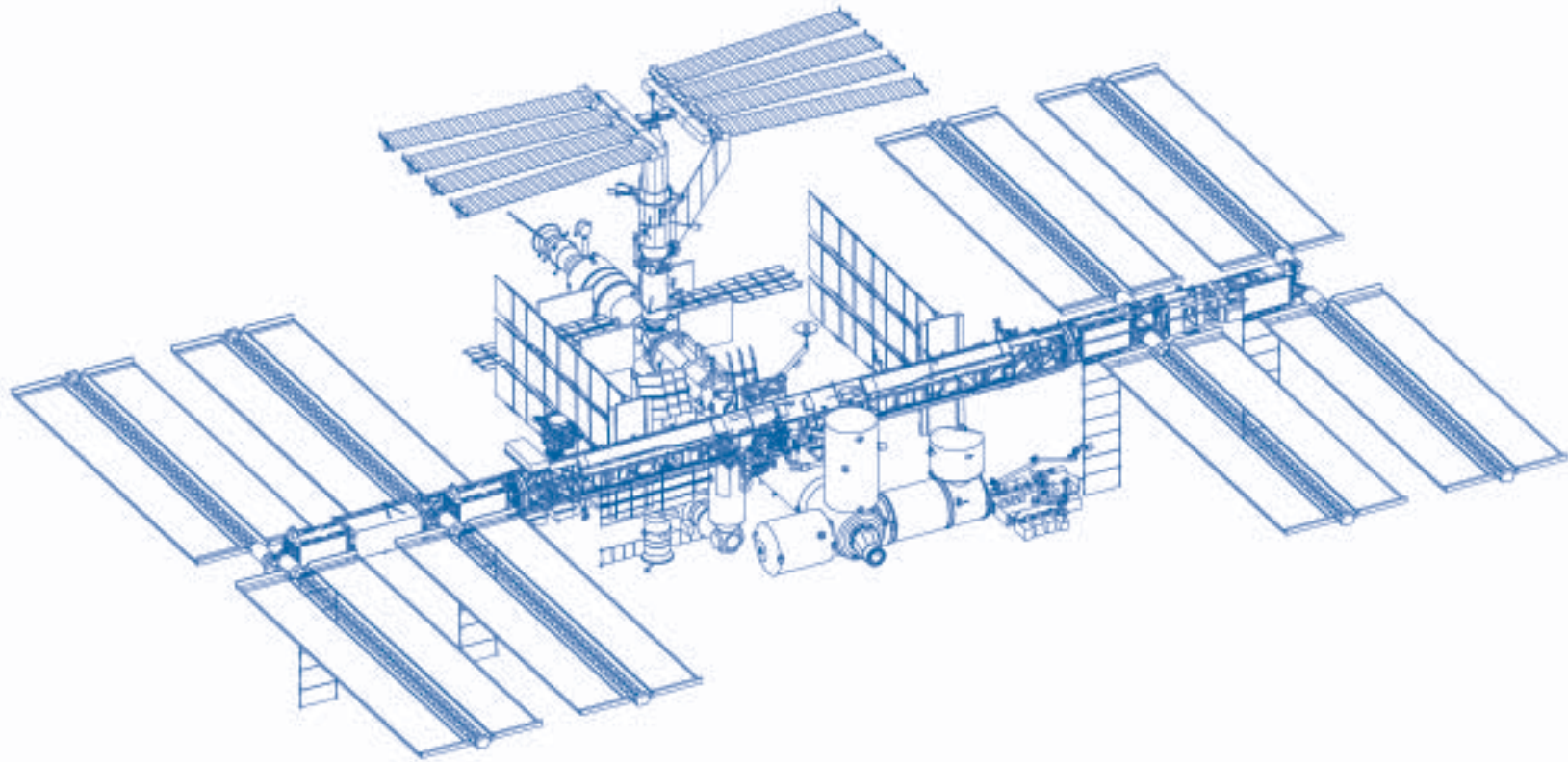




THE INTERNATIONAL SPACE STATION



This drawing may be used for educational purposes only. The actual International Space Station may differ significantly from this rendering.

TITLE			
International Space Station Revision G Assembly Sequence Assembly Complete Isometric View			
SIZE	DATE	ISSUE	DRAWING NUMBER
D*	7/31/2002		02-DR0066
SCALE	REVISION	APPROVED	BY
1/200	Original		NASA
* Modified for requester. Not per ANSI standards.			

The International Space Station

The International Space Station Educational Wallsheet

The International Space Station (ISS) is an engineering marvel! Its components have been built by thousands of different workers from around the world! The ISS program includes participation from 16 nations: the United States, Russia, Japan, Canada, Italy, Belgium, The Netherlands, Denmark, United Kingdom, Norway, France, Spain, Germany, Sweden, Switzerland, and Brazil. One by one, these components are rocketed into space, where orbiting construction workers (astronauts) assemble them over 200 miles above Earth. Consider the challenge of doing this while everything is orbiting Earth once every 90 minutes, traveling at 17,500 miles per hour!

