Life Support Team
Mission Day Instructions

Overview
The Environmental Control and Life Support (ECLS) System ensures that atmospheric gases stay within a normal range and are free of contaminants. A disruption to any part of the ECLS System could be dangerous.

Using the Internet, your team will receive real-time readings from an instrument called the major constituent analyzer. You must graph the data and make calculations. Communicate with the other teams and recommend ways to protect the space station crew.

Mission Day Materials
One computer for real-time data
Life support reference guide
Print and cut seven copies of blank report forms on colored paper (blue would be best) to deliver to the Communications Team
Calculators
Mission day instructions
Life support data graphs and instructions
Life support data tracking tables

Your Task
By the time the mission starts, the Life Support Team should be able to:

- Receive real-time data, record it, graph it, and make calculations.
- Monitor changes in the atmosphere of the station and report the possible effects on the astronauts.
- Use the life support reference guide to understand hypoxia and carbon dioxide poisoning.
- Recommend options and adjustments to avoid a dangerous situation.

Team Tasks
These tasks are listed in priority order. Next to each task, assign a team member. Depending on the size of your team, you may need to assign two tasks to one person.

_____ **Team leader:** Makes sure the team is working quickly and efficiently. Determines whether there are any concerns and helps the team decide what to do about them.

_____ **Data graphing:** Records real-time data on graphs and makes predictions. (May be combined with data analysis tasks if necessary.)

_____ **Data analysis (O_2):** Records real-time data in data tracking tables and conducts analyses. Completes report forms every few minutes.

_____ **Data analysis (CO_2):** Records real-time data in data tracking tables and conducts analyses. Completes report forms every few minutes.

_____ **Crisis management data runner:** Completes report forms every few minutes. Reports to Crisis Management Team and then delivers it to the Communications Team. Writes down questions from Mission Control and reports.

_____ **Data recording:** Records real-time data from the computer. The data will be accessed and downloaded after the start of the mission. (May be combined with other tasks if necessary.)

_____ **Research and reference:** Reads and understands information provided in the reference guide to make recommendations. (May be combined with other tasks if necessary.)

_____ **Reporter/Graphic organizer:** Takes notes during the mission like a reporter from a newspaper or TV station. Writes down all the emergencies, recommendations, choices, and successes. May want to use a white board or chalkboard posted on the wall to inform other teams about what is going on with your team.

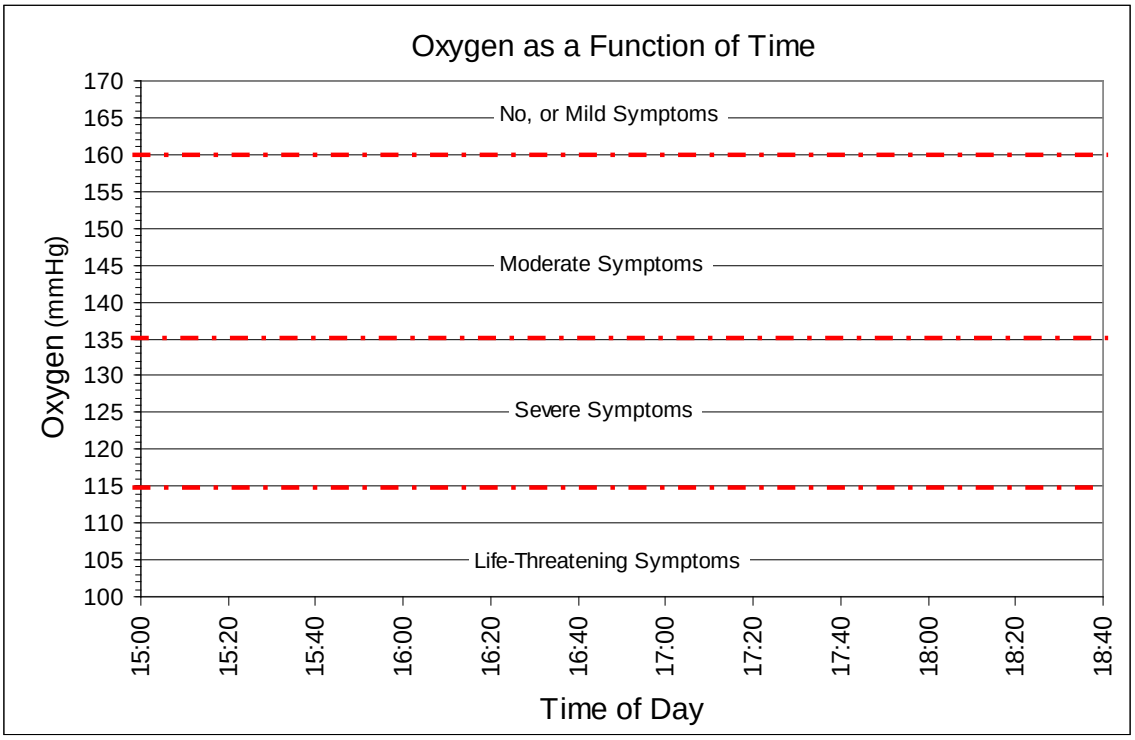
Life Support Team Graphs and Instructions

