive bail shall not be required, nor excessive fines imposed, nor cruel and unusual punishments inflicted.

Amendment IX

The enumeration in the Constitution of certain rights shall not be construed to deny or disparage others retained by the people.

Amendment X

The powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively, or to the people.

Young Astronaut Council • 1211 Connecticut Avenue, N.W., Suite 800 • Washington, D.C. 20036 • (202)682-1984

FOR IMMEDIATE RELEASE

FOR MORE INFORMATION
Contact: Stephanie Skurdy, McDonald's, 708/575-6395
Paul Burke, Young Astronaut Council, 202/682-1984
Libby FitzGibbons, Golin/Harris Communications, 312/836-7130

McDONALD'S AND YOUNG ASTRONAUT COUNCIL ANNOUNCE INTERNATIONAL SPACE YEAR EDUCATION INITIATIVES

To celebrate International Space Year in 1992, McDonald's and the Young Astronaut Council (YAC) have announced a unique education partnership. This January, every elementary, middle and junior high school in the United States will receive "Exploration and Discovery," a free, space-themed science and mathematics curriculum.

The McDonald's/YAC curriculum promotes the study of these subjects by exciting students in grades kindergarten through nine about space and the environment. Through active science experiments, mathematical games and students' natural curiosity, "Exploration and Discovery" helps to equip American students with skills needed to cope in an increasingly technical world.

"With so many budget cuts affecting so many school systems across the United States, we are glad that McDonald's family restaurants are able to provide a program that gives teachers creative, yet inexpensive, ways to reinforce math and science concepts in a format that will interest students," said Stephanie Skurdy, director of education, McDonald's Corporation.

- more -

In addition to the school curriculum, McDonald's and the Young Astronaut Council will award astronaut visits to ten schools -- the top 10 winners of a national competition. To enter the contest, students will create a set of governing regulations for a society in space, similar to the concept of the United States' Bill of Rights. Other contest prizes include plaques, merit certificates and letters of commendation.

"As the last man to walk on the moon, I'm delighted to see children preparing for their future on Earth and in space," said Eugene Cernan, former Gemini/Apollo astronaut. "I'm pleased to play a role in this excellent educational program and look forward to visiting the students."

"The Young Astronaut Council is grateful to McDonald's for its leadership role in support of math and science education in America," said Young Astronaut Council President T. Wendell Butler. "This unique partnership will provide the opportunity for children all across the nation to participate in hands-on math and science activities, and to learn more about their environment."

The Young Astronaut Council, a non-profit organization, was established by the White House in 1984 to help raise American students' proficiency in math and science. The Council is the world's largest space-related educational organization, developing and distributing curriculum materials to member chapters in elementary and middle schools. More than 26,500 chapters with more than 650,000 members belong to the Council's worldwide network.

McDonald's is the world's leading quick-service restaurant organization with more than 12,000 restaurants in 55 countries around the world, including more than 8,700 in the United States. Over seventy-five percent of McDonald's restaurant businesses are locally owned and operated by independent entrepreneurs.

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ROUGH IDEAS
FOR THE PRESIDENTS REMARKS

- This event kicks-off International Space Year (ISY), a year long celebration of our achievements in Space.

- It gives us an opportunity to focus on not only the benefits of space exploration, but the incredible laboratory that Space exploration offers for learning.

- Eight years ago, the Young Astronaut Program was conceived (downstairs in this building) to ignite young peoples interest in math, science and technology, using the excitement of Space. It was launched by President Reagan in the Rose Garden on October 17, 1984.

- Today, it is the world's largest space-related educational organization, with over 27,000 teachers and One Million students world-wide. There are Young Astronaut Chapters in every state of America and in some 42 nations around the world.

- On April 18, 1991, I announced my America 2000 educational strategy designed to make America first in the world in science and math achievement.

- Consistent with the America 2000 concept, the Young Astronaut Program honors local control and relies on local initiative. The Young Astronaut Council in Washington sets the standard, but allows flexibility to adapt the Program to the needs of the particular community or classroom.

- The Program recognizes that community by community and school by school, parents, teachers and officials know what is best for their students, and they have the will to do it.

- The Program looks beyond the classroom and recognizes that schools cannot do the job alone. The Program and its teachers rely on the assistance of parents, community leaders, businesses, civic organizations, the PTA and caring volunteers at the local level.

- The Young Astronaut Council shares the vision of the America 2000 strategy, that all children should start school ready to learn. To help achieve this end, the Council has created a special pre-school enrichment curriculum which includes both classroom and family activities emphasizing age-appropriate language, math, science, art, nutrition and health concepts.

- The Council believes that every school should be free of drugs and created special packages for students which emphasize the dangers of drug abuse as a significant barrier to achievement in school and in life.

- The Young Astronaut Program is designed not just for the extraordinary child, but the ordinary child. The Program is dedicated ~~to~~ the principle that all children can learn if the subjects are presented to them in a stimulating and exciting manner.

- In my opinion, the Council represents the type of educational organization that is making a difference with America's children.

- The Council recognizes the private sector as a vital partner. I would like to commend McDonald's Corporation and the Ronald McDonald's Children's Charities for making possible the exciting "Exploration and Discovery" Curriculum package that each of you have, celebrating ISY.

- Appropriately, its cover and the limited edition poster that each of you will receive depicts the Engines igniting as the Spacecraft leaves Earth's orbit and heads for Mars. This is not just a dream. We are planning that mission by the year 2019, and I expect that many Young Astronauts today will make routine visits to MARS in the 21st century.

PROPOSED ATTENDEES
WHITE HOUSE
YOUNG ASTRONAUT COUNCIL
EVENT
3 PM JANUARY 24 1992

COUNCIL STAFF

Mr. Jack Anderson	Chairman
Mr. T. Wendell Butler	President & CEO
Mr. Paul T. Burke	Executive Vice President
Ms. Cecelia Blalock	Director of Public Affairs
Ms. Brenda King	Director of Development
Ms. Jennifer Rae	Director of Membership
Ms. Jennifer Pishvaian	Director of Special Projects
Mr. Tosho Nedeilkov	President, Young Astronaut International Foundation
Ms. Elka Terzieva	Vice President, Young Astronaut International Foundation

VIPS

NAME	ORGANIZATION/AFFILIATION
Admiral Richard Truly	Administrator NASA
Mr. Frank Owens	Director of Educational Affairs NASA
Ms. Sue Richards	Director of Public Affairs NASA
Dr. Martin Harwit	Director National Air & Space Museum
Dr. Walter E. Massey	Director National Science Foundation
Dr. Gerhard Salinger	Program Director, Instructional Dev. National Science Foundation
Dr. Lamar Alexander	Secretary of Education Department of Education
Mr. David Kearns	Deputy Secretary of Education Department of Education

Mr. Sam Walker	Dept. Assoc. Secretary of OIIA Department of Education
Mr. Harvey Meyerson	President International Space Year
Lt. Gen. Thomas P. Stafford	Gemini/Apollo Astronaut Board Member Young Astronaut Council
Captain Eugene Cernan	Gemini/Apollo Astronaut Board Member Young Astronaut Council
Mr. Robert McCall	Artist Tuscon, AZ
Mrs. Louise McCall	Artist Tuscon, AZ
Mr. Fred Turner	President McDonald's Corporation
Mr. Ken Barun	Vice President and Executive Director McDonald's Corporation
Ms. Linda Kravitz	Assistant Vice President McDonald's Corporation
Ms. Mary Miller	Director of Youth Marketing McDonald's Corporation
Ms. Bridget Marshall	Staff Director, Public Relations McDonald's Corporation
Ms. Stephanie Skurdy	Director, Education McDonald's Corporation
Ms. Libby Fitzgibbons	Account Group Supervisor Golin/Harris
Mr. John Rangos	President Chambers Development Company, Inc.
Mr. Clay Jones	Vice President Aerospace Gov. Affairs and Marketing, Rockwell Int'l
Mr. Walter Dunn	Vice President Coca-Cola
Mr. Steve Koonin	Director, Entertainment Marketing Coca-Cola
Mr. Charles Lazarus	President Toys 'R' Us
Mr. Robert Weinberg	Senior Vice President Toys 'R' Us
Mr. Keith McCracken	President McCracken Brooks
Mr. Ellis Bullock	Vice President Public Affairs Jostens
Mr. Bob Johnson	President and CEO Black Entertainment Television
Dr. Vance D. Coffman	President Lockheed, Space Systems Division
Mr. I.M. Booth	Chairman and CEO Polaroid Corporation
Ms. Donna V. Dunlop	Program Director DeWitt Wallace-Reader's Digest Foundation

Ms. Mary Sandy	Director VA Space Grant Consortium
Mr. Kay R. Whitemore	Chairman and CEO Eastman Kodak
Ms. Mary Foster	Franchise Director of Sponsorship M&M Mars
Mr. Fowzi Al-Sultan	Acting Director Kuwait-America Foundation
Mr. Thomas H. Kean	Chairman New Amer. Schools Dev. Corp.
Mr. Reid Rundell	Vice President of Operations New Amer. Schools Dev. Corp.
Mr. Roger Semerad	Sr. Vice President RJR Nabisco
Mr. John Pohl	Vice President, Marketing The Dial Corporation
Mr. Charles Adsit	Vice President Martin Marietta Corp.

YOUNG ASTRONAUT TEACHER OF THE YEAR AWARD RECIPIENT

1988

Mr. Wayne Peterson
Ms. Barbara Koscak
Sr. Judy Bisignano

1989

Mr. Victor Williamson
Ms. Paula Formby
Ms. Barbara Moreau

1990

Ms. Ellen Goldstein
Ms. Faye Neathery
Ms. Donna Kimball

1991

Ms. Betty Bigney
Ms. Carol Berzina
Ms. Norma Griffin

TEACHERS AND YOUNG ASTRONAUTS

NAME	SCHOOL	CITY/STATE
Ms. Karyn Sotero plus 6 Young Astronauts	Houston Elementary School	Washington, D.C.
Ms. Norma Griffin plus 6 Young Astronauts	North Drive Elementary	Goldsboro, NC
Ms. Betty Bigney plus 6 Young Astronauts	Highland Street Elem. Sch.	DuBois, PA
Sr. Judy Bisignano plus 6 Young Astronauts	Kino Learning Center	Tucson, AZ
Ms. Carol Berzina plus 6 Young Astronauts	Fain Elementary	Wichita Falls, TX
Ms. Donna Kimball plus 6 Young Astronauts	Twin Oaks Elementary	Baton Rouge, LA
Ms. Barbara Moreau plus 6 Young Astronauts	Walnut Street Elementary	Toms River, NJ
Ms. Gustine Williams plus 6 Young Astronauts	Eugene Boroughs Middle	Accokeek, MD
Ms. Georgette Pleasant plus 6 Young Astronauts	St. Ann's	Arlington, VA
Ms. Celez Nitkowski plus 6 Young Astronauts	Patrick Henry Elementary	Arlington, VA
Ms. Bonnie Bracey plus 6 Young Astronauts	Ashlawn Elementary	Arlington, VA
Mr. Augie Frattali plus 6 Young Astronauts	Franklin Smith Intermediate	Chantilly, VA
Mr. Robert Turelli plus 6 Young Astronauts	Oakview Elementary	Fairfax Station, VA
Ms. Glenda Parker plus 6 Young Astronauts	Catawba Springs Elementary	Denver, NC
Ms. June Frisby plus 6 Young Astronauts	Bryant Woods Elementary	Columbia, MD
Ms. Pamela Ayers plus 6 Young Astronauts	Cedar Grover Elementary	Germantown, MD
Mr. Barry Sprague plus 6 Young Astronauts	Park View Elementary	Washington, D.C.

KEY EDUCATORS

NAME	ORGANIZATION/AFFILIATION
Dr. Franklin Smith	Superintendent D.C. Public Schools
Ms. Joan Abdallah	Supervisor of Science Howard County Sch. System
Ms. Saundra Nettles	Principal Research Scientist Johns Hopkins University
Ms. Dene Pendleton	Principal Houston Elementary
Dr. Paul Vance	Superintendent Montgomery County Schools
Mr. Edward M. Felegy	Superintendent Prince Georges County Schools
Dr. Robert Spillane	Superintendent Fairfax County
Dr. Arthur Gosling	Superintendent Arlington County
Dr. Michael Hickey	Superintendent Howard County

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- more -

In addition to the school curriculum, McDonald's and the Young Astronaut Council will award astronaut visits to ten schools -- the top 10 winners of a national competition. To enter the contest, students will create a set of governing regulations for a society in space, similar to the concept of the United States' Bill of Rights. Other contest prizes include plaques, merit certificates and letters of commendation.

"As the last man to walk on the moon, I'm delighted to see children preparing for their future on Earth and in space," said Eugene Cernan, former Gemini/Apollo astronaut. "I'm pleased to play a role in this excellent educational program and look forward to visiting the students."

"The Young Astronaut Council is grateful to McDonald's for its leadership role in support of math and science education in America," said Young Astronaut Council President T. Wendell Butler. "This unique partnership will provide the opportunity for children all across the nation to participate in hands-on math and science activities, and to learn more about their environment."

The Young Astronaut Council, a non-profit organization, was established by the White House in 1984 to help raise American students' proficiency in math and science. The Council is the world's largest space-related educational organization, developing and distributing curriculum materials to member chapters in elementary and middle schools. More than 26,500 chapters with more than 650,000 members belong to the Council's worldwide network.

McDonald's is the world's leading quick-service restaurant organization with more than 12,000 restaurants in 55 countries around the world, including more than 8,700 in the United States. Over seventy-five percent of McDonald's restaurant businesses are locally owned and operated by independent entrepreneurs.

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Enter the Space Bill of Rights National Contest To Win an Astronaut Visit to Your School

BACKGROUND

There are so many changes currently sweeping our world—dissolution of the Soviet Union, an economically united Europe, dismantling of apartheid in South Africa. What better time to introduce your students to the *U.S. Bill of Rights*, one of the most important cornerstones of our freedom?

America is celebrating the 200th anniversary of the ratification of the first ten amendments of the *U.S. Constitution*, the *Bill of Rights*. These documents have served as an inspiration to nations all over the world. Many countries have written their constitutions guided by the principles and values contained in our own cherished documents. Among the rights guaranteed in our *Bill of Rights* are the rights to freedom of speech and assembly, the right to practice religion free from governmental regulation, the right to be free from unreasonable searches and seizures, and the right to be tried by a jury of peers when being tried for criminal offenses.

In addition to these fundamental rights, the constitutions of many countries of the world (and some of our states which also have their own constitutions) contain provisions which guarantee individuals a quality education, employment, fresh air and sunshine and also call for world peace.

This contest challenges you to create a Space Bill of Rights for people who will be involved in the exploration and inevitable settlement of Outer Space. The document should clearly explain to individuals all of their guaranteed rights as well as their obligations, keeping in mind the unique environment of Outer Space. In choosing the types of provisions to include in your Space Bill of Rights, you should remember that Space will be inhabited by people from many nations, cultures and backgrounds.

When encouraging your students to draft their Space Bill of Rights, consider whether the fundamental values embodied in the U.S. Constitution shall apply to all individuals living in Outer Space. Do you wish to incorporate some of the provisions contained in the constitutions of other countries? What is the best way to harmonize any differences in values? How can you provide for community safety and individual survival in the hostile environment of space without infringing on individual rights? What contraints should there be on governing authority? Should there be a system of checks and balances similar to ours?

Remember that our Bill of Rights has lasted 200 years. Yours, too, must be relevant today and also flexible enough to meet the challenges of the future.

CONTEST RULES

This contest is open only to students in grades K-9. Schools may hold competitions at different levels within the school, but there can only be **ONE ENTRY PER LEVEL PER SCHOOL.**

The Space Bill of Rights must contain no more than 10 amendments and no more than 500 words. (Approximately 50 words per amendment.)

An important part of drafting your Bill of Rights is the process by which it was developed. Each contest entry must include a one-page, single-spaced letter, written by the classroom teacher, that explains the process by which the document was developed by your students, and how they decided which rights to guarantee citizens. Please list the procedure steps numerically.

Entries must be postmarked no later than midnight, **April 1, 1992.**

Entries will be judged by a panel including representatives of the Young Astronaut Council, NASA, a constitutions law scholar, space law practitioner, and a federal judge. Criteria include thoroughness of ideas and presentation, the universal nature of the rights and appropriateness to the Outer Space environment. Writing, spelling and punctuation also will be considered.

There will be 63 winners selected from each of the three levels—K-3, 4-6, 7-9. There will be three (3) grand-prize winners, ten (10) second-place winners, and fifty (50) third-place winners. Entries will be judged only against those in the same grade level. One astronaut visit will be awarded to the school attended by each of the nine grand-prize winners. Astronaut visits will be conducted during the 1992 school year. Plaques will be awarded to second-place winners, and third-place winners will receive certificates. Winners will be notified by mail prior to April 15, 1992, and Certificates of Participation will be sent to all entrants as submissions are received.

Entries should be submitted to: **The Young Astronaut Council, "Space Bill of Rights Contest," P.O. Box 65432, Washington, D.C. 20036.**

Ronald McDonald Children's Charities. Established in memory of Ray A. Kroc

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Young Astronauts™

T. WENDELL BUTLER

T. Wendell Butler is President, CEO and a member of the Board of Directors of the Young Astronaut Council. The Program is designed to promote heightened interest and skills of youth in math, science and related subjects using the excitement of the U.S. space program as a catalyst. Since its inception in 1984, the Young Astronaut Program has become the largest, space-related, youth educational organization in the world, with a membership exceeding a half million students at home and abroad.

Mr. Butler directs all the Council's activities as well as acting as chief spokesman for the Program. He oversees the development of innovative, high-quality curricula, activities and materials which are distributed to Chapters throughout the year. He represents the Young Astronaut Council in the space and educational communities and is a member of the Presidentially-appointed National Commercial Space Advisory Committee. In addition, he has developed strong ties with educational leaders and teachers throughout the nation. As the Program has grown in international stature and spread to 41 other countries, Mr. Butler has assisted in the establishment of correlated programs in Canada, Japan, Korea, Bulgaria and China as President of Young Astronauts International.

The Young Astronaut Program is a privately-supported, non-profit organization which relies principally on its membership fees to maintain its $2.1 million budget.

The Young Astronaut Program has won recognition from both the public and private sectors for its contribution to American education and its management success. In 1989, the Program was selected by the Harvard Business School as a model case study for a new course entitled "Entrepreneurship, Youth Creativity and Organization."

Mr. Butler was the chief architect of the Program while serving as Director of Corporate Liaison within the White House Office of Private Sector Initiatives. While there, he also developed and managed the National Partnerships in Education Program which resulted in the creation of over 35,000 partnerships among business, government agencies, local community organizations and schools.

Prior to his tenure at the White House, Mr. Butler held a number of other government positions, including Assistant Administrator of the Department of Energy. He served with the Congressional Budget Office, the Cost of Living Council, the Office of Management and Budget and the National Security Agency.

Mr. Butler holds a B.S. degree in Biological Sciences from Howard University and an M.P.A. from Harvard. He served as a Communications Officer with the Air Force for five years.

Young Astronaut Council • 1211 Connecticut Avenue, N.W., Suite 800 • Washington, D.C. 20036 • (202)682-1984

FACT SHEET

MISSION: The Young Astronaut Program is a national educational enrichment program for elementary, middle and junior high school students designed to promote the study of science, mathematics and technology. Its primary purpose is to raise the proficiency levels of American students in these subjects.

The Program aims to equip students at an early age with the skills needed to live in a technological world. To this end, students natural curiosity with space and the U.S. Space Program are used to instill a sense of fun into learning science and math. The Program has proved effective with girls and boys of all geographic, ethnic and economic backgrounds.

GROWTH: The Young Astronaut Council, which administers the Program, is a nonprofit corporation created in 1984. The Program has since become the world's largest, space-related, educational youth organization. Over 28,000 Chapters with 700,000 members have joined in America, with another half-million members in foreign countries.

OUTREACH TO SCHOOLS: The Council develops and distributes original, high-quality, space-related, curricular materials and hands-on activities to member Chapters. Chapters consist of up to 30 student members, aged 6-16, established in schools or communities under a volunteer Chapter Leader (teacher/adult). The Program may be implemented as a classroom or extracurricular activity.

Materials sufficient for two-three hours per week of activity are provided to each Chapter for an annual fee of $40. Many Chapters have local sponsors for their annual fee and for additional activities such as Chapter field trips.

PRESCHOOL PROGRAM: The Council also has developed an innovative program for preschoolers called The Youngest Astronauts. These materials are presented in a single reusable package that provides a year's worth of age-appropriate, scientific, fun activities for $44.90. The package includes lessons on gravity, stars, Sun, Moon, clouds, etc. and an accompanying storybook. This well-received science program has been introduced into 1,305 Head Start programs in America serving 452,000 children annually and is available to the nation's 229,000 licensed day-care facilities.

CURRICULUM: 96% of users of curriculum rated this year's materials "Outstanding". The materials are developed under an annual space theme by Council staff, educational consultants and aerospace specialists, with the support of NASA and other experts from industry and government. Materials are reviewed by an advisory group and pretested in classrooms across the country before nationwide distribution.

Each Chapter initially receives Membership Cards and Pledge Certificates for each child, together with a Handbook of instructions and guidance for Chapter Leaders. The monthly curriculum is centered on the Adventure Series containing hands-on, self-explanatory, fun activities. Space Watch, with a calendar of astronomical events, is issued annually. Chapters also receive a variety of special activity packages, including videos, and the bimonthly newsletter, ASTRO-NEWS. ASTRONET, a high-tech electronic mail system, provides Leaders and members with monthly updates on space exploration and networking opportunities at no additional cost.

COMPETITIONS: Chapters and their members are eligible to compete for trophies and certificates in national essay, art, math and science contests. Special recognition awards have included trips to the nation's capital, shuttle launches and student exchanges with the Soviet Union, Canada, Japan and China.

EDUCATIONAL CONFERENCES AND TRAVEL: A major feature of the Program involves educational travel and both domestic and international conferences. Individual Chapters are encouraged to develop their own bilateral exchanges with foreign and domestic counterparts.

INTERNATIONAL EXPANSION: Chapters have been formed in over 35 countries. As a result of the universal appeal of the Program, Young Astronauts International (YAI) has been established as an umbrella organization to oversee national programs in the US, USSR, Canada, Japan, Korea and China and all other foreign nations which wish to join. YAI Conferences take place annually. Young Astronauts and their Chapter Leaders meet famous astronauts and cosmonauts and join children and teachers from YAI member countries in educational activities, tours, workshops and youth exchanges. YAI Conferences have been held in Tsukuba (Japan), Oklahoma City, Yokohama and Orlando. To celebrate International Space Year 1992, YAI Conferences are being scheduled in the US, Japan and USSR.

NATIONAL SUPPORT: Government agencies which have provided support include NASA, the National Science Foundation and the Departments of Education, Commerce and Labor. The Parent Teacher Association (PTA) and other national educational and scientific associations endorse the Young Astronaut Program. Other organizations such as the Civil Air Patrol and Air Force Association sponsor Young Astronaut Chapters. Kiwanis International has adopted the Young Astronaut Program as a "major emphasis" educational project. Local Youth Service Kiwanis Chairmen can be contacted for sponsorship and financial support to Chapters. The Kiwanis locator phone number is 1-317-875-8755.

CORPORATE SUPPORT: YAC has gained the support of America's major corporations, including McDonald's, Toys 'R Us, Rockwell International, Martin Marietta, Apple Computers, Safeway, Zebra Publishing, McDonald Douglas, Estes Rocket, Pepsi and others. Corporate support is essential since membership fees cover only a portion of the cost of production of Program materials.

HOW TO START A CHAPTER:

o Send in the Young Astronaut Membership Application with your payment of $40.00 (check, money order, purchase order). Foreign Chapters add $20.00 for airmail.

o Chapter materials are produced for three grade levels: TRAINEE (grades 1-3), PILOT (grades 4-6), COMMANDER (grades 7-9). Each Chapter receives materials for one level only, as indicated on the Chapter Application Form.

Initially, you will receive Membership Cards and Pledge Certificates for each child and a Chapter Leader Handbook which provides you with detailed instructions on starting your Chapter. The full curriculum will follow monthly.

Call or write the Council if you have any questions.

JOIN THE SPACE PROGRAM AND KEEP AMERICA NO. 1

WHEN I GROW UP
CAREERS OF THE FUTURE

A UNIQUE CURRICULUM ACTIVITY PACKET
FROM THE YOUNG ASTRONAUT PROGRAM
SPONSORED BY McDONALD'S CORPORATION

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WHEN I GROW UP
CAREERS OF THE FUTURE

McDonald's® YOUNG ASTRONAUTS™

1. SOCIOLOGIST

Objective: to identify the working styles of individuals; to determine the best working conditions for a group.

Answers: For Trainee Level, answers will vary. For Pilot Level: A-4, B-1, C-3, D-5, E-7, F-2, G-6. It is important to emphasize that no one role within the group is better than another. A person's contribution to the group may also involve more than one role. For Commander Level, recommendations will vary. The crew might be more united if 1) the astronomer worked more closely with an electrical engineer, or vice versa; or if 2) an electrical engineer worked more closely with any other crew member. Sociograms indicate leaders and isolated pairs. The more connected the sociogram, the more cohesive the group.

2. MICROBIOLOGIST

Objective: to demonstrate the technique for growing bacteria; to observe the changes in bacterial growth over a period of time.

Answers: Answers will vary. Students should use color pencils to show changes in various cultures. If no bacterial growth is indicated in the control jar over time, the experiment was begun and conducted under sterile conditions. If the control jar shows bacterial growth, the other jars were most likely contaminated from the onset of or during the experiment.

Note: The procedure for Trainee and Pilot activities are described in the Commander Level activity.

3. CHEMIST

Objective: to demonstrate that plants are a source of oxygen that support human life.

Answers: Oxygen is given off by green plants in the presence of sunlight or artificial light. If you place a glowing splint into the test tube containing oxygen, the splint will burst into flame because oxygen supports combustion. By growing green plants in space, a continuous supply of oxygen can be released within the confines of the small, sealed space station. The plants can also absorb the poisonous carbon dioxide exhaled by the astronauts. Earth is a much larger, sealed environment than the space station, yet the exchange of gases between plants and people is the same. Plants give off oxygen and take in carbon dioxide. Animals take in oxygen and gives off carbon dioxide.

Note: The procedure for Trainee and Pilot activities are described in the Commander Level activity.

4. PSYCHOLOGIST

Objective: to observe and record the psychological effects of colors and shapes in one's environment; to design a restful environment for astronauts in the living module of the space station.

11. SAFETY SPECIALIST

Objective: to identify structural similarities and differences in the transverse beam of the space station.

Answers: for Trainees, 3 and 4 differ from the drawing on the "computer monitor." For Pilots and Commanders, 2, 4 and 5 differ from the computer drawing.

12. PUBLIC RELATIONS SPECIALISTS

Objective: to describe the benefits of the space station in an effort to increase public support for this project.

Answers: Answers will vary. The space station crew will take several days to readapt to Earth's gravity and will suffer some calcium loss in their bones. The international character of the crew could increase cooperation despite possible misunderstandings due to language and cultural differences. When the space station is complete in 1998, the goals of maintaining a U.S. presence in space, fostering space science and manufacturing and providing a base for further exploration will yield a variety of benefits. The living quarters of the space station are considerably larger than the space shuttle, with private compartments for each crew member.

MY PERSONAL PLANNING GUIDE

Objectives: to plan for a future career by 1) completing an interest survey, 2) interviewing an expert in a professional field, 3) researching information about a profession of interest to the student, 4) stating academic goals for high school and beyond, and 5) imagining oneself as prosperous and successful in the future (future focus role image).

DETERMINING MY INTERESTS

Objective: to complete a survey related to one's interests in science, art, social studies and music as well as mechanical and domestic activities.

Answers: The following statements relate to these stated areas of interest: science (1, 7, 16, 24), art (6, 18, 9, 21), social studies (2, 10, 14, 19), music (4, 8, 12, 20), mechanical skills (3, 13, 17, 23) and domestic skills (5, 11, 15, 22).

8. ASTRONAUT

Objective: to feel momentary weightlessness on Earth.

Answers:

1. At the moment the swing stops climbing and starts its descent, both the student and the swing will be falling at the same rate. For a short time, there will be no pressure between the student and the seat. As the student descends along the circular path, he/she will feel the push of the swing as it provides the centripetal force needed to move the student along a circucular path.
2. Students can feel the sensation of weightlessness on Earth jumping off a diving board or noting their movement as an elevator starts to descend. They can get a sense of weightlessness by floating in water. However, they can swim in water. Students couldn't "swim" if they were stranded in the center of a space station because there would be nothing to push against.
3. Weightlessness or microgravity exists aboard the space station because the forward motion of the station equals the force of gravity. As a result, the space station and everything in it falls toward Earth at the same rate. It would be similar to riding on a free-falling elevator. There would be no force on your feet. You would feel weightless.

9. MISSION CONTROL SPECIALIST

Objective: to work together to solve a problem that has been communicated to mission control specialists by the space station crew.

Answers: for Trainees, the temperature inside the laboratory module of the space station will increase from 80°F to 90°F in five minutes. It will take a total of ten minutes for the area to reach 100°F. For Pilots and Commanders, the temperature of the module will be 86.6°F in ten minutes (1° ÷ 1.5 min. = 20° ÷ X min.). **THE SOLUTION**: Answers will vary. Students may suggest postponing experiments that generate heat, decreasing the physical activity of the astronauts, moving the astronauts to the living module, etc. Eventually, the problem might be solved by expelling excess heat through the outside radiators or creating a solar fan inside the module.

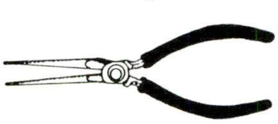
10. MECHANIC

Objective: to identify mechanic tools and their uses.

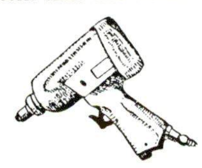
SOCKET WRENCH AND SOCKETS: turns and holds nuts and bolts.

HAND WRENCH: turns and holds nuts and bolts.

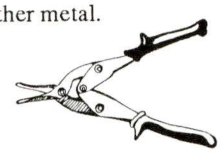
LONG-NOSED PLIERS: pinches, twists and cuts wires and other small objects.



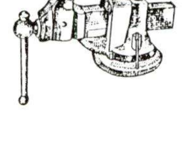
ELECTRIC DRILL: loosens and tightens nuts and bolts.



METAL SHEARS: snips tin and other metal.



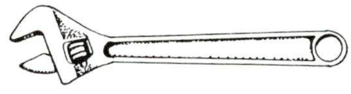
VISE: holds work in place.



STANDARD SCREWDRIVER: turns screws with a ⊖ head.

PHILLIPS SCREWDRIVER: turns screws with a ⊕ head.

ADJUSTABLE WRENCH: turns or holds nuts, bolts and pipes.



BALL PEEN HAMMER: pounds nails, shapes metal.

Answers: Answers will vary. On the Commander Level survey, YES should be the most frequent answer for each question. Ask students to explain/justify their choices of colors and shapes for the habitation module.

RELATED INFORMATION: Astronauts who have experienced extended stays in space have reported that the lack of colors in their environment causes discomfort. Research in the area of psychology has indicated that color, shapes and patterns affect one's level of comfort and discomfort, passive and aggressive behavior, energy and productivity and the feeling of size and space within one's environment.

5. ENVIRONMENTAL PROTECTION ENGINEER

Objective: to demonstrate a filtration system to purify dirty water.

Answers: Answers will vary as students draw and describe the water before and after filtration. It is far more practical for astronauts to recycle water in space rather than transport clean water from Earth and return waste water to Earth. Since one gallon of water weighs eight pounds, it would be too costly to transport water and other liquids to and from space.
Precipitation is filtered through layers of soil and rock until it reaches the water table. The water is then pumped from the ground to be used again in a wide variety of ways. Water obtained from underground is filtered naturally. Water obtained from rivers is purified in chemical treatment plants.
Precipitation is filtered through layers of soil and rock until it reaches the water table. The water is then pumped from the ground to be used again in a wide variety of ways. Water obtained from underground is filtered naturally. Water obtained from rivers is purified in chemical treatment plants.

Note: The procedure for Trainee and Pilot activities are described in the Commander Level activity.

6. ELECTRICAL ENGINEERING

Objective: to build and operate solar powered mechanical devices.

Answers: Solar cells, when exposed to light, generate electricity to drive machinery. There are many benefits for converting solar energy to electrical energy for people living on Earth as well as in space. The Sun is an endless, clean energy supply with no harmful byproducts. While the development of this new industry is initially expensive, the ultimate benefits are long-lasting and far-reaching. The solar powered boat built by Pilots and Commanders should move freely through water. If the rudder is set properly and the surface area is large enough, the boat will move in a continuous circle. The solar powered boat would not have enough light to generate electricity inside the space station. If an astronaut were to shine a strong light on the solar cell, the propeller would turn but the air would not be a thick enough medium to move the boat forward. The boat would, however, move slightly because of cabin air currents. If the boat were deployed as a satellite from the space station, it would move in orbit at the same speed at which it were released. If the solar cells were facing the Sun, the propeller would spin rapidly - so rapidly that the boat might also spin. The propeller would have no affect on the forward motion of the boat since there is no medium to push against in space.

Note: The procedure for Trainee and Pilot activities are described in the Commander Level activity.

7. ASTRONOMER

Objective: to interpret picture elements (pixels) similar to those analyzed by astronomers; to observe the movement of a planet through the night sky; to photograph star trails.

Answers: For Trainee Level (T-9), the color pixels combine to form the planet Jupiter. For Commander Level (C-14), the graph forms a spiral galaxy similar to: Note: It is important to emphasize that many images collected by astronomers are computer generated and not directly viewed by the human eye.

RESOURCES RELATED TO CAREERS OF THE FUTURE

Fraser, Sherry. SPACES: Solving Problems of Access to Careers in Engineering and Science. Palo Alto, CA., 1982. Dale Seymour Publications.
A collection of activities for 9-15 year olds designed to stimulate students' thinking about scientific careers, develop problem solving skills, promote positive attitudes toward the study of mathematics and increase interest and knowledge about scientific work.

Hopke, William E. The Encyclopedia of Careers and Vocational Guidance. Chicago, IL., 1987. J. G. Ferguson Publishing Company.
The descriptions found in this volume are designed to help students make career choices based on up-to-date, factual information.

Career Information Center. Mission Hills, CA., 1987. Glencoe Publishing Company.
Volume 6 offers descriptions and educational requirements for careers in engineering, science and technology.

Career Opportunities in Aerospace Technology: Number NN-100. Washington, D.C., 1988. National Aeronautics and Space Administration.
This booklet describes NASA's job specialties in aerospace technology as well as education and experience requirements.

Careers in Aerospace Technology. Washington, D.C., 1988. National Aeronautics and Space Administration.
This easy to read NASA Fact Sheet lists aerospace careers related to engineering, science and technology. It offers a checklist to help students determine their interest in aerospace technology and describes the type of education needed beyond high school for specific careers.

CREDITS

Space station facility: McDonnell Douglas Space Systems (Huntington Beach, CA)
Photography for illustrations by Susan Victoria

This packet prepared by curriculum design specialists at Kino Learning Center, Inc., Tucson, Arizona. Written by Judith Bisignano, Ed.D., Corinne Sanders, David Anderson and Elizabeth Prohaska. Illustrated by Trina Baiz Felty. Special thanks to the students at Kino School for modeling for the art work for this learning packet.

WHEN I GROW UP
CAREERS OF THE FUTURE

7. What skills and talents are required for this job?

____

____

8. How can you begin today to prepare for this career?

____

____

9. What classes will you need to take in high school to prepare for this career?

____

____

10. In what city, state or country might you choose to be employed? ____________________

PLANNING AHEAD

Use the information obtained about yourself in this learning packet to complete the statements below.

1. Describe your goals and objectives for high school. ____________________

____

2. Describe your goals and objectives for trade school or college. ____________________

____

LOOKING BACK

Throughout your life you will know happiness and sadness. You will experience success and failure. Describe the impact that you hope your life will have on other people.

I would like to be remembered for ____________

____

____

Plan today to create your future!

COMMANDER LEVEL (Grades 7-9)

WHEN I GROW UP
CAREERS OF THE FUTURE

McDonald's ASTRONAUTS

GATHERING JOB INFORMATION

There are two excellent resources available in your school or public library that describe various careers of the future. Refer to The Occupational Outlook Handbook and the Dictionary of Occupational Titles, or DOT, to answer the following questions about a job of interest to you.