How can NASA and its partners ensure that every item can be fully integrated when it reaches orbit? If you guessed that it's the same way architects and engineers design and build homes, office buildings, and laboratories here on Earth, you are right. Every project begins with the design process. Detailed engineering drawings for each and every component are required.

The images and activities featured on this wallsheet will engage students in interpreting and analyzing three-dimensional engineering drawings of the International Space Station.

International Space Station

Take a large measure of engineering and technology, add giant dashes of science and mathematics, and throw in years of effort from 16 nations, and you have the largest space structure ever constructed—the International Space Station (ISS). When completed, the space station will be nearly as large as two football fields side by side and have a mass of almost 500,000 kilograms. Its interior volume will be equivalent to the inside space of a 747 commercial jet aircraft.

From an altitude of 354 kilometers, astronauts from many nations are able to conduct fundamental scientific research, process biological materials, carry out medical investigations, experiment with chemical reactions, and study living things without the distorting effects of gravity. Although gravity and the station's velocity keep the station in orbit, the combination of forces at work produce a freefall condition in which gravity's effects on the station and the objects inside are reduced.

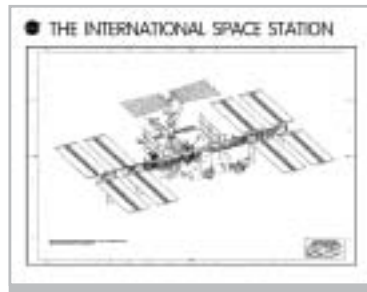
In addition to research on materials and living things, space station crews are able to study Earth's environment and resources from a high vantage point. The station will pass over 80 percent of Earth's surface, flying over the same area every three days as it orbits the rotating planet below. Additionally, research will characterize the environment of space and the long-term effects of the space environment on humans and materials in future space flights to the distant reaches of our solar system. Crews work on the space station for three to six months at a time, and the ways in which their bodies react to microgravity over these long periods are the subject of intense study, with great relevance to future space exploration efforts. Trips to Mars, for example, could take six months one way. Information gained on the ISS will be invaluable in planning for the well-being of Mars crews.

Making It Happen

The International Space Station will become a world-class scientific laboratory, providing a unique research environment in Earth orbit for 10 or more years. Making it all happen is a complex design, fabrication, and assembly process. The space station includes more than 100 major elements such as cylindrical habitation and research modules, solar panels, connecting truss beams, and robots. These elements can be classed into several systems, including the following:

- Structure
- Environmental Management
- Energy
- Communications and Data Handling
- Attitude (direction) Control and Propulsion
- Transportation and Assembly (including robotics)

The system elements are being constructed on Earth in packages determined by the capacities of the launch vehicles



that will deliver them to orbit. The Space Shuttle, for example, has a cargo bay that is 18.2 meters long and 4.6 meters in diameter. ISS elements must either be small enough to fit the bay, collapsible for transport, or able to be divided into components that will be rejoined in orbit.

Transporting the many pieces of the ISS to orbit is only one of many challenges in making the ISS happen. The elements must be easily joined together in orbit with simple connections for electric power and fluid transfer lines. Docking ports must be failsafe so that when habitation and laboratory modules are connected the interior working volume is permanently sealed. In the vacuum of space, even small leaks can drain a spacecraft of its vital atmosphere. The International Space Station is too large and irregular in shape to permit launching if it were assembled on Earth. Most elements have been joined together for the first time in space, and they had to fit together precisely and function as a unit, leaving no room for error.

The space station must have electrical power for all its laboratories, environmental systems, and communications and data systems. It requires insulation from temperature extremes that can range from 100 degrees Celsius in the Sun to -100 degrees Celsius in the shade. Shielding against impacts from meteorites and space debris has also been essential. These and many more considerations require precise engineering and fabrication.

A Note on the Classroom Activities

The three activities that follow can each be done as standalone activities or integrated sequentially or concurrently. They will research station systems and components, develop construction standards, and assemble the model. In the first activity (Center of Mass), the students learn about the necessity of controlling the location of the center of mass of the station. In the second activity (Go for Launch), students determine the launch manifest or order in which the station elements are launched. In the third activity (ISS Model), students construct a model of the International Space Station. Each activity depends upon understanding the overall ISS design and the nature and purpose of the station systems.

For more information on the International Space Station, visit the following Web sites:

ISS Home Page
<http://spaceflight.nasa.gov/station>

ISS Image Gallery
<http://spaceflight.nasa.gov/gallery/images/station>

ISS Model Images
<http://spaceflight.nasa.gov/gallery/images/station/iss-models/ndxpagel.html>

ISS Reference Library
<http://spaceflight.nasa.gov/station/reference/index.html>

ISS Assembly—Component View, Scale Model Drawing Package, etc.
<http://spaceflight.nasa.gov/station/assembly/index.html>

Acknowledgements

The *International Space Station* educational wallsheet was developed in collaboration with the NASA Office of Education, the International Technology Education Association, Lockheed Martin and Wheeling Jesuit University/NASA Classroom of the Future™. This publication is in the public domain and is not protected by copyright. Permission is not required for duplication.