Instructions

You need to create graphs of the O_2 and CO_2 levels. Use the data from **column C** on each data tracking table for the y-axis values and plot them along the x-axis by the time of day. This graph will help determine whether or not the changes are a concern. Examine the slope of the line between the data points for the current reading and the last reading. You may want to use a ruler to do this. Is the slope of the line showing a trend moving **toward** or **away** from a danger area?

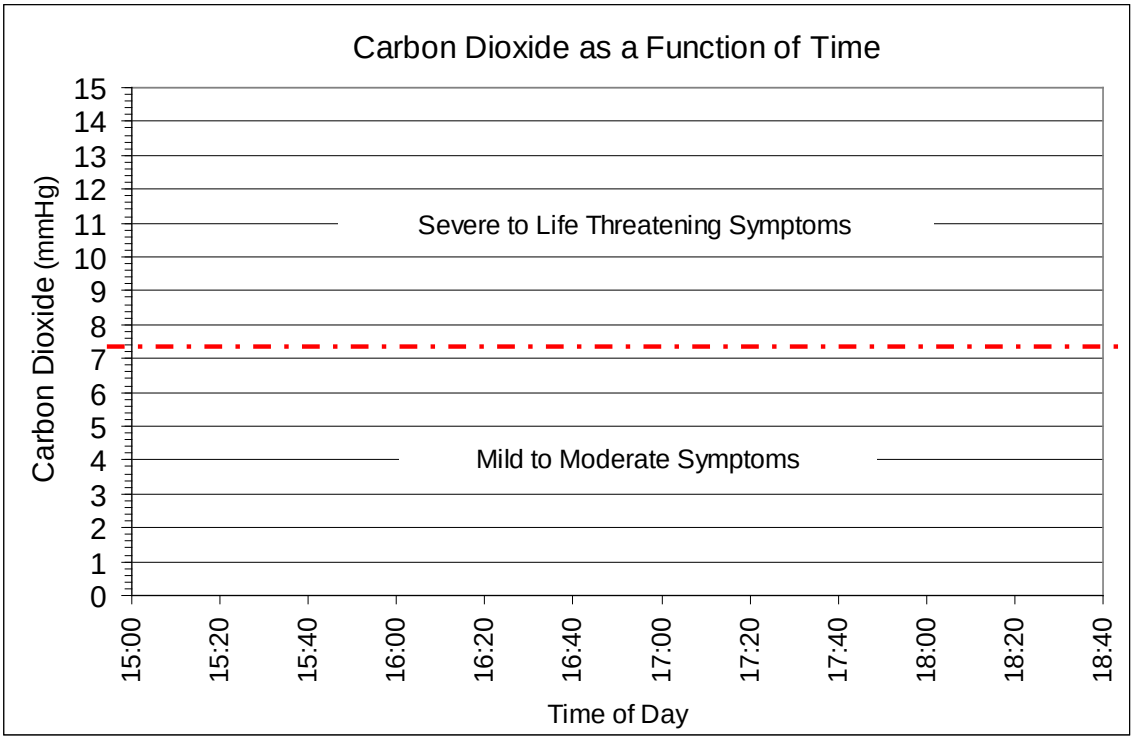
Oxygen

Levels ►



Carbon Dioxide

Levels ►



Life Support Team
Data Analysis Instructions

You will receive pressure readings every few minutes from the major constituent analyzer. Analyze them quickly. **Important! Before mission day use the practice worksheets and practice graphs to prepare yourself.** The instructions below explain how to complete the data tracking table on the next page.

Find the sheet labeled "Life Support Team Data Tracking Table." Make one copy for oxygen and one for carbon dioxide.

Column A: Time of Day

This is like military time. Time is given using a 24-hour clock with no "a.m." or "p.m." For example, one o'clock in the morning is 01:00, and 4:20 in the afternoon is 16:20, while 11:15 at night is 23:15.

Column	A	B	C (Graph this column)	D	E	F
Table Headings	Time of Day	Content of O_2 or CO_2	Pressure of O_2 or CO_2	Change in O_2 or CO_2	Rate	Trend
Units	24 Hour Clock	Percent (%)	mmHg	mmHg	mmHg per hour	
Calculations	From Data	From Data	C= 760 x B/100	D = Current C - Previous C	E = D/0.33	Look at the graph and check one
	15:00	(This example shows data for CO_2) 0.35	2.66	n/a	n/a	☐ Increasing ☐ Decreasing

Column B: Real-time Data

Record the current reading from the data for the gas you are tracking (O_2, or CO_2) in column B.