JOB TITLE: ______________________

1. What specific activities are performed on this job? (For example, measuring, writing, sawing, giving speeches.)

____

____

2. What is the job environment? (For example, the job is done indoors or outdoors; in an office or factory.)

____

____

3. What rewards does the job provide? (For example, high salary, convenient hours, pleasant surroundings, adventure, emotional satisfaction.)

____

____

4. How does this job support your personal values, interests and goals?

____

____

5. How much training or education is required? Where could you get this training? (For example, four-year degree from a college or university; certification from a business or trade school.)

____

____

6. Are there several or few job openings expected in this field when you plan to enter the job market?

____

____

WHEN I GROW UP
CAREERS OF THE FUTURE

INTERVIEWING AN EXPERT

You can learn a great deal about careers by talking with an adult whom you respect and admire. You may know this person well, such as a parent or neighbor. Or, you may know of the accomplishments of a person through news reports. Use the following questions to interview a person who performs work of interest to you.

Person interviewed: ______________________

Job title: ______________________

1. Why did you choose your career ?

____

____

2. What is the most satisfying part of your job?

____

____

3. What is the most difficult part of your job?

____

____

4. Would you make the same choice of this career today? Why? Why not?

____

____

5. What advice can you give me as I begin to think about careers of the future?

____

____

____

____

Student: ______________________ Date: ______________________

COMMANDER LEVEL (Grades 7-9)

WHEN I GROW UP
CAREERS OF THE FUTURE

MY PERSONAL PLANNING GUIDE

DETERMINING MY INTERESTS

Knowing your likes and dislikes will allow you to plan your future career according to your particular interests. Circle one answer for each statement. Ask an adult to help you interpret the survey to determine your areas of interest.

I would like to...

1. watch a young bird learn to fly.	YES	NO	MAYBE
2. learn a different language.	YES	NO	MAYBE
3. fix a broken clock.	YES	NO	MAYBE
4. play a musical instrument.	YES	NO	MAYBE
5. go shopping for groceries.	YES	NO	MAYBE
6. take pictures with a camera.	YES	NO	MAYBE
7. predict weather changes.	YES	NO	MAYBE
8. go to an opera.	YES	NO	MAYBE
9. carve something out of wood.	YES	NO	MAYBE
10. know more about people in China.	YES	NO	MAYBE
11. clean a closet.	YES	NO	MAYBE
12. make up a song.	YES	NO	MAYBE
13. run a printing press.	YES	NO	MAYBE
14. see the news on television.	YES	NO	MAYBE
15. iron clothes.	YES	NO	MAYBE
16. know how sound is put on movie film.	YES	NO	MAYBE
17. make bookshelves.	YES	NO	MAYBE
18. paint with water colors.	YES	NO	MAYBE
19. know how governments work.	YES	NO	MAYBE
20. sing in a group.	YES	NO	MAYBE
21. make a ceramic pot.	YES	NO	MAYBE
22. cook a meal.	YES	NO	MAYBE
23. change the oil of a car.	YES	NO	MAYBE
24. experiment with magnets.	YES	NO	MAYBE

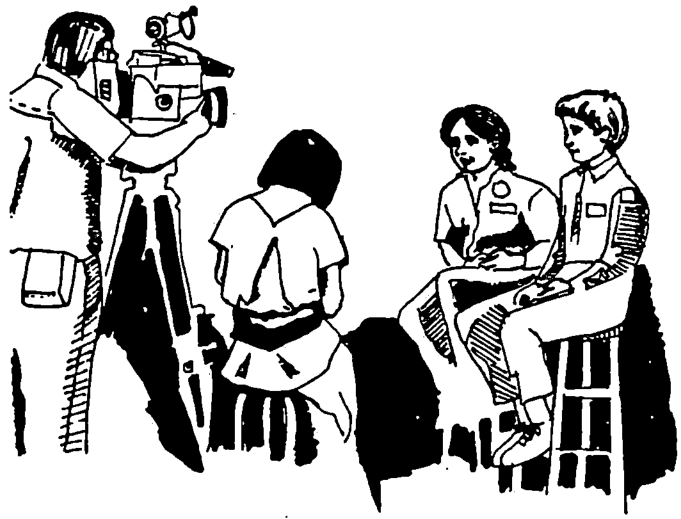
Student: ______________________ Date: ______________

COMMANDER LEVEL (Grades 7-9)

WHEN I GROW UP

CAREERS OF THE FUTURE

12. PUBLIC RELATIONS SPECIALIST



Public relations specialists communicate NASA's goals and purposes of space exploration to the general public. These specialists talk and write about the benefits of space exploration in ways that generate interest and support for the space program.

The year is 1997. The first eight-member, international crew of Space Station Freedom has successfully returned to Earth after six months in space. As public relations specialist for NASA, it is your job to answer the questions of reporters during a press conference. Using a tape recorder or video camera, give clear, concise answers to some of the following questions.

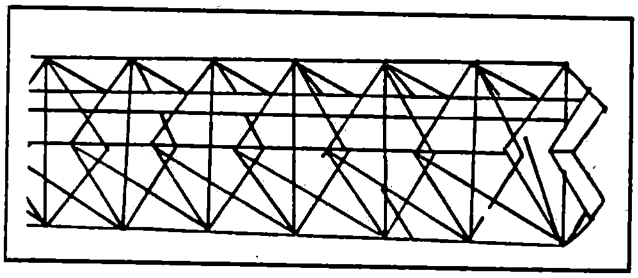
1. What is the general physical and emotional condition of the crew members?
2. What, if any, are the negative effects of long-term weightlessness?
3. What were the major accomplishments of this mission?
4. What are the benefits and drawbacks of having an international crew?
5. Do the overall benefits of the space station warrant its expense? What are these benefits?
6. What are the goals of Space Station Freedom over the next ten years?
7. Is construction on the space station going as planned? When will the entire station be completed?
8. Did the crew think the living situation was conducive to personal growth? Why or why not?
9. If the crew could make one statement to the people of Earth, what would it be?

WHEN I GROW UP
CAREERS OF THE FUTURE

11. SAFETY SPECIALIST

Computer monitors at Mission Control show safety specialists the various parts of Space Station Freedom. The monitor below shows a section of the transverse beam. All of the parts of the space station are attached to this beam.

Three sections of the beam differ from the standard drawing in the box below. Examine the various drawings. Circle the three sections that differ from the standard drawing.



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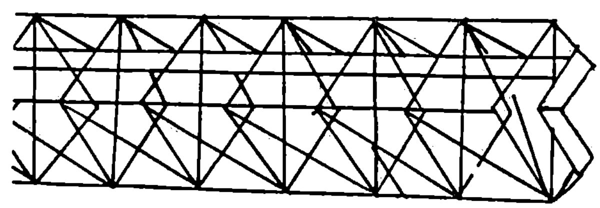

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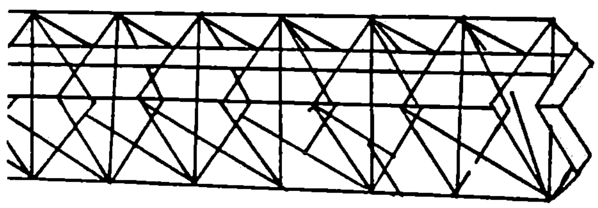

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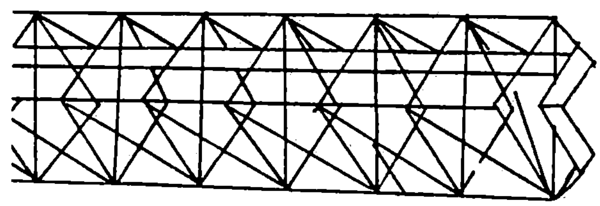

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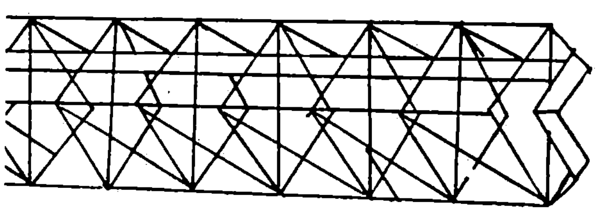

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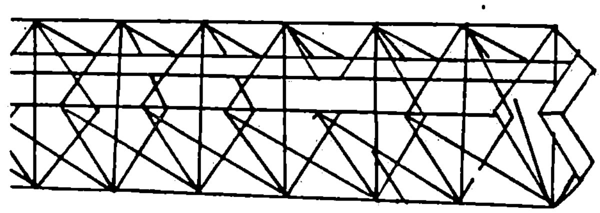


Safety Specialist: ______________________ Date: ______________

WHEN I GROW UP

CAREERS OF THE FUTURE

MECHANIC (cont.)

SOCKET WRENCH AND SOCKETS: turns and holds nuts and bolts.

METAL SHEARS: snips tin and other metal.

HAND WRENCH: turns and holds nuts and bolts.

ELECTRIC DRILL: loosens and tightens nuts and bolts.

LONG-NOSED PLIERS: pinches, twists and cuts wires and other small objects.

VISE: holds work in place.

ADJUSTABLE WRENCH: turns or holds nuts, bolts and pipes.

STANDARD SCREWDRIVER: turns screws with a ⊖ head.

BALL PEEN HAMMER: pounds nails, shapes metal.

PHILLIPS SCREWDRIVER: turns screws with a ⊕ head.

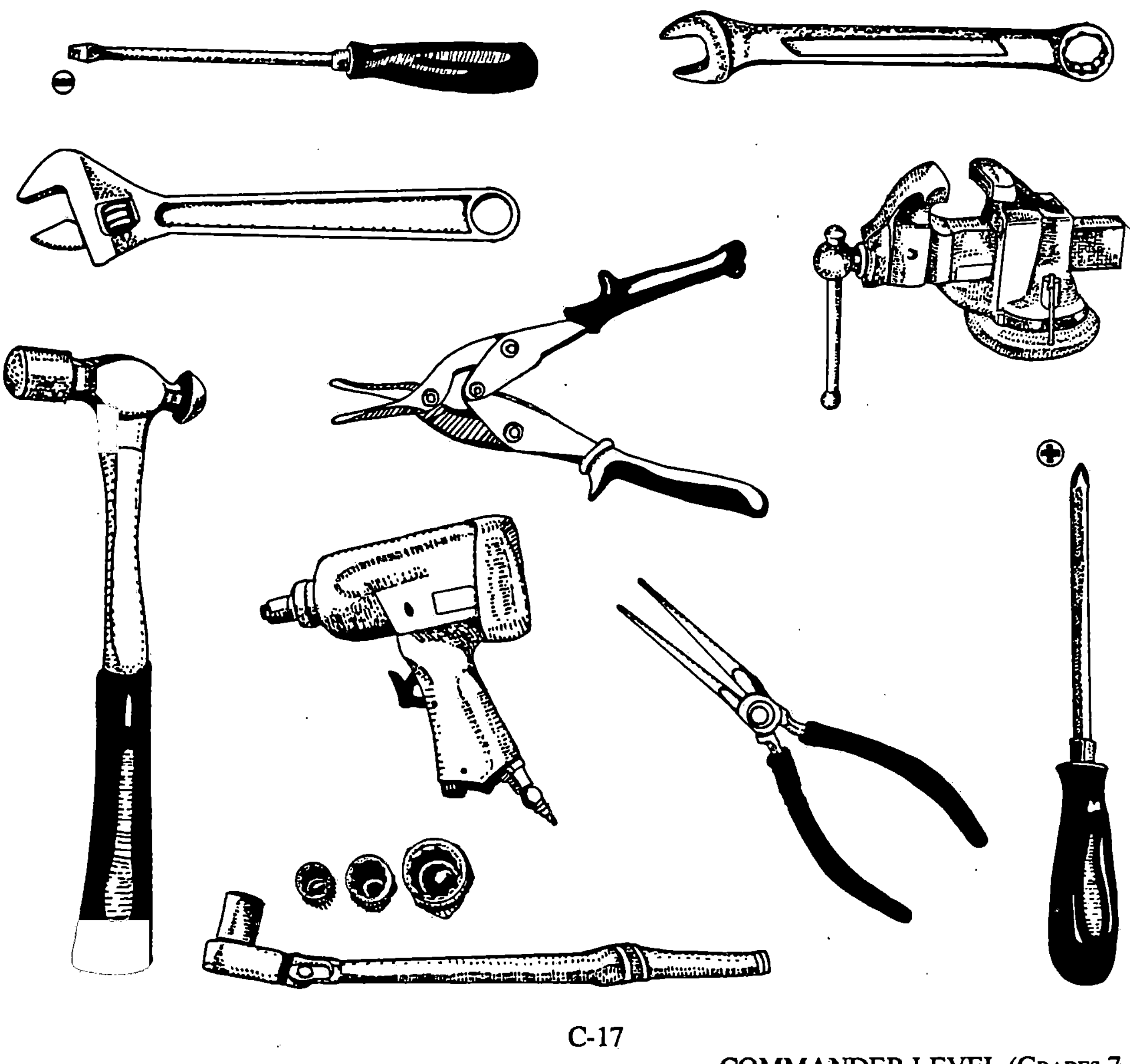
EXTENDED ACTIVITY
Visit an aircraft hanger. Ask a mechanic to describe and demonstrate his/her work on aircraft engines.

WHEN I GROW UP
CAREERS OF THE FUTURE

10. MECHANIC

Mechanics maintain and repair engines. As an aerospace mechanic, it is your responsibility to check, clean and repair the shuttle rocket engines as well as the electrical and break systems of the orbiter.

Cut out the drawings of the mechanic tools below. Cut out the names and descriptions of the tools on the next page. Practice matching the drawings of the tools with their names and descriptions.



WHEN I GROW UP

CAREERS OF THE FUTURE

9. MISSION CONTROL SPECIALIST

Mission Control specialists direct and monitor all space flight activities. One specialist radios advice and information to the flight crew.

Below is a situation that has been radioed to you by the commander of Space Station Freedom. Work with other mission control specialists to solve the problem in as little time as possible. Write your response to the situation in the space provided.

THE SITUATION

"Mission Control, this is Freedom. Sensors on our display panel indicate the air temperature aboard the laboratory module is 80° F and is increasing one degree every 90 seconds. Please calculate our expected air temperature in ten minutes. Also, calculate how many minutes it will take for the temperature to reach 100° F. Please suggest ways this problem might be rectified. This is Freedom. Over and out."

THE SOLUTION

____

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Mission Control Specialist: ____________________ Date: ____________________

WHEN I GROW UP

CAREERS OF THE FUTURE

McDonald's® YOUNG ASTRONAUTS™

8. ASTRONAUT

Astronauts are people who work in space. Some astronauts operate space vehicles. Others conduct experiments in the micro-gravity environment. As an astronaut aboard Space Station Freedom, you observe how people adapt to microgravity. You also conduct experiments and gather information high above the Earth's atmosphere.

Back on Earth, however, many people ask you to describe your feelings of weightlessness in space. Here is an activity by which these people may experience momentary weightlessness on Earth.

Pump high on a playground swing. At the moment the swing stops climbing and starts its descent, both you and the swing will fall to Earth at the same rate. At this moment, you will feel weightlessness or no gravity between you and the seat of the swing. As you continue to fall toward Earth, you will again feel the swing pushing against you. The swing is providing the force needed to move you along its circular path.

1. Describe the feeling of weightlessness you experienced on the swing.

____

____

2. Name other activities where you feel momentary weightlessness on Earth.

____

____

3. Explain why weightlessness or *microgravity* exists aboard the space station.

____

____

Astronaut: ______________________ Date: ______________

WHEN I GROW UP

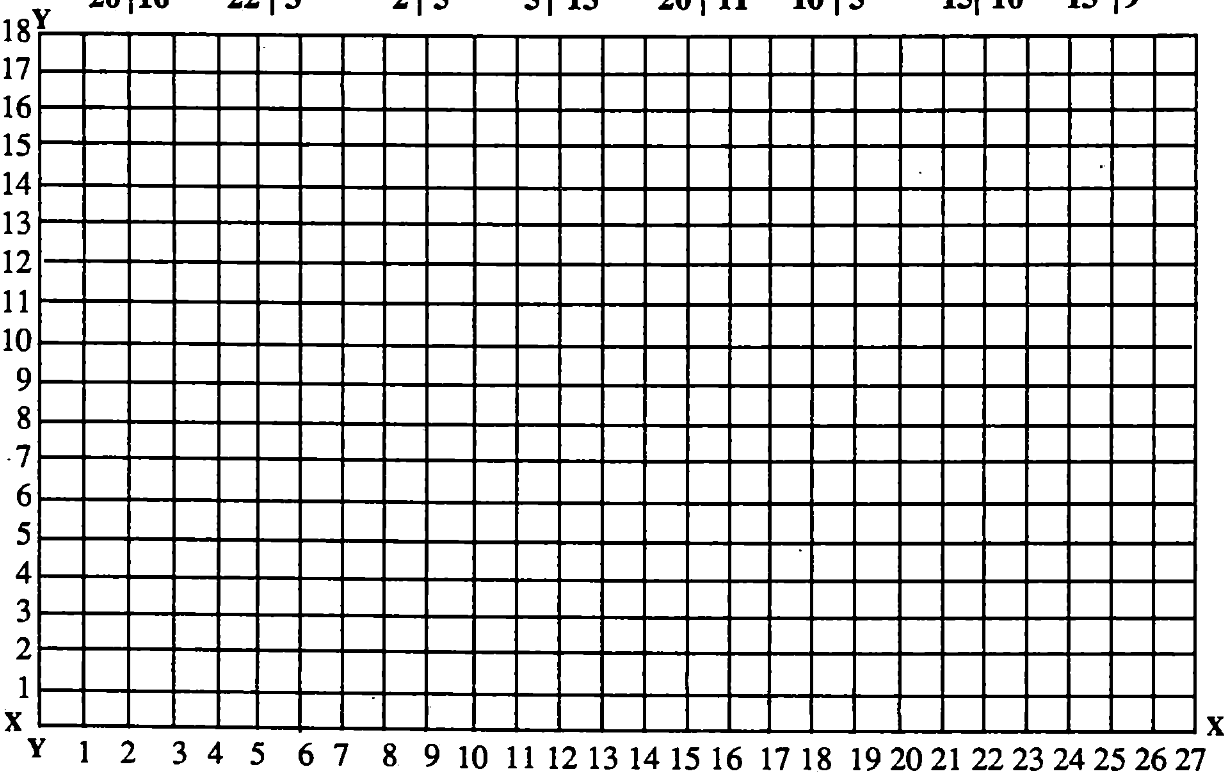
CAREERS OF THE FUTURE

ASTRONOMER (cont.)

Astronomers at the space station receive *picture elements* called *pixels* from space probes. Each tiny pixel is translated by computer and transferred to a screen to make a whole picture.

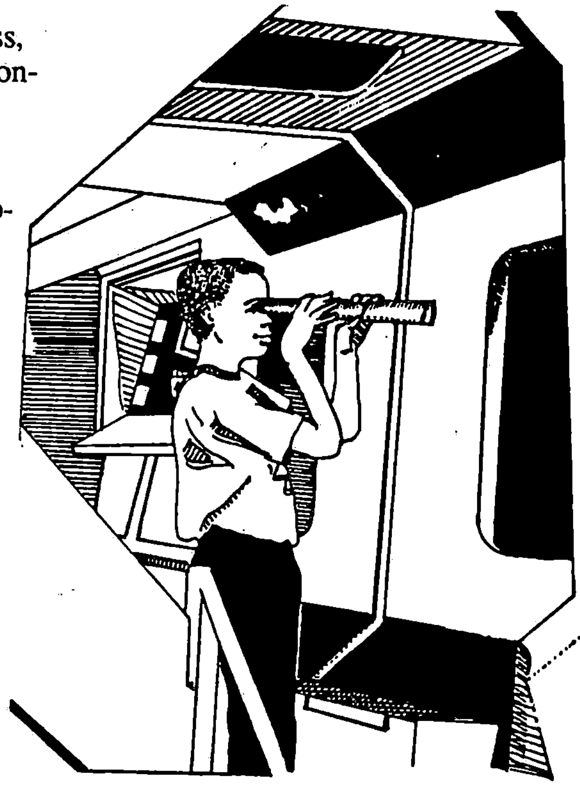
Below are the coordinates needed to draw the spiral-shaped Milky Way galaxy. Draw a star at each point. Connect the stars in order to draw the galaxy.

X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
0	15	23	14	18	1	1	6	10	14	21	9	9	6	16	8
5	17	25	12	13	0	0	8	13	14	19	7	8	8	14	7
9	18	27	10	9	1	1	11	17	13	17	6	8	9	12	8
15	18	26	6	5	3	3	12	19	12	13	5	12	11	12	9
20	16	22	3	2	5	5	13	20	11	10	5	15	10	13	9



Astronomer: ______________________ Date: ______________

7. ASTRONOMER



Astronomers are scientists who study the brightness, motion and makeup of celestial bodies. As an astronomer aboard Space Station Freedom, you have the opportunity to view the stars without interference from the Earth's atmosphere. You will make some observations directly through telescopes. Many observations will also be made by interpreting computer information from telescopes.

Record your observations of stars and planets by photographing these objects in the night sky.

Materials needed:
- camera (with shutter that can be left open)
- tripod
- black and white film (Tri X-ASA 400)
- color slide film (Ektachrome 400)
- cable release
- pencil and paper
- watch or clock

Procedure for photographing stars:

1. Put the camera on the tripod pointing toward a constellation. Choose a constellation high in the sky to avoid distortion from the atmosphere.
2. Focus the camera at infinity or as far away as it will go.
3. Set the aperture (f stop) at its maximum opening.
4. Set the shutter for a time exposure.
5. Attach the cable release and experiment with shutter speeds. If you leave the camera open for several minutes, you will begin to record star trails--the curved paths of light made by moving stars over a period of time.
6. Record the date, constellation and exposure time of each photograph.

Procedure for photographing planets:

1. Take photographs of planets over a period of time to show their movement in the night sky. Always include stars around the planet as reference points.
2. Use color film. Try to show the red of Mars and the yellow of Saturn compared with the white of Venus. You can do the same with the colors of stars.

WHEN I GROW UP

CAREERS OF THE FUTURE

ELECTRICAL ENGINEER (cont.)

8. Cut a small piece of balsa in the shape of a rudder. Push the rudder into the front of the boat as shown in the illustration. Place the rudder at an angle to allow the boat to run in a wide circle. Glue the rudder in place.
9. Request that a friend on Earth make a similar solar-powered boat. Have this person test the boat in a container of water, swimming pool or pond on a sunny day.

Results:

1. Describe the movement of the boat in water on Earth. ____________________

____

____

2. Describe the movement of the boat aboard the space station.

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3. Describe the movement of the boat if it were deployed as a satellite from the space station.

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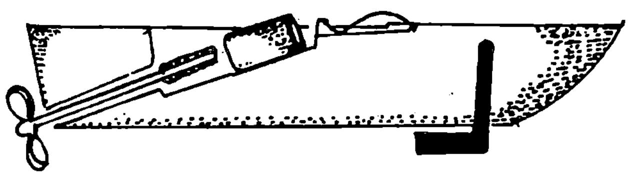
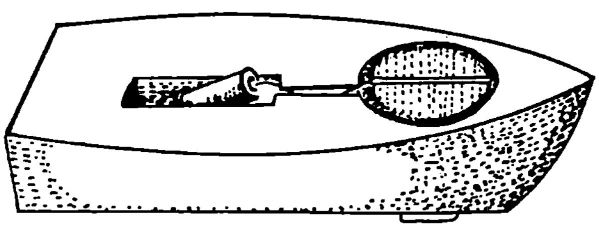
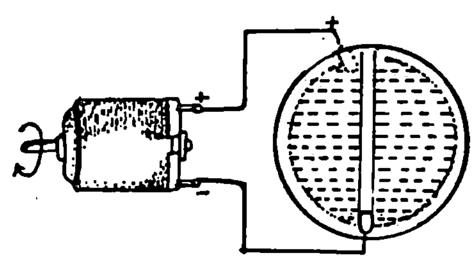






Engineer: ____________________ Date: ____________________

WHEN I GROW UP
CAREERS OF THE FUTURE

6. ELECTRICAL ENGINEER

Engineers develop ways to make life more safe and comfortable for others. As an electrical engineer aboard Space Station Freedom, you develop solar power as a source of energy for Earth.

Perform the following experiment to demonstrate how solar energy is converted into mechanical energy to do work.

Materials needed:

- 2 in. solar cell (from hobby store)
- 1.5 volt motor (from hobby store)
- styrofoam block 6 in. x 3 in. x 2 in.
- fine sandpaper
- toy propeller with long shaft (from hobby store)
- X-acto knife
- balsa scrap (for rudder)
- piece of clothes hanger (6 in. long)
- 1/2 in. length of rubber tubing (with inside diameter small enough to connect shaft of motor with shaft of propeller)

Procedure:

1. Carve a block of styrofoam to resemble a speed boat. The flat top of the boat will hold the solar cell to power the boat. NOTE: Caution should be taken when using an X-acto knife. Have an adult help you with this part of the procedure.
2. Sand the boat with fine sandpaper.
3. Carve the boat as shown in the illustration on the next page to properly locate the motor and rubber connector.
4. Push the wire clothes hanger through the styrofoam to make the hole for the propeller shaft as shown in the illustration. Remove the hanger.
5. Use the rubber tubing to connect the propeller shaft to the motor shaft.
6. Use white glue to secure the motor and solar cell in place.
7. Connect the negative wire of the solar cell to the negative wire of the motor. Connect the positive wire of the solar cell to the positive wire of the motor. This will allow the motor shaft to turn in a clockwise direction and allow the boat to move in a forward direction when put in water.

ENVIRONMENTAL PROTECTION ENGINEER (cont.)

Results:

1. Describe the degree of visible pollution before filtering the water.

____

____

2. Describe the degree of visible pollution after filtering the water.

____

____

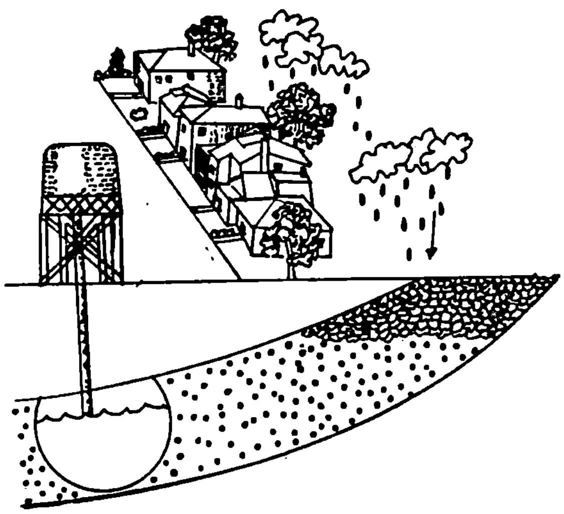
3. Is it more practical for astronauts to recycle their water aboard the space station or transport their water from and to Earth? Give reasons for your answer.

____

____

Other Applications:

1. Study the illustration. Tell how the Earth purifies water that falls to the ground in the form of rain.



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2. Why is water obtained from underground water tables often cleaner than water obtained from rivers?

____

____

Environmental Engineer: _______________ Date: _______________

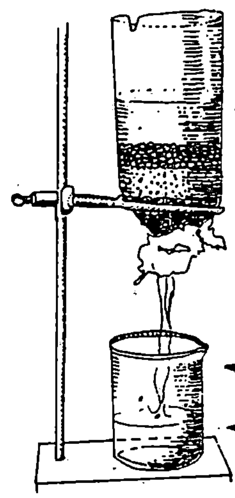
WHEN I GROW UP
CAREERS OF THE FUTURE

5. ENVIRONMENTAL PROTECTION ENGINEER

Engineers develop ways to make life more safe and comfortable for others. As an environmental protection engineer aboard Space Station Freedom, you develop ways to use and recycle its resources in an effort to create a balanced environment to sustain life.

Perform the following experiment to demonstrate how water can be purified to be used again aboard the space station.

Materials needed:
- 2-liter plastic bottle
- cheesecloth
- charcoal (2-3 in. layer)
- sand (3-4 in. layer)
- gravel (2-3 in. layer)
- collecting beaker or jar
- scissors
- rubberband
- ring stand and clamp
- dirty water



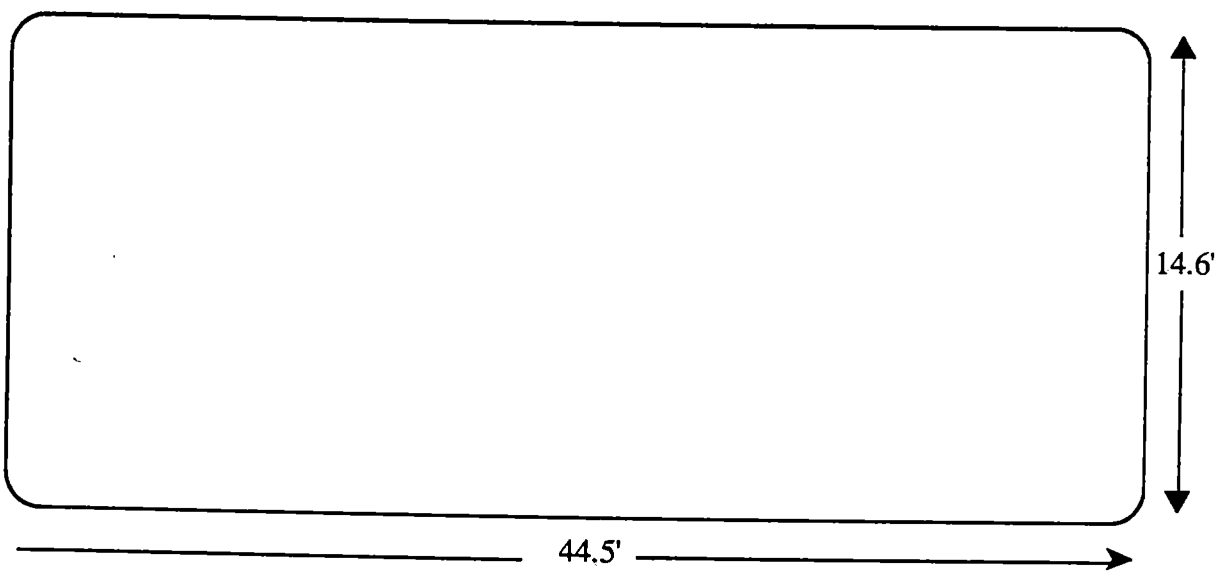
Procedure:
1. Cut the bottom out of the 2-liter bottle.
2. Place the cheesecloth over the mouth of the bottle and secure it with a rubberband.
3. Invert the bottle and add the charcoal, sand and gravel as shown in the illustration.
4. Place a collecting beaker or jar under the mouth of the bottle.
5. Pour dirty water into the bottle. Use the filtered water that comes through the bottle to water plants at home or school. DO NOT DRINK THE FILTERED WATER. EVEN THOUGH IT MAY APPEAR TO LOOK CLEAN, IT COULD CONTAIN DISSOLVED CONTAMINANTS.

PSYCHOLOGIST (cont.)

Survey results:
Ask ten people the following questions. Record the total answers in the space provided.

	Yes	No	Uncertain
1. Do cool colors make you feel relaxed?			
2. Do cool colors make you feel cool?			
3. Do cool colors make the space seem large?			
4. Do warm colors make you feel active?			
5. Do warm colors make you feel warm?			
6. Do warm colors make the space seem small?			
7. Do hot colors make you feel active?			
8. Do hot colors make you feel warm?			
9. Do hot colors make the space seem small?			
10. Do curved lines make you feel calm?			
11. Do polka dots make you feel active?			
12. Do angles make you feel tense?			

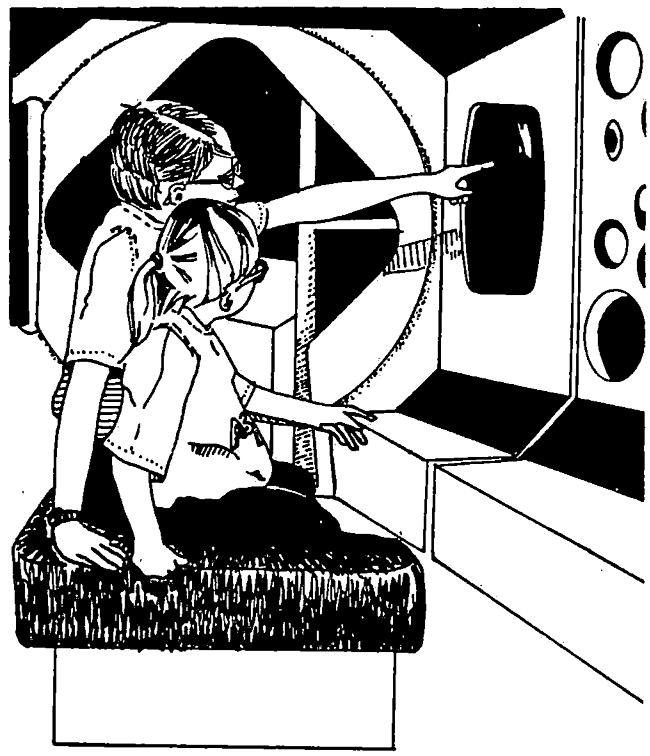
Conclusions:
From the information you acquired through this experiment, design a color scheme and line design for the living module of the space station on the diagram below. Create your design on a wall in your home or school.



Psychologist: ______________________________ Date: ____________________

WHEN I GROW UP
CAREERS OF THE FUTURE

4. PSYCHOLOGIST



Psychologists are scientists who study the behavior of people. As a psychologist aboard Space Station Freedom, you observe the effects of this small environment on the behavior of the crew over an extended period of time.

Perform the following experiment to observe the effects of colors and shapes on people who live in confined spaces for extended periods of time.

Materials needed:
- construction paper of various colors
- scissors
- white glue
- magazine photographs
- masking tape
- large magic marker
- large boxes (optional)

Procedure:

1. Choose three small areas of identical size, such as under tables or inside boxes. Make sure these areas have three sides and a space where you can sit comfortably.

2. Place large sheets of cool colors (blue and green) in one area. Stay in this area for several minutes or hours. Ask other students to stay in this area for extended periods of time.

3. Decorate the second space with warm colors (yellow, orange, brown and mild pink). Spend time in this area. Ask other students to do the same.

4. Decorate a third space with hot colors (red and hot pink). Spend time in this area. Ask other students to do the same.

5. Now decorate the first area with curved lines, the second area with various sizes of polka dots and the third area with sharp angles. Again, spend time in each of these areas. Ask other students to do the same.

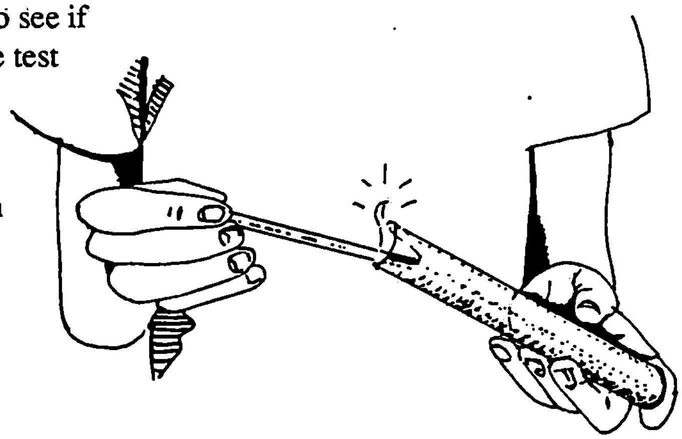
WHEN I GROW UP

CAREERS OF THE FUTURE

CHEMIST (cont.)

7. When you have collected a tube of the gas, test to see if it is oxygen. To do this, put your thumb over the test tube and remove it from the water.

8. Light a match. Remove your finger from the test tube and quickly place the burning match into the mouth of the tube. If the gas is oxygen, the match will burn more brightly since oxygen supports combustion.



Results:

1. Was a gas given off by the plant and collected in the test tube? ____________

2. How do you know the gas collected was oxygen?

____

____

____

3. How can plants help support human life aboard the space station?

____

____

____

4. How can plants help support human life on Earth?

____

____

____

Chemist: ______________________ Date: ______________

WHEN I GROW UP
CAREERS OF THE FUTURE

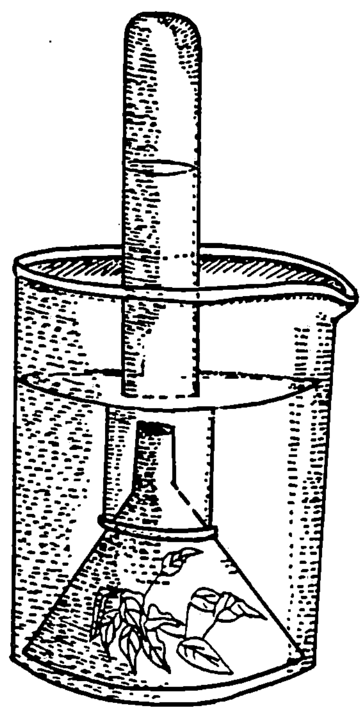
3. CHEMIST

Chemists are scientists who study the composition of substances and the changes they undergo. As a chemist aboard Space Station Freedom, you are researching how plants might be used to make oxygen for people to breathe.