NASA Resources for Educators

NASA's Central Operation of Resources for Educators (CORE) was established for the national and international distribution of NASA-produced educational materials in multimedia format. Educators can obtain a catalogue and an order form by one of the following methods:

CORE
Lorain County Joint Vocational School
15181 Route 58 South
Oberlin, OH 44074-9799
Phone: (440) 775-1400

FAX: (440) 775-1460
E-mail: nasaco@leeca.org
Home Page: <http://core.nasa.gov>

Educator Resource Center Network (ERCN)

To make additional information available to the education community, NASA has created the NASA Educator Resource Center (ERC) network. Educators may preview, copy, or receive NASA materials at these sites. Phone calls are welcome if you are unable to visit the ERC that serves your geographic area. A list of the Centers and the regions they serve includes the following:

AK, Northern CA, HI, ID, MT, NV, OR, UT, WA, WY
NASA Educator Resource Center
NASA Ames Research Center
Mail Stop 253-2
Moffett Field, CA 94035-1000
Phone: (650) 604-3574
<http://amesnews.arc.nasa.gov/erc/erchome.html>

AZ and Southern CA
NASA Educator Resource Center
NASA Dryden Flight Research Center
P.O. Box 273 M/S 4839
Edwards, CA 93523-0273
Phone: (661) 276-5009
<http://www.dfrc.nasa.gov/Education/ERC/>

IL, IN, MI, MN, OH, WI
NASA Educator Resource Center
NASA Glenn Research Center
Mail Stop 8-1
21000 Brookpark Road
Cleveland, OH 44135
Phone: (216) 433-2017
<http://www.grc.nasa.gov/WWW/OEPI/ERCn.htm>

CT, DE, DC, ME, MD, MA, NH, NJ, NY, PA, RI, VT
NASA Educator Resource Laboratory
NASA Goddard Space Flight Center
Mail Code 130.3
Greenbelt, MD 20771-0001
Phone: (301) 286-8570
<http://www.gsfc.nasa.gov/vc/erc.htm>

CA
NASA Educator Resource Center for
NASA Jet Propulsion Laboratory
Village at Indian Hill
1460 East Holt Avenue, Suite 20
Pomona, CA 91767
Phone: (909) 397-4420
<http://education.jpl.nasa.gov/resources/>

CO, KS, NE, NM, ND, OK, SD, TX
Space Center Houston
NASA Educator Resource Center for
NASA Johnson Space Center
1601 NASA Road One
Houston, TX 77058
Phone: (281) 244-2129
http://www.spacecenter.org/educator_resource.html

FL, GA, PR, VI
NASA Kennedy Space Center
NASA Kennedy Space Center
Mail Code ERC
Kennedy Space Center, FL 32899
Phone: (321) 867-4090
<http://www-pao.ksc.nasa.gov/kscpao/educate/edu.htm>

KY, NC, SC, VA, WV
Virginia Air & Space Center
Educator Resource Center for
NASA Langley Research Center
600 Settlers Landing Road
Hampton, VA 23669-4033
Phone: (757) 727-0900, x 757
<http://www.vasc.org/erc/>

AL, AR, IA, LA, MO, TN
U.S. Space and Rocket Center
NASA Educator Resource Center for
NASA Marshall Space Flight Center
One Tranquility Base
Huntsville, AL 35807
Phone: (256) 544-5812
<http://erc.msfc.nasa.gov>

MS
NASA Educator Resource Center
NASA Stennis Space Center
Mail Stop 1200—ERC
Stennis Space Center, MS 39529-6000
Phone: (228) 688-3338
<http://education.ssc.nasa.gov/erc/erc.htm>

VA and MD's Eastern Shores
NASA Educator Resource Center for
GSFC/Wallops Flight Facility
Visitor Center Building J-17
Wallops Island, VA 23337
Phone: (757) 824-2298
<http://www.wff.nasa.gov/~WVC/ERC.htm>

Regional Educator Resource Centers offer more educators access to NASA educational materials. NASA has formed partnerships with universities, museums, and other educational institutions to serve as regional ERCs in many States. A complete list of regional ERCs is available through CORE, or electronically via NASA Spacelink at <http://spacelink.nasa.gov/ercn>

NASA's Education Home Page serves as the education portal for information regarding educational programs and services offered by NASA for the American education community. This high-level directory of information provides specific details and points of contact for all of NASA's educational efforts, Field Center offices, and points of presence within each State. Visit this resource at <http://education.nasa.gov>

NASA Spacelink is one of NASA's electronic resources specifically developed for the educational community. Spacelink serves as an electronic library to NASA's educational and scientific resources, with hundreds of subject areas arranged in a manner familiar to educators. Using Spacelink Search, educators and students can easily find information among NASA's thousands of Internet resources. Special events, missions, and intriguing NASA Web sites are featured in Spacelink's "Hot Topics" and "Cool Picks" areas. Spacelink may be accessed at <http://spacelink.nasa.gov>

NASA Spacelink is the official home to electronic versions of NASA's educational products. A complete listing these products can be found at <http://spacelink.nasa.gov/products>

NASA Television (NTV) features Space Station and Shuttle mission coverage, live special events, interactive educational live shows, electronic field trips, aviation and space news, and historical NASA footage. Programming has a three-hour block—Video (News) File, NASA Gallery, and Education File—beginning at noon Eastern and repeated four more times throughout the day. Live feeds preempt regularly scheduled programming.

