GLOBAL EDITION

Technical Communication Strategies for Today

SECOND EDITION

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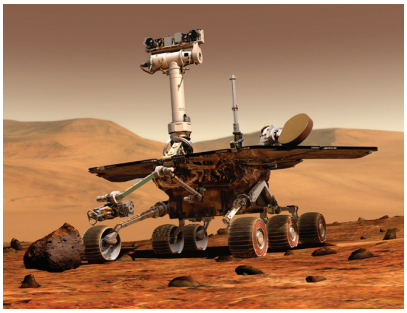
Brief Contents

Mars Exploration Rover



At the heart of each Mars Exploration Rover spacecraft is its rover. This is the mobile geological laboratory that will study the landing site and travel to examine selected rocks up close.

The Mars Exploration Rovers differ in many ways from their only predecessor, Mars Pathfinder's Sojourner Rover. Sojourner was about 65 centimeters (2 feet) long and weighed 10 kilograms (22 pounds). Each Mars Exploration Rover is 1.6 meter (5.2 feet) long and weighs 174 kilograms (384 pounds). Sojourner traveled a total distance equal to the length of about one football field during its 12 weeks of activity on Mars. Each Mars Exploration Rover is expected to travel six to 10 times that distance during its three-month prime mission. Pathfinder's lander, not Sojourner, housed that mission's main telecommunications, camera and computer functions. The Mars Exploration Rovers carry equipment for those functions onboard and do not interact with their landers any further once they roll off.

Major part: Core Structure

On each Mars Exploration Rover, the core structure is made of composite honeycomb material insulated with a high-tech material called aerogel. This core body, called the warm electronics box, is topped with a triangular surface called the rover equipment deck. The deck is populated with three antennas, a camera mast and a panel of solar cells. Additional solar panels are connected by hinges to the edges of the triangle. The solar panels fold up to fit inside the lander for the trip to Mars, and deploy to form a total area of 1.3 square meters (14 square feet) of three-layer photovoltaic cells. Each layer is of different materials: gallium indium phosphorus, gallium arsenide and germanium. The array can produce nearly 900 watt-hours of energy per martian day, or sol. However, by the end of the 90-sol mission, the energy generating capability is reduced to about 600 watt-hours per sol because of accumulating dust and the change in season. The solar array repeatedly recharges two lithium-ion batteries inside the warm electronics box.

Minor parts

Major part: Suspension System

Doing sport utility vehicles one better, each rover is equipped with six-wheel drive. A rocker-bogie suspension system, which bends at its joints rather than using any springs, allows rolling over rocks bigger than the wheel diameter of 26 centimeters (10 inches). The distribution of mass on the vehicle is arranged so that the center of mass is near the pivot point of the rocker-bogie system. That enables the rover to tolerate a tilt of up to 45 degrees in any direction without overturning, although onboard comput-

Definition of subject

Overall description of subject

Figure 6.3: This description of the Mars Exploration Rover shows how a subject can be partitioned into major and minor parts.

Source: NASA, http://www.jpl.nasa.gov/news/press_kits/merlandings.pdf.

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Figure 6.3:
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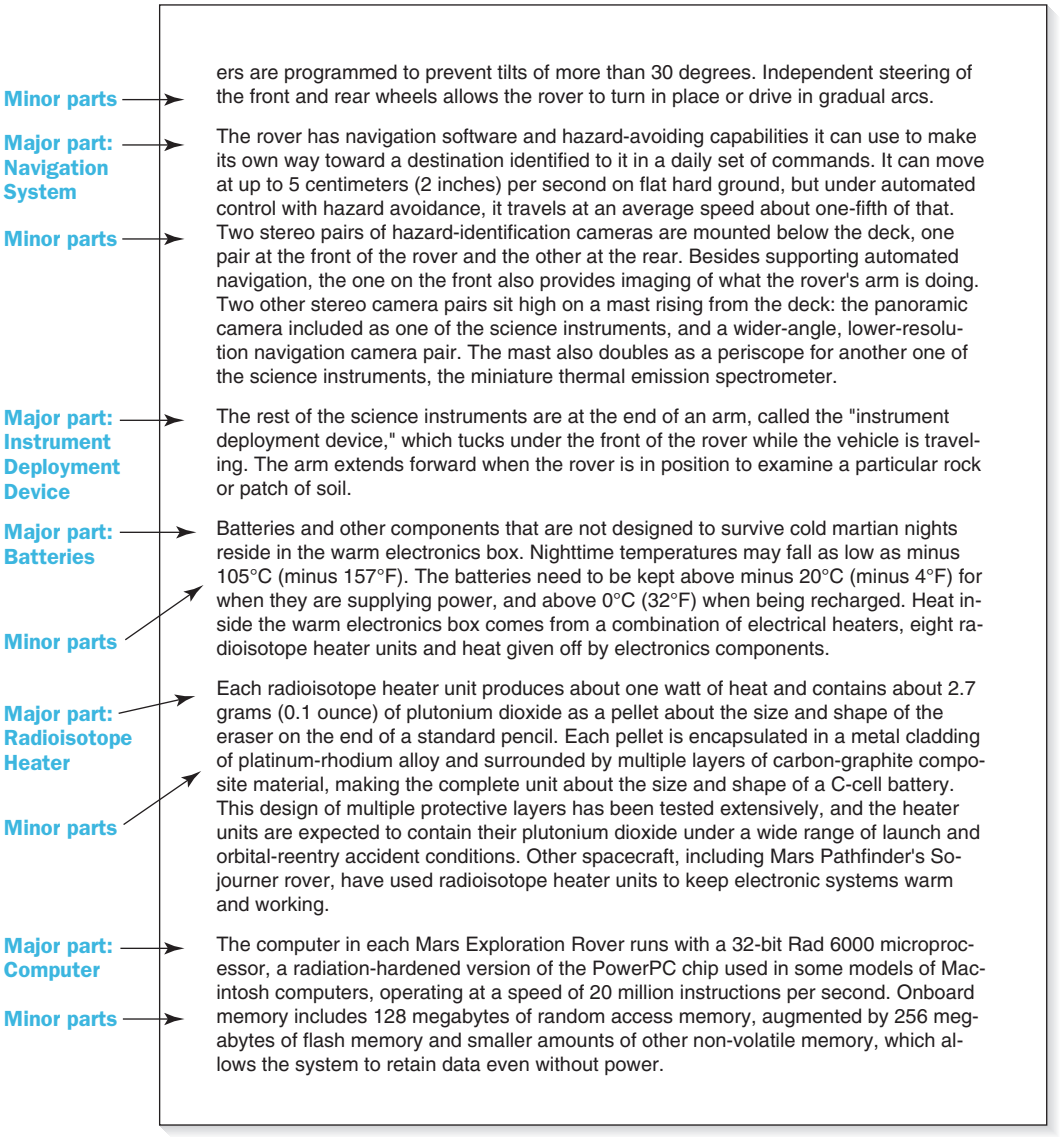