Perform the following experiment to demonstrate how plants produce oxygen.

Materials needed:

- large beaker of water
- Elodea plant (from aquarium store)
- short-stemmed funnel
- test tube
- scissors
- wooden matches
- reading lamp



Procedure:

1. Fill the beaker with water.
2. Clip a sprig off of a live Elodea plant.
3. Place the sprig in the funnel. Invert the funnel in the beaker.
4. Fill a test tube with water. Place your thumb over the test tube. Invert the test tube in the water and remove your finger.
5. Carefully place the test tube over the end of the funnel. Do not allow any air to enter the test tube.
6. Over time, water in the test tube is displaced by a gas given off by the plant. You can speed up this process by placing the plant near a lamp with a bright light.

WHEN I GROW UP

CAREERS OF THE FUTURE

MICROBIOLOGIST (cont.)

2. Draw changes in the jars over a twelve-day period.

JAR B	location	Day 3	Day 6	Day 9	Day 12
JAR C	location	Day 3	Day 6	Day 9	Day 12
JAR D	location	Day 3	Day 6	Day 9	Day 12

3. Were there changes in the jar A marked *control*? ______________
4. What does this tell you about the equipment used for this experiment? ______________

RELATED INFORMATION: One of the purposes of the Viking spacecraft that landed on Mars was to look for microscopic life forms on the planet. The test was called the *Gulliver Experiment*. In this test, a sticky string was pulled across the surface of Mars. The string was then put in a petri dish with agar (gelatin). If any life forms were stuck to the string, they would be nourished and grow in the container. No such life forms as we know them were found on Mars at that time.

Microbiologist: ______________________ Date: ______________

WHEN I GROW UP
CAREERS OF THE FUTURE

McDonald's YOUNG ASTRONAUTS™

2. MICROBIOLOGIST

Microbiologists are scientists who design experiments to observe tiny, microscopic bacteria. As a microbiologist aboard Space Station Freedom, you are looking for possible life forms from other planets.

Perform the following experiment to look for bacterial growth aboard the space station.

Materials needed:

- string
- 4 baby food jars with lids
- unflavored gelatin
- hot water
- measuring cup
- pen or marker
- masking tape
- saucepan
- spoon
- scissors

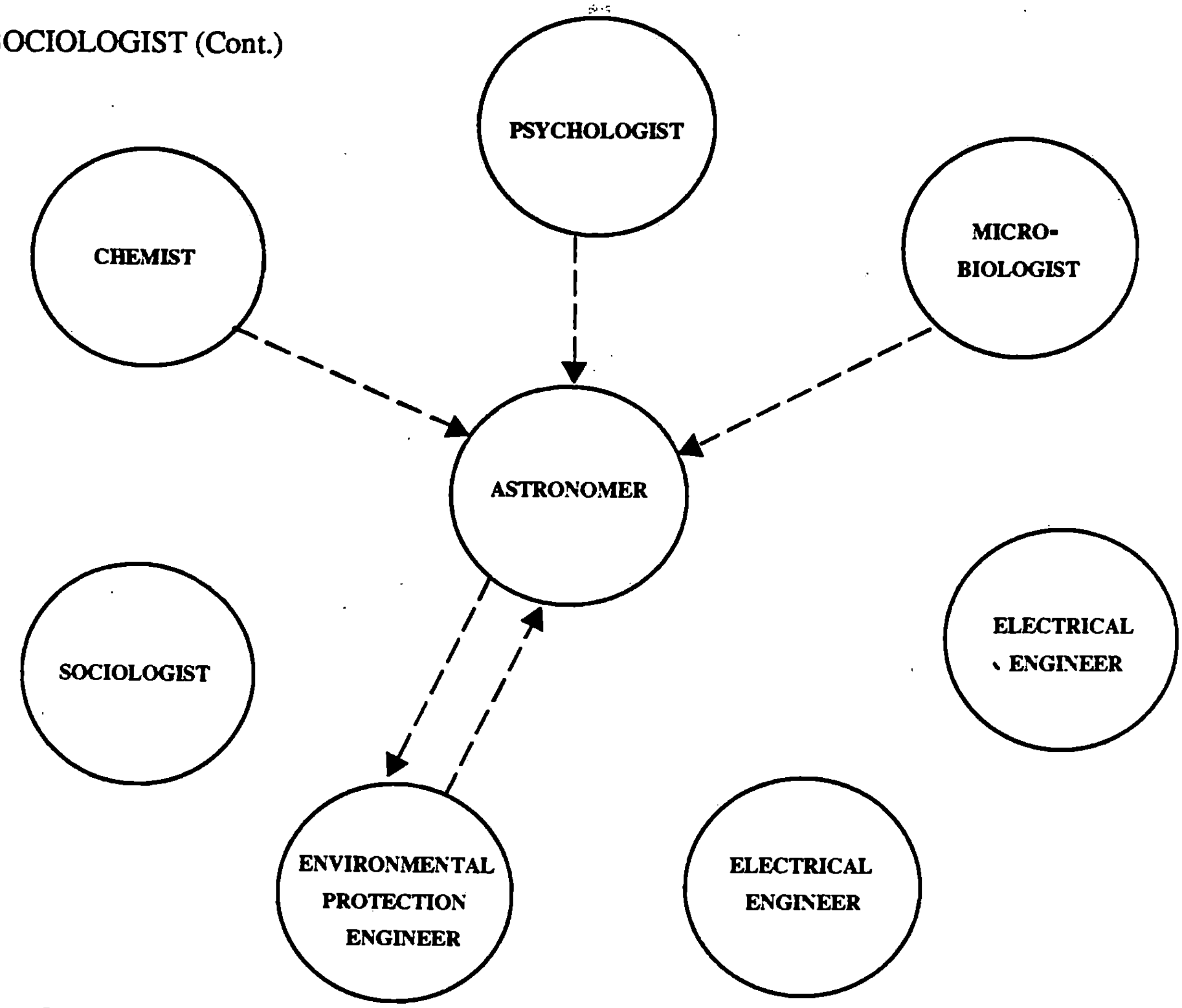
Procedure:

1. Sterilize the jars by pouring boiling water into them to remove any bacteria that might be there. Let the jars and lids stand until the water is cool. ASK AN ADULT TO HELP WITH THIS STEP.
2. Pour two cups of very hot tap water into a saucepan. Add one package of unflavored gelatin. Stir until the gelatin is completely dissolved. This is enough liquid for 12-16 jars.
3. Pour 1/2 inch of gelatin into each of the jars.
4. Soak 4 pieces of 12 in. long string in the remaining gelatin in the saucepan.
5. Place one string in a jar and seal it. Use masking tape and a pen to label this jar *A: Control.* Over time, this jar will show that your containers were initially germ-free or contaminated with bacteria.
6. Drag the other three strings in some area of your environment, e.g., floor, table top, closet, potted plant.
7. Put one string in each of the three remaining jars. Secure the lids to the jars. Label each jar as to the location of the sample, e.g., *B: floor.*
8. Check the jars for life forms every day for twelve days. Remember, you are looking for bacteria on the string and gelatin.

Results:

1. On a separate sheet of paper, describe your observations of bacterial growth over a twelve-day period. Record the dates of your observations.

SOCIOLOGIST (Cont.)



The Solution

Study the diagram to observe the working relationships among the space station crew members. State recommendations as to how the crew might work more closely together. Remember, it is your job to better unite the crew, not to solve the possible carbon dioxide problem.

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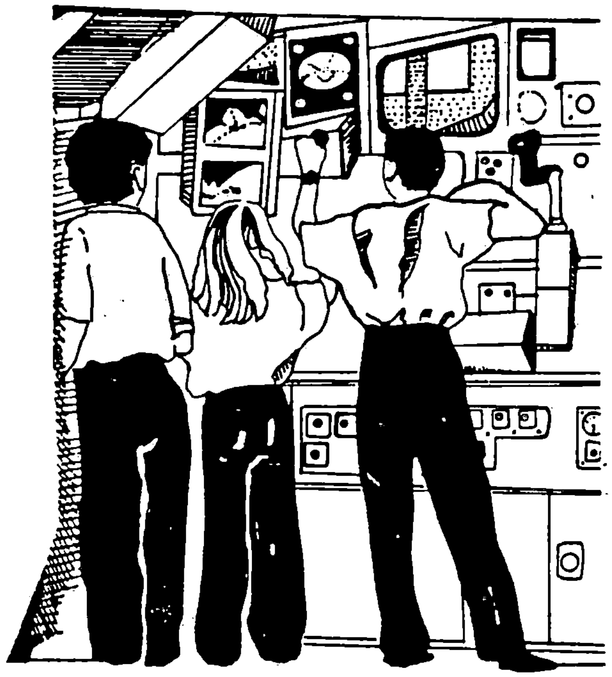
Sociologist: ______________________________ Date: ______________________

WHEN I GROW UP
CAREERS OF THE FUTURE

McDonald's ASTRONAUTS

1. SOCIOLOGIST



Sociologists are scientists who study groups and how individuals work within groups. As a sociologist aboard Space Station Freedom, you analyze the roles and behaviors of various crew members in problem solving situations.

The Situation

You are a sociologist and part of an eight-member crew aboard Space Station Freedom. A light sensor shows that there may be an increase in carbon dioxide in the living module of the station. You point out this potential problem to the rest of the crew. Each person is involved in her/his individual work and seems unconcerned about the activated sensor.

The Problem

As a sociologist, it is your role to observe the behavior of the crew to determine how the members might work more closely together.

The Process

You make the following observations:

1. The chemist, psychologist and microbiologist choose to work with the astronomer. Draw arrows on the diagram on the next page from these people to the astronomer.

2. The astronomer and environmental protection engineer choose to work together. Draw arrows on the diagram between these people.

3. The two electrical engineers choose to work together. Draw arrows on the diagram between these people.

4. You choose to work with the environmental protection engineer. Draw an arrow on the diagram from yourself to this person.

CHOICES AND CHALLENGES OF A NEW GENERATION

AN EXCITING CURRICULUM ACTIVITY PACKET FROM THE YOUNG ASTRONAUT PROGRAM SPONSORED BY THE PEPSI-COLA COMPANY

PEPSI

YOUNG ASTRONAUTS™

INTRODUCTORY ACTIVITY: YOUNG ASTRONAUT PASSPORT

Objective

Students will better know and appreciate themselves by setting goals, solving problems and planning for the future. These activities will prepare students for the more interactive mission activities contained in this learning packet.

Procedure

Photocopy the passport cover on heavy paper or bristol board. Photocopy passport pages. Cut, fold and staple these pages to the cover. As passport activities are completed, students should be encouraged to share their passport entries with one another.

Skills Emphasized

goal-setting, problem-solving, predicting, writing, communicating

Related Disciplines

English, mathematics, speech, futures education, values education

LAUNCH

Research NASA's launch procedure between mission control and the shuttle flight deck. Write a simplified version of this procedure for your use. Have students read this procedure to launch their orbiter. Mission activities may be presented and completed as part of the students' flight plan.

MISSION 1: ME SATELLITE (Trainee)
DEPLOYMENT OF SELF-CONCEPT SATELLITE (Pilot and Commander)

Objective

Students describe themselves in positive ways and tell who and what they value most in life.

Procedure

Trainees list people and things that are important to them on space station satellites. Pilots and Commanders write positive descriptions of themselves on three-dimensional octahedrons. Art work should be displayed in a prominent place in the classroom or school.

Skills Emphasized

decision-making, writing, communicating

Related Disciplines

English, mathematics, visual arts, values education

MISSION 2: MOONBASE (Trainee)
ESTABLISHING TRANQUILITY MOONBASE (Pilot and Commander)

Objective

Students describe those things basic to human happiness; they determine positive ways to deal with negative feelings.

Procedure

Students define and discuss the physical and emotional qualities needed to be happy and successful members of a lunar space colony. The importance of possessing these same qualities as members of planet Earth should also be emphasized.

INTRODUCTION

"Choices and Challenges of a New Generation" is a Young Astronaut curriculum packet, sponsored by the Pepsi-Cola Company, designed to help students recognize their responsibilities to themselves and improve their relationships with their families, peers and other people in their lives. When students have finished this packet, they will be able to better safeguard their own health by implementing productive responses to negative peer pressure and make more rational decisions regarding the use of nicotine, alcohol and other drugs.

TARGET AUDIENCE

The TRAINEE LEVEL activities are designed for students between the ages of 6 and 8. PILOT LEVEL and COMMANDER LEVEL activities may be used with students between the ages of 9 and 16. Teachers may adapt these activities to make them easier or more difficult in order to meet the needs of individual students.

GOALS

After completing this learning packet, students will be able to:

- distinguish between positive and negative behavior and predict the consequences of each.
- describe how their behavior contributes to or detracts from their own well-being and that of their families and friends.
- identify and use a variety of productive responses to everyday problems and situations.
- use their time productively to prepare for their future.

PROGRAM COMPONENTS

1. Student Passport: a preflight activity designed to help students better know themselves and others before undertaking their mission activities. The passports may be duplicated for student use.

2. Missions: eight activity sheets for Trainees and eight activity sheets for Pilots and Commanders that may be duplicated to serve as student worksheets.

3. Leader's Guide: learning objectives and procedures for presenting each mission activity. Includes skills emphasized and related subject areas.

4. Poster: a full-color print of Christa McAuliffe with discussion ideas regarding her choices and challenges for a new generation.

5. Application Form: your opportunity to join the Young Astronaut Program and participate in additional educational activities.

6. Earth Shuttle: information on a travel opportunity via Eastern Airlines for you and your students to visit Kennedy Space Center's SpacePort USA and Walt Disney World's EPCOT Center.

SETTING THE STAGE FOR LEARNING

Arrange your classroom or "orbiter" for flight. Ask students to draw flight deck consoles and shuttle windows on the blackboard. Teachers of TRAINEES may want to convert a refrigerator box for ongoing shuttle flights. Pilots and Commanders could work together to construct an orbiter for Trainees. Students should rotate the job of commander, pilot and mission specialist. All other students may be payload specialists.

Skills Emphasized
problem-solving, comparing, decision-making, assessing, relating, communicating

Related Disciplines
drama, speech, values education

MISSION 6: THE RIGHT STUFF (Trainee, Pilot, Commander)

Objective
Students measure their physical and mental abilities and determine the value of teamwork in their lives.

Procedure
Trainees, Pilots and Commanders score their general overall fitness from a checklist of physical, mental and social characteristics. Pilots and Commanders apply their teamwork skills to solve a problem during spaceflight.

Skills Emphasized
decision-making, problem-solving, assessing, communicating

Related Disciplines
drug education, health, social studies, values education, space education

MISSION 7: FLIGHT FOOD (Trainee, Pilot, Commander)

Objective
Students plan balanced menus and recognize the importance of sound nutrition in their lives.

Procedure
Trainees plan a balanced meal, while Pilots and Commanders plan breakfast, lunch, dinner and snacks for a four-day period. Students prepare and eat astronaut food from squeeze bags.

Skills Emphasized
decision-making, assessing, communicating

Related Disciplines
health, English, space education

MISSION 8: CLEAN AIR (Trainee, Pilot, Commander)

Objective
Students observe the effects of cigarette smoke on themselves and their environment.

Procedure
Students assemble smoking apparatus. With adult assistance, students observe the effects of cigarette smoke as tar and debris collect within the apparatus and on cotton balls. Students draw conclusions about the hazards of cigarette smoking.

Skills Emphasized
observing, predicting, assessing, writing, communicating

Related Disciplines
health, science, drug education, space education

Skills Emphasized
problem-solving, relating, assessing, communicating

Related Disciplines
English, speech, values education

MISSION 3: UPS AND DOWNS (Trainee) THE RHYTHM OF LIFE (Pilot and Commander)

Objective
Students recognize their high and low energy levels throughout the day; they name factors that affect these energy levels.

Procedure
Trainees plot their moods for a 24-hour period. Pilots and Commanders chart their time mechanisms (circadian rhythms) for this same time period. Students should discuss appropriate behavior during times of fatigue and frustration.

Skills Emphasized
goal-setting, comparing, interpreting, assessing, communicating

Related Disciplines
English, mathematics, health, space education

MISSION 4: LOOKING AHEAD (Trainee) TIME-WARP MIRROR (Pilot and Commander)

Objective
Students improve their present self-concept by depicting themselves in positive ways in the future.

Procedure
Students make flight log entries of a time-warp experience where they observe their physical appearance, work experience and social setting 15 years in the future.

Skills Emphasized
predicting, interpreting, decision making, writing, communicating

Related Disciplines
English, speech, space education

MISSION 5: WORKING TOGETHER (Trainee) SURVIVING ALONE OR TOGETHER (Pilot and Commander)

Objective
Students recognize that cooperative interaction can lead to safe and effective solutions to problems.

Procedure
Students role-play situations where individual motives and personal gain are replaced with group participation and success. Compare each situation so that students recognize that cooperation among individuals is a key ingredient to conflict resolution.

POSTER

Enclosed is a full-color poster of Christa McAuliffe — finalist for Teacher in Space Program and first civilian in space. Christa, along with the six other 51-L crew members, died when the Challenger exploded shortly after liftoff on January 28, 1986. Discuss Christa's personal and professional qualities. Emphasize her willingness to try new challenges for her personal development and growth of others. Discuss whether or not her goal to encourage students to believe in themselves and reach for new heights was accomplished in spite of the ill-fated Challenger mission. Discuss the lessons Christa continues to teach even by death. Reference: *"I Touch the Future..." The Story of Christa McAuliffe,* by Robert T. Hohler.

RELATED READING

For Adults

Oberg, James E. and Alcestis R. *Pioneering Space.* McGraw-Hill. New York. 1986.

Stine, G. Harry. *Handbook For Space Colonists.* Holt, Rinehart and Winston. New York. 1985.

Activity Books for Children

Bisignano, Judith, and Mary Jane Cera, et al. *Creating Your Future.* Levels I through III. Sheed and Ward. Kansas City, MO. 1985.

Odyssey. AstroMedia, a division of Kalmbach Publishing Co. Milwaukee, Wisconsin.

Sanders, Corinne and Cynthia Turner. *Coping:* A Guide to Stress Management. Good Apple. Carthage, IL. 1983.

Sylvester, Sandra M., Mary Jane Cera and Judith Bisignano. *Living With Stress.* Sheed and Ward. Kansas City, MO. 1985.

Young Astronaut Council • 1211 Connecticut Avenue, N.W., Suite 800 • Washington, D.C. 20036 • (202) 682-1985

Dear Chapter Leader:

We are pleased to provide you with this educational packet. It is another in a series of unique learning materials developed by the Young Astronaut Council and is sponsored by the Pepsi-Cola company. We are certain the "Choices and Challenges of A New Generation" is timely and will be of benefit to you, your Young Astronauts, and your school community in the months ahead. The materials have been designed for use this Spring, as well as for activities over the Summer and for next Fall.

This packet was developed by the Council in cooperation with Model Chapter Leaders and some of the nation's outstanding consultants on anti-substance abuse programs, and Pepsi Cola company. It is designed to help students grow in responsibility, decision-making and conflict resolution. It is intended to help students look ahead to the choices and challenges they will face in the 21st century.

The goal of the packet is to help Young Astronauts recognize their responsibility to themselves, as well as improve the quality of their relationships with their families, peers and other people in their lives. They will also come to understand how the use of nicotine, illicit drugs and other substances can affect their well-being and interfere with the achievement of their goals. It should help your people develop their own strategies to respond to negative peer pressure. It also calls attention to health promoting practices, including diet, sleep and rest, exercises and relaxation. This packet is also intended to help your Young Astronauts understand that their talents, interests and skills overlap. This awareness can lead to the planning and development of productive careers.

If your Chapter has not registered for this school year, please complete and return the enclosed Chapter Renewal/Registration Form. If you have already renewed your membership, give the form to someone who might want to start another Young Astronaut Chapter in your school or area.

We are also delighted to announce our extraordinary new relationship with Walt Disney Worlds's EPCOT Center, Kennedy Space Center's SpacePort USA and Eastern Airlines. This exciting new program is called The Young Astronaut EARTH SHUTTLE. Starting this Fall, CHAPTER LEADERS and their YOUNG ASTRONAUTS will be able to participate in TEACHER WORKSHOPS and experience the ultimate field trip in a unique learning environment. Coordinated with the 1988-89 Young Astronaut curriculum, teacher training workshops will be combined with hands-on tours of special "classrooms," unlike any you have seen, at two of the most remarkable learning centers in America (See the enclosed flyer.)

Enjoy this curriculum activity packet and look forward to other innovative products from the Council.

Sincerely,

T. Wendell Butler

T. Wendell Butler
Executive Director

START A CHAPTER!!
OR
RENEW YOUR MEMBERSHIP!!!

The Young Astronaut Program is about to enter its fourth year of national and international success. OVer 21,000 Chapters have been formed with a half-million members in more than 30 countries. Your evaluations indicate that both teachers and students are delighted with the curriculum. Our Program has now been restructured to provide YEAR-ROUND space-based materials and activities. To support this expansion and to cover increased expenses, Chapter membership fees are being increased to $40 annually. You will be provided with curricular materials costing triple that amount and representing the best aerospace eductioanal bargain available anywhere.

Here is a PREVIEW of the challenging materials and exciting activities for the year to come.

MAILINGS AND ACTIVITIES WILL INCLUDE:

- Personal membership cards and certificates
- Revised and updated Chapter Leader's Handbook
- Curriculum Planning Document for 1988-1989
- Adventure Series (Toys that Teach, Recycled Science, Physics of Fun)
- Newly designed Space Watch
- Exciting Curriculum Posters
- New special summer enrichment package
- Special Curriculum Activity Packages
- Young Astronaut Newsletter, "Astro-News"
- Contests and Competitions
- ASTRONET, our free electronic network
- Depot catalogue for Young Astronaut articles
- Opportunities for exchanges with Young Astronauts and Young Cosmonauts from other nations (USSR, Japan, etc.)
- Opportunities to participate in our new EARTH SHUTTLE, the ultimate Young Astronaut field trip to the Kennedy Space Center, the EPCOT Center and Walt Disney's new Magic Kingdom in Florida.

BONUS!!!

From the first 500 Chapter Leaders renewing by June 1, 1988 (regardless of individual renewal date), we will select 5 Chapter Leaders by lottery for an all-expense round-trip weekend to Orlando, Florida, to preview our New Young Astronaut EARTH SHUTTLE Program at The Kennedy Space Center and EPCOT Center.

Renew your membership now!

Please record your: Chapter No__________ Date Paid:__________
Check/P.O. No.________ Amount Paid:__________

Retain this portion for your records and detach and return the portion below with a $40.00 check/money order or purchase order from you or your Sponsor.

THE YOUNG ASTRONAUT COUNCIL
1211 Connecticut Ave., N.W., Suite 800
Washington, D.C. 20036
(202) 682-1985

I authorize you to Start a Chapter or renew my Chapter membership for another full year. Enclosed is a check/money order or purchase order in the amount of $40.00, payable to the Young Astronaut Council

CHAPTER START
OR
RENEWAL AUTHORIZATION

Chapter No. ________ Level ____________
(Trainee, Pilot, Commander)

Chapter Leader's Name and Address
____
____
City State Zip Code

____
Chapter Leader's Signature

____
Date

RETURN THIS PORTION WITH PAYMENT

MISSION 1: "ME" SATELLITE

Level: Trainee

Background

The astronauts feel good about themselves. They live and work together in new situations and are usually successful. They care for themselves and others as they meet their goals in life.

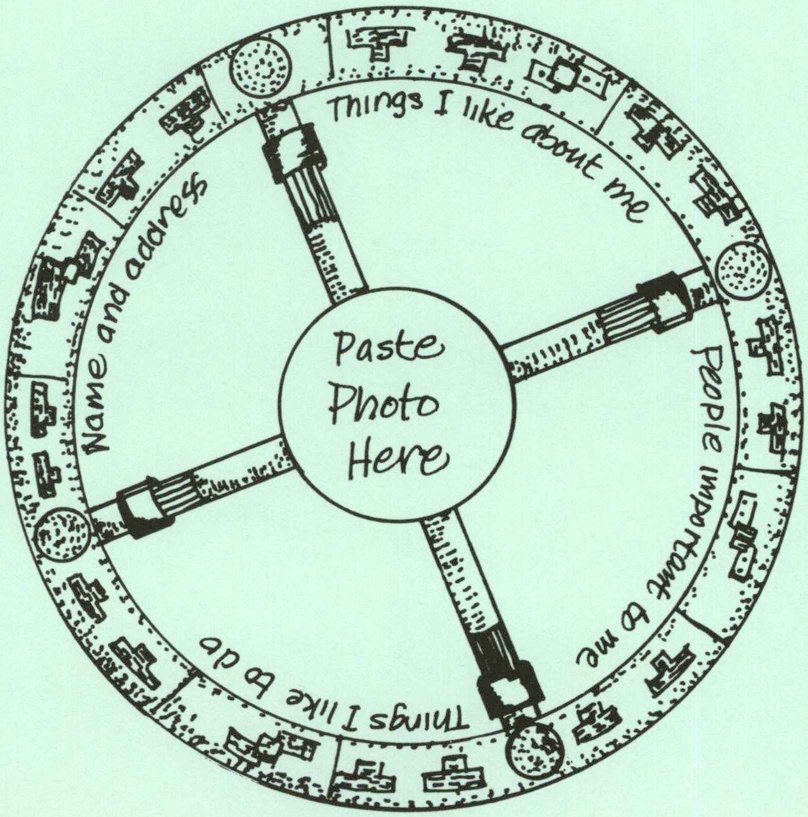
Activity

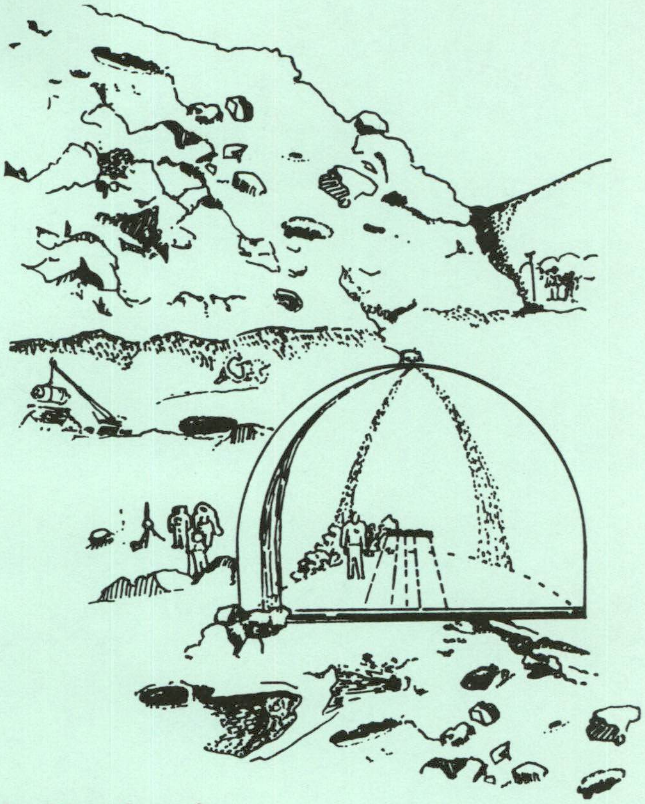
1. Complete the information on your self-concept satellite. Remember to use positive words when describing yourself.

2. Color and decorate the satellite.

3. Cut out the satellite and glue it to a piece of construction paper.

4. Hang your satellite from the ceiling.





MISSION 2: MOONBASE

Level: Trainee

Background

Future astronauts will build a colony on the Moon. They will learn more about the Moon and how we can use its resources.

Activity

You are a crew member building the first Moonbase.

A. What do you need to live safely and happily on the Moonbase?

MY NEEDS ON THE MOONBASE	
____________________	____________________
____________________	____________________
____________________	____________________
____________________	____________________

Put a star (*) next to the most important need.

B. When you feel unhappy or angry, how do you act?

____

____

____

C. When you feel unhappy or angry, how could you act differently?

____

____

____

Astronaut: ____________________ Date: __________

MISSION 3: UPS AND DOWNS

Level: Trainee

Background

When the Sun rises in the morning, you wake up full of energy. As the day goes on, you become tired. When the Sun sets at night, you are ready to sleep. Your body is accustomed to this rhythm. If you change this rhythm, you may become tired and irritable.

Astronauts circle the Earth every 90 minutes and see 16 sunrises and sunsets a day. They need to maintain their body rhythm in order to stay relaxed and alert.

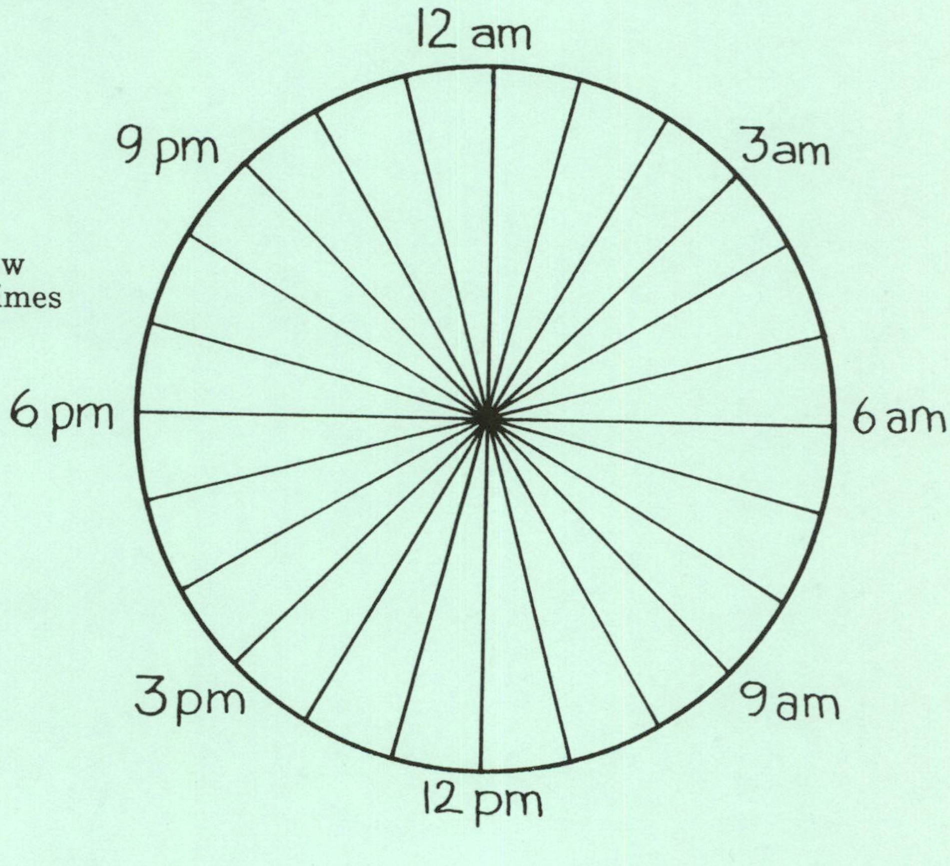
Activity

The circle shows 24 hours in one day.

Color as follows:

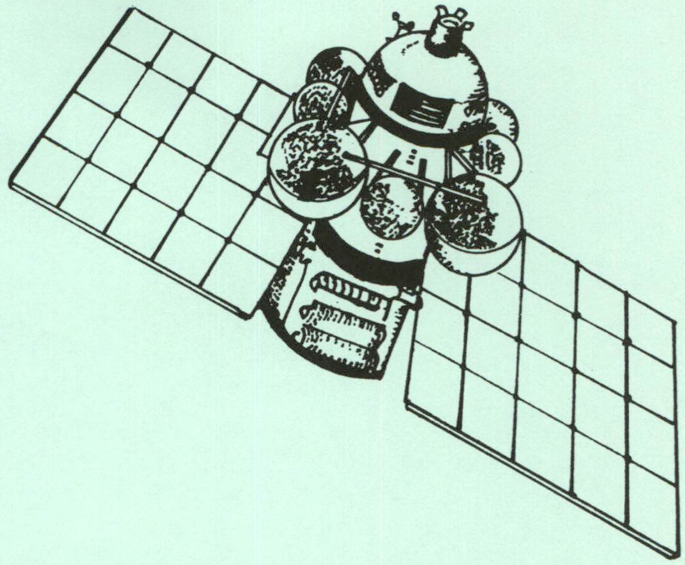
my sleep times = blue
my good times = green
my bad times = red
my okay times = yellow

Discuss with your teacher how you might make more good times in your life.



Astronaut: ______________________ Date: ______________

MISSION 4: LOOKING AHEAD



Level: Trainee

Background

Both the United States and the Soviet Union plan to send unmanned spacecraft to Mars in the next few years. NASA is also developing plans for a manned spaceflight to Mars.

Activity

You are flying in a spacecraft from Earth to Mars. You are playing a game with friends when suddenly an alarm sounds and warning lights flash. Your ship is in a time warp! You see what you look like 15 years in the future.

1. How old are you? ______________________________

2. What do you look like? What are you wearing?

____

____

3. What kind of work do you do? Do you like your work?

____

____

4. What are your friends and co-workers like?

____

____

Whoosh! You suddenly leave the time warp. Only a few seconds have gone by. As you fly on to Mars, you think about what happened.

5. What can you do today to become the adult you would like to be in the future?

____

____

Astronaut: ____________________ Date: ____________________

MISSION 4:

Level: Trainee (cont.)

6. Where do you work? Describe your physical environment.

____

____

7. Is the work emotionally satisfying? Tell why or why not.

____

____

8. What kind of training did you receive for this job?

____

____

9. What are your friends and co-workers like? How important are they in your life?

____

____

Whoosh! you leave the time warp as quickly as you entered. Only a few seconds have elapsed. As you continue on your journey to Mars, you have time to reflect upon this most unusual phenomenon.

10. What decisions will you make in the near future to prepare yourself for your distant future?

____

____

11. What feelings, attitudes and habits do you have today that will allow you to become the person you saw in the future?

____

____

Astronaut: ________________________ Date: __________

MISSION 5: WORKING TOGETHER

Level: Trainee

Background

The space shuttle is a small place to live and work with other people. The astronauts must cooperate so that they can live and work safely together.

Activity

Do the following activities alone, and then with a group of friends.

1. Fill a burlap sack with rocks. Fill the sack with the help of your friends. Which is easier?______________________________

   Why?______________________________

2. Pull the sack for a distance of twenty feet. Pull the sack with your friends. Which is easier?______________________________

   Why?______________________________

3. Lift the sack onto a table. Lift it with your friends. Which is easier?______________________________

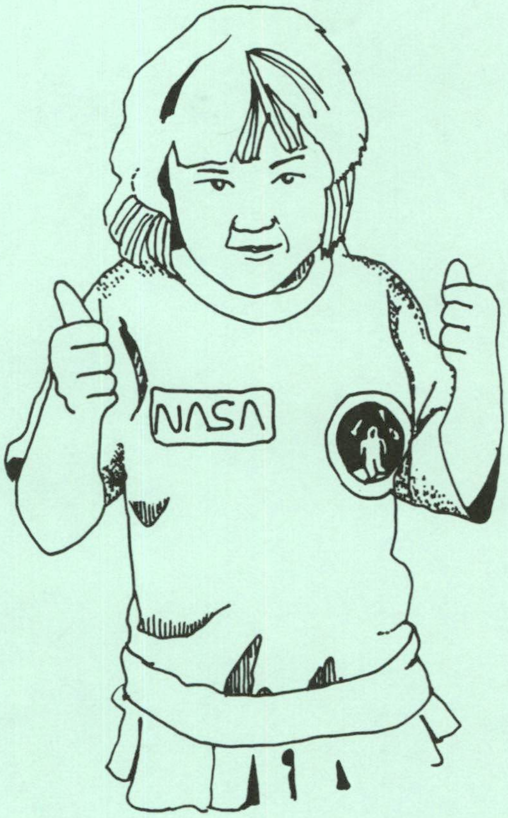
   Why?______________________________

4. If you have a big job to do, would you do it alone or with friends? Why?

Astronaut: ____________________ Date:________________

MISSION 6: THE RIGHT STUFF

Level: Trainee



Background

Shuttle crew member work together as a team. In an emergency astronauts want crew members whom they can rely upon for help.

Activity

Do you have the "right stuff" to be an astronaut? Your mind and body must be in top condition to live and work in space.