Check the Internet for program listings at <http://www.nasa.gov/multimedia/nasatv/>
For more information on NTV, contact:

NASA TV
NASA Headquarters—Code P-2
Washington, DC 20546-0001
Phone: (202) 358-3572

NTV Weekday Programming Schedules (Eastern Times)

Video File	NASA Gallery	Education File
12–1 p.m.	1–2 p.m.	2–3 p.m.
3–4 p.m.	4–5 p.m.	5–6 p.m.
6–7 p.m.	7–8 p.m.	8–9 p.m.
9–10 p.m.	10–11 p.m.	11–12 p.m.
12–1 a.m.	1–2 a.m.	2–3 a.m.

How to Access Information on NASA's Education Program, Materials, and Services

(EP-2002-07-345-HQ) This brochure serves as a guide to accessing a variety of NASA materials and services for educators. Copies are available through the ERC network or electronically via NASA Spacelink.
<http://spacelink.nasa.gov/Instructional.Materials/NASA.Educational.Products/Accessing.NASA.Education.Brochure/>

Please take a moment to evaluate this product at http://ehb2.gsfc.nasa.gov/edcats/educational_wallsheet. Your evaluation and suggestions are vital to continually improving NASA educational materials. Thank you.



Center of Mass

National Standards:

Technology

Standard 9—Students will develop an understanding of engineering design.

Standard 18—Students will develop an understanding of and be able to select and use transportation technologies.

Mathematics Standards

- Algebra—Understand patterns
- Use mathematical models

Science

- Physical Science
- Position and motion of objects
- Science and Technology
- Abilities of technological design

Assessment:

Ask students to prepare a briefing on center of mass to a group of new technicians hired by NASA to help build the International Space Station. The briefing should include a description of what the center of mass of an object is and why it is important to the ISS. The text for the briefing should be written out and illustrated with diagrams that will be presented with viewgraphs or with presentation software.

Background:

The space around Earth is becoming crowded with satellites, old rocket boosters, and other debris. Although wayward space objects eventually reenter Earth's atmosphere, they could present a danger to the International Space Station while still in low-Earth orbit. The ISS will be orbiting Earth at a speed of about 8 kilometers per second. A spent rocket booster, traveling in a similar orbit but from the opposite direction, could collide with the ISS with a total closing speed of 16 kilometers per second. The impact would be catastrophic. Even collisions with much smaller objects could lead to significant damage.

To protect the ISS, all objects in Earth orbit above a few centimeters in diameter are tracked by radar from the ground. When orbital projections indicate the potential of a collision, positive action can be taken to move the ISS out of the way. A situation like this occurred in 1998, when a Pegasus booster rocket was on a possible collision course with the first two ISS elements in orbit. Orbital plots indicated that the booster and the station would come within 1.4 kilometers of each other. Uncertainties in the plot led ISS mission controllers to command the station to fire its thrusters for five seconds. The adjustment to the ISS orbit kept the two bodies 25 kilometers from each other when they passed.

As the ISS grows in size, it will become a greater target for orbital debris. Thus, the station needs excellent maneuvering capability. To make accurate orbital adjustments, thrusts have to be accomplished in a direct line with the station's center of mass. Pushing out of line of the center of mass will cause the station to rotate rather than to alter its orbit. When new station elements are added to the structure, they have to be placed symmetrically in order to maintain the center of mass of the entire structure in the desired location.

Materials:

Heavy book	Nail	2 small cardboard boxes
Table top	Marker pen	1/2-inch dowel
Cardboard	String with plumb bob or small weight	Various weights

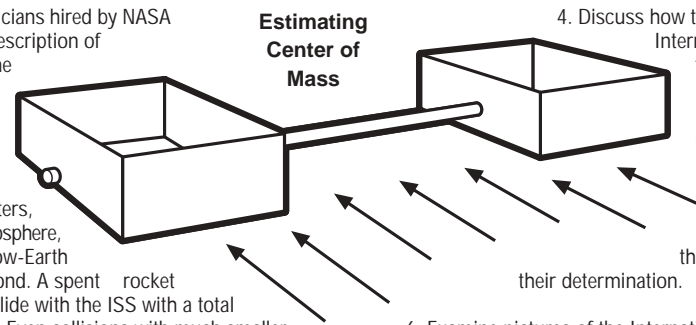
Procedure:

1. Demonstrate the importance of knowing where the center of mass is moving an object by placing a heavy book on a smooth tabletop and pushing it across the surface with one finger. Push the book at one of its edges and then in the middle. The book will rotate whenever a push is not in line with its center of mass.