Organizing and Drafting

With your subject partitioned into major and minor features, you are ready to start organizing and drafting your description. You can describe your subject in many ways, but it is best to choose an organizational pattern that demonstrates an obvious logic that readers will immediately recognize. The Quick Start at the beginning of this chapter shows a basic model to help you get started.

Specific and Precise Title

The title of your technical description should clearly identify the purpose of the document. For example,

> Description of the Mars Exploration Rover
>
> Specifications for the XC-9000 Microprocessor
>
> How Does a Fuel Cell Work?
>
> Lung Cancer: Profile of a Killer

Your title should clearly distinguish your document as a technical description.

Introduction with an Overall Description

Typically, the introduction will set a framework or context by including some or all of the following features:

DEFINITION OF SUBJECT A sentence definition of your subject includes three parts: the *term*, the *class* in which the subject belongs, and the *characteristics* that distinguish the subject from the other members in its class.

Link

For more information on writing definitions, see the Microgenre on page 169.

> The International Space Station is a multinational research facility that will house six state-of-the-art laboratories in orbit.
>
> Hodgkin's disease is a type of cancer that starts in the lymph nodes and other organs that are the body's system for making blood and protecting against germs.

The definition of the subject should appear early in the introduction, preferably in the first sentence.

PURPOSE STATEMENT Directly or indirectly state that you are describing something.

> This description of the International Space Station will explain its major features, highlighting its research capabilities.
>
> In this article, we will try to demystify Hodgkin's disease, so you can better understand its diagnosis and treatment.

MAIN POINT Give your readers an overall claim that your description will support or prove.

> Building the International Space Station is an incredible engineering feat that will challenge the best scientists and engineers in many different nations.
>
> To fight Hodgkin's disease, you first need to understand it.

IMPORTANCE OF THE SUBJECT For readers who are unfamiliar with your subject, you might want to include a sentence or paragraph that stresses its importance.

> The ISS, when completed, will provide scientists and other researchers with an excellent platform from which to study space.
>
> Hodgkin's disease is one of the most acute forms of cancer, and it needs to be aggressively treated.

OVERALL DESCRIPTION OF THE SUBJECT Descriptions sometimes offer an overall look at the item being described.

> From a distance, the International Space Station looks like a large collection of white tubes with two rectangular solar panels jutting out like ears from its side.
>
> Hodgkin's disease spreads through the lymphatic vessels to other lymph nodes. It enlarges the lymphatic tissue, often putting pressure on vital organs and other important parts of the body.

This overall description will help your readers visualize how the parts fit together as they read further.

LIST OF THE MAJOR FEATURES, FUNCTIONS, OR STAGES In many descriptions, especially longer descriptions, the introduction will list the major features, functions, or stages of the subject.

> The International Space Station includes five main features: modules, nodes, trusses, solar power arrays, and thermal radiators.
>
> Once Hodgkin's has been detected, doctors will usually (1) determine the stage of the cancer, (2) offer treatment options, and (3) make a plan for remission.

You can then use this list of features, functions, or stages to organize the body of your description.