Read the statements below and check (✓) the things you do every day.

______ I exercise.

______ I get enough sleep.

______ I ask questions when I don't understand.

______ I eat fresh fruits and vegetables.

______ I try to help people.

______ I eat three balanced meals.

______ I try my hardest at everything I do.

______ I finish what I start.

______ I have hobbies I enjoy.

______ I relax my mind and body.

How may statements did you check? __________ The more you checked, the more fit you are to be an astronaut.

Astronaut: ______________________________________ Date: ____________________

MISSION 7: FLIGHT FOOD

Level: Trainee

Background

Astronaut's food is dried and stored in plastic containers. When the astronauts are ready to eat, they add water to the food. On early flights, the astronauts squeezed their food directly into their mouths.

Activity

Prepare a space snack by putting soft food into a resealable, plastic, sandwich bag. Pudding or applesauce works well. You might even want to try pureed fruits and vegetables.

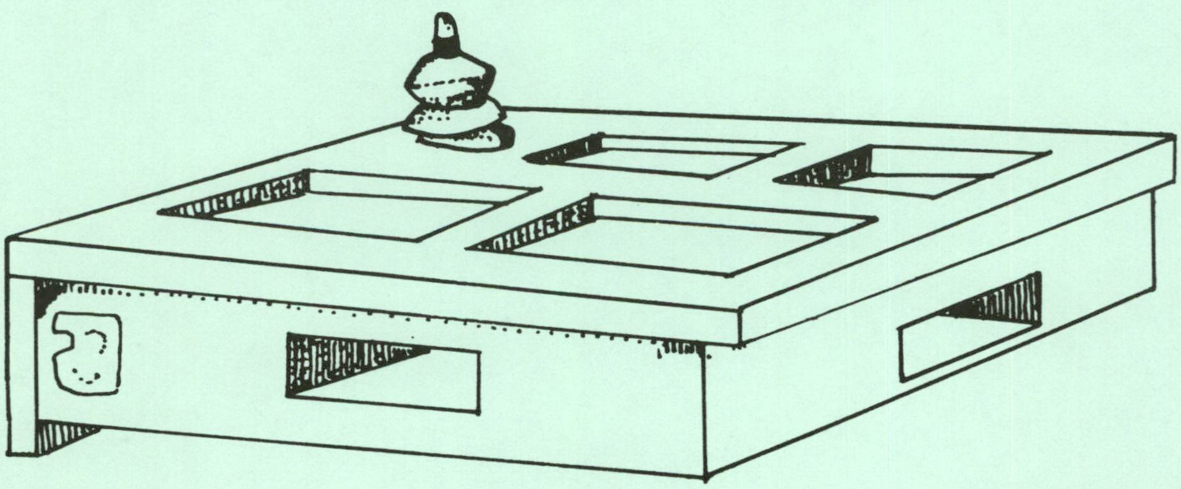
When you are ready to eat, snip a small hole in the bottom corner of bag. Squeeze the food directly into your mouth.

What was your snack? ________________________________

What was it like to eat in this manner? ________________________

Would you enjoy eating like this all the time? ____________________

Prepare a balanced meal. Draw your choice of food in the tray below.



Astronaut: ______________________________ Date: __________

MISSION 8: CLEAN AIR

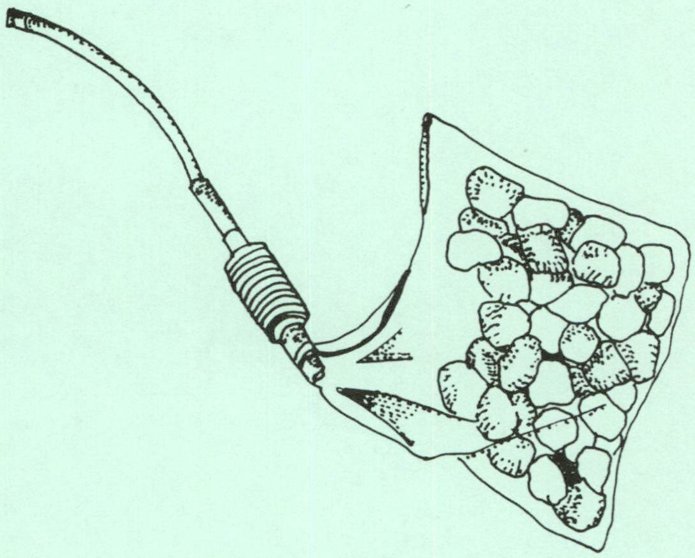
Level: Trainee

Background

Clean air is important to the health of astronauts living in space. To protect their health and to keep the air in the shuttle clean, astronauts do not smoke. Smoking makes you feel light-headed and may cause cancer.

Activity

Try this experiment to observe the effect of cigarette smoke on your surroundings.



Materials:

a small, resealable baggie
8-12 cotton balls
plastic gas siphon (available in hardware stores)
1 foot of plastic tubing (5/16" diameter)
masking tape
straight pin
cigarettes (unfiltered)
matches

Procedure:

With adult assistance:

1. Set up the apparatus by:

   a. placing cotton balls in the baggie,
   b. taping the back of the siphon to the sealed baggie,
   c. attaching the plastic tubing to the front of the siphon,
   d. placing a cigarette in the plastic tubing.

2. Light the cigarette by holding a match to it while gently pumping the siphon. Continue pumping until the baggie is filled with smoke.

3. Use a straight pin to make 3-5 holes in the bottom of the baggie to allow smoke to escape.

4. Continue this procedure with several cigarettes.

5. Record your observations.

MISSION 8:

Level: Trainee (cont.)

a. What happened to the cotton balls in the smoke?

____

____

b. What happened to the plastic tubing?

____

____

c. If the baggie were the living area of the space shuttle, what would happen to the air?

____

____

d. If the tubing were your throat and the baggie were your lungs, how would your body be affected by the smoke?

____

____

e. Why is cigarette smoking harmful to you and your environment?

____

____

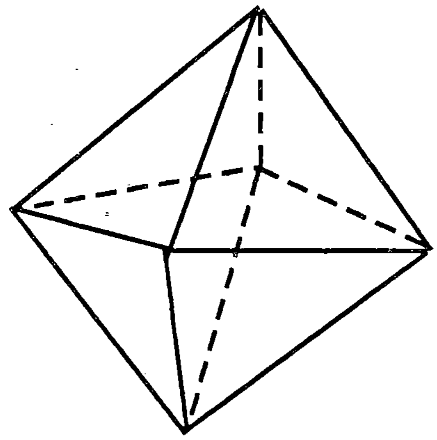
Glue a clean cotton ball in the space below.

Glue a cotton ball that has been near a cigarette smoke in the space below.

Astronaut: ____________________ Date: ____________

MISSION 1: DEPLOYMENT OF SELF-CONCEPT SATELLITE

Levels: Pilot and Commander



Background

Your self-concept is the image you have of yourself. A strong self-concept allows you to like yourself and others. It allows you to take logical risks and generally meet with success. It allows you to like yourself even if you have taken a risk and failed.

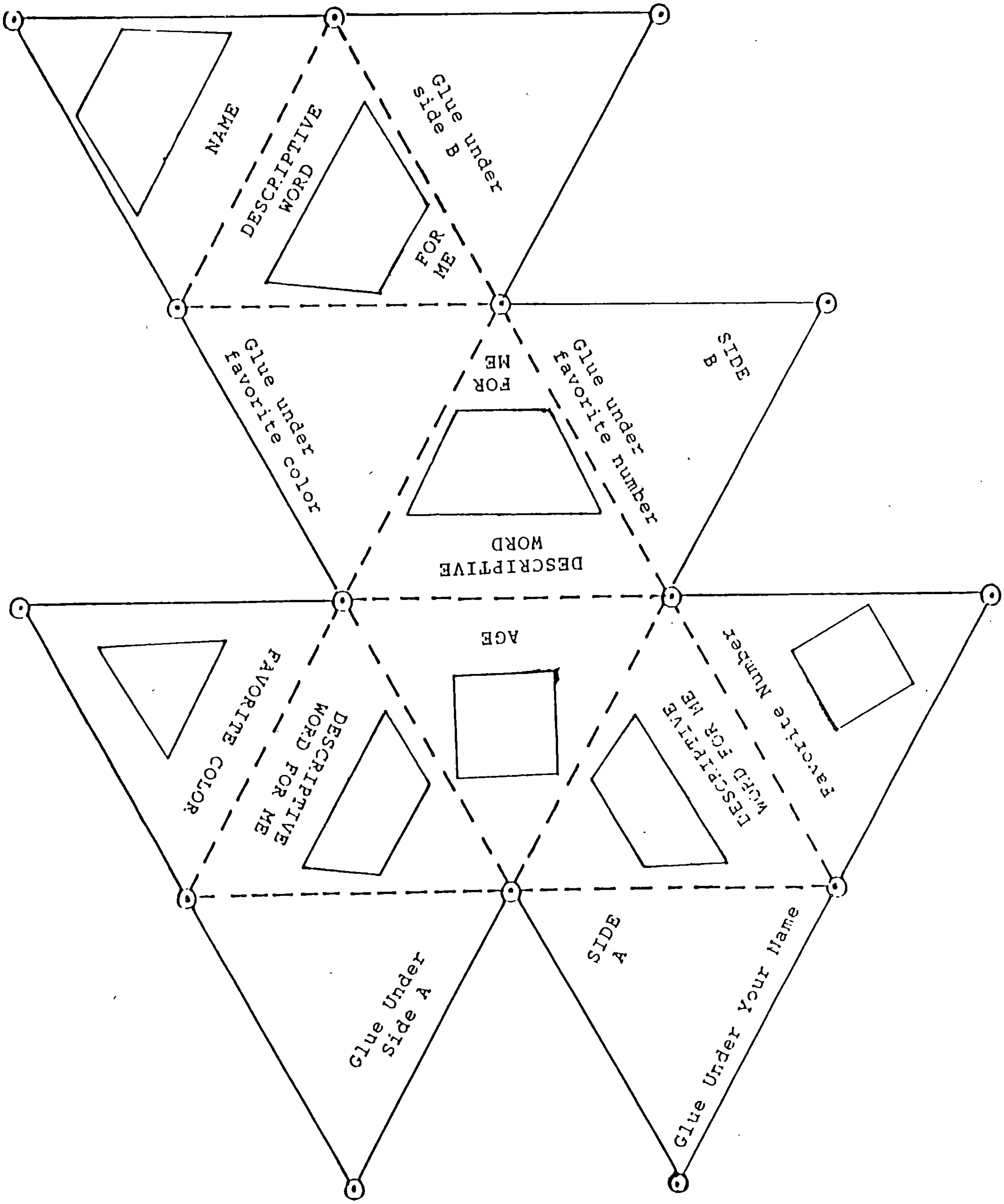
The astronauts make a strong effort to develop positive self-concepts.They live and work together under stressful conditions and generally meet with success. They show patience with themselves and others as they strive to accomplish their goals in life.

Activity

Materials needed: color markers, scissors, glue, string.

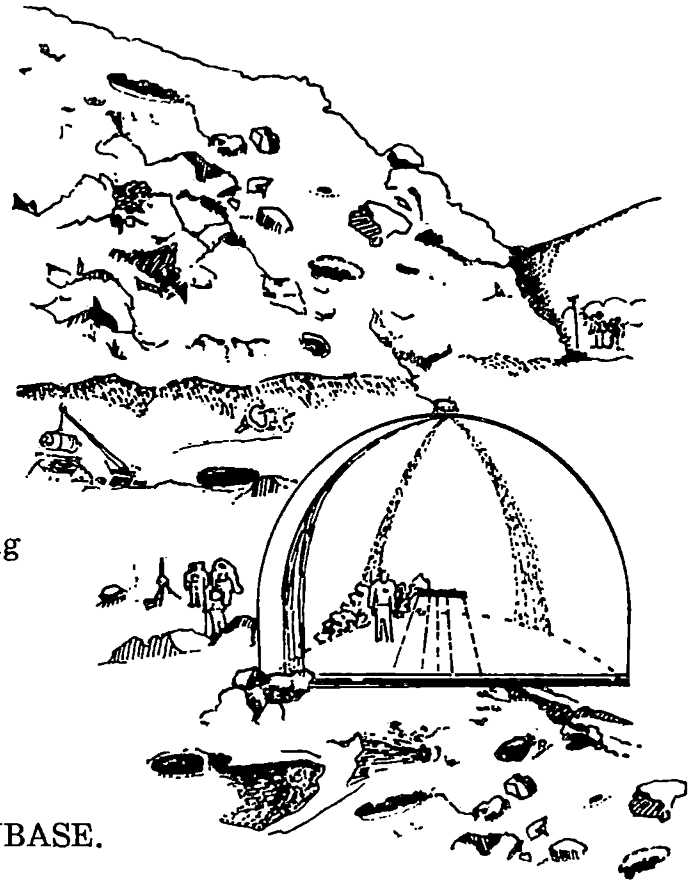
1. Complete the information on the self-concept satellite. Remember to use positive words when describing yourself.
2. Color and decorate the satellite.
3. Cut out the satellite along the solid lines.
4. Fold the satellite along the dotted lines to form an octahedron.
5. Glue all but the final side of your satellite in place.
6. Knot one end of an 18-24 in. string. Place the knot inside the satellite.
7. Glue the final side of the satellite so that it holds the string in place.
8. Hang your satellite from the ceiling.

MISSION 1:
Levels: Pilot and Commander (cont.)



MISSION 2: ESTABLISHING TRANQUILITY MOONBASE

Levels: Pilot and Commander



Background

Early in the next century, people will establish a colony on the Moon. The astronauts working on the lunar base will be involved in scientific research. They will be mining rocks and processing the soil to make rocket fuel.

Activity

You are a crew member assigned to establishing the first lunar space colony.

A. List the physical things that you will need to live safely and happily on TRANQUILITY MOONBASE.

MY PHYSICAL NEEDS ON TRANQUILITY MOONBASE	
______________________	______________________
______________________	______________________
______________________	______________________
______________________	______________________

Put a star (*) next to your three most important physical needs.

B. List the emotional outlets that you will need on TRANQUILITY MOONBASE to help you deal with your feelings of happiness, excitement, fear, etc.

MY EMOTIONAL OUTLETS ON TRANQUILITY MOONBASE	
______________________	______________________
______________________	______________________
______________________	______________________
______________________	______________________

Put a star (*) next to your three most important emotional outlets.

MISSION 2

Levels: Pilot and Commander (cont.)

C. Describe some common negative responses to your feelings of unhappiness, anger, boredom, etc.

NEGATIVE RESPONSES TO MY FEELINGS

D. Describe how you could react to your feelings of unhappiness, anger, boredom, etc. in positive ways.

POSITIVE RESPONSES TO MY FEELINGS

Astronaut: ______________________________ Date: ____________

MISSION 3: THE RHYTHM OF LIFE

Levels: Pilot and Commander (cont.)

Background

Astronauts working in the space shuttle are able to watch the sun rise and set every ninety minutes. They view sixteen sunrises and sunsets every twenty-four hours. On Earth, of course, you can only see the Sun rise and set every twenty-four hours.

"Circadian rhythm" is your body's time mechanism during a twenty-four-hour day. Most likely you wake up refreshed and ready to begin your day, and you tire as the day progresses. When you disturb your normal patterns, you may become tired and irritable. Your communication and decision-making skills may weaken.

A long airplane flight can produce "jet lag," which is a disruption of the body's circadian rhythm. Astronauts have a vital interest in maintaining their circadian rhythm while in flight, since a life-threatening situation may arise at any time.

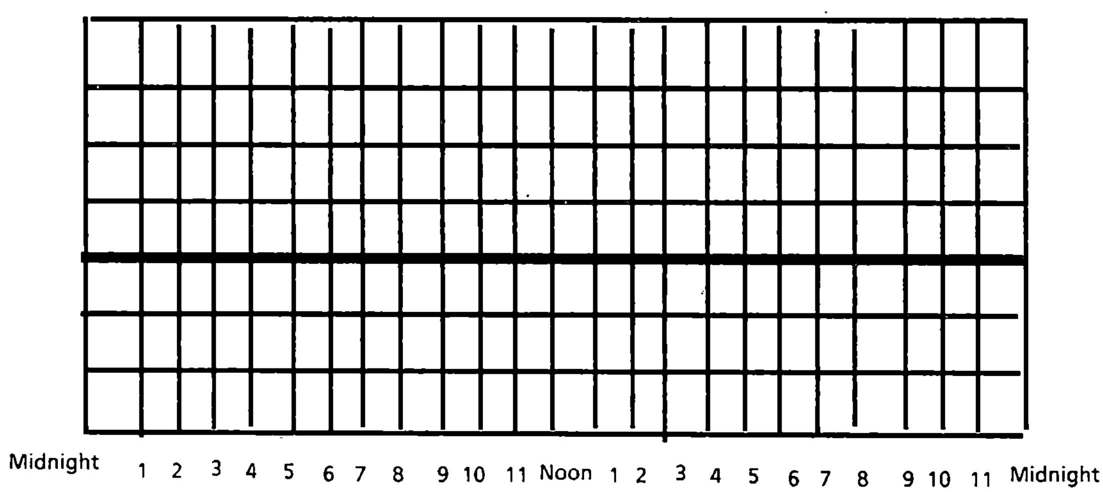
Activity

The graph below is a circadian rhythm chart. The dark horizontal line, indicated by 0, is your average mood period and sleep time. The positive numbers indicate high or peak times in the day. The negative numbers indicate low or down periods. Record your mood at the time indicated by placing an X on the graph. Connect the X's to form your circadian rhythm line.

Chart your circadian rhythm every day for a period of one week. Answer the questions from the data collected.

Scale:

maximum high period
moderate high period
minimum high period
baseline
minimum low period
moderate low period
maximum low period



Astronaut: ______________________________ Date: ____________

MISSION 3

Levels: Pilot and Commander (cont.)

1. What hours were the general high or peak times in your day?

____

2. What hours were the general low or down times in your day?

____

3. What is the average number of hours you sleep per day?

____

4. Is there a time of day that is generally best for you? ____________

   Generally worst for you? ________

5. What would generally be a good time of day to make important decisions?

____

6. What would generally be a good time of day to make an extra effort to better relate to people? ____________

7. Describe the patterns to your high and low periods, if any.

____

____

____

8. State those factors that affect your high periods.

____

____

____

9. State those factors that affect your low periods.

____

____

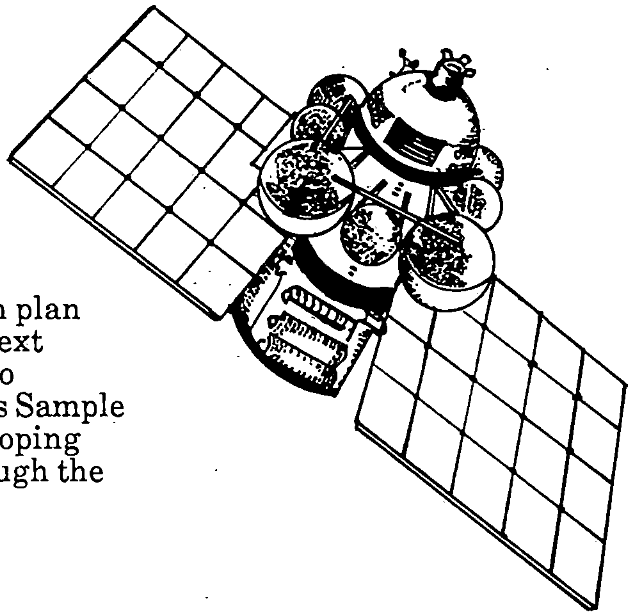
____

10. Tell how you might take better advantage of the high and low periods of your day.

____

____

MISSION 4: TIME-WARP MIRROR



Levels: Pilot and Commander (cont.)

Background

Both the United States and the Soviet Union plan to send unmanned missions to Mars in the next few years. NASA is designing robot rovers to explore the Martian surface during the Mars Sample Return Mission. In addition, NASA is developing plans for a manned spaceflight to Mars through the Pathfinder Study.

Activity

You are in flight from the space station that orbits the Earth to the docking station that orbits Mars. Your solar sails are set and your spacecraft is spinning on its axis to provide gravity. You just settle in for the nine-month journey when alarms sound and warning lights flash. Your ship is momentarily snared in a time warp in which you see yourself fifteen years in the future. Make journal entries in your flight log by answering the following questions.

FLIGHT LOG ENTRIES

1. How old are you? What do you look like? What are you wearing?

____

____

____

____

2. What things are most important in your life?

____

____

____

____

3. Where do you work? Describe your physical environment.

____

____

MISSION 4

Levels: Pilot and Commander (cont.)

4. Is the work emotionally satisfying? Tell why or why not.

____

____

5. What kind of training did you receive for this job?

____

____

6. What are your friends and co-workers like? How important are they in your life?

____

____

Whoosh! You leave the time warp as quickly as you entered. Only a few seconds have elapsed. As you continue on your journey to Mars, you have time to reflect upon this most unusual phenomenon.

7. What decisions will you make in the near future to prepare yourself for your distant future?

____

____

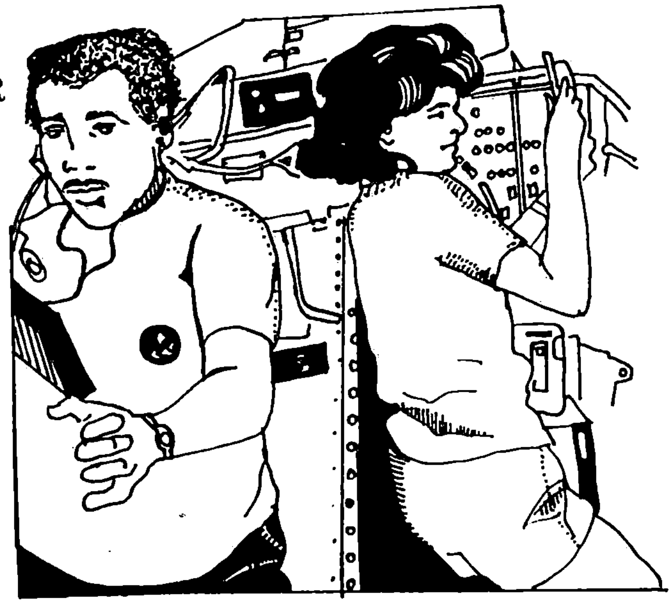
8. What feelings, attitudes and habits do you have today that will allow you to become the person you saw in your future?

____

____

Astronaut: ______________________ Date: ______________

MISSION 5: SURVIVING ALONE OR TOGETHER



Levels: Pilot and Commander

Background

Cosmonaut Valery Ryumin spent a whole year in space. He wrote this about Cosmonaut Leonid Popov, with whom he had lived for six months aboard the Salyut - 6 space station: "He is calm, judicious, with a certain gentle warmth. He showed a desire to resolve debatable issues with the least amount of loss to anyone. He was respectful among his friends." (From Pioneering Space by James and Alcestis Oberg.)

Activity

Role-play the following situations. Observe how well you and your crew members adapt to the limitations of your environment.

THE SITUATION

Three astronauts are in a damaged shuttle and are awaiting rescue. The lights do not work, the temperature is dropping, and only a small amount of food remains. Astronaut A has all the food. Astronaut B has the only flashlight and the water. Astronaut C has sleeping bags.

Situation 1:
Astronaut B wants to eat well and stay warm. He tries to take care of himself without any concern for the other two crew members.

Situation 2:
Astronauts B and C join together and share what they have without including Astronaut A.

Situation 3:
Astronaut A takes care of herself without thinking about Astronauts B and C.

Situation 4:
All three astronauts share what each other has so that everyone is comfortable and safe.

Which situation worked out the best for everyone?______________________

How did you make decisions and resolve conflicts so that everyone was comfortable and safe?

____

____

Astronaut: ______________________________ Date: ____________

MISSION 6: THE RIGHT STUFF

Levels: Pilot and Commander

Background

Shuttle crew members work together as a team. Teamwork requires people who can get along well with each other. In an emergency situation, astronauts want crew members whom they can rely upon for advice and assistance.

Activity

Check yourself on the following standards. You'll find out what, if anything, you have to work on the get in top physical and mental condition.

Give yourself two points for things you do often. Give one point for things you do sometimes. Give no points for things you do rarely or never.

______ I exercise vigorously.

______ I get an adequate amount of sleep.

______ I ask questions about things I don't understand.

______ I eat fresh fruits and vegetables.

______ I finish what I start.

______ I keep up with what is happening in the world.

______ I help other people.

______ I eat three meals a day.

______ I participate in group projects.

______ I communicate well with other people.

______ I have quiet hobbies I enjoy.

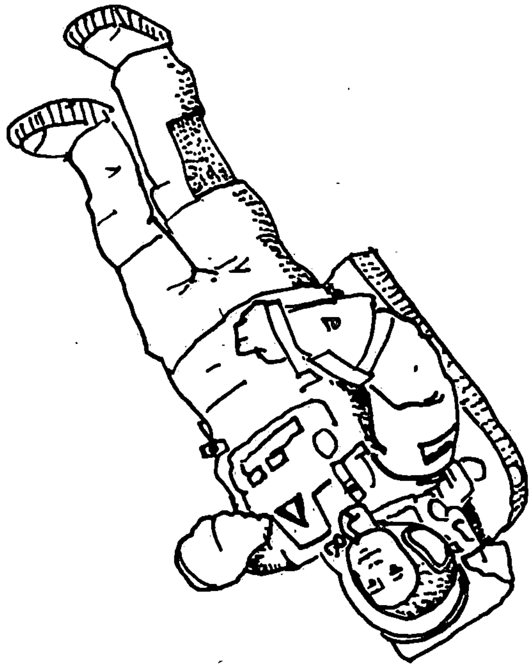
______ I set personal goals and evaluate them.

TOTAL: __________ A total of 18 or more means you are choosing to find balance in your life, but could be doing these things more consistently. Under 15 means you've got some work to do to arrive at balance in your life, but the rewards will be well worth your effort.

MISSION 6

Levels: Pilot and Commander (cont.)

REACTING WITH THE RIGHT STUFF



Situation

You are on an EVA when a micrometeor hits your face mask. A small crack starts to develop and your vision is blurred. You radio your crew members for help.

Write YES next to those responses you would like to hear from your crew members. Write NO next to those responses you would not like to hear.

______1. "We're busy with our own problems."

______2. "We're coming to get you."

______3. "If I thought you needed help, I wouldn't have gotten drunk."

______4. "Your helmet should be fine."

______5. "So, what?"

______6. "Grab the Remote Manipulator Arm and we'll pull you in."

______7. "I could think better if I didn't take pills to relax."

______8. "Do I have to?"

Why is it important to remain alert during work and recreation?

____

____

What qualities are needed in yourself and others so you can respond to situations and problems in a helpful and safe manner?

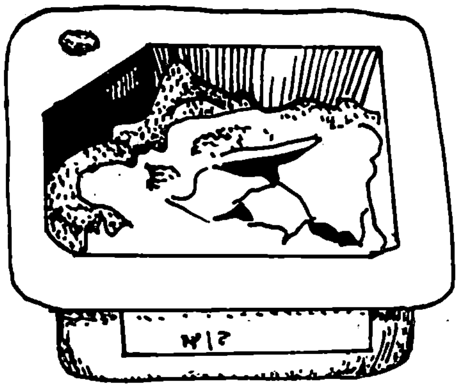
____

____

Astronaut: ________________________ Date: __________

MISSION 7: FLIGHT FOOD

Levels: Pilot and Commander



Background

Astronauts maintain balanced diets in order to be fit and healthy. Food for Shuttle flights is dehydrated or freeze-dried so that it is lightweight, compact and fresh for long periods of time. Water is added to the food packets just before eating. A limited amount of fresh fruits and vegetables are also provided for each flight.

Activity

You are in charge of preparing balanced menus for a four-day shuttle flight. Record your food choices in the space provided.

	Breakfast	Lunch	Dinner	Snack
Day 1				
Day 2				
Day 3				
Day 4				

Astronaut: ______________________________ Date: ____________

MISSION 7: SPACE SNACK

Levels: Pilot and Commander (cont.)

Background

Prior to eating, astronauts add water to their dehydrated or freeze-dried food that is stored in individual plastic containers. On early flights, astronauts squeezed the food directly into their mouths. This procedure kept the food from floating throughout the living and working area.

Activity

Prepare two space snacks by putting soft food into resealable, plastic, sandwich bags. Pudding or applesauce works well. You might even want to try pureed fruits or vegetables!

Exchange one space snack with a friend. When you are ready to eat, snip a small hole in the bottom corner of the bag. Squeeze the food directly into your mouth.

What kind of food did you prepare for your space snack?

____

What kind of food did your friend prepare for you?

____

Describe these space foods in terms of color, taste, texture, etc.

____

Would you enjoy eating in this manner for long periods of time? Why or why not?

____

What could NASA do to make eating in space a more enjoyable activity?

____

Astronaut: ______________________________ Date: __________

MISSION 8: CLEAN AIR

Levels: Pilot and Commander

Background

Clean air is vital to the safety and well-being of astronauts living in space. The atmosphere inside the shuttle must be maintained with the proper balance of oxygen, carbon dioxide and other gases. If there is too much carbon dioxide in the air, the astronauts may experience rapid pulse rates, deep breathing, dizziness and headaches. If there is too little oxygen in the air, the astronauts may experience an inability to think clearly and remember well. With the delicate atmosphere in the shuttle, it is little wonder that the astronauts do not smoke. It would be wise to create similar conditions for our delicate atmosphere on Earth.

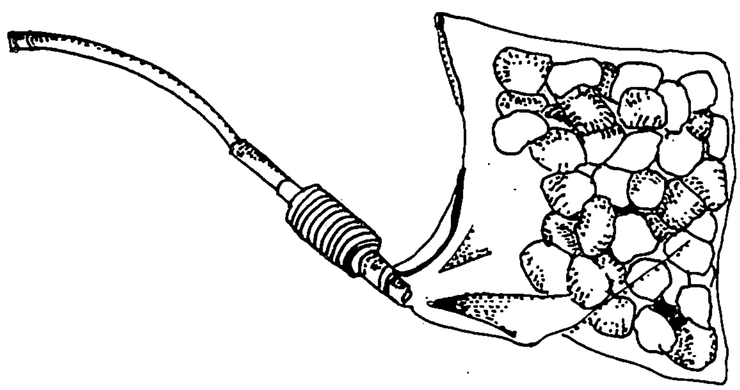
Smoking one cigarette puts enough carbon monoxide into a person's bloodstream to create lightheadedness. It would feel as if you were suddenly lifted to an altitude of 9,000 feet. The burning of tobacco also releases radioactive radon gas, which may cause cancer.

Activity

Try this experiment to observe the effect of cigarette smoke on your surroundings.

Materials:

a small, resealable baggie
8-12 cotton balls
plastic gas siphon (available in hardware stores)
1 foot of plastic tubing (5/16" diameter)
masking tape
straight pin
cigarettes (unfiltered)
matches



Astronaut: ______________________ Date: ____________

MISSION 8

Levels: Pilot and Commander (cont.)

Procedure:

1. Set up the apparatus by
   a. placing cotton balls in the baggie,
   b. taping the back of the siphon to the sealed baggie,
   c. attaching the plastic tubing to the front of the siphon.
2. With adult assistance, place a cigarette in the plastic tubing.
3. Light the cigarette by holding a match to it while gently pumping the siphon.
4. Continue pumping until the baggie is filled with smoke.
5. Punch 3-5 holes in the bottom of the baggie to allow smoke to escape.
6. Continue this procedure with several cigarettes.
7. Record your observations below.

How were the cotton balls affected by the cigarette smoke?

___

How was the plastic tubing affected by the cigarette smoke?

___

If the baggie were the living and working areas of a space shuttle, how would the environment be affected by cigarette smoke?

___

___

If the tubing were your throat and the baggie were your lungs, how would your body be affected by the cigarette smoke?

___

___

What conclusions can you make about the hazards of cigarette smoking?

___

___

PASSPORT COVER
Levels: Trainee, Pilot,Commander

YOUNG ASTRONAUT

PASSPORT

As the bearer of a YOUNG ASTRONAUT PASSPORT, you are asked to grow in understanding and respect for self, family, friends and all people of planet Earth.

UNITED STATES OF AMERICA

**CHOICE AND CHALLENGES
FOR A NEW GENERATION**

PEPSI

YOUNG ASTRONAUTS™

PASSPORT INSIDE COVER
Levels: Trainee, Pilot, Commander

PURPOSE OF PASSPORT

American astronauts are issued passports before a Shuttle launch in case they are forced to make an emergency landing in a foreign country.
Your Young Astronaut Passport is intended to help you better know and like yourself.

Important: This Young Astronaut Passport is NOT VALID until completed and signed by THE BEARER.

Fold on dotted line.

4

WHEN I GROW UP

I want to be ____________________

____

____

I would like to live and work in

____

____

To do this job, I will need to know

____

____

____

____

____

____

____

____

1

YOUNG ASTRONAUT PASSPORT

Date issued: ____________________

Bearer's Name:

____

Bearer's Address:

____
Street

____
City State Zip

Telephone: ____________________

Paste your photo here

____
Signature of Bearer

2

SOLVING PROBLEMS

My problem is: ____________________

____

____

____

I can solve my problem by:

____

____

____

____

____

____

____

3

SETTING GOALS

Setting goals helps you plan your time. Knowing what you want to do will help you be more successful.

Write your goals below. Star (*) those goals that are a priority in your life. Check (✔) each goal upon its completion.

____
Date

GOALS

____

____

____

____

____

____

Fold on dotted line

PASSPORT COVER
Levels: Trainee, Pilot, Commander

YOUNG ASTRONAUT

PASSPORT

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Fold on dotted line.

8

PLANNING FOR THE FUTURE

Describe your ideal career related to a national or world space program. Use your imagination in creative yet realistic ways.

Type of work: ______________________

My primary responsibilities:

____

____

Training needed to qualify for this position:

____

____

Location in the universe in which I work:

____

Length of time I will have this position:

____

1

YOUNG ASTRONAUT PASSPORT

Date issued: ______________

Bearer's Name:

____

Bearer's Address:

____

Street

____

City State Zip

Telephone: ______________

Paste your photo here

____

Signature of Bearer

2

KNOWING MYSELF

Birth Date	Birth Place	
Height	Hair Color	Eye Color
Names and Ages of Brothers/Sisters		
Most Interesting Thing About Me		
Favorite Hobby		
Favorite Subject		
Favorite Exercise		
Favorite Food		
Favorite Book		

7

Put a star (*) before the best possible solution to the problem.

Advantages of this Solution:

____

____

____

Disadvantages of this Solution:

____

____

____

Name of person who might help you resolve the problem:

____

Date you expect to have problem improved or resolved:

____

Ways to know that problem is improved or resolved:

____

Fold on dotted line

6

SOLVING PROBLEMS

Being able to solve problems will allow you to take greater control of your life. Use the following steps to solve or improve a problem in your life.

PROBLEM:

____

____

____

POSSIBLE SOLUTIONS TO PROBLEM:

____

____

____

____

____

____

____

3

SETTING GOALS

Setting goals helps you organize your time. Knowing what you want to do and how you want to do it increases your success and happiness.

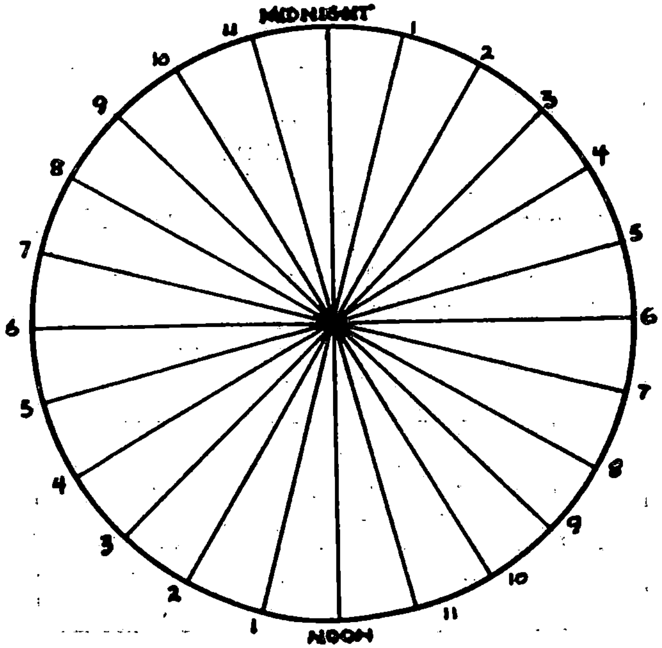
Write your goals below. Star (*) those goals that are a priority in your life. Check (✔) each goal upon its completion.