2. Cut an irregular shape from a piece of cardboard. Punch small holes in various locations around the edge of the cardboard. Hang the cardboard from a nail and slip the string with the plumb bob over the nail. Use a marker to draw a line across the cardboard along the string. Remove the cardboard and hang it again from another hole, and again draw a line. Repeat until you have several lines crossing the cardboard shape. The intersection of the lines will be the center of mass.

3. Punch a hole in both sides of two boxes and pass the dowel through the four holes. Find the location of the center of mass of boxes and dowel by pushing it across a table with a force perpendicular to the dowel. Add a weight to one box.

What happens to the center of mass? Add a weight to the other box. What happens to the center of mass? Have students predict where the center of mass will be when more weights are added to one box or the other. Why do the location of the weights in the boxes make a difference?



4. Discuss how the weights added to the boxes represent modules and other elements of the International Space Station, and why it is important for the placement of these pieces to be symmetrical.

5. Challenge students to find a way to mathematically determine the center of mass of a simple system, such as a meter stick with various weights of known mass attached to it in different locations. After determining mathematically where the center of mass should be, have students test their prediction by suspending the stick from its center of mass. If the stick remains horizontal, the center of mass will have been located if the stick does not balance. Ask students if they included the mass of the stick on each side of the predicted balance point in their determination.

6. Examine pictures of the International Space Station and discuss the possible location of the station's center of mass. Identify the thrusters on the station. Ask students if thrusters must be in direct line with the ISS's center of mass. Could balanced pairs of thrusters on opposite sides of the center of mass accomplish orbital adjustments? You can demonstrate this concept by pushing equally on both boxes or unevenly if the weights were different.

Extension:

Examine other structures, vehicles, and systems in which the placement of center of mass is important. Why is the location of the center of mass important to airplanes, trucks, and ships? How can center of mass placement problems be counteracted with technology? For example, the center of mass of a bicycle rider is high above the bike frame, causing an unstable condition. Why don't the bike and rider tip over? (The wheels provide stability while rotating.)



Create a Full-Scale Layout of the International Space Station

National Standards

Technology—Students will apply design processes (model a solution; test, evaluate, and refine the design; reevaluate the final solution).

Mathematics—Students will apply problem solving and measurement (make decisions about units and scales that are appropriate for problem situations involving measurement).

Assessment

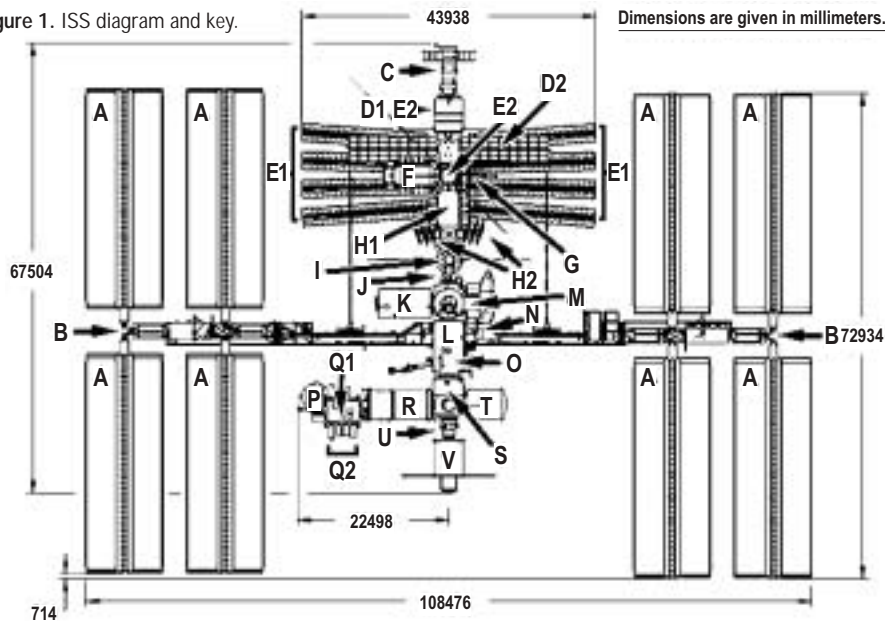
When you are finished, your team should have the following:

- Table of team component dimensions.
- A diagram identifying and labeling all distances and key points.
- Completed, full-scale layout of the International Space Station (ISS) dimensions within 10 percent of those in Figure 1.
- Team presentation with comments on results of the activity, suggestions for improvement, table, sketch, and photographs of final layout if available.

Background

Although it is difficult to imagine, the ISS, when completed, will be longer and wider than a football field. This activity will allow you to envision the actual dimensions of the completed ISS as it orbits Earth. You'll work in teams to convert scale dimensions to obtain the actual size of the International Space Station. Then you'll lay out a full-scale perimeter outline of the ISS. Once you're done, you can even invite other students and community members on a tour!