You will receive data for each component as a percentage, for example O_2 = 25 percent. This indicates what percentage of the air inside the station is made up of oxygen.

Column C: Conversion to Pressure

Column C = 760 mmHg X Column B divided by 100

We need to know the pressure to know how safe or dangerous the situation is. To convert from percent to mmHg, multiply the total pressure of 760 mmHg by the current reading from column B and divide by 100.

Your result will be in mmHg, which is millimeters of mercury. This is the common unit that scientists use for atmospheric gases.

Column D: Change in Pressure

Column D = Current reading from column C minus the previous reading from column C

How much are the readings changing? To determine this, subtract the previous reading in column C from the current reading in column C. Your result will be in mmHg.

Column E: Rate of Change

$$\textit{Column E} = \frac{\textit{Column D (mmHg)}}{\textit{Time elapsed (hours)}}$$

The rate of change tells us how quickly things are changing. Take the result from column D and divide by the amount of time. There have been 0.33 hours since the last reading. This gives a rate of change in mmHg per hour.

Column F: Trend

Is the dose increasing or decreasing?

Mark the "X" next to "increasing" or "decreasing" to describe whether the levels are higher or lower than the last reading. If they are higher from one reading to the next, then the rate is "increasing."

To determine whether or not these changes are a concern, use the line graph. Examine the slope of the line between the data points for the current reading and the last reading. You may want to use a ruler to do this. Is the slope of the line showing a trend moving **toward** or **away** from a danger area?

Life Support Team
Data Tracking Table

Examples and Practice

Circle One: **Oxygen (O_2)** **Carbon Dioxide (CO_2)**

Column	A	B	C (Graph this column)	D	E	F
Table Headings	Time of Day	Content of O_2 or CO_2	Pressure of O_2 or CO_2	Change in O_2 or CO_2	Rate	Trend
Units	24-hour Clock	Percent (%)	mmHg	mmHg	mmHg per hour	
Calculations	From Data	From Data	C= 760 x B/100	D = Current C - Previous C	E = D/0.33	Look at the graph (Column C) and check one:
Examples and Practice	15:00	(This example shows data for CO_2) 0.35	2.66	n/a	n/a	□ Increasing □ Decreasing
	15:20	0.57	4.33	1.67	5.06	X Increasing □ Decreasing
	15:40	0.37	2.81	-1.52	-4.61	□ Increasing X Decreasing
	16:00	0.80	6.08	3.27	9.91	X Increasing □ Decreasing
	16:20	1.20	9.12	3.04	9.21	X Increasing □ Decreasing
	16:40	1.40				□ Increasing □ Decreasing
	17:00	0.90				□ Increasing □ Decreasing
	17:20	1.80				□ Increasing □ Decreasing
	17:40	0.95				□ Increasing □ Decreasing
	18:00	0.74				□ Increasing □ Decreasing
	18:20	0.51				□ Increasing □ Decreasing

Note: Round all calculations to two decimal places.

For additional practice use these values for O_2: You will need to print out the next page.

Time	Content of O_2
16:40	20.15
17:00	19.50
17:20	18.65
17:40	21.33
18:00	21.56
18:20	21.60

Life Support Team
Data Tracking Table

For the Mission

Circle One: **Oxygen (O^2)** **Carbon Dioxide (CO^2)**

Column	A	B	C (Graph this column)	D	E	F
Table Headings	Time of Day	Content of O_2 or CO_2	Pressure of O_2 or CO_2	Change in O_2 or CO_2	Rate	Trend
Units	24-hour Clock	Percent (%)	mmHg	mmHg	mmHg per hour	
Calculations	From Data	From Data	C= 760 x B/100	D = Current C - Previous C	E = D/0.33	Look at the graph and check one
For the Mission	15:00			n/a	n/a	□ Increasing □ Decreasing
	15:20					□ Increasing □ Decreasing
	15:40					□ Increasing □ Decreasing
	16:00					□ Increasing □ Decreasing
	16:20					□ Increasing □ Decreasing
	16:40					□ Increasing □ Decreasing
	17:00					□ Increasing □ Decreasing
	17:20					□ Increasing □ Decreasing
	17:40					□ Increasing □ Decreasing
	18:00					□ Increasing □ Decreasing
	18:20					□ Increasing □ Decreasing
	18:40					□ Increasing □ Decreasing

Note: Round all calculations to two decimal places.