Priority	Goals	Date Finished
______	______________	______
______	______________	______
______	______________	______
______	______________	______
______	______________	______

PLANNING TIME

The circle below represents a twenty-four hour day. Color the circle to indicate the time you spend doing the following activities:

Sleeping - blue
Eating - green
Schooling - red
Playing - orange
Relaxing - yellow



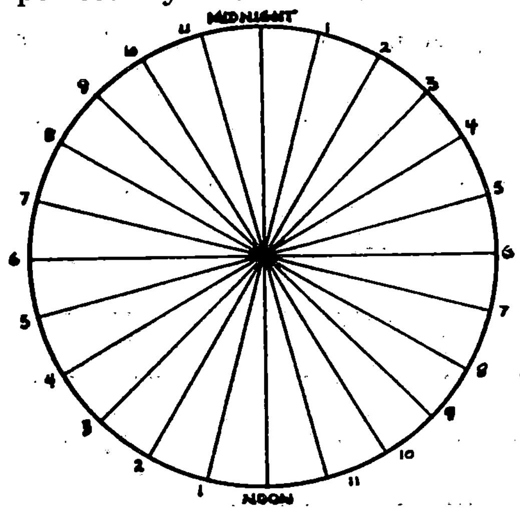
Use the circle graph to evaluate your use of time. Do you spend a sufficient amount of time sleeping, playing, etc.?

____

____

____

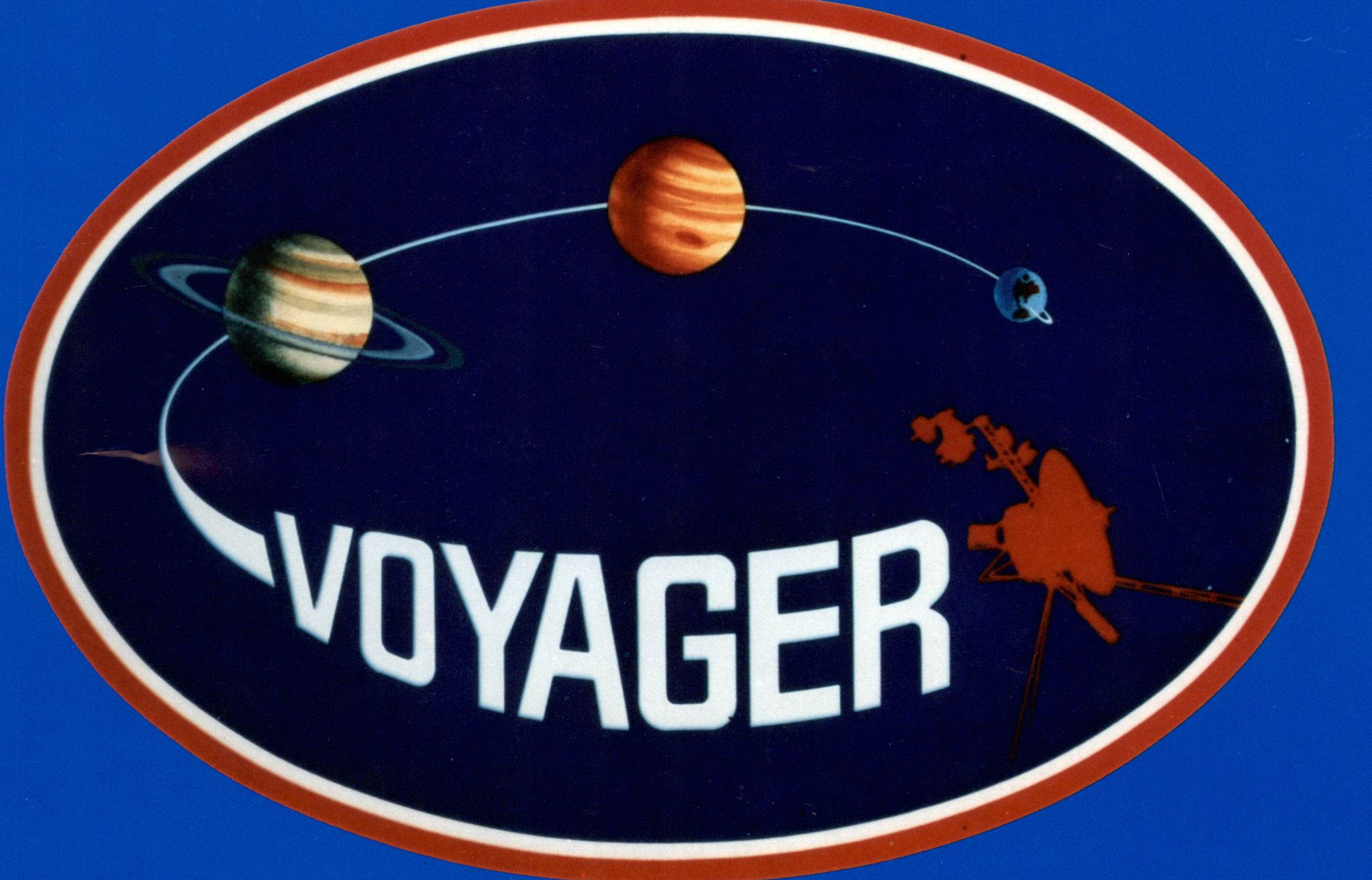
MY PERFECT DAY: Plan a perfect day on the chart below.



Put your plan for a perfect day into action.

Fold on dotted line

VOYAGER
THE GRAND TOUR



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FROM THE YOUNG ASTRONAUT PROGRAM
SPONSORED BY McDONALD'S CORPORATION

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VOYAGER
THE GRAND TOUR

MONTHS: OCTOBER/NOVEMBER
LEVEL: COMMANDER (Grades 7-9)

GOAL: to consider significant features discovered by Voyagers 1 and 2 as these spacecraft traveled past the outer planets of Jupiter, Saturn, Uranus and Neptune.

In this learning packet, students will complete the following activities:

1. **THE GIANT PLANETS**
   Objectives: to show the scale size of Jupiter, Saturn, Uranus and Neptune; to make a scale model of their distances from the Sun.

> ***Two roads diverged in a wood, and I -***
> ***I took the one less traveled by,***
> ***And that has made all the difference.***
> Robert Frost

2. **THE VOYAGER MISSION**
   Objective: to demonstrate the alignment of Jupiter, Saturn, Uranus and Neptune for observation by Voyager 2.
3. **JOURNEY BY JUPITER**
   Objective: to identify significant features of Jupiter with emphasis on its belts and zones, its Great Red Spot and the active volcanoes on the surface of its moon Io.
4. **SIGNALS FROM SATURN**
   Objective: to identify significant features of Saturn with emphasis on its complex ring system, its intermediate-sized moons and the nitrogen atmosphere of its moon Titan.
5. **UNIQUE URANUS**
   Objective: to identify significant features of Uranus with emphasis on its extremely tilted axis, its dark ring system and the varied geology of its moon Miranda.
6. **NEWS FROM NEPTUNE**
   Objective: to identify significant features of Neptune with emphasis on its Great Dark Spot, its three rings and the ice geysers on its moon Triton.
7. **CONCENTRATION GAME**
   Objective: to recognize some of the unique features of Jupiter, Saturn, Uranus and Neptune.
8. **MAPPING MIRANDA**
   Objective: to examine a topographic map of an area of Miranda (a moon of Uranus) and to compare it with similar maps of Earth.
9. **REACHING OUT**
   Objective: to depict the sights and sounds of Earth that you would want to communicate to possible intelligent life somewhere in the universe.
10. **IDENTIFYING THE PARTS OF VOYAGER**
    Objectives: to match each part of the Voyager with its description; to label these parts on a diagram of the spacecraft.

NOTE: Refer to background information, answers to activities and resource information at the end of this packet.

VOYAGER
THE GRAND TOUR

THE GIANT PLANETS

The planets of the solar system fall into two groups. The four inner planets of Mercury, Venus, Earth and Mars are the ***terrestrial planets***. They most nearly resemble Earth in size and in rocky composition. The four outer planets of Jupiter, Saturn, Uranus and Neptune are the ***giant planets***. They are much bigger than the terrestrial planets and very different in composition. They are rich in icy or gaseous hydrogen compounds such as methane, ammonia and water. The giant planets are the ones the Voyager mission was designed to visit.

Neptune is the farthest planet from the Sun today. Pluto usually has that position. In 1980, Pluto crossed inside Neptune's orbit, moving closer to the Sun. It will move out again in 1999. Pluto is neither a terrestrial planet nor a giant planet. Many astronomers are beginning to think that Pluto is not really a normal planet at all, but possibly a giant double asteroid.

The symbols for the giant planets are: ♃ (Jupiter), ♄ (Saturn), ♅ (Uranus) and ♆ (Neptune). These symbols come from ancient astrology. They are often used as abbreviations by astronomers and others.

ACTIVITY:

Make a model of the positions of the giant planets. To keep the distances in the correct proportion to the photographs of the planets on pages C-3 through C-6, you would need to have Neptune 2.5 km (1.6 mi) from the Sun. It is probably more practical to use a distance of 25 m (75 ft) and to imagine that the distances between the planets are 100 times as great as shown here. The planet pages, C-3 to C-6, describe the unique characteristics of these planets and the discoveries made in the course of the Voyager mission.

Materials needed: string - one piece 25 m (80 ft) long and four pieces about 20 cm (8 in) long, hole punch, photocopies of planet pages (C-3 to C-6) on card stock

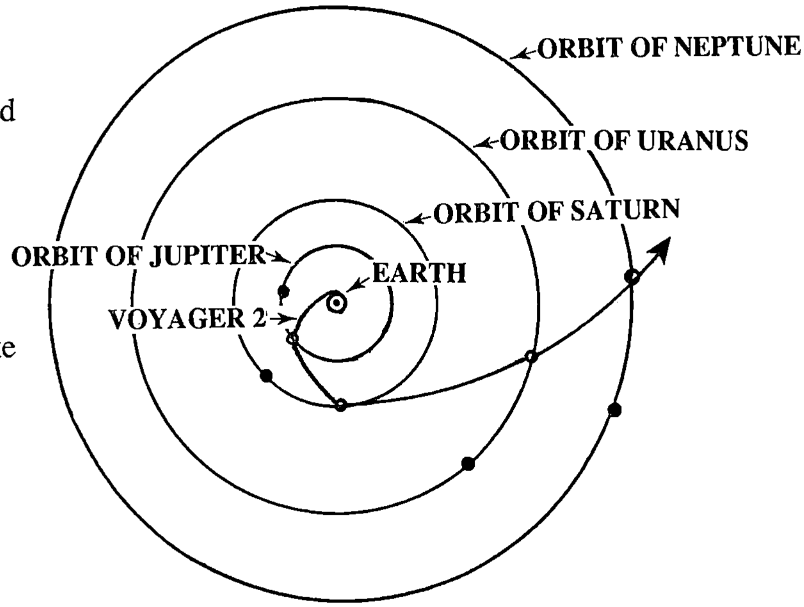
Procedure:

1. Punch holes in the tops of the planet pages C-3 through C-6. Tie the short pieces of string through the holes.
2. Tie one end of the 25 m (80 ft) string to a doorknob or some similar object. This object will represent the Sun. If made to the scale of the planet photos, the Sun would actually be 715 mm (28.25 in) in diameter. Make sure you will be able to stretch the string out to its full length. It may be necessary to do this activity outdoors or in your school corridor.
3. Measure 3.99 m (13 ft, 1 in) from the "Sun" on the string. Tie the Jupiter page to the string here to represent its distance from the Sun.
4. Repeat step 3 for Saturn at a scale distance of 7.32 m (24 ft) from the "Sun." Put Uranus at 14.68 m (48 ft, 1 in) and Neptune at 23.06 m (75 ft, 8 in).

This will give you an idea of the distances between the giant planets and their distances from the Sun. If you would like to make a model of the entire solar system, refer to the information on the answer page at the back of this packet. Research how each planet got its name.

VOYAGER
THE GRAND TOUR

THE VOYAGER MISSION



Once every 175 years, the giant outer planets of Jupiter, Saturn, Uranus and Neptune fall into a unique pattern with respect to Earth and to each other. This pattern permits a spacecraft launched from Earth to Jupiter to visit them all. Each planet's gravity bends the spacecraft's flight path toward the next and increases its velocity. The outer planets formed this pattern beginning in 1979 and ending in 1989. The Voyager program, consisting of two spacecraft, was designed to take advantage of this planetary alignment. Voyager 1 and 2 sent new information about the outer planets and their moons back to Earth. The first spacecraft, launched on August 20, 1977, was called Voyager 2. The second spacecraft, launched on September 5, 1977, was called Voyager 1. The reason their names were the opposite of their order of launching is that the scientists and engineers knew, based on mission design, that the second spacecraft would soon overtake the first one. When it did so, their names correctly reflected their positions as they moved through interplanetary space. Both satellites were launched from Kennedy Space Center in Florida, atop Titan-Centaur launch vehicles.

The planets are constantly moving and changing position with respect to each other, but they do so in very orderly fashion. Their positions can be predicted with confidence based on the patterns of motion that have been observed by humans over the centuries. The circular chart is a view of the outer solar system as seen from above--looking down on it from the north. (This is a simplified view of the solar system--orbits are not really circular, but nearly so.) On this chart are the orbits of Earth, Jupiter, Saturn, Uranus and Neptune. These planets all move in the same direction (counterclockwise) but each one has a different ***orbital period***, the length of time it takes to complete one orbit around the Sun.

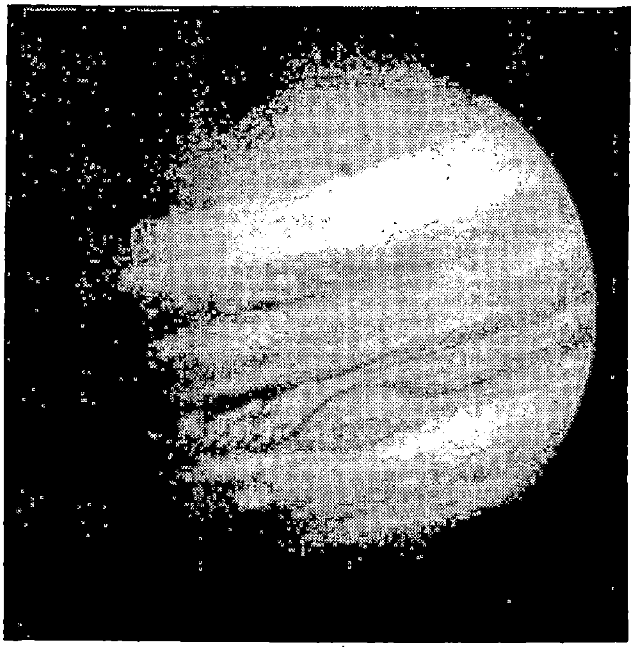
The diagram shows the path of Voyager 2 through the outer solar system. (Voyager 1 only visited Jupiter and Saturn.) When Voyager 2 was launched on August 20, 1977, the positions of Jupiter, Saturn, Uranus and Neptune were shown on the chart as solid dots. The positions of the planets when Voyager 2 approached the planets were shown as open dots. This is the pattern that allowed the Voyager 2 mission to happen. Future missions will be planned with planetary motions in mind as well.

ACTIVITY: Assign a student to be the Sun. This student should stand in the center of an open area. Other students can be Jupiter, Saturn, Uranus and Neptune. They should place themselves in a pattern similar to the black dots on the circular diagram. A sixth student can play the part of Earth, orbiting near the Sun. One more student is needed--to be Voyager 2. This student will leave Earth and visit Jupiter, then Saturn, then Uranus, then Neptune. These giant planet students will gradually move to the positions shown on the chart as open dots. They may rotate (spin around) if they wish. Voyager 2 will then depart the solar system.

EXTENDED ACTIVITY: Calculate how many times the Earth student should orbit around the Sun before Voyager 2 leaves the solar system.

VOYAGER
THE GRAND TOUR

JOURNEY BY JUPITER



Voyager 1, launched in September 1977, took 546 days to reach Jupiter. Well known as the largest planet in our solar system, Jupiter contains three times the mass of all the other planets combined. Its diameter, 142,984 km (88,846 mi), is 11 times that of Earth. If hollow, Jupiter could hold 1,300 Earths.

Jupiter rotates faster than any other planet in our solar system with one day only 9 hours, 55 minutes long. It takes Jupiter 11.86 Earth years to travel around the Sun. Surface gravity on Jupiter is 2.6 times Earth gravity.

Jupiter is over five times as far from the Sun as Earth. It gives off more heat than it absorbs from the Sun. Some scientists believe Jupiter is too hot to be a planet, yet too cool to be a star. Jupiter and its 16 known moons are regarded as a "mini-solar system" within our solar system.

Voyager 1 analyzed Jupiter's outer atmosphere in great detail. The planet displayed alternating patterns of ***belts*** and ***zones***. The zones are generally lighter in color, higher in altitude, colder and dominated by frozen ammonia ice crystals. The belts are generally darker in color, lower in altitude and warmer. Evidence of lightning in Jupiter's cloud tops was an exciting discovery by Voyager 1. Jupiter's ring was the first planetary ring discovered by a spacecraft. Voyager 1 confirmed its existence in 1979.

The Great Red Spot of Jupiter is three times as big as Earth. It is actually a huge storm that has raged for more than 300 years.

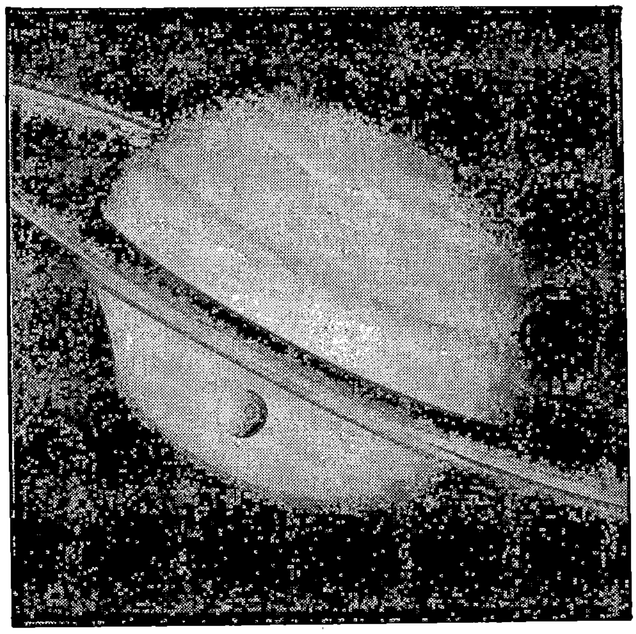
Jupiter's 16 moons have been discovered over a period of four centuries. Io is perhaps the most interesting of Jupiter's moons since it is the first body other than Earth and Venus known to have active volcanoes. During the two Voyager encounters, nine of its volcanoes were active. Plumes were observed as high as 300 km (185 mi) above Io's surface, or 30 times higher than Mt. Everest on the Nepal/China border.

ACTIVITY:
Use the information above to answer the following questions.

1. How much would you weigh on the surface of Jupiter?
2. Which were the first three solar system bodies known to have active volcanoes?
3. What weather feature was found by Voyager 1 in Jupiter's cloud tops?

EXTENDED ACTIVITY:
Use the information on pages C-4 through C-6 to determine how much you would weigh on each of the other three giant planets.

SIGNALS FROM SATURN



Voyagers 1 and 2 reached Saturn in 1980 and 1981. One day on Saturn is 10 hours, 40 minutes long. It takes Saturn 29.46 Earth years to orbit the Sun. Saturn, like Jupiter, is a giant sphere of gas, mostly hydrogen and helium, with no solid surface. Its diameter, 120,536 km (74,898 mi), is 9½ times Earth's and it is 9½ times as far from the Sun as Earth. The outer atmosphere of Saturn consists of hydrogen, helium and methane gases. Saturn's gravity is 1.1 times Earth's.

The Voyager encounters of Saturn showed the true splendor, expanse and thickness of the ring system first observed by Galileo in 1610. The ring particles are made of water ice ranging in size from smaller than sugar grains to as large as houses. They create the effect of a permanent snowstorm in orbit around Saturn. Astronomers knew of six separate rings around Saturn before the Voyager flybys. After the Voyager visits, over one thousand individual rings were counted.

Titan, the only known moon with an atmosphere, is the largest of Saturn's 20 known moons. It is the second largest moon in the solar system. The only larger moon is Jupiter's Ganymede. On November 11, 1980, Voyager 1 passed the surface of Titan at a distance of 4,000 km (2,500 mi). This was the closest approach to any celestial body encountered by either of the two Voyagers.

Mimas, a moon of Saturn, has a heavily cratered surface. Voyager photos showed that Mimas has a huge crater about one-third its diameter. The crater is 10 km (6 mi) deep with a central peak rising 6 km (4 mi) from its floor. Mimas came close to being shattered by the impact of the meteor that caused this crater.

ACTIVITY:
Use the information above to answer the following questions.

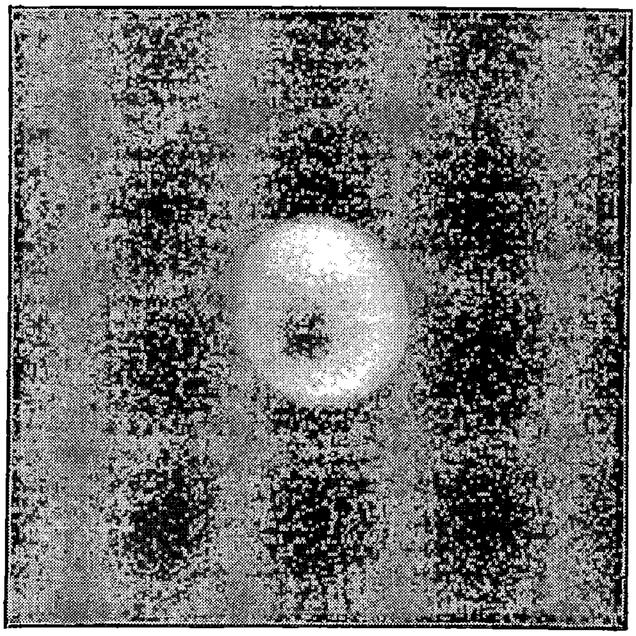
1. How many Earth hours would be spent in daylight on the average Saturn day?

2. What Saturn year would it be if Saturn years were numbered starting at the same time as Earth years?

3. What are Saturn's rings made of?

EXTENDED ACTIVITY:
Use the information on pages C-3, C-5 and C-6 to determine the average duration of daylight on each of the other giant planets.

UNIQUE URANUS



In November 1985, the Voyager 2 spacecraft began its 3½-month tour of Uranus and its moons after an 8-year journey from Earth. One day on Uranus is 17 hours, 14 minutes long. It takes Uranus 84 Earth years to travel around the Sun. Like a lazy blue-green giant with 15 gray dwarfs, Uranus and its moons tour our solar system on their sides. Uranus is tilted on its axis more than any other planet. While Earth is tilted 23.5 degrees, Uranus is tilted nearly 98 degrees. The diameter of Uranus, 51,118 km (31,763 mi), is four times Earth's. Surface gravity on Uranus is 0.88 times Earth's. Uranus is 19 times as far from the Sun as Earth.

Voyager 2 showed Uranus to have a large core composed of a mixture of rock, ice and gas. This core is covered by a low, thick atmosphere of hydrogen, helium and heavier gases. Ninety-eight percent of the upper atmosphere is composed of hydrogen and helium; the remaining two percent is methane. Uranus looks blue-green, but its clouds are really colorless. The clouds get their color because the methane absorbs the red light contained in sunlight. When the red light is absorbed, the blue light in the sunlight shows up more.

Voyager 2 discovered two dark rings and several dust bands circling Uranus. This brought the total number of known Uranus rings to ten. The spacecraft also observed flickering starlight from behind the ring area, which indicates many more rings. Ring particles blocked the light from the star as they came between the star and the Voyager camera.

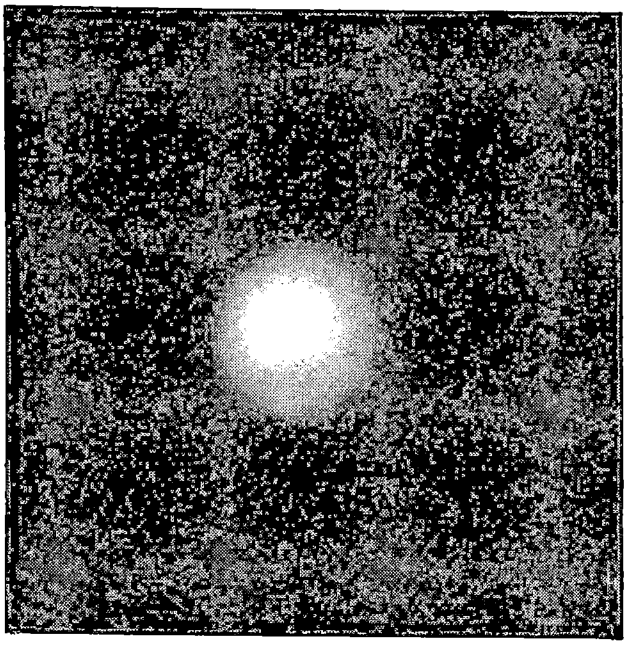
Ten additional Uranian moons were discovered by Voyager 2, bringing the total number of known moons to 15. The strangest of Uranus' moons, Miranda, is marked with craters, rope-like patterns, deep valleys that turn at right angles, ridges that look like racetracks and cliffs that plunge ten times deeper than the Grand Canyon. All of these features indicate a long and complex geologic history, but one that stopped abruptly in mid-evolution.

ACTIVITY:
Use the information above to answer the following questions.

1. How long would a Uranus summer be in Earth years?
2. What is the real color of the clouds of Uranus?
3. What causes Uranus to be blue-green?

EXTENDED ACTIVITIES:
Use the information on pages C-3, C-4 and C-6 to calculate how long summer would be on the other three giant planets. Discuss what flybys and probes you would design for future exploration of Uranus.

NEWS FROM NEPTUNE



In August 1989, the Voyager 2 spacecraft flew by Neptune after a 12-year journey from Earth. It was very difficult for Voyager 2 to obtain clear photographs of Neptune and its rings and moons because they are made up of darker material than most other solar system bodies. Another problem was that the light level was so low. Neptune is 30 times as far from the Sun as Earth, so it would be like trying to read a book 60 m (197 ft) away from a lamp in a dark room when you usually read 2 m (6½ ft) away from the lamp. In spite of the problems, Voyager 2 sent back 9000 pictures and added a great deal to the scientific knowledge about this planetary system.

From the data collected, scientists learned that Neptune's day is 16 hours, 7 minutes long. It takes Neptune 165 Earth years to travel around the Sun. Surface gravity on Neptune is 1.14 times Earth's, and its diameter, 49,528 km (30,775 mi), is almost four times Earth's diameter.

Several storms were discovered on the planet's southern hemisphere. One of them, the Great Dark Spot, is larger than Earth. High white clouds were found above the Great Dark Spot. Some of Neptune's winds were clocked at about 2,400 km (1,500 miles) per hour--the fastest in the solar system. This is about seven times the highest wind speed ever measured on Earth.

The biggest news from Neptune was the discovery of geyser-like plumes on its moon Triton. Four liquid eruptions took place as Voyager 2 went by. Some astronomers believe that Triton's geysers are caused by warmer, underground lakes of liquid nitrogen, which sometimes erupt to the surface and then freeze to form patches of solid nitrogen ice.

Voyager 2 discovered that there are at least four rings around Neptune. The spacecraft also took pictures of six new moons revolving around Neptune, most of them rather small. This brought the total of known Neptune moons to eight.

ACTIVITY:
Use the information above to answer the following questions.

1. What is the circumference of Neptune at its equator?
2. What is the highest wind speed ever recorded on Earth?
3. What was found above Neptune's Great Dark Spot?

EXTENDED ACTIVITY:
Use the information on pages C-3 through C-5 to calculate the circumferences of the other three giant planets at their equators.

CONCENTRATION GAME

Purpose: to recognize important features of Jupiter, Saturn, Uranus and Neptune.

Number of players: 2 to 4

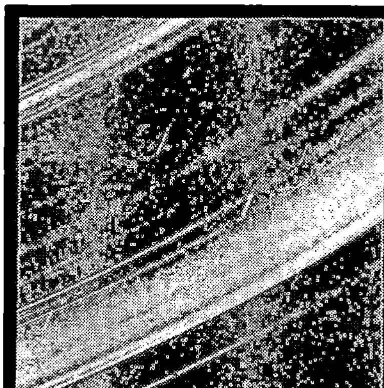
Materials needed: photocopies of photographs on pages C-7 and C-8, scissors, white glue, tag - board.

Procedure:
1. Cut out the photographs of the unique features of the four outer planets on pages C-7 and C-8.
2. Glue each photograph to a piece of tagboard.
3. Trim the tagboard as needed.

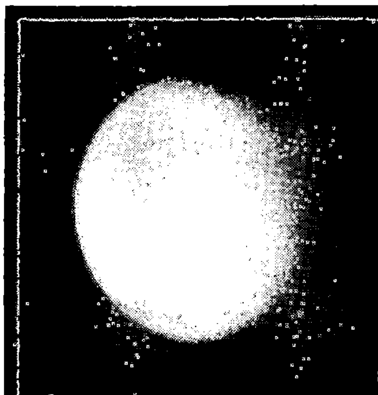
Rules of game:
1. Turn the twelve cards face down. Mix up the photographs.
2. The first player picks one photograph and tries to identify the planet with which it is associated.
3. If correct, the student keeps the card. If incorrect, the student returns the card face down on the table and loses his/her turn to the next player.
4. Repeat this procedure until all the cards have been identified successfully.
5. The player holding the most cards is the winner.

EXTENDED ACTIVITY: Add more cards of photographs or words that depict the unique features of the four outer planets.

1 An atmosphere of belts and zones



2 Dust seen within dark rings



3 Titan

VOYAGER
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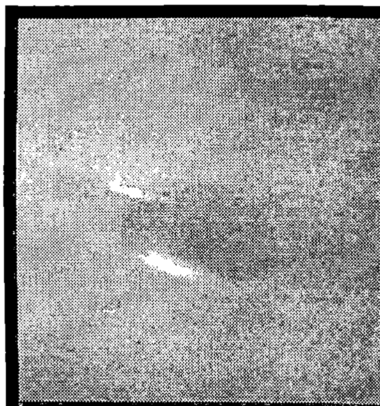
CONCENTRATION GAME (cont.)

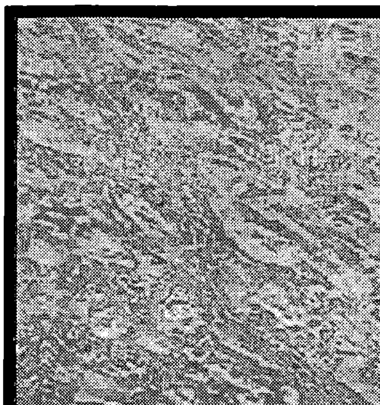
4 Over one thousand ice rings



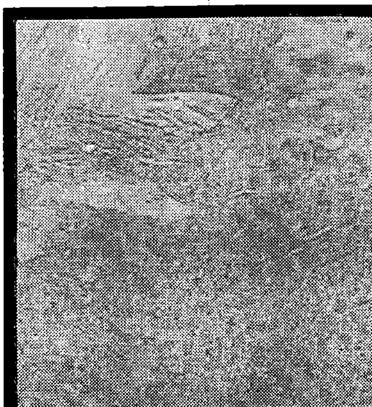
5 Great Dark Spot

6 The blue-green planet with three of its moons

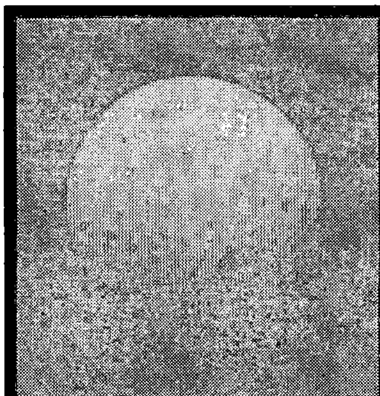
7 Great Red Spot



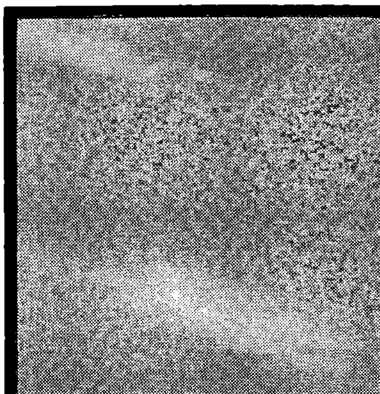
8 Nitrogen ice patterns formed by geysers on Triton



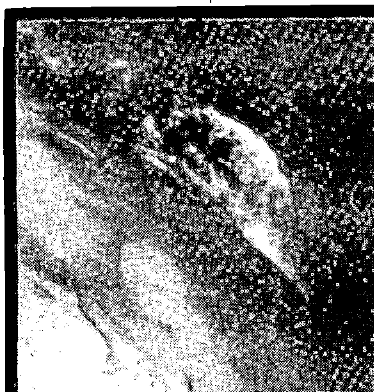
9 The unique surface of the moon Miranda



10 The moon Mimas with its huge crater



11 White clouds show fastest winds in solar system

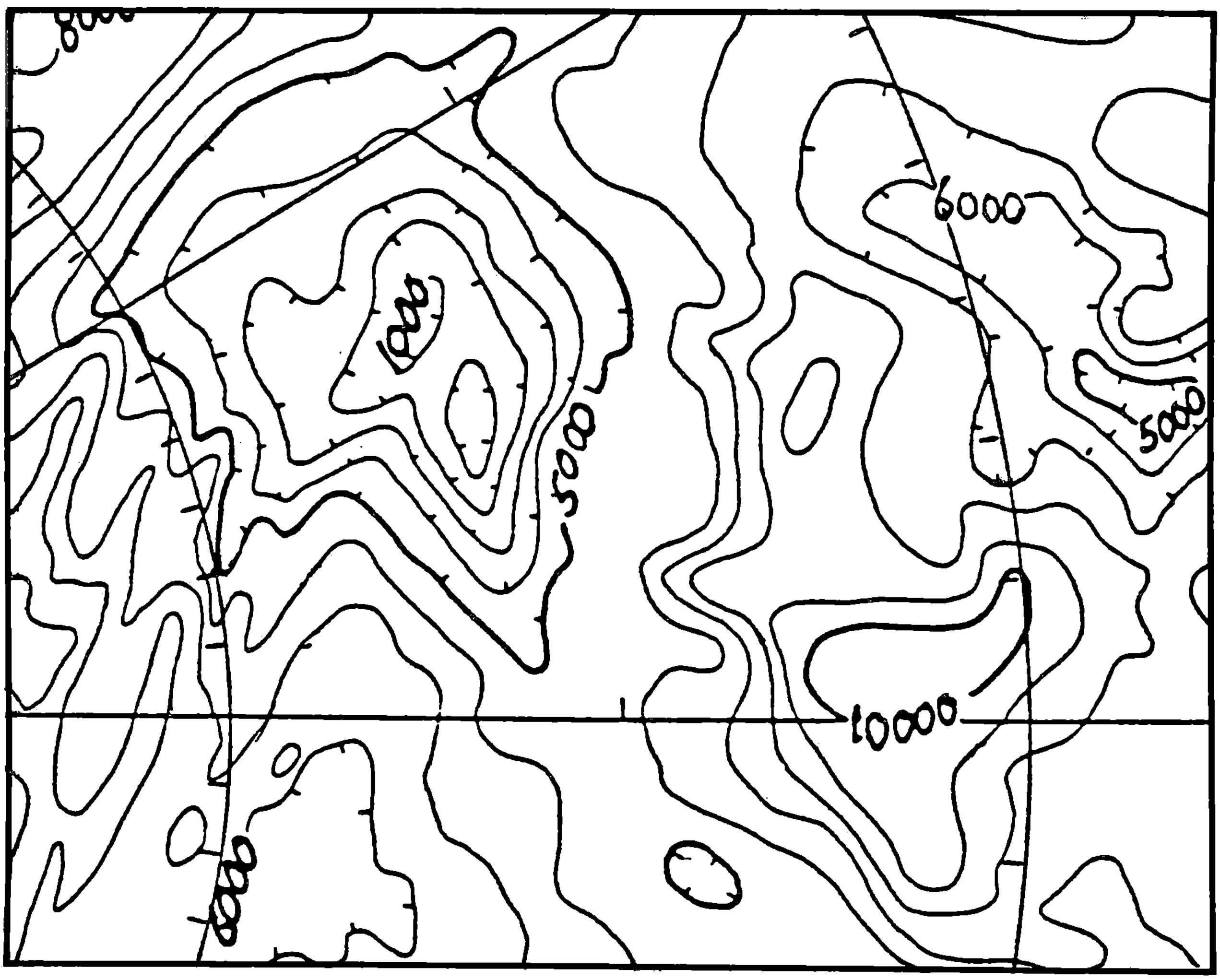


12 An erupting volcano on the moon Io

MAPPING MIRANDA

The purpose of preparing a **topographic (topo) map** is to portray a three-dimensional object or surface in two dimensions, so that it can be shown on a printed page. On Earth, topo maps are made to show all of the places where the land rises and falls: mountains, valleys, cliffs, canyons, ridges, etc. In addition, topo maps can show the same features under Earth's oceans. ***Contour lines*** connect points of equal elevation. On Earth, the elevation is measured either up or down from sea level, but on planets and moons that have no oceans, elevation is generally measured up from the lowest point or up and down from some arbitrary elevation. The ***contour interval*** is the difference in elevation between one contour line and the next. On topo maps of Earth, it is typical to measure in intervals of 10, 25, 50, 100, or 1000 ft or m. Such maps are often printed in color to make them easier to interpret. ***Hachure marks*** on a contour line indicate a depression in the surface of the land.