Description by Features, Functions, or Stages

The body of your description will be devoted to describing the subject's features, functions, or stages.

Address each major part separately, defining it and describing it in detail. Within your description of each major part, identify and describe the minor parts.

Definition of major part → **Modules** are pressurized cylinders of habitable space on board the Station. They may contain research facilities, living quarters, and any vehicle operational systems and equipment the astronauts may need to access.

Minor parts →

If necessary, each of these minor parts could then be described separately. In fact, you could extend your description endlessly, teasing out the smaller and smaller features of the subject.

Figure 6.4 shows a description of a subject by "stages in a process." In this description of a fuel cell, the author walks readers through the energy generation process, showing them step-by-step how the fuel cell works.

Description by Senses, Similes, Analogies, and Metaphors

The key to a successful technical description is the use of vivid detail to bring your subject to life—to make it seem real. To add this level of detail, you might consider using some of the following techniques:

DESCRIPTION THROUGH SENSES Consider each of your five senses separately, asking yourself, "How does it look?" "How does it sound?" "How does it smell?" "How does it feel?" and "How does it taste?"

> A visit to a Japanese car manufacturing plant can be an overwhelming experience. Workers in blue jumpsuits seem to be in constant motion. Cars of every color—green, yellow, red—are moving down the assembly line with workers hopping in and out. The smell of welding is in the air, and you can hear the whining hum of robots at work somewhere else in the plant.

SIMILES A simile describes something by comparing it to something familiar to the readers ("A is like B").

> The mixed-waste landfill at Sandia Labs is like a football field with tons of toxic chemical and nuclear waste buried underneath it.

Similes are especially helpful for nonexpert readers, because they make the unfamiliar seem familiar.

ANALOGIES Analogies are like similes, but they work on two parallel levels ("A is to B as C is to D").

> Circuits on a semiconductor wafer are like tiny interconnected roads criss-crossing a city's downtown.

METAPHORS Metaphors are used to present an image of the subject by equating two different things ("A is B"). For example, consider these two common metaphors:

> The heart is a pump: it has valves and chambers, and it pushes a fluid, blood, through a circulation system of pipes, called *arteries* and *veins*.

> Ants live in colonies: a colony will have a queen, soldiers, workers, and slaves.

A Technical Description: Stages in a Process

Fuel Cell Technology

How It Works

Definition of subject

A fuel cell produces electricity by means of an electrochemical reaction much like a battery. But there is an important difference. Rather than extracting the chemical reactants from the plates inside the cells, a fuel cell uses hydrogen fuel and oxygen extracted from the air to produce electricity. As long as these substances are fed into the fuel cell, it will continue to generate electric power.

Overall description of subject

Different types of fuel cells work with different electrochemical reactions. The following is a basic description of how a phosphoric acid fuel cell generates electric power.

Steps in the process

1. Hydrogen gas is extracted from natural gas or other hydrocarbon fuels and permeates the anode. Oxygen from the air permeates the cathode.

2. Aided by a catalyst in the anode, electrons are stripped from the hydrogen. Hydrogen ions pass into the electrolyte.

3. Electrons cannot enter the electrolyte. They travel through an external circuit, producing electricity.

4. Electrons travel back to the cathode where they combine with hydrogen ions and oxygen to form water.

Numbers refer to diagram

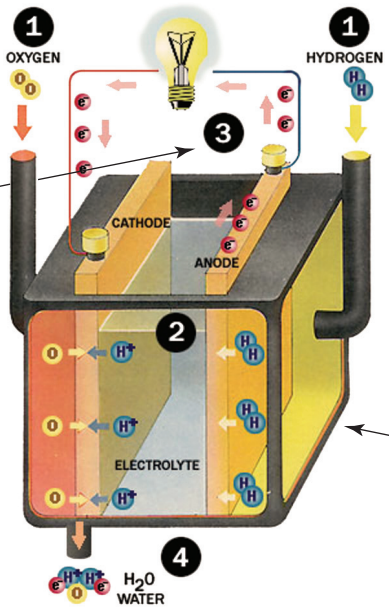

Diagram illustrates the process

Subject is shown at work in the conclusion

A fuel cell provides DC (direct current) voltage that can be used to power motors, lights or other electrical appliances. To supply electricity for homes, businesses, and buildings, however, the direct current must be changed into AC (alternating current). A device called an "inverter" makes this conversion.

Look to the future

Hydrogen needed by a fuel cell can be extracted from a variety of fuels. Natural gas—a chemical combination of carbon and hydrogen atoms—is perhaps the most common fuel, but other hydrocarbon fuels can also be used. For example, some fuel cells operate on gases released from wastewater digesters or from landfills. In the future, gas made from coal or biomass might be candidate fuels. Some types of fuel cells extract the hydrogen in a separate fuel processor called a "reformer"; other fuel cells incorporate reforming inside the cell stack itself.

Source: U.S. Department of Energy, http://www.fe.doe.gov/coal_power/fuelcells/fuelcells_howitworks.shtml.

Figure 6.4: A description of a process. In this description, the subject has been partitioned into major and minor stages.