Figure 1. ISS diagram and key. Dimensions are given in millimeters.



Module Identification Key

A – Main Solar Panels	K – Habitation Module
B – Truss	L – Node 3
C – Progress Vehicle	M – Common Berthing Adapter
D1 – Zvezda Service Module	N – Crew Return Vehicle
D2 – Zvezda Micrometeoroid/Orbital Debris Wings	O – U.S. Lab (Destiny Laboratory Module)
E1 – Science Power Platform (SPP) Solar Panels	P – JEM ELM Exposed Section
E2 – Science Power Platform (SPP) Core	Q1 – JEM Exposed Facility
F – Research Module	Q2 – JEM Exposed Facility “Projections”
G – Docking Compartment	R – JEM Pressurized Module (Kibo)
H1 – Zarya (Functional Cargo Block or FGB)	S – Node 2
H2 – Zarya’s Solar Panels	T – Columbus Orbital Facility
I – Docking and Storage Module	U – Pressurized Mating Adaptor 2 (PMA 2)
J – Pressurized Mating Adaptor 1 (PMA 1)	V – Propulsion Module

Materials—Part 1—Calculations, Sketches, and Planning

- ISS diagram and key (Figure 1)
- Metric rulers (one per person)
- Calculators or computer with spreadsheet program (one per team)
- Paper for team sketches

Materials—Part 2—Physical Layout

- Measuring devices, including human “pacers” (Take 5 steps or “paces,” measure the distance traveled, and determine the length of one pace. Then use your paces to measure distance.)
- String or flagging tape (approx. 6,000 ft—extra if you lay out material for reference lines)
- Items to fix tape/string to the ground (400 brightly colored golf tees, weights, pegs, masking tape, etc.)
- Nine road hazard cones or other easily visible field markers
- Scissors to cut tape (at least one pair per team)

Procedure—Part 1—Calculations, Sketching, Planning (approximately 45 minutes)

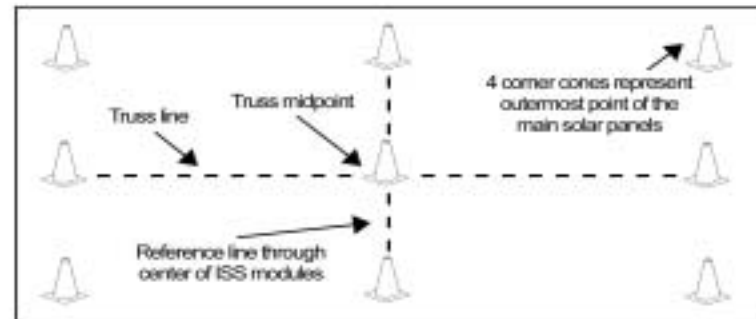
1. After student team assignments are made, use Figure 1 to identify your team’s space station components.
2. As a class, use Figures 1 and 2 to decide upon the point or points that will represent the “design/layout center” of your space station outline. Draw an appropriate vertical and/or horizontal line through the point(s).
3. Each team should highlight and identify its space station components on Figure 1. Check with the neighboring team(s) to make sure there is no duplication of ISS components. Make a sketch of your team’s components.
4. Use a team table of ISS components provided by the teacher (or if you have time, make your own table).
5. Determine how many times the drawing shown in Figure 1 will “fit into” the actual size of the International Space Station. This will give you a scale ratio, such as 1,000 to 1.
6. Measure each dimension of your assigned ISS components on Figure 1. Multiply dimensions by the scale determined in step 5. Record the diagram measurements and calculated ISS dimensions in your table.
7. When all teams have finished their calculations, prepare to lay out your outline of the ISS. Consult with the other teams to make sure your “design decisions” (component distances from reference points, etc.) meet their design needs and expectations.

Procedure—Part 2—Outdoor Layout of ISS Perimeter (approximately 2 hours)

1. Take your labeled sketch and all needed materials to the field to lay out the perimeters of your team’s ISS components.
2. First, position the truss midpoint in the middle of the field to make sure the finished outline will fit into the space available. Put down marker cones for the truss line and a vertical line that will run through the center of the ISS components. These two center lines will be perpendicular to each other. Place four additional cones to represent the outer points of the main solar panels. Verify that all the cones are correctly aligned and the right distance from each other (see Figure 2).
3. Perform your ISS layout assignments.
4. Once outlines are completed, label all components.
5. Be prepared to give a guided tour of your team’s ISS components.

Visit the ISS Challenge™ Web site for help with metric conversions, additional diagrams, and other ISS-related activities (<http://www2.cet.edu/iss/activities/main.asp>).

Figure 2. Reference marker placement before outlining ISS components.



ISS Model

National Standards:

Technology

Standard 9—Students will develop an understanding of Engineering Design Standard 10 and of the roles of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.

Standard 16—Students will develop an understanding of and be able to select and use energy and power technologies.

Standard 17—Students will develop an understanding of and be able to select and use information and communication technologies.