A topo map of part of the surface of Miranda, a moon of Uranus, was prepared by Dr. Sherman Wu of the U.S. Geological Survey based on data provided by Voyager 2. The surface had such extreme variations in elevation (canyons and mountains, for example) that a 1000 m (3281 ft) contour interval was chosen. A portion of this map showing elevations ranging from 1000 m to 10,000 m appears below.



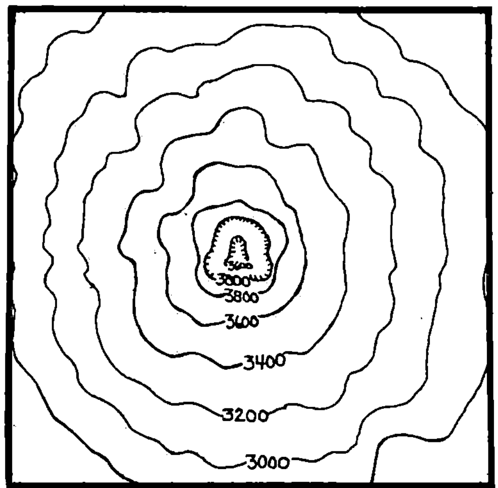
VOYAGER
THE GRAND TOUR

MAPPING MIRANDA (cont.)

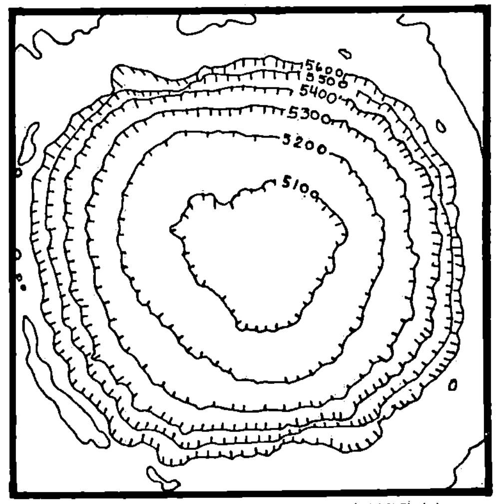
Activity One: Color the topo map of Miranda, a moon of Uranus.

Materials needed: page C-9, markers or colored pencils.

Procedure:
Using markers or colored pencils, fill in the areas between contour lines on the Miranda map. You will need 11 colors. It may help to use lighter colors for the lower elevations (1000 to 5000 m) and darker colors for the higher elevations (5000 to 10,000 m). Try to visualize what this terrain would look like in three dimensions.



Mt. Fuji, Japan
(in meters)

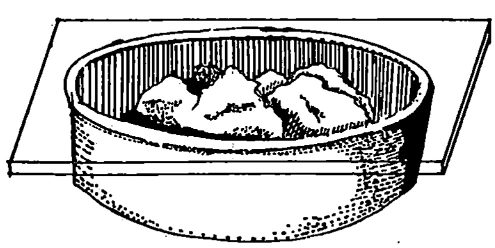


Arizona Meteor Crater (USA)
(in feet)

Compare the features on the Miranda topo map with the Earth features on the topo maps to the right. Mt. Fuji and the area marked 10,000 m on the Miranda map are mountains, and Arizona Meteor Crater and the spot marked 1000 m on the Miranda map are both depressions. Arizona Meteor Crater is the best-preserved impact crater on Earth. About 22,000 years ago, a huge iron meteroid broke through the atmosphere and struck the Arizona desert at over 40,000 km (25,000 mi) per hour. The blast displaced millions of tons of rock and dug the crater bowl shown in the topo map. The same type of collision was probably responsible for the depression on Miranda.

Activity Two:
Make a topo map of a rock.

Materials needed: a medium-sized rock 20-25 cm (8-10 in); a deep basin or pan for water; ruler; crayon or grease pencil; a sheet of glass to fit over rock inside the pan.



Procedure:
1. Put the rock in the pan.
2. Pour water into the pan to a depth of 2.5 cm (1 in). Measure the depth with the ruler.
3. Draw around the rock with a crayon or grease pencil at the water line.
4. Pour in another 2.5 cm (1 in) of water.
5. Again, draw around the rock with a crayon at the water line.
6. Continue until the rock is under the water level.
7. Pour out the water, but leave the rock in the pan.
8. Put the glass sheet over the pan.
9. Looking down at the rock through the glass, copy the crayon lines onto the glass.

Extended Activity: Repeat this activity with different types of rocks to see what sort of patterns result. Try smooth rocks, jagged rocks, round rocks, etc.

VOYAGER
THE GRAND TOUR

REACHING OUT

The spacecraft known as Voyager 1 and Voyager 2 traveled through the solar system making new discoveries about Jupiter, Saturn, Uranus and Neptune. Both spacecraft are now headed on endless journeys through interstellar space. Each Voyager carries a laser disk containing sounds and pictures of Earth as messages to any intelligent life that might find them. Each record contains 118 photographs of Earth, 90 minutes of music from all over our planet, greetings in 54 languages and the sounds of whales, rain, baby cries and much more.

ACTIVITY:

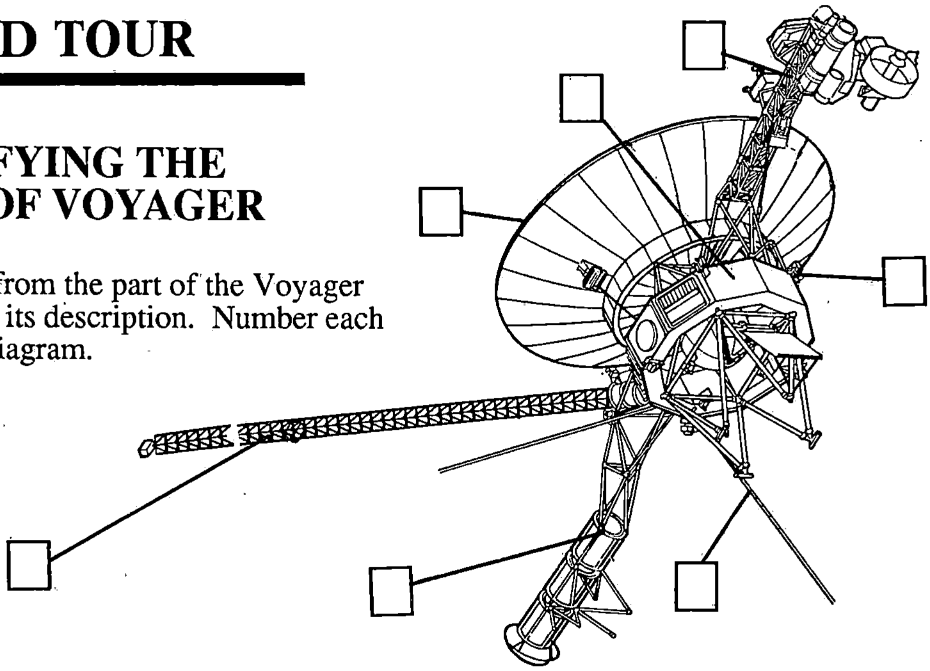
Make a videotape of the sights and sounds of Earth that **you** consider important enough to be carried out of our solar system and into deep space. You might consider making a video of your favorite musical group, your pet, a family dinner or party, a gathering of your friends, wind blowing through the trees, a religious ceremony or service, a clip from your favorite movie, a view of your favorite dinner or dessert (including a verbal description of its taste, aroma and texture), a computer in action, a time-lapse sequence of a flower growing and opening, an artist painting or sculpting or drawing, or a friend modeling a new outfit.

EXTENDED ACTIVITY:
Write a letter or create a videotape of the sights and sounds of Earth that you would share with intelligent life. If you are interested in sending your written project into space, contact Space Arc, Rochester Museum and Science Center, 657 East Avenue, Box 1480, Rochester, New York 14603-1480, USA. For possible inclusion of your videotape in television programs featuring students' work, send your video to 21st Century News, 10270 N. Calle del Carnero, Tucson, Arizona 85737, USA. Your videotape will not be returned to you.

VOYAGER
THE GRAND TOUR

IDENTIFYING THE PARTS OF VOYAGER

Draw a line from the part of the Voyager spacecraft to its description. Number each part on the diagram.



1 HIGH GAIN ANTENNA	a Small rockets used to align the bus.
2 BUS	b Used to measure changes in the Sun's magnetic field; use to determine if outer planets have magnetic fields.
3 MAGNETOMETER	c Three small nuclear power plants that convert heat into electricity.
4 RADIO ANTENNA	d Basic ten-sided structure housing scientific instruments.
5 THRUSTERS	e This structure contains instruments that measure charged particles, visible light, infrared light (frequencies lower than red) and ultraviolet light (frequencies higher than violet). It also has a telescope and camera.
6 GENERATOR	f Dish on which the bus sits. This dish transmits science and engineering data to Earth.
7 SCIENCE BOOM	g The "rabbit ears" of a radio receiver used to listen to signals from the Sun and planets; can record sounds made by magnetospheres and lightning.

Number the parts on the Voyager diagram.

VOYAGER
THE GRAND TOUR

ANSWERS TO ACTIVITIES AND BACKGROUND INFORMATION

THE GIANT PLANETS - page 1

If desired, use the following dimensions to include all planets on the scale model. You will need a string just over 30 m (100 ft) long.

Planet	Scale Diameter	Scale Distance from Sun
Mercury	2.5 mm	0.30 m (1 ft)
Venus	6.2 mm	0.55 m (1 ft, 10 in)
Earth	6.5 mm	0.77 m (2 ft, 6 in)
Mars	3.5 mm	1.17 m (3 ft, 10 in)
Jupiter	73.0 mm	3.99 m (13 ft, 1 in)
Saturn	61.7 mm	7.32 m (24 ft)
Uranus	26.0 mm	14.68 m (48 ft, 1 in)
Neptune	24.8 mm	23.06 m (75 ft, 8 in)
Pluto	1.2 mm	30.24 m (99 ft, 3 in)

SIGNALS FROM SATURN - page 4
Activity:
1. On the average Saturn day there are 5 hrs, 20 min of daylight in Earth time.
2. It would now be Saturn year 67 (1990 Earth years divided by a Saturn year which equals 29.46 Earth years).
3. Water ice.

Extended Activity: Jupiter: 4 hrs, 57 1/2 min; Uranus: 8 hrs, 37 min; Neptune: 8 hrs, 3 1/2 min.

NEWS FROM NEPTUNE - page 6
Activity:
1. Multiply Neptune's diameter, 49,528 km (30,775 mi) by pi (π), 3.1416. The circumference of Neptune is 155,597 km (96,683 mi).
2. The highest wind speed ever recorded on Earth is about 343 km (214 mi) per hour.
3. High white clouds.

Extended Activity: Circumference of Jupiter = 449,197 km (279,118 mi); circumference of Saturn = 378,675 km (235,298 mi); circumference of Uranus = 160,592 km (99,787 mi).

THE VOYAGER MISSION - page 2

Extended Activity: Earth student would have to orbit the Sun 12 times, because Voyager 2 took 12 years to go from Earth to Neptune. One Earth year equals one Earth orbit.

JOURNEY BY JUPITER - page 3
Activity:
1. Multiply your Earth weight by 2.6, because Jupiter's gravity is 2.6 times as great as Earth's.
2. Earth, Venus and Io.
3. Lightning.

Extended Activity: On Saturn your weight would be 1.1 times your Earth weight; on Uranus 0.88 times your Earth weight; on Neptune 1.1 times your Earth weight.

UNIQUE URANUS - page 5
Activity:
1. Uranus summer = 21 years (Uranus year divided by 4).
2. They are actually colorless.
3. Sunlight contains all colors. The red in sunlight is absorbed by the methane in Uranus' clouds, so that only the blue and green colors are reflected back from Uranus. This is also true for Neptune.

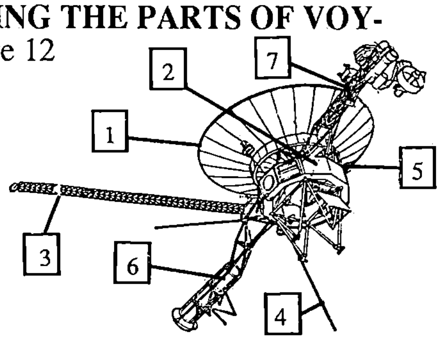
Extended Activity: Jupiter summer = almost 3 years; Saturn summer = almost 7 1/2 years; Neptune summer = 41 1/2 years.

CONCENTRATION GAME - page 7

Jupiter: 1, 7, 12; Saturn: 3, 4, 10;
Uranus: 2, 6, 9; Neptune: 5, 8, 11.

IDENTIFYING THE PARTS OF VOYAGER - page 12

1-f
2-d
3-b
4-g
5-a
6-c
7-e



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CREDIT: NASA photos provided by Space Imagery Center, Lunar and Planetary Lab, University of Arizona, Tucson, Arizona.

 This learning packet was developed for the Young Astronaut Council by Judith Bisignano, Ed.D., Corinne Sanders, Ed.D. candidate, David Anderson, Elizabeth Prohaska and Joanne Pifer, curriculum design specialists at Kino Learning Center, Inc. in Tucson, Arizona. Illustrated by Jane Bretschger and Trina Baiz Felty.

EXPLORATION AND DISCOVERY

BUILDING A SPACE CITY

A UNIQUE CURRICULUM ACTIVITY PACKET
CELEBRATING THE INTERNATIONAL SPACE YEAR
DEVELOPED BY THE YOUNG ASTRONAUT COUNCIL
SPONSORED BY RONALD McDONALD CHILDREN'S CHARITIES®
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Established in memory of Ray A. Kroc

YOUNG ASTRONAUTS™

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These educational materials have been made possible by a grant from Ronald McDonald Children's Charities.

EXPLORATION AND DISCOVERY
BUILDING A SPACE CITY

Dear Educator:

We are pleased to provide you with this complimentary copy of "Exploration and Discovery," a unique space-themed curriculum designed to excite your students about science and math, and help improve their skills in these vital areas.

Enclosed you'll find hands-on activities that you and your students can use to design and build a space city by using science experiments, mathematical games and critical thinking skills. Learning packets have been developed for three levels--TRAINEE (grades K-3), PILOT (grades 4-6), and COMMANDER (grades 7-9). These activity pages may be reproduced so students can use them in the classroom and take them home.

An autographed limited edition color poster, illustrated by renowned space artist Robert T. McCall, is also included in this packet. We suggest you display it in your classroom or elsewhere in the school to generate teacher and student interest in the program. After students complete activities in this packet, present them with the enclosed reproducible certificate. It is a tool which will reward their efforts and increase their enthusiasm about "Exploration and Discovery."

This curriculum package, made possible by a grant from Ronald McDonald Children's Charities (RMCC), has been delivered to every elementary, middle and junior high school in the United States. At a time when education funding is being slashed across the country, we hope this teaching tool will provide fun, multidisciplinary activities that appeal to students' natural sense of curiosity. **PLEASE SHARE THIS CURRICULUM PACKAGE WITH OTHER INTERESTED TEACHERS IN YOUR SCHOOL.**

Ronald McDonald Children's Charities, McDonald's Corporation and the Young Astronaut Council are committed to helping improve the quality of education in American schools. We believe "Exploration and Discovery" can enhance your existing lesson plans and excite students about learning--and perhaps, along the way, will develop future astronauts. Get ready to "blast off!"

Sincerely,

Ken Barun
Vice President & Executive Director
Ronald McDonald Children's Charities

Stephanie Skurdy
Director, Education
McDonald's Corporation

T. Wendell Butler
President
Young Astronaut Council

BUILDING A SPACE CITY

HOW IS THIS CURRICULUM BOOKLET TO BE USED?

The activities in the learning packets have a definite emphasis on science and mathematics. These materials can be incorporated directly into other areas of the curricula or be used as extracurricular activities. The program has been designed to meet current educational standards established by state boards of education.

Each module is a self-contained unit and may be used as such. Teachers may choose to follow the activities as presented or vary the units to meet the individual needs and interests of the students.

HOW WAS THIS PACKAGE DEVELOPED?

This package was developed by the Young Astronaut Council, a nonprofit organization that administers the Young Astronaut Program. The educational materials were produced by a team of experienced curriculum specialists under the Council's direction. These materials were field tested and reviewed by teachers and students.

WHAT IS THE YOUNG ASTRONAUT PROGRAM?

The Young Astronaut Program is a national educational program for children ages 3-16 designed to help improve the proficiency of American children in science and mathematics. By using children's natural curiosity about space as the motivator, Young Astronaut activities instill a sense of fun and adventure into learning these subjects and help develop the thinking skills necessary to succeed in the ever more technological world of tomorrow. All Young Astronaut activities take a learning-by-doing approach, allowing children to demonstrate the principles they learn.

Young Astronaut programs are organized in school or community groups led by a volunteer teacher/adult. The Young Astronaut Council provides monthly curriculum materials, such as those included in this package, to its members. It also sponsors national contests and hosts national and international conferences for Young Astronauts from around the world. More than 26,500 chapters have been formed in every state and some 40 foreign countries, reaching more than 650,000 children.

The Young Astronaut Program has been endorsed by a number of leading educational, scientific and civic organizations, including the White House, NASA, the U.S. Department of Education, the National Education Association, the National Science Foundation, the Air Force Association, Kiwanis, and others.

CAN WE RECEIVE OTHER SUCH CURRICULUM MATERIALS?

This is a unique curriculum package developed especially for this project. However, Young Astronaut Chapters may be formed at any time during the year. The last page of this booklet contains registration information should you desire to begin a Young Astronaut Chapter in your school.

DESIGNING AND CONSTRUCTING A SPACE CITY IN HIGH EARTH ORBIT

Note to Teachers: The activity packets for this project are preceded by background information and questions to stimulate open-ended discussion (pp. 2-6). Each of the three packets is followed by answers and further background information for the activities. Resources that will further your investigation of space exploration are listed in the bibliography on the back cover of this booklet.

GOAL: **to consider essential aspects of designing, constructing and living in an international space city in the year 2042.**

SETTING: Five hundred years ago, Martin Behaim made the first Earth globe; North and South America weren't on it. In the same year, Leonardo da Vinci made a wild leap of the imagination and sketched an idea for a flying machine. Pencils were invented. The mace, a heavy club with a spiked metal head, was a popular weapon of war; artists were discovering perspective. On October 12, 1492, Christopher Columbus dropped anchor off San Salvador Island in the Bahamas, starting the chain of events that we now call **Modern American history**.

What would Christopher Columbus have imagined for the world of 1992? What would you imagine for the world of 2492, five hundred years from now?

The year 1992 is the International Space Year and the 500th anniversary of Christopher Columbus' first voyage to the New World. The Young Astronaut Council invites you to think about the exciting prospects for the future with your students.

Consider building a city in space 50 years from now, in 2042. Imagine planning a structure in high Earth orbit 4,000 miles (6,400 km) above Earth, that will be home for 10,000 to 30,000 people. The following activities may help you plan the city. You and your students will undoubtedly have many questions and suggestions of your own as you plan for quality living aboard the space city. Be sure to include these ideas in the planning process.

BUILDING A SPACE CITY

I. TECHNOLOGICAL CONSIDERATIONS

A. PHYSICAL STRUCTURE

Your space city may be as large as 20 km (12 mi) in diameter, with a land surface area of several hundred square km. The laboratories and living habitats of the city could be variations of spheres, cylinders and rings. The largest structures might be 500 meters (1,600 ft) in diameter with an inside circumference of about 1.5 km (0.9 mi). Will some chambers rotate to produce artificial gravity? Will some areas remain weightless to produce the best conditions for manufacturing materials and products? How will people safely move between the weightless and gravity chambers? Will shops and homes be in inner areas so the outer level of the colony can be used for parks and natural settings?

B. LIFE SUPPORT SYSTEMS

Life support systems for the space city will have to be designed to provide an environment in which humans can live in comfort and safety. The initial water stock can be produced by combining hydrogen brought from Earth with eight times its weight in lunar oxygen. Oxygen would be a waste product from industrial processes that produce metals and glass from lunar soil and is generated by plants through photosynthesis. How will people be protected from solar radiation and temperature extremes? How will air pressure and humidity be kept within human limits?

C. FOOD PRODUCTION

Fresh vegetables and fruits will be in season continuously in your space city because of agricultural cylinders with crops for each month of the year. Will animals be raised in order to provide high-protein food? How might these animals react to microgravity? Will vegetables be grown in soil or water nutrients? How much space will be needed for crop production? Will there be a need for pesticides? How will food waste be recycled into the colony's total waste system?

D. WASTE MANAGEMENT

Because of the unlimited supply of inexpensive solar energy, there will be no pollution in your space city. Where energy from the Sun costs almost nothing and raw materials are relatively expensive, it will pay to break down every waste product into its constituent elements. How will human, plant and industrial waste be recycled to maintain a balanced, closed energy system?

E. **ENERGY USE**

Large solar panels attached to the outside structure will meet all the electrical needs within the space city. Would the city supply large amounts of energy to Earth? Would the sale of energy to Earth be your greatest source of revenue? Would revenue be relevant?

II. HUMAN CONSIDERATIONS FOR A SPACE CITY

A. **SELECTION OF PARTICIPANTS**

The population of the space city will be composed of a great diversity of people from Earth. Virtually every skill possessed by people on Earth will be needed or wanted aboard the orbiting space city. How will people be chosen? Will prior space experience be required? Will people who work in a weightless environment qualify for higher pay than people who work in artificial gravity? Will there even be a need for money? Will people from every country want or be allowed to participate? Will children be encouraged to participate?

B. **GOVERNMENT STRUCTURE**

Because of the large number of diverse people inhabiting the space city, it is expected that a variety of subcommunities will develop. Legally, all the communities will be under the jurisdiction of a multinational consortium of the United Nations. Will this project be funded by the United Nations with contributions from its members? Will there be as many different kinds of local government as there are national groups within the city? Will a common language be spoken? Common clothing? Common currency? Will leaders be elected by the people? How will rules be determined? What will be the consequences for breaking the rules? Will a new justice system be determined for the city or will the system be based on existing models such as we know them today?

C. **MEDICAL CONSIDERATIONS**

Living and working in the space city will require a healthy and safe environment. Everyone will practice a high degree of personal and public hygiene. Because of the remoteness of the colony in terms of the time necessary to return a sick or injured person to Earth, medical facilities in the space city will be among the very best available anywhere. Could some surgery and medical techniques be best performed in microgravity? Could microgravity hasten recuperation? Could bacteria and viruses be prevented from entering the colony? Will addictions be eliminated? What conditions will contribute to one's mental health? How will long-term illness and death be addressed?

D. **ENTERTAINMENT AND LEISURE TIME**

People need recreation and exercise to keep fit and healthy on Earth. Since bones and muscles get less exercise in the weightless environment of space, bodies will actually deteriorate if a regular, planned exercise program is not followed. Will crew members aboard the space colony be able to exercise in a low-gravity swimming pool? What exercises, games and sports can be performed in a weightless environment? What special equipment will be needed? Will eating go beyond the need for nutrition? Will it provide an opportunity for companionship and interaction? Will a variety of food textures, tastes and aromas be available to contribute to personal pleasure and staff morale? Will people feel isolated or experience "island fever?" Will the colony contain cinemas and restaurants? Will amateur theatrical and musical performances be encouraged? Will people have telephone and videophone time to Earth? Will trips to Earth be provided on a seat-available basis? Will travel between space colonies be encouraged? Will inhabitants be able to retire in the space city?

E. **FAMILY UNIT**

An individual who spends long periods of time in the space city must deal with the absence of family and friends. Are friends and family of value to you? If so, how would you cope without them? In time, entire families will live together aboard the space city. Will babies be born in space? Will these children learn to accept their space environment as home? Will they visit Earth to experience its gravity? Will the frontiers of space truly be called "home?"

F. **CELEBRATION AND RITUAL**

From the beginning of civilized time, people have come together to celebrate community. Special days have been designated for cultural and religious ritual. Will people in the space city observe holidays similar to those recognized on Earth? Will new ceremonies and rituals be developed within the space community? Will people's need for privacy and solitude be respected? Will people's need for community and socialization be met?

> *"It's human nature to stretch, to go, to see, to understand. Exploration is not a choice, it's an imperative."*
>
> Michael Collins, Astronaut, USA

EXPLORATION AND DISCOVERY

NOTE TO TEACHER OF YOUNGER STUDENTS:

Many of the questions raised on pages 3-5 were intended for use with older students. If you are a primary teacher, perhaps the following questions may assist you in leading discussions with your students.

- What will it be like to live in a space city? What about ***physical structures***? Will they be spheres, cylinders and rings? Will there be living and working areas? Will there be shops and homes? Farms? Parks? Pools?

- What about ***air***? Since there is no air in space, our city will have to make its own air supply. All openings to the outside will have to be sealed tightly so the air does not leak into space.

- What about ***gravity***? Will some areas need artificial gravity for long-term living? Will some areas need ***microgravity*** in order to make medicine and crystals for business? (Microgravity is the pull of Earth on the space city; it appears negligible due to the forward speed of the city. Microgravity is commonly called ***weightlessness***.)

- What about ***food***? Can all the needed food be grown within our space city? Will animals be raised for food? Will vegetables be grown the same way as on Earth or differently? Will waste be recycled?

- What about ***energy***? Will we produce electricity from the Sun? Can we send extra solar energy to Earth?

- What about the ***crew***? Who will be chosen to go? Will volunteers be accepted? Will the crew be made up of people from many countries on Earth? Will children be encouraged to participate? What kind of rules will there be? Who will decide the rules? What will happen if people break the rules?

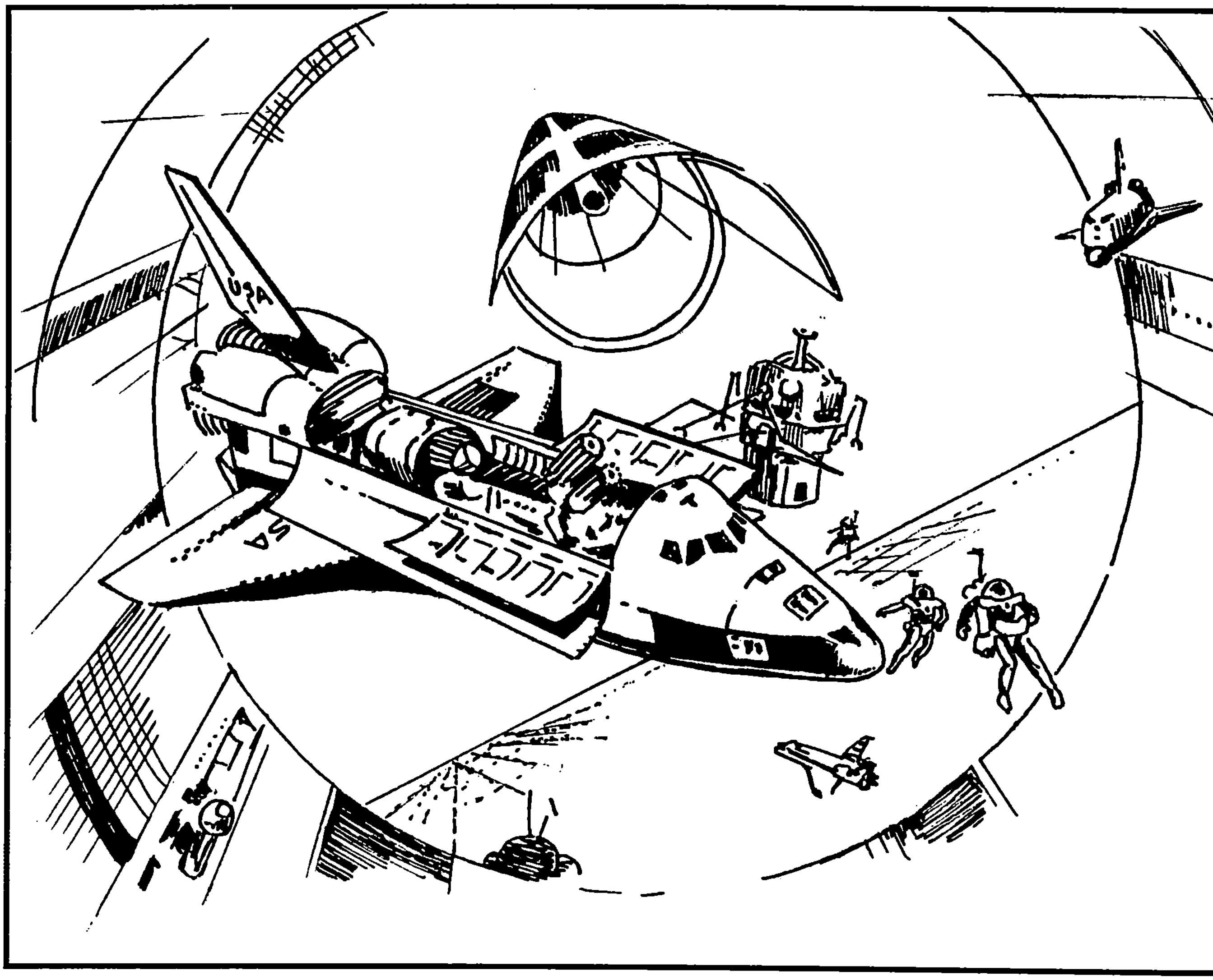
- What about ***health care***? Will there be a hospital in the space city? Could disease be prevented? What could you do to stay healthy?

- What about ***fun***? Will new games and sports be invented? Will there be T.V. and video games? Will you be able to call your friends on Earth? Will the people make up new celebrations and rituals?

EXPLORATION AND DISCOVERY

BUILDING A SPACE CITY

TRAINEE LEVEL: GRADES K-3



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YOUNG ASTRONAUTS™

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EXPLORATION AND DISCOVERY
BUILDING A SPACE CITY

GOAL: to recognize essential aspects of living in an international space city in the year 2042.

In this learning packet, students will complete the following activities:

1. **HAVING THE RIGHT STUFF**
   Objective: to help students understand the importance of maintaining one's general fitness for life on Earth and in space.

2. **KEEPING A SPACE LOG**
   Objective: to understand what life might be like in a space city.

3. **DESIGNING A MISSION PATCH**
   Objective: to help students understand the importance of symbols as a representative of peace and cooperation.

4. **REMEMBERING HISTORY**
   Objective: to give children an understanding of the evolution of space flight.

5. **PRODUCING FOOD IN SPACE**
   Objective: to help children understand the need to produce food without soil for the space city.

6. **MAKING ENERGY FOR SPACE USE**
   Objective: to demonstrate solar energy.

7. **CLEANING THE AIR**
   Objective: to demonstrate how air pollution can harm the environment.

8. **EXPLORING MARS**
   Objective: to help children identify and describe the social issues that influence daily living in space.

NOTE: Answers to activities and further background information may be found on page 18 of this packet.

HAVING THE RIGHT STUFF*

It is the Year 2042. You have been picked to travel to and live in a space city high above Earth. Your mind and body must be in top condition to live and work in space. It will be important to have the "right stuff."

Read the statements below and check (✓) the things you do every day.

_______ I exercise.

_______ I get enough sleep.

_______ I ask questions when I don't understand.

_______ I eat fresh fruits and vegetables.

_______ I try to help people.

_______ I eat three balanced meals.

_______ I try my hardest at everything I do.

_______ I finish what I start.

_______ I have hobbies I enjoy.

_______ I relax my mind and body.

How many statements did you check? _______ The more statements you checked, the more fit you are as a person and astronaut.

---

* The first seven astronauts from the United States were known to have the "right stuff"--the ability to travel in space. These astronauts conducted the Mercury program that allowed them to orbit Earth between 1961 and 1963.

KEEPING A SPACE LOG

It is the year 2042. You are living in a space city of 10,000 people orbiting 6,400 km (4,000 mi) above Earth. Tell about your experience in the log book below.

SPACE LOG

Name: ______________________________ **Date:** ________________

1. Most interesting things about me. ______________________________
____

2. My profession and jobs in the space city. ______________________
____

3. What I did to prepare for this work. ___________________________
____

4. Things I do in the space city to relax and have fun. _____________
____

5. My biggest problem in the space city. __________________________
____

6. How I expect to solve this problem. ____________________________
____

7. Qualities I have that make me a good citizen in space. ___________
____

8. Where and why I plan to travel beyond the space city. ___________
____

DESIGNING A MISSION PATCH

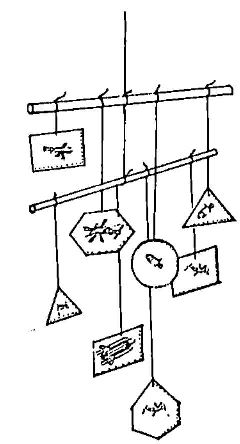
Every space mission has a patch designed by its crew members. Patches are worn on the clothing of astronauts and non-astronauts alike. The drawing shows the patch for the Magellan mission to Venus. In April 1989, the orbiter Atlantis ***deployed*** (released) the Magellan spacecraft into low-Earth orbit. The spacecraft cruised through space for 15 months, including flying around the Sun, before reaching Venus in July 1990. Magellan has mapped all of the surface of Venus with sensitive radar instruments. It was discovered that the surface of Venus has active volcanoes.

Design a patch for your space city. Let your design represent a mission of peace for all people of planet Earth.

REMEMBERING HISTORY

In the 1970s, the United States and the Soviet Union began to work together in space. Astronauts from the Soviet Union are called ***cosmonauts***. In 1975, the U.S. Apollo capsule and the U.S.S.R. Soyuz linked together in space. The three astronauts and two cosmonauts worked together to conduct experiments. Scientists from the United States, Canada, Japan and Europe are working together to construct Space Station Freedom by 1998.

Make a mobile showing the history of space flight.



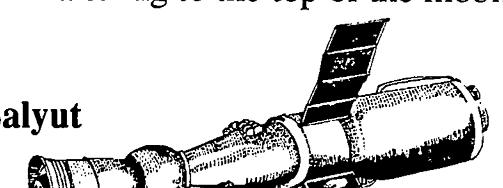
Materials needed:

- two metal, plastic or wooden rods 45 cm (18 in) long
- string
- card stock paper
- hole punch
- glue
- crayons

Procedure:

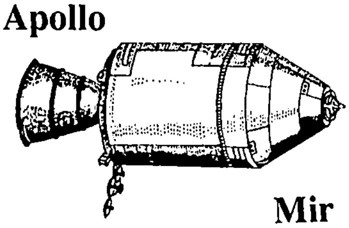
1. Cut out the eight spacecraft. Glue each to a piece of card stock.
2. Cut out the descriptions of the spacecraft. Glue the proper description of the spacecraft to the reverse of each card.
3. Punch a hole in the top of each card. Color each spacecraft.
4. Tie the rods together with a string about 25 cm (10 in) long.
5. Tie strings to the cards and suspend them from the rods.
6. Tie a string to the top of the mobile and hang it in your home or school.

Salyut



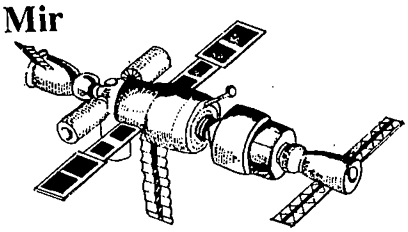
Salyut - Soviet space stations. Crews of cosmonauts have made flights of six months or more since 1971.

Apollo



Apollo - An American spacecraft that carried crews of three astronauts to the Moon and to Skylab. In 1975, this spacecraft ***docked***, or linked together, in orbit with a Soviet Soyuz spacecraft.