Standard 18—Students will develop an understanding of and be able to select and use transportation technologies.

Standard 19—Students will develop an understanding of and be able to select and use manufacturing technologies.

Standard 20—Students will develop an understanding of and be able to select and use construction technologies.

Mathematics Standards

Number and Operation—Compute fluently

Geometry—Specify locations

Apply transformation

Use visualization

Measurement—Understand measurable attributes

Apply appropriate techniques, tools, and formulas

Science

Science and Technology

Abilities of technological design

Assessment:

Examine the quality of construction of the station elements, how well they fit together, and their appropriate sizing. Have each team submit a written report describing the system they specialized in and how they met the challenges they experienced in constructing their station elements. Also review the scale drawings made by the teams of the elements they constructed.

Background:

The International Space Station poses major engineering and fabrication challenges. Not only is the station made up of more than 100 major elements, the elements are being fabricated in 16 different nations. Every piece of the ISS must use the same measurement systems or equivalents. Electrical power must be the same. Fluid transfer lines must precisely match. Data and communication systems must be compatible. The different assembly teams need to communicate clearly, often, and in the same language.

To create a successful, safe, and useful Space Station, standards of all sorts had to be established, including standards for materials and manufacturing techniques.

Materials:

Metric measurement tools (engineer scale, ruler or tape measure, caliper, balance or electronic scale, etc.)

Construction tools (the kinds of tools will be determined by the materials used)

Wood, plastic, metal, paper, or other construction stock

Fasteners (glue, etc.)

Paint and brushes or paint sprayer

Computer with Internet access to ISS sites

CAD program (optional)

This poster

Procedure:

1. Students will be working in teams to construct a model of the International Space Station. Each team will be responsible for one or more specific systems of the station. It will be up to each team to research the systems they are assigned to construct, determine what materials to use, and construct the components that make up the system. Because the actual station will be as large as two football fields side by side, their model will have to be considerably smaller. It will be important for all teams to construct their components to the same scale. It will also be important to develop standard ways of joining elements, produced by each of the teams, together.

2. Identify the different teams for the model. The following teams, based on a systems approach, are suggested:

Structure

Environmental Management

Energy

Communications and Data Handling

Attitude Control and Propulsion

Transportation and Manufacturing

3. Have teams refer to this poster and to the NASA ISS Internet sites listed in the Resource section for information about the systems they are assigned to work on. Each team will have to understand not only their requirements but also those of the other teams. For example, the Environmental Management team will need to understand the requirements for providing a healthy and usable environment for the crew, how energy is provided, and how waste heat and other contaminants are dealt with. This will require familiarization with the ISS needs for Structure and Energy.

4. Have each team select a representative to meet with other team representatives to discuss design issues such as construction standards, scale, and a timetable for completion.

5. If possible, have students create construction diagrams on a computer using a CAD program.

6. Have teams construct the components for their systems. Remind them to communicate with other teams on a regular basis to coordinate efforts and test how well systems integrate with each other.

7. Assemble the model in the classroom. If possible, suspend the model from the ceiling or create some sort of stand to support it.

8. Ask each student team to brief the rest of the class on the system and elements they created for the model. Be sure they describe both the system and how it integrates with the functions of the other systems of the station.



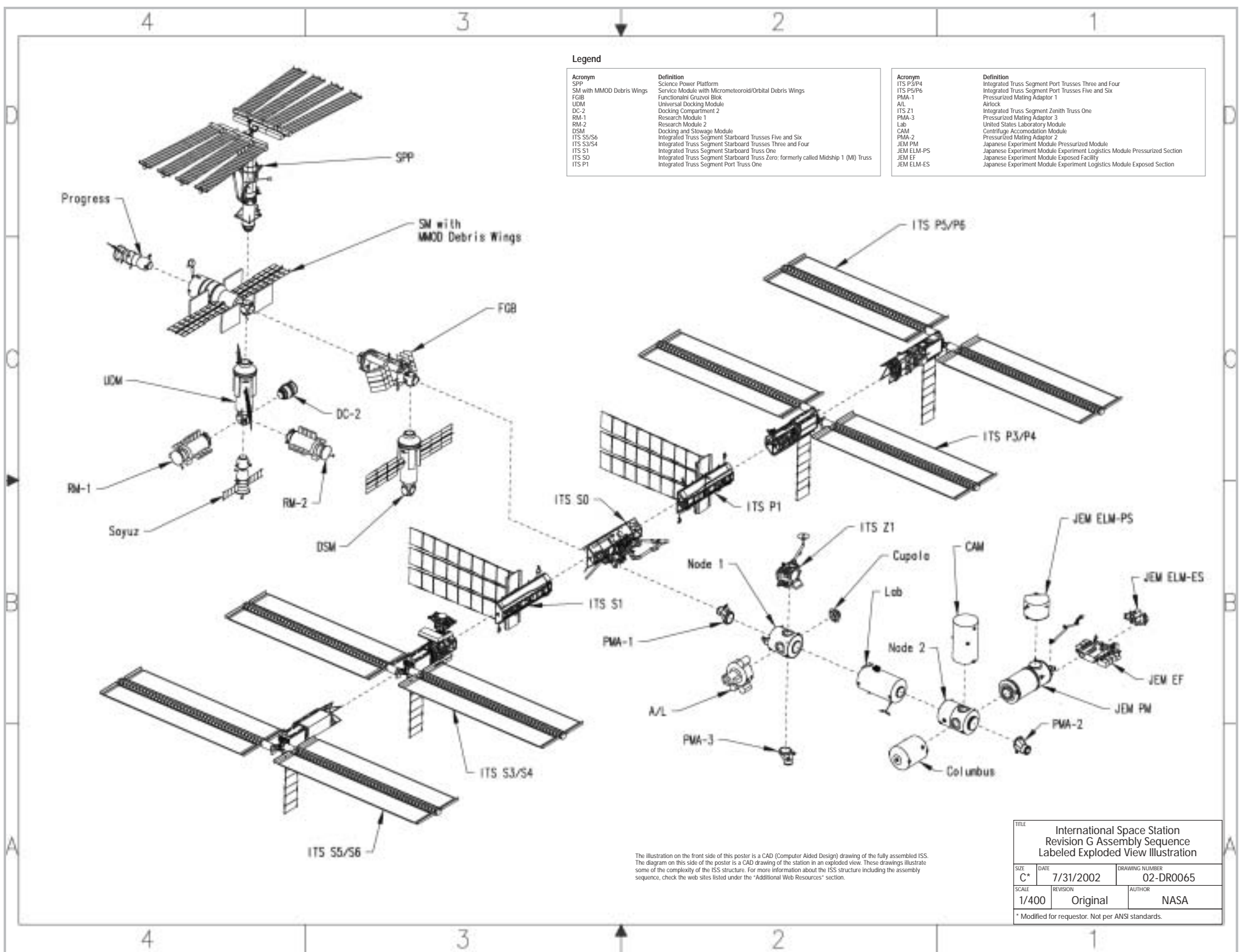
Astronaut Susan J. Helms, Expedition Two flight engineer, works at the Human Research Facility's (HRF) Ultrasound Flat Screen Display and Keyboard Module in the Destiny/U.S. Laboratory. A digital still camera was used to record this image.

Extension:

As a follow-up activity or as an alternative to modeling the International Space Station, have students design and construct their own station for use in orbit around the Moon or another planet. What design, transportation, manufacturing, energy, and communication problems will be encountered by placing an orbital station hundreds of thousands or millions of kilometers away?

Pretend that your class has decided to go into business constructing models of the International Space Station for other schools and museums. Discuss ways in which the teams could mass-produce the model. How would the pieces be constructed? Should the model be shipped in pieces for assembly by the receivers or shipped fully assembled? How much would they charge for the model?





Legend

Acronym	Definition
SPP	Science Power Platform
SM with MMOD Debris Wings	Service Module with Micrometeoroid/Orbital Debris Wings
FGB	Functional Cargo Block
UDM	Universal Docking Module
DC-2	Docking Compartment 2
RM-1	Research Module 1
RM-2	Research Module 2
DSM	Docking and Stowage Module
ITS S5/S6	Integrated Truss Segment Starboard Trusses Five and Six
ITS S3/S4	Integrated Truss Segment Starboard Trusses Three and Four
ITS S1	Integrated Truss Segment Starboard Truss One
ITS S0	Integrated Truss Segment Starboard Truss Zero: formerly called Midship 1 (M1) Truss
ITS P1	Integrated Truss Segment Port Truss One

Acronym	Definition
ITS P3/P4	Integrated Truss Segment Port Trusses Three and Four
ITS P5/P6	Integrated Truss Segment Port Trusses Five and Six
PMA-1	Pressurized Mating Adaptor 1
A/L	Airlock
ITS Z1	Integrated Truss Segment Zenith Truss One
PMA-3	Pressurized Mating Adaptor 3
Lab	United States Laboratory Module
CAM	Centrifuge Accommodation Module
PMA-2	Pressurized Mating Adaptor 2
JEM ELN-PS	Japanese Experiment Module Pressurized Section
JEM ELM-PS	Japanese Experiment Module Experiment Logistics Module Pressurized Section
JEM EF	Japanese Experiment Module Exposed Facility
JEM ELM-ES	Japanese Experiment Module Experiment Logistics Module Exposed Section

The illustration on the front side of this poster is a CAD (Computer Aided Design) drawing of the fully assembled ISS. The diagram on this side of the poster is a CAD drawing of the station in an exploded view. These drawings illustrate some of the complexity of the ISS structure. For more information about the ISS structure including the assembly sequence, check the web sites listed under the "Additional Web Resources" section.

TITLE			
International Space Station Revision G Assembly Sequence Labeled Exploded View Illustration			
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SCALE	REVISION	AUTHOR	
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* Modified for requestor. Not per ANSI standards.			