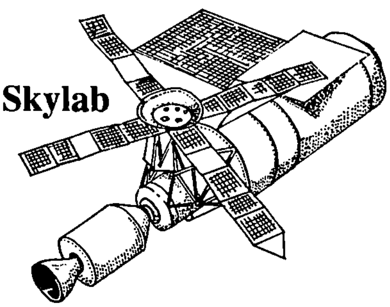
Mir



Mir - An improved form of Soviet space station first launched in 1986. Cosmonauts have spent almost one year aboard this vehicle.

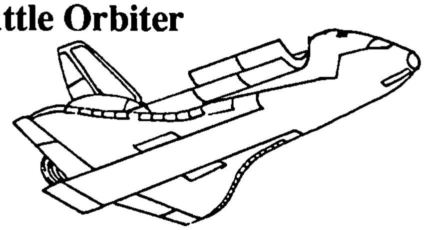
BUILDING A SPACE CITY

Skylab



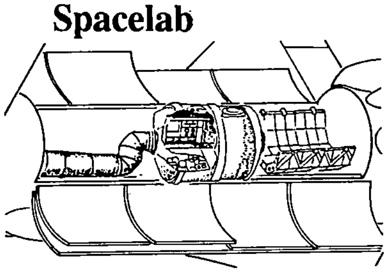
Skylab - An American space station that was in orbit from 1973-1979. Three crews of three astronauts lived in the station for up to three months.

Shuttle Orbiter



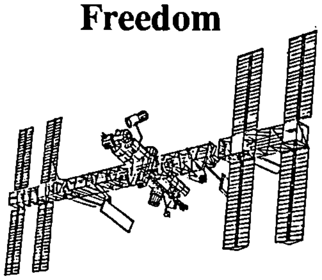
Shuttle Orbiter - The reusable American launch vehicle that takes off like a rocket and lands like a glider.

Spacelab

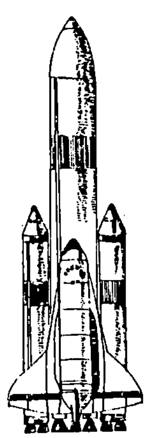


Spacelab - A small space station housed in the cargo area called the ***payload bay*** of the U.S. Space Shuttle. It was built for NASA by the European Space Agency (ESA).

Freedom



Freedom - An international space station to be built in the 1990s with components from the United States, Japan, Canada and the European Space Agency (ESA).

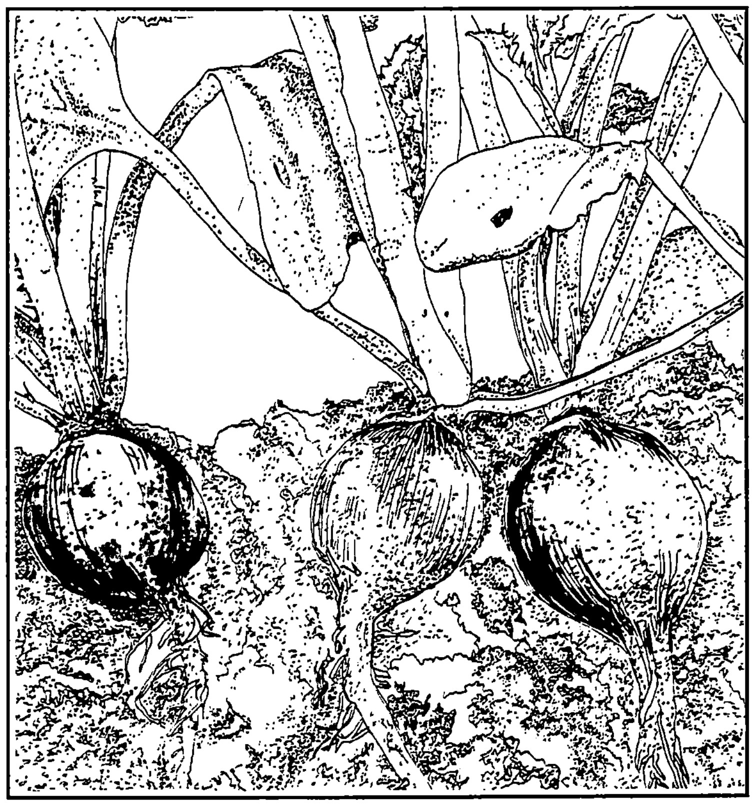


Buran

Buran - The Soviet shuttle to be used in the 1990s to take people and equipment to their orbiting space station.

PRODUCING FOOD IN SPACE

Experiments in growing foods with new ways of using soils, fertilizers and plants will make it possible to grow all our own food in our space city.



Grow plants using only water.

Materials needed:
- 2 sponges
- radish seeds*
- 2 shallow dishes
- water
- liquid plant food*

*Available at local garden store or nursery.

Procedure:

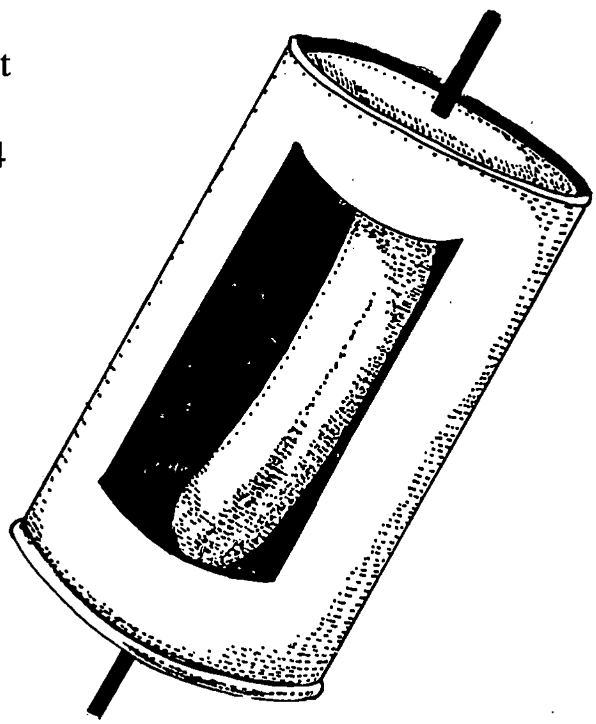
1. Soak both sponges with water. Place each sponge in a shallow dish of water.
2. Sprinkle seeds over the top of each sponge.
3. As soon as leaves appear, add liquid plant food to <u>one</u> dish to supply nutrients. Continue to add a few drops of plant food every day to the same dish.
4. Watch your plants grow for 10 days. Be sure to keep water in both dishes so the sponges do not dry out.

Describe the differences in how the plants grow in the two dishes.

____

____

MAKING ENERGY FOR SPACE USE



The Sun's rays are a source of energy and heat for Earth. They will also be a source of energy and heat for future space cities. A large mirror outside the space city will be fixed so that sunlight falls on it 24 hours a day. Sunlight from this mirror will reflect on solar cells which will make electricity for the city. This sunlight will also be directed towards other mirrors which will reflect light as needed for the farming and housing areas.

Use the energy of the Sun's rays to cook a hot dog.

Materials needed:

aluminum soda can	hammer
tin snips (metal cutters)*	nail
clothes hanger	hot dog
duct tape*	wire cutters* (or pliers)

*These materials may be obtained in a hardware store.
Note: This experiment should be done on a sunny day with an adult helper.

Procedure:

1. Draw a large rectangle on the soda can as shown.
2. Have an adult use tin snips to cut along the lines of the rectangle.
3. Carefully remove the piece that has been cut out. Throw it away.
4. Have an adult cover the sharp edges of the rectangle with duct tape.
5. Using the hammer and nail, put a hole in the center of each end of the soda can.
6. Use the wire cutters to cut a piece of clothes hanger wire about 20 cm (8 in) long.
7. Holding the hot dog inside the can, push the wire through one end of the can, through the hot dog and out the other end of the can.
8. Prop the can and hot dog outside so that the opening is directly facing the Sun.
9. Time how long it takes for the Sun's rays to cook the hot dog. Eat and enjoy.

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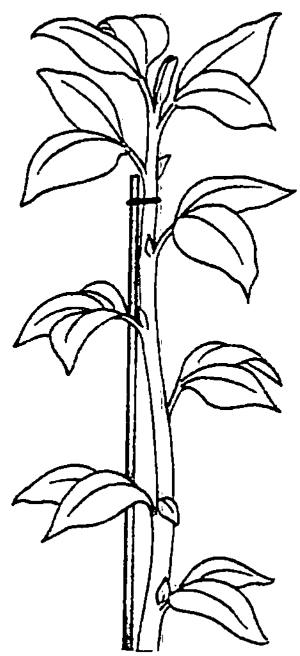
Young Astronauts

CLEANING THE AIR

Clean air is very important to the health of people and plants living in a space city. Air pollution can be harmful to the plants that are being grown for food. Pollutants can block the tiny openings plants use to breathe.

Show how air pollution can harm plants.



Materials needed:

3 potted green plants (pothos, philodendron, or similar type of plant)
petroleum jelly

Procedure:

1. Coat the tops and bottoms of some of the leaves on one plant with a thin layer of petroleum jelly. Label the pot #1.
2. On the second plant, coat just the tops of some leaves and just the bottoms of others. Label the pot #2.
3. Tie strings to the coated leaves so they can be easily identified.
4. Do not put any petroleum jelly on the leaves of the third plant. Label the pot #3.
5. Observe the plants for several days.

Describe what happened to plant #1 when compared with plant #3.

____

____

Describe what happened to plant #2 when compared with plant #3.

____

____

Describe the differences between plants #1 and #2.

____

____

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EXPLORING MARS

Your space city has launching pads and spacecraft to take you far beyond Earth's orbit.

A trip to Mars has been planned. Because Mars is so far away, the trip will take two years. All technical aspects of the trip have been worked out. You have been asked to consider the emotional aspects of leaving the space city for the trip to and from Mars. What things are needed to make each crew member feel safe and happy?

Materials needed:
- large paper
- drawing paper
- markers

The Situation:
You are a crew member of a Mars Explorer Mission. Two crew members have landed on the planet's surface for scientific work. You and another crew member are left behind in the command ship to maintain the spacecraft as it orbits Mars. It will take one month to complete the work on the surface of Mars. The two of you will greet the crew when they return to the command ship. Everyone will then leave Mars orbit and head for home to your space city high above Earth. You and the other crew members will have to spend a lot of time together in a small spacecraft. Each person's happiness is important, so everyone will have to be helpful and cooperative.

Procedure:

1. Discuss what makes you happy.
2. List these items on a large sheet of paper.
3. Classify these items into groups. Categories could include physical needs, emotional needs, social needs, etc.
4. Discuss the listed needs in terms of living in space and how you can help the other crew members to be happy.

Extended Activity:
Write a play or skit about living happily in space.

ANSWERS TO ACTIVITIES

PRODUCING FOOD IN SPACE - page 14
The plants that receive the liquid plant food should grow bigger and healthier than the ones that receive no nutrients.

MAKING ENERGY FOR SPACE USE - page 15
The amount of time needed to cook a hot dog with solar energy will vary with the time and temperature of the day as well as the angle at which the can receives sunlight. Cans painted black on the outside will absorb more heat than unpainted cans.

CLEANING THE AIR - page 16
Pollutants in the air can block stomata, the tiny openings in leaves that plants breathe through. Stomata take in carbon dioxide and give off oxygen. They also help plants cool through evaporation. There are more stomata on the bottom of leaves than on the top. They are open during the day and closed at night. Coating the leaves of plants with petroleum jelly simulates blocking the stomata with pollutants.

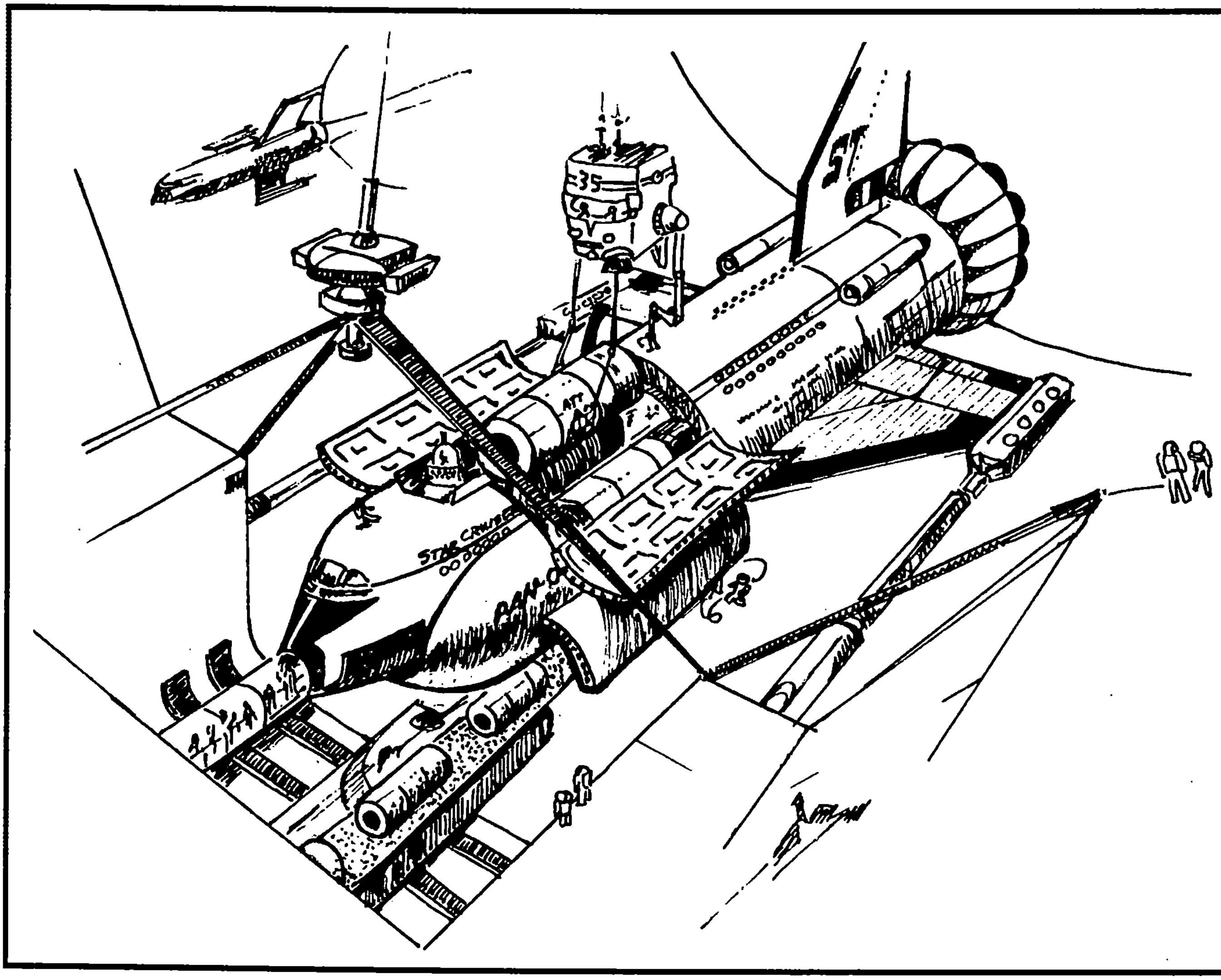
BACKGROUND INFORMATION FOR PLANNING THE SPACE CITY

1. The city could be as large as 20 km (12 mi) in diameter, with a land surface area of several hundred square km. The largest structures might be 500 meters (1,600 ft) in diameter with an inside circumference of about 1.5 km (0.9 mi).
2. Life support systems will have to be designed to provide an environment in which humans can live in comfort and safety. The initial water stock can be produced by combining hydrogen brought from Earth with eight times its weight in lunar oxygen. Oxygen would be a waste product from industrial processes that produce metals and glass from lunar soil and is generated by plants through photosynthesis.
3. Fresh vegetables and fruits could be in season continuously because of agricultural cylinders for each month of the year, each with its own day length.
4. Because of the unlimited supply of cheap energy, there will be no pollution in the space city. Whereas energy from the Sun costs almost nothing and raw materials are relatively expensive, it will pay to break down every waste product into its constituent elements.
5. Large solar panels attached to the outside structure will meet all the electrical needs within the space city.
6. The population of the space city will be composed of a great diversity of people from Earth. Virtually every skill possessed by people on Earth will be needed or wanted aboard the orbiting space city.
7. Because of the large number of diverse people inhabiting the space city, it is expected that a variety of subcommunities will develop. Legally, all the communities could be under the jurisdiction of a multinational consortium of the United Nations. The project could be funded by the United Nations with contributions from its members.
8. The space city must be a healthy environment in which to live and work. Everyone will practice a high degree of personal and public hygiene. Because of the remoteness of the city in terms of the time necessary to return a sick or injured person to Earth, medical facilities will be among the very best available anywhere.
9. People need recreation and exercise to keep fit and healthy on Earth. Since bones and muscles get less exercise in the weightless environment of space, bodies will actually deteriorate if a regular, planned exercise program is not followed.
10. From the beginning of civilized time, people have come together to celebrate community. Special days have been designated for cultural and religious ritual. People aboard the space city may observe holidays similar to those recognized on Earth. New ceremonies and rituals may be developed within the space community.

EXPLORATION AND DISCOVERY

BUILDING A SPACE CITY

PILOT LEVEL: GRADES 4-6



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EXPLORATION AND DISCOVERY
BUILDING A SPACE CITY

GOAL: to recognize essential aspects of living in an international space city in the year 2042.

In this learning packet, students will complete the following activities:

1. **REMEMBERING HISTORY**
   Objective: to give students an understanding of the evolution of space flight.

2. **CONSTRUCTING THE SPACE CITY**
   Objective: to help students understand the essential components of a space city.

3. **PRODUCING FOOD IN SPACE**
   Objective: to help students understand the need to produce food without soil for the space city.

4. **PRODUCING ARTIFICIAL GRAVITY**
   Objective: to help students understand the importance of gravity to living and traveling in space.

5. **KEEPING TRACK OF TRASH**
   Objectives: to help students understand the need to reduce and dispose of trash on Earth and in space.

NOTE: Answers to activities and further background information may be found on page 26 of this packet.

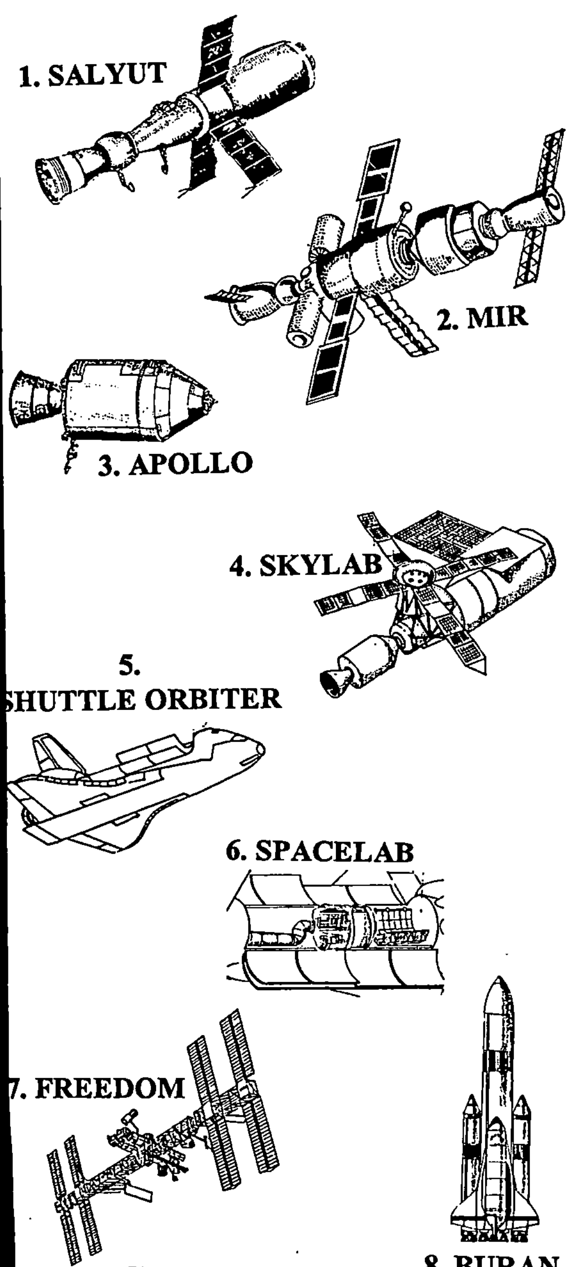
BEFORE YOU BEGIN: DESIGN A MISSION PATCH FOR YOUR SPACE CITY.

Embroidered patches or emblems are called ***insignias***. Europeans and Canadians call them ***crests***. Every NASA space mission has a patch designed by its crew members. The patch depicts the purpose of the mission and includes the names of the crew members. It is worn on the clothing of astronauts and non-astronauts alike. Design a patch for your space city. Let your design represent a mission of peace for all people of planet Earth. (Refer to page 11 of this packet.)

REMEMBERING HISTORY

Whereas the earliest stages of space exploration were marked by US-USSR scientific and strategic competition, it became increasingly clear that nations should work together and pool their knowledge, experience and resources in a cooperative effort to explore space. The Apollo-Soyuz link-up in 1975, Skylab in 1973 and the participation of astronauts of many different countries in space flights of the '70s and '80s are impressive demonstrations of this new spirit. The success of Space Station Freedom in the 1990s will be due to the cooperative efforts of the U.S., Canada, Japan and the countries comprising the European Space Agency.

Match the early spacecraft with its specific program description.



a. An American space station made from the top stage of a Saturn V rocket. In orbit from 1973-1979. Three crews of three astronauts manned the station for up to three months.

b. A series of Soviet space stations made from the top stage of Proton rockets. The first station launched in 1971; several others followed. Crews of cosmonauts have made flights of six months or more.

c. The reusable American launch vehicle takes off like a rocket and lands like a glider. It can carry a 29-ton payload (cargo) into space and return with a 14-ton payload.

d. An improved form of Soviet space station, first launched in 1986. Cosmonauts have spent almost one year aboard this vehicle.

e. An international space station to be built in the 1990s with components from the United States, Japan, Canada and the European Space Agency (ESA).

f. An American spacecraft that carried crews of three astronauts to the Moon and to Skylab. In 1975, this spacecraft docked, or linked together, in orbit with a Soviet Soyuz spacecraft.

g. The Soviet shuttle to be used in the 1990s to transport people and equipment to their orbiting space station.

h. A small space station housed in the cargo area or payload bay of the U.S. space shuttle. It was built for NASA by the European Space Agency (ESA).

Extended Activity: You may want to make a spacecraft mobile as described on page 12.

CONSTRUCTING THE SPACE CITY

In designing a space city, engineers must think about every need of the people who will be living there. The inhabitants must have air, water, food and energy produced in their city. They need places to live and areas for recreation.

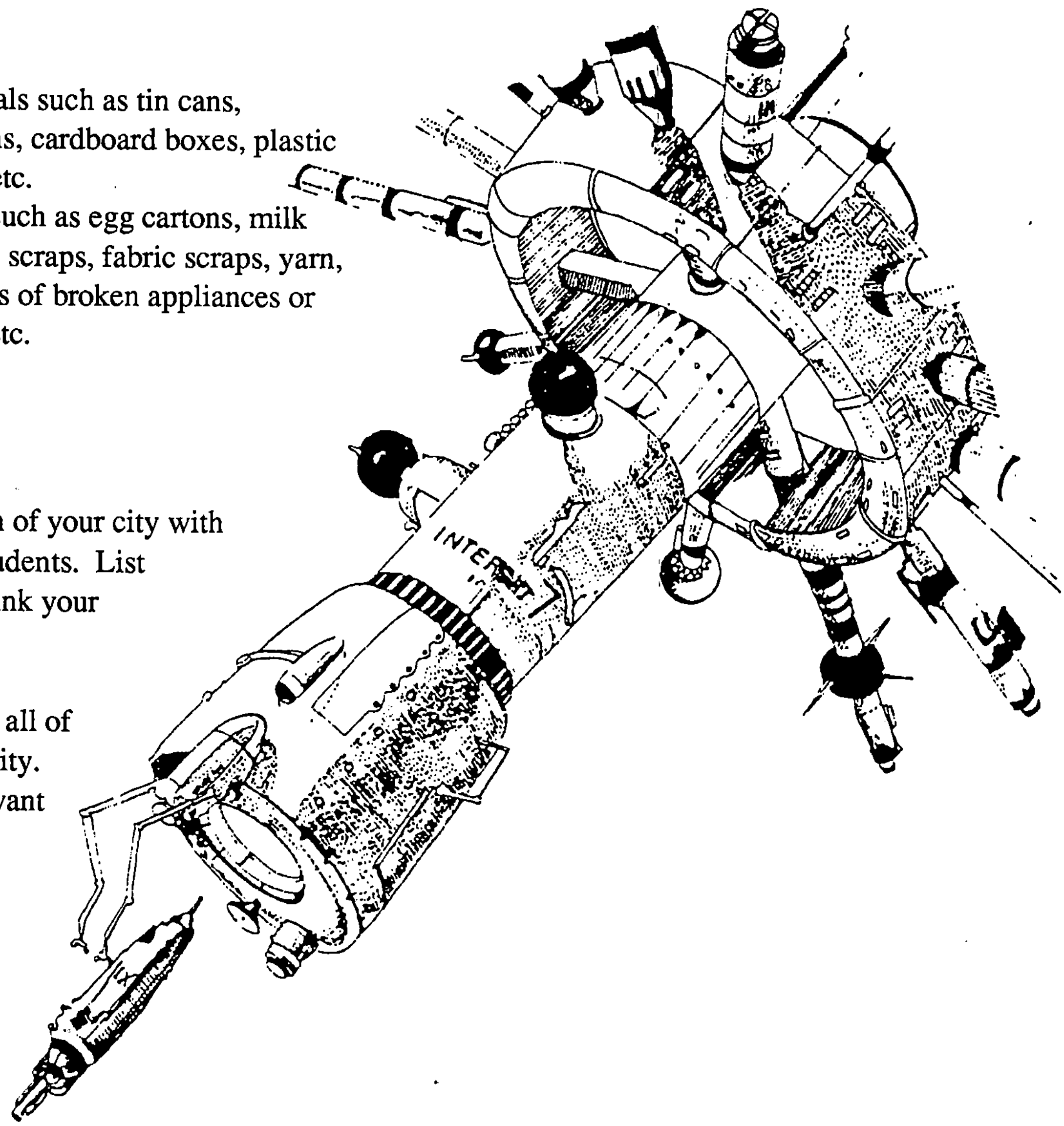
Create a model of a space city.

Materials needed:

- recyclable materials such as tin cans, aluminum cans, cardboard boxes, plastic soda bottles, etc.
- found materials, such as egg cartons, milk cartons, wood scraps, fabric scraps, yarn, buttons, pieces of broken appliances or broken toys, etc.
- white glue

Procedure:

1. Discuss the design of your city with a team of other students. List everything you think your city needs.
2. Draw diagrams of all of the parts of your city. Decide how you want the parts to go together.
3. Build your city, making changes as needed.
4. Name your city.



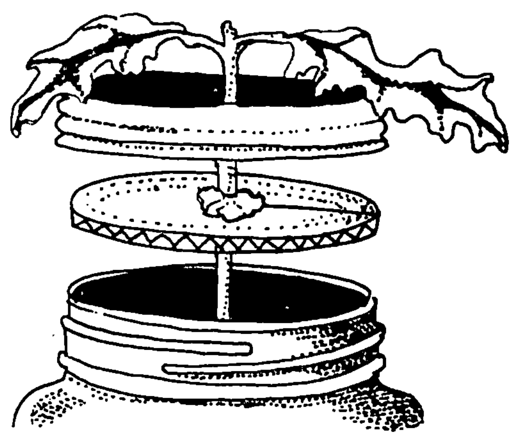
PRODUCING FOOD IN SPACE

Pioneering experiments in astro-agriculture made by scientists at the Environmental Research Laboratory and Biosphere 2 (Tucson, Arizona) will make it possible for us to grow all our own food within our Earth-orbiting city. This technique for growing plants in a nutrient solution is called ***hydroponics.***

Work in small groups to grow plants without soil in a manner similar to the process used for growing food in space.

Materials needed:

- 3 canning jars (liter or quart volume) with rings
- 3 lettuce seedlings (started from lettuce seeds obtained at a garden store)
- 2 types of plant food (commercial solutions obtained from garden store)
- tap water
- cardboard, cotton, aluminum foil, scissors
- 2 covered containers (2 liter or 2 quart size)



Procedure:

1. Mix separately the two plant nutrient solutions with tap water in the large containers, as directions suggest. Label the containers.
2. Cut three cardboard disks to fit snugly inside the jar rings. Cut a 2 cm (3/4 in) diameter opening in the center of each disk. Cut a slot extending from the edge of each disk into the center opening.
3. Slide a seedling through the slot and into the center opening. Secure the plant about 2.5 cm (1 in) below the ***cotyledons*** (seed leaves) by filling the remaining space between the stem and cardboard with cotton. Repeat this procedure for the two other plants.
4. Add separate plant nutrient solutions to two of the jars. Add tap water to the third jar. Label each of the jars. The control plant will be grown in this non-nutrient water for comparative purposes.
5. Secure the plant assemblies to the jars with rings.
6. Wrap the jars with aluminum foil to shade the roots and minimize algae growth.
7. Maintain the liquid level in each jar by adding the proper nutrient solutions to the two jars and tap water to the third jar.
8. Chart and compare the growth of the plants grown in nutrients to the plant grown in tap water for a period of 2 to 3 weeks.
9. Draw conclusions about the need for proper nutrients for plant growth and the value of hydroponics for growing food in space.

Note: More information on hydroponics may be obtained at your local library.

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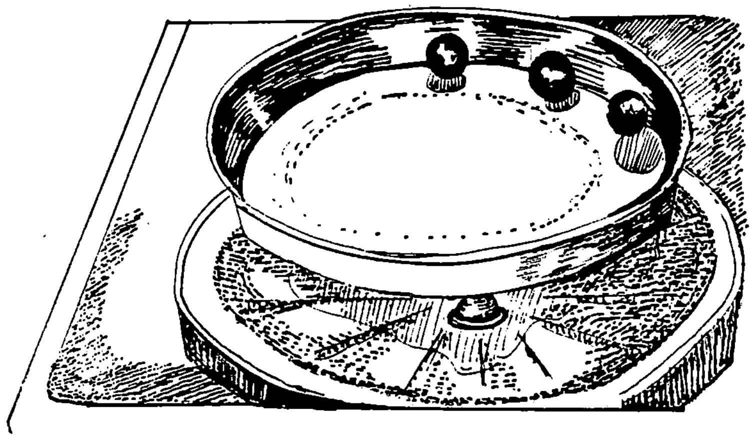
PRODUCING ARTIFICIAL GRAVITY

In our space city, there will be suitable accommodations for people to live and work in space for extended periods of time. The development of artificial gravity greatly reduces the negative effects of microgravity on the human body, such as nausea, loss of calcium in the bones and muscle deterioration.



Materials needed:
- record player
- 8-12 marbles
- 3 corks
- several round cake pans of various diameters

Procedure:
1. Use corks to raise the cake pan above the turntable spindle.
2. Center the pan carefully.
3. Randomly arrange marbles in the pan.
4. Start the turntable spinning.

Conclusion:
1 Describe what happens to the marbles in the spinning pan. ______________________

____

2. Stop the spin and observe what happens to the marbles. Describe your observations.

____

____

3. Experiment by placing the marbles at different distances from the center of the pan. Also experiment with various speeds of the turntable. Describe your observations.

____

____

4. Tell how artificial gravity might someday benefit astronauts in the space city or on long-term flights through the solar system.

____

____

KEEPING TRACK OF TRASH

Trash disposal is a big problem on Earth. People produce a lot of trash and we are finding it difficult to dispose of it safely. Many landfills are full and places to put new landfills are hard to find. Trash is also a problem in space. In a space city, inhabitants will need to find ways to produce less trash and safe ways to dispose of the trash they do produce.

1. Determine how much trash you produce in one week. For seven days, save all of your trash--candy wrappers, milk cartons, soda cans, cereal boxes, etc. At the end of the week, weigh the trash you have collected. Calculate (in pounds) how much trash you would collect in one year.

[ ] lbs per week

x [52] weeks per year

[ ] lbs per year

TYPES OF TRASH

Recyclable	Non-recyclable

2. Put your week's worth of trash into two piles--recyclable and non-recyclable. List those items that are recyclable and non-recyclable. ______________________________

____

3. How many pounds of trash are recyclable within a one-week period? ______________

4. How many pounds of trash could be recycled within a one-year period? ______________

5. How many pounds of trash is non-recyclable within a one-week period? ______________

6. How many pounds of trash would be non-recyclable within a period of one year? ________

ANSWERS TO ACTIVITIES

REMEMBERING HISTORY - page 21

1-b	5-c
2-d	6-h
3-f	7-e
4-a	8-g

CONSTRUCTING THE SPACE CITY - page 22
Encourage the students to imagine what it would really be like to live in a space city and what their needs would be. Use the material on pp. 2-6 to encourage creative thinking continually during discussions, the drawing of diagrams and the actual building of the city.

PRODUCING FOOD IN SPACE - page 23
The plants should grow well when provided with nutrients. The following symptoms may be exhibited if certain nutrients are lacking: **Nitrogen** - yellow to light green leaves, appearing first in the older leaves. **Phosphorus** - general stunting of plants. Leaves may be dark green and eventually have a purplish tint on the underside. **Potassium** - yellow to light green leaves. Discoloring usually occurs at margins of leaves. **Iron** - young leaves are light in color with green areas next to the veins. **Calcium** - leaves are light in color with green areas next to the veins. Plants are usually short with a distortion of growth near the stem tip.

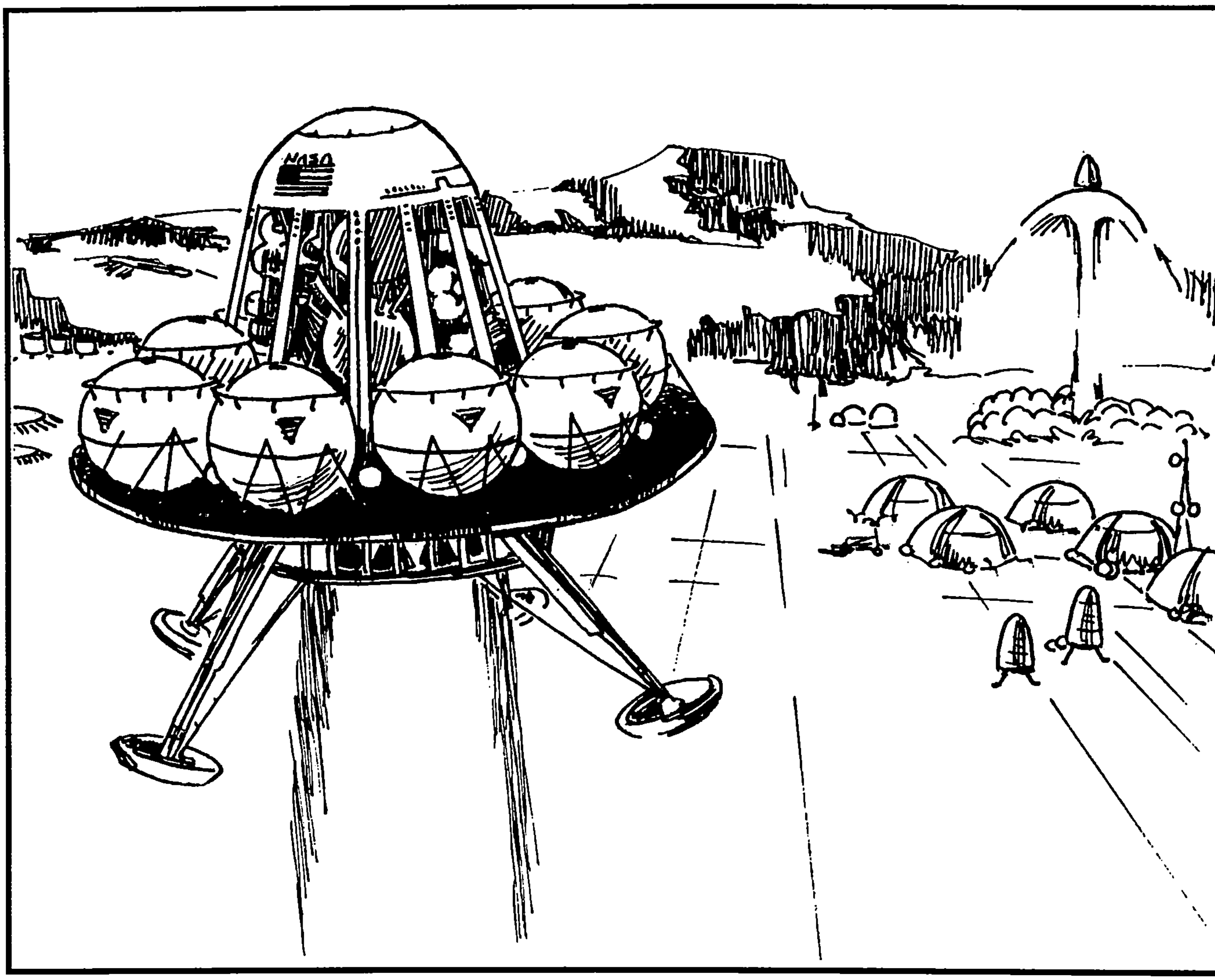
PRODUCING ARTIFICIAL GRAVITY - page 24
Start the turntable spinning. If the pan turns fast enough, the straight-ahead effect of inertia will occur. The marbles will continue in a forward motion until they are stopped by the side of the pan. Astronauts, or unattached objects, would be moved to the "floor" of a spinning space vehicle in this same manner. (The floor would be the equivalent of the vertical sides of the cake pan.) Stop the spin and, like astronauts in free fall, the marbles wander again. A strange property of artificial gravity is that it weakens as you move toward the center, finally becoming zero.

KEEPING TRACK OF TRASH - page 25
Answers will vary. It is important that students discuss how they might help solve the trash disposal problem in their geographic area. Emphasize the importance of using recyclable products whenever possible. You may want to plan a field trip to the recycling center or waste disposal site in your area.

EXPLORATION AND DISCOVERY

BUILDING A SPACE CITY

COMMANDER LEVEL: GRADES 7-9



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Young Astronauts™

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EXPLORATION AND DISCOVERY

BUILDING A SPACE CITY

GOAL: to recognize essential aspects of living in an international space city in the year 2042.

In this learning packet, students will complete the following activities:

1. **REMEMBERING HISTORY**
   Objectives: to help students understand how exploration has united our world.

2. **USING ASTEROIDS TO CONSTRUCT THE SPACE CITY**
   Objectives: to help students identify and locate sources of natural materials in space which can be used to construct a space city.

3. **PRODUCING FOOD IN SPACE**
   Objective: to help students understand the need to produce food without soil for the space city.

4. **MAKING ENERGY FOR SPACE USE**
   Objective: to help students understand how a space city can be powered by converting solar energy into electrical energy.

5. **DEALING WITH RADIATION**
   Objective: to teach students the importance of detecting radiation and protecting a space city from its harmful effects.

6. **EXPLORING THE SOLAR SYSTEM**
   Objective: to give students a sense of the planning necessary for a space mission.

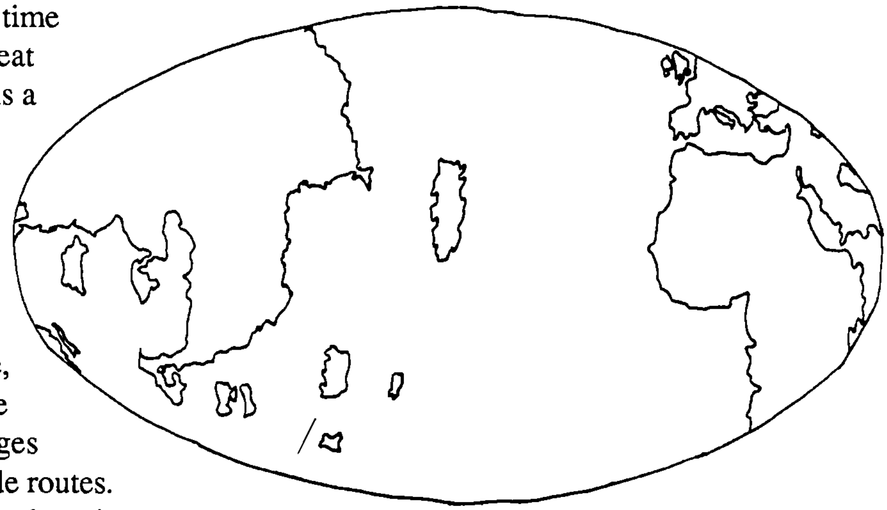
NOTE: Answers to activities and further background information may be found on pages 38 through 40 of this packet.

BEFORE YOU BEGIN: DESIGN A MISSION PATCH FOR YOUR SPACE CITY

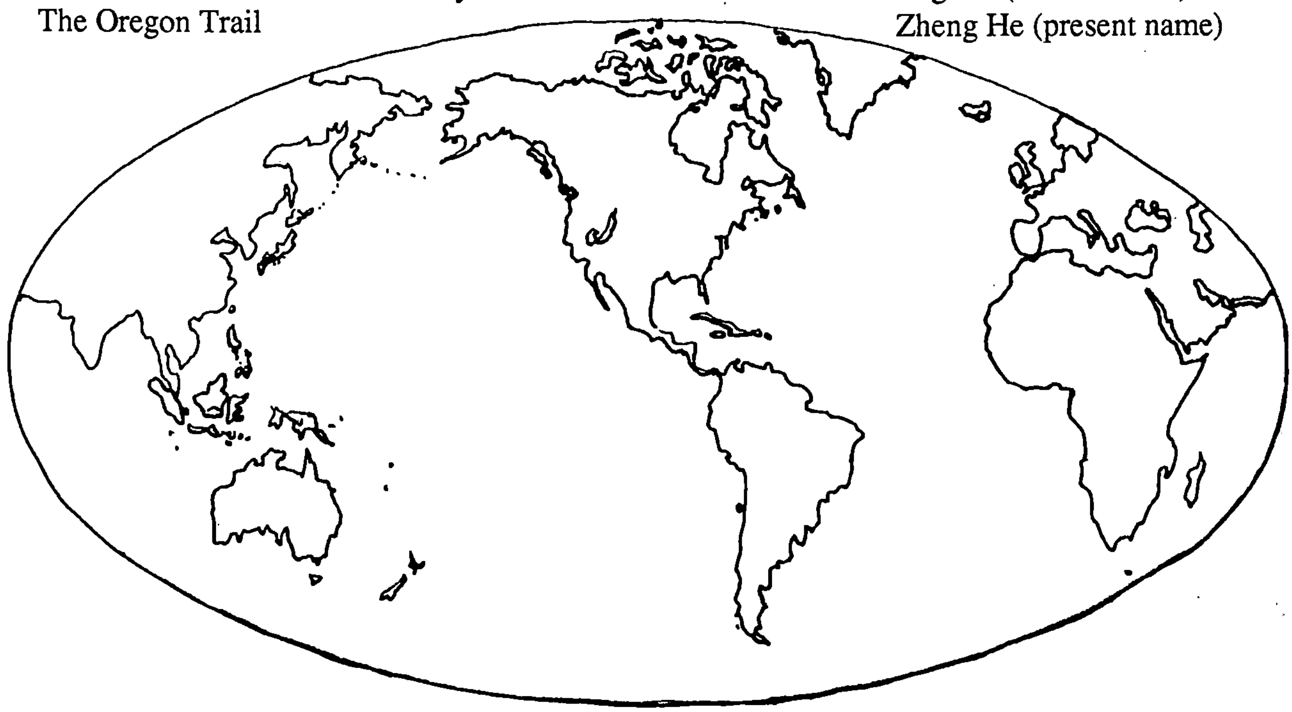
Embroidered patches or emblems are called ***insignias***. Europeans and Canadians call them ***crests***. Every NASA space mission has a patch designed by its crew members. The patch depicts the purpose of the mission and includes the names of the crew members. It is worn on the clothing of astronauts and non-astronauts alike. Design a patch for your space city. Let your design represent a mission of peace for all people of planet Earth.

REMEMBERING HISTORY

The first map represents the world as people thought of it in about the time of Columbus, just prior to the great European voyages. Next, there is a map of the world as we know it today. We have learned much about our planet in the last 500 years. Although our planet's history has been turbulent, the world has united in many ways related to communications, trade, etc. On the map below, draw the routes of some of the great voyages of exploration or connecting trade routes. Choose one route and learn more about it.



Christopher Columbus
Ferdinand Magellan
Vasco Núñez de Balboa
Sieur de LaSalle
The Silk Road
The Oregon Trail
The Santa Fe Trail
Francisco Vásquez de Coronado
Alvar Núñez Cabeza de Vaca
Captain James Cook
Henry Hudson
Pedro Alvares Cabral
Vitus Bering
The Appian Way
Vasco da Gama
Cheng Ho (former name)
Zheng He (present name)



USING ASTEROIDS TO CONSTRUCT THE SPACE CITY

Some space cities will be made of materials from Earth. However, since it is very expensive to launch materials from Earth to space, materials from the Moon and the asteroids will also be used to build the city. The Moon's ***regolith*** (soil) has the necessary chemical composition to allow for the making of concrete. Lunar materials will be propelled to the space city by means of a ***mass driver***--a magnetic railroad that shoots materials into lunar orbit. From lunar orbit they can be transported to the space city with less energy than would be required to break free of Earth's gravity.

The asteroids will also be a source of important construction material for the space city. The asteroid belt is a mass of rocks 150,000,000 km (93,000,000 mi) wide. It is located between Mars and Jupiter. Although the mass of the asteroid belt is small compared to the Earth's mass, the minerals are more accessible. It would be far better to mine these asteroids for their minerals than to mine Earth and transport these minerals to space.

Collisions among the asteroids propel some of the rock into elliptical, Earth-approaching orbits. In 1989, an asteroid named 1989 FC came within 800,000 km (500,000 mi) of Earth, a near miss by astronomical standards. If an asteroid of this size (between 200 and 500 meters [650 and 1,600 ft] in diameter) were to strike Earth, it could destroy a city the size of Los Angeles, Tokyo or Moscow. The possibility of such an event happening is very unlikely, however.

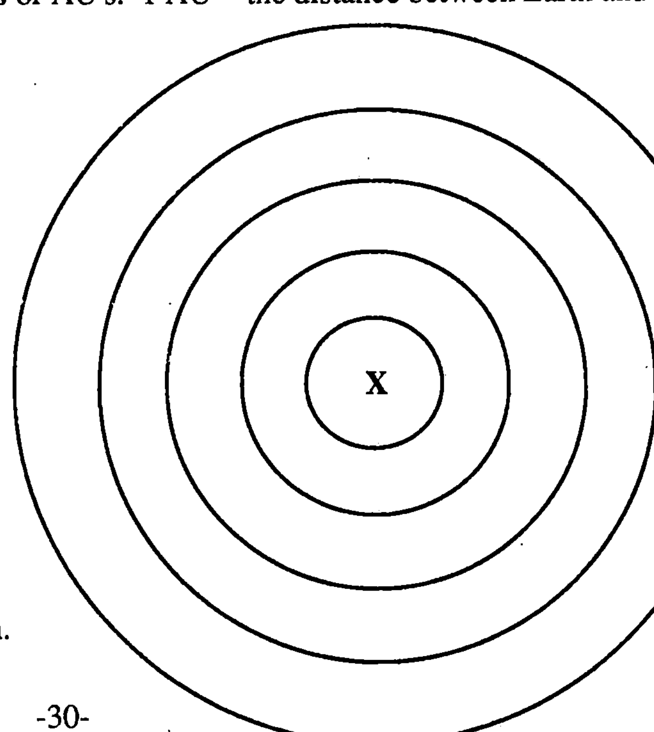
Indicate the orbits of Mercury, Venus, Earth, Mars, Jupiter and the asteroid belt on the diagram. Distance is measured in ***astronomical units*** or AU's. 1 AU = the distance between Earth and the Sun.

Materials needed: pencil

Procedure:

1. Locate and label Mercury at 0.4 AU from the Sun, Venus at 0.7 AU, Earth at 1 AU, Mars at 1.5 AU, and Jupiter at 5 AU distant from the Sun.
2. Locate the asteroid belt. It is 1 AU across between Mars and Jupiter. Shade this section.
3. Draw an asteroid's elliptical orbit that crosses Earth's orbit.

Note: X represents the position of the Sun.

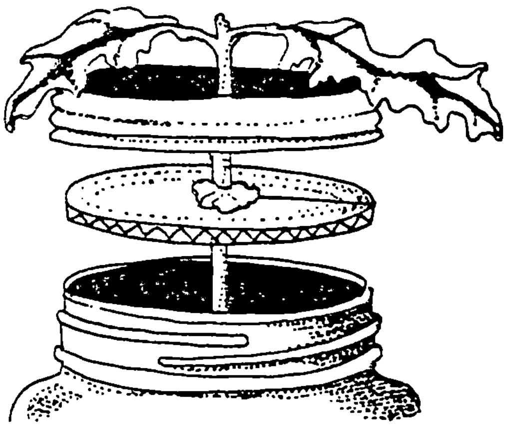


PRODUCING FOOD IN SPACE

Hydroponics, growing plants in a nutrient solution rather than in soil, may make it possible to grow plants in space. Soil provides a plant with nutrients and support so that it doesn't fall over. Nutrients can be added to water and a frame can be made to secure the plant. Soil becomes unnecessary.

How much nutrient solution do plants need?

What is the optimum amount of nutrient solution to provide the best plant growth?



Work in small groups to grow plants without soil in a manner similar to the process used for growing plants in space.

Materials needed:
- 5 canning jars (liter or quart volume) with rings
- 15 lettuce seedlings, started from seeds*
- plant nutrient* (commercial solution)
- distilled water
- cardboard, cotton, aluminum foil, scissors
- 8 liter or 2 gallon covered container

*These supplies may be obtained at a local garden store or nursery.

Procedure:
1. Mix the plant nutrient solution with water, as directions suggest, in the covered container.
2. Cut five cardboard disks to fit snugly inside the jar rings. Cut a 2 cm (3/4 in) diameter opening in the center of each disk. Cut a slot extending from the edge of each disk into the center opening.
3. Slide one seedling through the slot and into the center opening of the first jar. Secure the plant about 2.5 cm (1 in) below the ***cotyledons*** (seed leaves) by filling the remaining space between the stem and cardboard with cotton. Repeat this procedure for the other jars. Put two seedlings in the second jar, three in the third, four in the fourth and five in the fifth.
4. Add the plant nutrient solution to the jars. It should come to within 2.5 cm (1 in) of the top of the jar.
5. Secure the plant assemblies to the jars with the rings.
6. Wrap the jars with aluminum foil to shade the roots and minimize algae growth.
7. Mark the solution level in all jars. Add more solution when the level gets below the mark. Keep a record of the amount of solution that you add to each jar. Make copies of the chart below for each of the jars for each of three weeks. Write in the amount of solution added, if any, each day.
8. Measure the plant growth. Record your findings on the chart on page 32.

EXPLORATION AND DISCOVERY

PRODUCING FOOD IN SPACE (cont.)

9. At the end of two or three weeks, answer the following questions:

- Which jar produced the best plants?
- How much solution per plant did the most productive jar require?
- Which jar produced the most economical plants? That is, which jar produced good plants with the smallest amount of solution per plant?
- How much solution does a plant in the most productive jar use per week?
- How much solution would you need to keep one plant alive for one year?

Plant Number: ____________

Date experiment started: ____________

Date experiment ended: ____________

Scientists: ______________________________

	Monday	Tuesday	Wednesday	Thursday	Friday
Plant Height (cm or in)					
Average leaf length (cm or in)					
Amount of solution added (milliliters or ounces)					
Description of plant					

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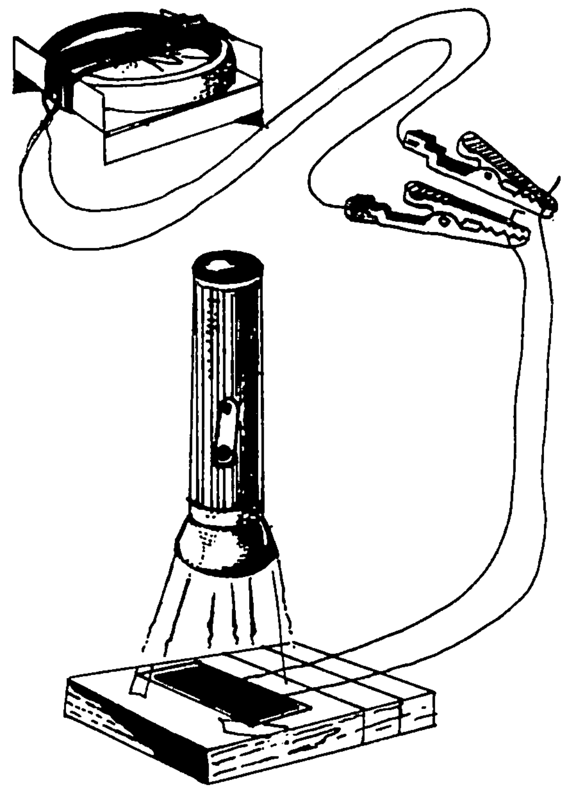
YOUNG ASTRONAUTS™

MAKING ENERGY FOR SPACE USE



Energy for the space city will be supplied by solar panels and towers rather than an onboard nuclear power source. Some of the energy collected will power the lights and mechanical equipment inside and outside the city. The unused energy will be stored in batteries to be used when the panels are not in direct sunlight. Mirrors will also be used to reflect light to various parts of the city--particularly to the food production area. These rotating mirrors will reflect the entire image of the Sun onto the settlement to create "daylight." The impression of night will be created by closing huge shades within the facility.

Make a ***galvanometer***--a device used to measure electricity.

Materials needed:

silicon solar cell*	soldering iron
#28 or finer wire	solder
2 small alligator clips	tape
small block of wood	glue
compass	

*Available at hobby stores or scientific supply houses. All other materials are available at the hardware store.

Procedure:
1. Cut two pieces of wire 30 cm (12 in) long. Scrape 1.25 cm (1/2 in) of insulation from the ends of both wires.
2. Solder one piece of wire to the silver edge on the front of the solar cell. Solder the other wire anywhere on the silver surface on the back of the cell. **Caution:** This step of the procedure should be completed with the assistance of an adult.
3. Protect the solar cell by taping it to a block of wood.
4. Wrap 100 turns of wire around the compass. Run the wire over the North-South markings, keeping close to the center. Leave two wire ends 30 cm (12 in) long. Twist the wires near the compass to keep them from unwinding.
5. Attach alligator clips to the free ends of both wires.
6. Arrange the compass so the wire coils line up with the compass needle.
7. Expose the solar cell to light from a flashlight. Describe what happens to the needle of the compass.

Extended Activity: Attach the solar cell to a flashlight bulb or small electric motor to demonstrate how solar energy can be converted directly into electrical energy.

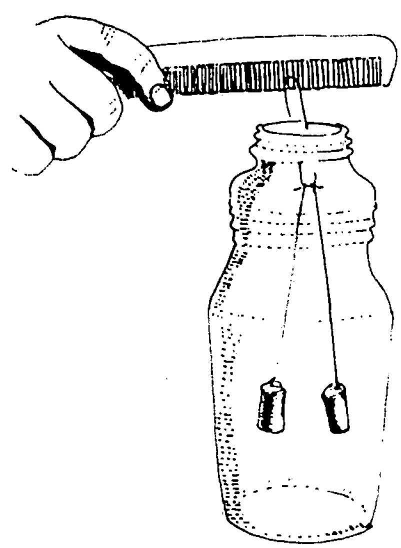
DEALING WITH RADIATION

The hazards of radiation will be a major concern of the space city. Objects in space are continuously bombarded by high-energy ***cosmic radiation*** from outside the solar system, as well as low-energy radiation from the Sun. The Sun's radiation, ***solar wind***, is a stream of electrons, protons and photons from the Sun caused by solar flare explosions on its surface. Some of this low-energy radiation is trapped by the Earth's magnetic field in radiation belts.

Scientists were not aware of these dangerous radiation belts until 1958, when instruments designed by Dr. James Van Allen to measure radiation flew on the U.S. Explorer 1 satellite. The level of radiation was higher than his instruments could measure. The Apollo missions were planned to spend as little time as possible in the ***Van Allen belts*** on their way to the Moon. The missions were also timed to avoid any expected solar flares. There are two Van Allen radiation belts. The inner belt is in the altitude region from 1,000 to 5,000 km (620 to 3,100 mi) above the Earth, and the outer belt in the region from 15,000 to 25,000 km (9,300 to 15,500 mi).

On Earth, we are protected from radiation by the Earth's magnetic field, which deflects most of it to the North and South Poles where it can be seen as the ***aurora borealis***. In addition, the Earth's atmosphere absorbs all except the most energetic components of the remaining radiation. It will be necessary to provide radiation shielding for a space colony located outside the protection of the Earth's magnetic field and atmosphere.

Build an electroscope to detect radiation on Earth.



Materials needed:
- clean glass liter jar with an opening of at least 5 cm (2 in)
- thin aluminum foil
- long sewing needle
- knife
- styrofoam
- 1 metal paper clip
- metallic thread (used for decorative sewing)
- hard rubber hair comb

Procedure:
1. Carve two cylinders from the styrofoam, each 1 cm (3/8 in) diameter and 2 cm (3/4 in) long.
2. Cover the cylinders with aluminum foil using just enough foil to cover entirely.
3. Carve a tight-fitting plug from the styrofoam to fit the top of the jar snugly.
4. Straighten one end of the paper clip and push it through the center of the plug. Bend the clip up to form a hook.

DEALING WITH RADIATION (cont.)

5. Use the needle to pass the metallic thread through the length of each cylinder. Make the length of the thread such that each cylinder will hang from the plug hook down to about 2 cm (3/4 in) from the bottom of the jar. Knot the thread to hold the cylinders.
6. Insert the apparatus in the glass jar as shown in the drawing.
7. Vigorously stroke the comb through your hair to collect electrical charge on the comb.
8. Slide the teeth of the comb along the exposed portion of the paper clip. Observe any changes in the position of the cylinders.

Results:

Electrical charge is stored on the foil-covered styrofoam cylinders. Once charged, the cylinders will hang separated from each other because the two cylinders share the same charge. Objects with like charges repel. The cylinders will be separated by a distance that depends on the amount of charge. The cylinders will be negatively charged because they were charged with a comb. (Benjamin Franklin arbitrarily assigned the charges as follows: rubbing glass and silk together produces positive charge and rubbing hard rubber [the comb] and fur [hair] together produces negative charge.)

If you touch the exposed part of the paper clip with your finger, the cylinders will come back together, because all of the charge will be discharged into your body. If there were no local radiation, the cylinders would very slowly come back toward each other as the charge leaks off the cylinders. If there were radiation in the area, its effect would be to ***ionize*** (make conducting) the air surrounding the bottle. This would allow the charge to leak off the cylinders at a much faster rate. The length of time for the charge to leak off is a rough measure of the level of local radiation. If the experiment were done in a cave with a high radon level or in a uranium mine, the electroscope would discharge more rapidly (the cylinders would come together sooner). The rate of discharge would also be higher on a high mountain or in an airplane. In the Van Allen belts, the electrometer would discharge very rapidly compared with the discharge rate on Earth. In our space city, an electroscope could be used to determine whether the radiation level is comparable to that on Earth.

Try charging the electroscope with positive charge using a glass rod and silk. Does it make any difference regarding the movement of the cylinders?

Discussion:

1. This experiment would not work in microgravity. Why not?

2. How could you adjust the apparatus to make it work successfully in microgravity?

3. Measure the time it takes for the cylinders to come together in various places such as indoors, outdoors, in a basement, on top of a tall building, and if possible on a high mountain.

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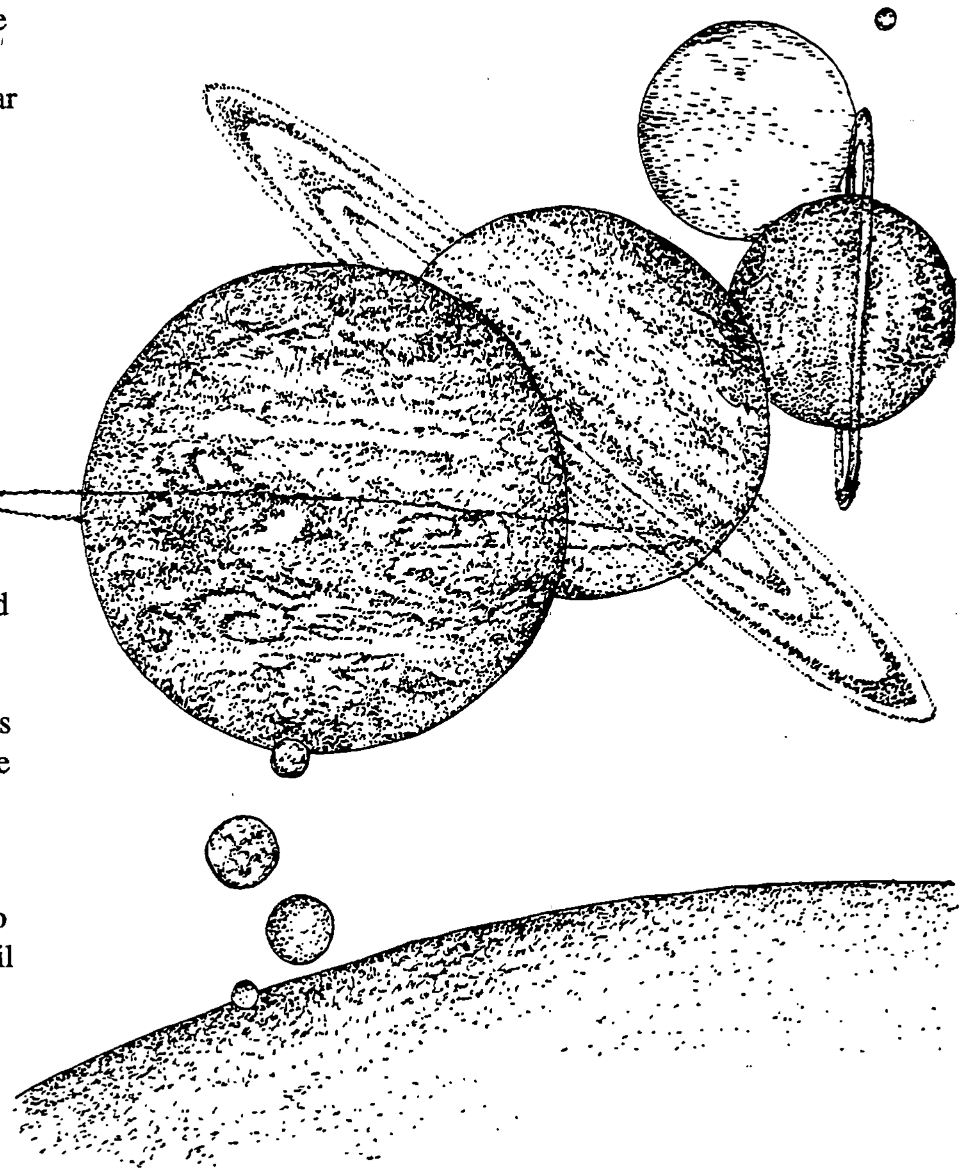
EXPLORING THE SOLAR SYSTEM



Explorers will leave the space city in high Earth orbit to explore the planets of the solar system. Expeditions will be readied on Earth. Supplies will be sent to the space city and launched farther into space from there.

Procedure:

You have been selected to make the first voyage of exploration into the solar system. Decide where to go by researching the planets and their moons. Fill in the information on the chart on the following page. From this information, decide to explore one planet or one of its moons.

Create a proposal to submit to the Space Exploration Council of your space city. Make a formal request to explore the planet of your choice. Since you want your proposal to be accepted, you must make it convincing and attractively illustrated.

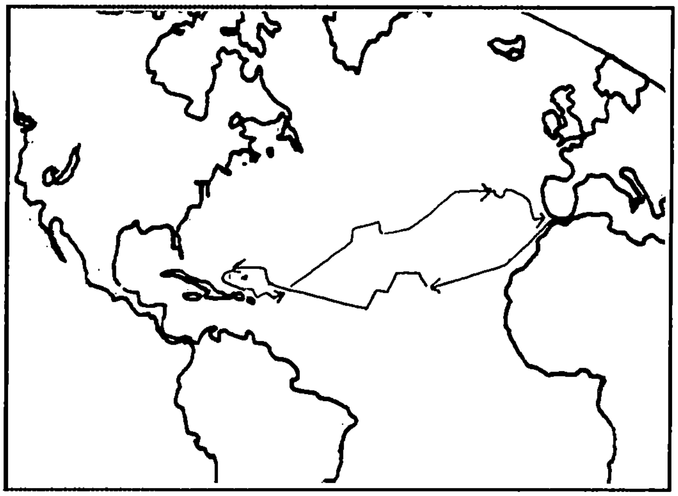
EXPLORING THE SOLAR SYSTEM

	Distance from Earth(in miles)	Diameter (in miles)	Surface composition	Surface temperature (Fahrenheit)	Moons	Atmosphere	Rings	Travel time at 20,000 mph
Mercury								
Venus								
Earth								
Mars								
Asteroids (average)								
Jupiter								
Saturn								
Uranus								
Neptune								
Pluto								
(A moon you'd like to visit)								

EXPLORATION AND DISCOVERY

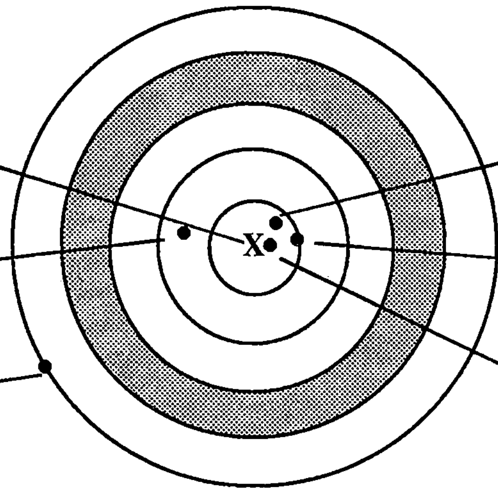
ANSWERS TO ACTIVITIES

REMEMBERING HISTORY - page 29
Columbus followed the path shown here on his voyage of exploration of 1492. He and his crew sailed from Palos, Spain, on August 3, 1492. They made a stop at the Canary Islands and on October 12 landed on San Salvador, an island in the Bahama group. He visited a number of islands in the area and then sailed back to Spain.



Encourage your students to trace the other voyages of exploration and trade routes by referring to encyclopedias, history books, etc. This can be followed by plotting future voyages of exploration on a chart of the solar system.

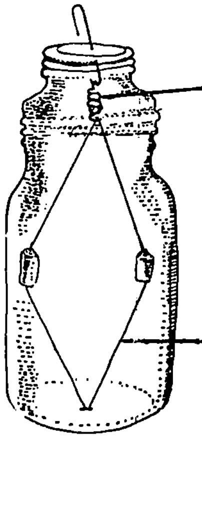
USING ASTEROIDS TO CONSTRUCT THE SPACE CITY - page 30



Elliptical orbits may vary: Their main characteristics are 1) that they originate in the asteroid belt, 2) that they cross the Earth's orbit, and 3) that they loop around the Sun. They may also crash into the Sun.

DEALING WITH RADIATION - pages 34-35

1. This experiment would not work in ***microgravity*** because it is gravity that causes the cylinders to hang down from the hook.
2. Answers will vary. Adjustments to the apparatus could be made by anchoring the threads to the bottom of the jar and suspending the threads from a weak spring at the top. Just enough slack should be left to allow the cylinders to separate without touching the sides of the jar.



	Distance from Earth(approximation at closest approach in miles)	Diameter in miles	Surface composition	Approx. Surface temperature (Fahrenheit)	Moons	Atmosphere	Rings	20,000 mph Travel time
Mercury	57,009,000	3,040	rocky	-280° to 800°		Sodium, potassium, helium, hydrogen.	no	2,850.5 hrs.
Venus	25,761,000	7,600	rocky	800°		Carbon dioxide, carbon monoxide, hydrogen chloride, hydrogen fluoride, water, argon, nitrogen, oxygen, hydrogen sulfide, sulfur dioxide, helium.	no	1,288
Earth	------	8,000		----	1	Nitrogen, oxygen, water, argon, carbon dioxide, neon, helium, methane, krypton, nitrous oxide, ozone, xenon, hydrogen, radon.	no	-----
Mars	48,732,000	4,420	rocky	-80° to 80°	2	Carbon dioxide, carbon monoxide, water, oxygen, ozone, argon, nitrogen.	no	2,436.6
Asteroids (average)	74,400,000	----	rocky				no	3,720
Jupiter	390,879,000	89,520	liquid	-260° to-190°	16	Hydrogen, helium, methane, ammonia, water, carbon monoxide, acetylene, ethane, phosphine.	yes	19,544
Saturn	794,220,000	75,280	liquid	-290°	17	Hydrogen, helium, methane, ammonia, acetylene, ethane, phosphine, propane.	yes	39,711
Uranus	1,690,740,000	32,080	liquid	-350°	15	Hydrogen, methane.	yes	84,537
Neptune	2,702,580,000	31,120	liquid	-360°	8	Hydrogen, methane, ethane.	yes	135,129
Pluto	3,574,920,000	1,440	rocky	-390°	1	Methane	no	178,746
A Moon you'd like to visit	answers will vary. Earth's Moon 250,000. Moons of other planets are roughly the distance of the planets.	2,160 (Earth's Moon)		-240° to 240° (Earth's Moon)				1,215 (Earth's Moon) (compare Apollo flights)

Ronald McDonald Children's Charities®
Established in memory of Ray A. Kroc

McDonald's®

YOUNG ASTRONAUTS™ USA

Certificate of Merit

This document, issued this ________ day of __________, hereby certifies that

____

has successfully completed the EXPLORATION AND DISCOVERY packet at the ______________ Level.

______________________ *Student Signature*

______________________ *Teacher Signature*

Young Astronaut Pledge
"I pledge my best efforts to improve my grades in science, mathematics and related subjects, to learn about space and to help others towards these goals."

Use the form below to start a Young Astronaut Chapter at your school. Your Chapter will receive monthly curriculum materials, such as those included in this package. These materials are designed to capitalize on the enthusiasm and curiosity that students bring to the subject of space and space exploration and to stimulate increased interest in science and math. Many Chapters use their curriculum packets as the starting point for open-ended activities that allow students and group leaders alike to tailor the subject matter to the interests and abilities of the group.

The Young Astronaut Council sponsors national contests and hosts national and international conferences for Young Astronauts from around the world. More than 26,500 Chapters have been formed to date. They are found in every state and in 40 foreign countries and reach over 650,000 children.

So sign up today . . . Don't miss out on the fun, adventure and learning that await you and your students. Simply fill out and return the form below with your check, money order or purchase order for $40. This will entitle you to a full year's membership in the Young Astronaut Program.

YOUNG ASTRONAUT COUNCIL
P.O. Box 65432
Washington, DC 20036

CHAPTER START AUTHORIZATION

Please start up a new Young Astronaut Council Chapter at our school as follows:

Choose One:

- ☐ TRAINEE Level (Grades K to 3)
- ☐ PILOT Level (Grades 4 to 6)
- ☐ COMMANDER Level (Grades 7 to 9)

Enclosed is a check, money order or purchase order in theamount of $40, payable to the Young Astronaut Council.

Chapter Leader's Name: ____________________

Name of School: ____________________

Address: ____________________

City, State, Zip Code: ____________________

____
Chapter Leader's Signature

PLEASE HELP US

We would like to know how you feel about the materials in this packet and how they were used at your school. Please take a moment to fill out this mini-form and let us know. Thank you for taking the time.

Name: ____________________

School: ____________________

Phone Number: (   )   -

Address: ____________________

City, State, Zip Code: ____________________

Grade(s) taught using these materials (please check all that apply)

- ☐ Preschool
- ☐ K
- ☐ 1-2
- ☐ 3-4
- ☐ 5-6
- ☐ 7-9

Number of students presented these materials

- ☐ 1-25
- ☐ 25-50
- ☐ 50-100
- ☐ 100-200
- ☐ 200-300
- ☐ More than 300

Rate the materials
(5 = highest, 1 = lowest):

Quality of materials:
5 4 3 2 1

Ease of use:
5 4 3 2 1

Content covered:
5 4 3 2 1

Please return this form to:

YOUNG ASTRONAUT COUNCIL
P.O. Box 65432
Washington, DC 20036

TEACHER RESOURCES

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This learning packet was developed for the Young Astronaut Council by Judith Bisignano, Ed.D., DavidAnderson, Elizabeth Prohaska and Joanne Pifer, curriculum design specialists at Kino Learning Center, Inc., 6625 N. First Ave., Tucson, AZ 85718. Assistance was also given by Karyn Sotero. Illustrated by Trina Baiz Felty and Chris Lytwynczuk, Kino student.

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