Proofreader's Marks

MARK	EXPLANATION	EXAMPLE
∂	TAKE OUT CHARACTER INDICATED	∂ Your prooff.
^	LEFT OUT, INSERT	u Yor proof.
#	INSERT SPACE	# Yourproof.
9	TURN INVERTED LETTER	Your pɹoof.
×	BROKEN LETTER	× Your proof.
eq#	EVEN SPACE	eq# A good proof.
⁀‿	CLOSE UP: NO SPACE	Your pro of.
tr	TRANSPOSE	tr A proof good
wf	WRONG FONT	wf Your proof.
lc	LOWER CASE	lc Your Proof.
caps	CAPITALS	Your proof. caps Your proof.
ital	ITALIC	Your proof. ital Your proof.
rom	ROMAN, NON ITALIC	rom Your *proof.*
bf	BOLD FACE	Your proof. bf Your proof.
...... stet	LET IT STAND	~~Your~~ proof. stet ~~Your~~ proof.
out sc.	DELETE, SEE COPY	out sc. She Our proof.
spell out	SPELL OUT	spell out Queen Eliz.
¶	START PARAGRAPH	¶ read. Your
no ¶	NO PARAGRAPH: RUN IN	no ¶ marked. Your proof.
⌴	LOWER	⌴ Your proof.

MARK	EXPLANATION	EXAMPLE
⌐¬	RAISE	⌐¬ Your proof.
⊏	MOVE LEFT	⊏ Your proof.
⊐	MOVE RIGHT	⊐ Your proof.
‖	ALIGN TYPE	‖ ⊏ Three dogs. Two horses.
=	STRAIGHTEN LINE	= Your proof.
⊙	INSERT PERIOD	⊙ Your proof
,/	INSERT COMMA	,/ Your proof
:/	INSERT COLON	:/ Your proof
;/	INSERT SEMICOLON	;/ Your proof
'	INSERT APOSTROPHE	' Your mans proof.
" "	INSERT QUOTATION MARKS	" " Marked it proof
=/	INSERT HYPHEN	=/ A proofmark.
!	INSERT EXCLAMATION MARK	! Prove it
?	INSERT QUESTION MARK	? Is it right
(?)	QUERY FOR AUTHOR	(?) was Your proof read by
[/]	INSERT BRACKETS	[/] The Smith girl
(/)	INSERT PARENTHESES	(/) Your proof 1
1/m	INSERT 1-EM DASH	1/m Your proof.
□	INDENT 1 EM	□ Your proof
□□	INDENT 2 EMS	□□ Your proof.
□□□	INDENT 3 EMS	□□□ Your proof.

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International Space Station Life Science Research

Executive Committee of the Space Medicine Association

Executive Committee, Space Medicine Association. ***International Space Station life sciences research funding.*** **Aviat Space Environ Med 2008; 79:1–3.**

THE INTERNATIONAL Space Station (ISS) is scheduled for completion by 2011, bringing to reality an amazing and unparalleled capability for the unique science and technology development that can be accomplished only in space. The International Partners have contributed heavily to the construction and eventual research utilization of the ISS. The ISS concept was developed to become a laboratory for scientific research, especially life science research focused on the physiological effects of long-duration spaceflight. The ISS therefore supports the U.S. national goal to accomplish the "Vision for Space Exploration," including a lunar base and a human expedition to Mars. The ISS legacy is ultimately to enable human exploration of other planets.

The early years of space exploration gave us confidence that men and women could live in space, and the hope that they could someday bridge the gulf between Earth and other planets. Those achievements and the steady progress of work on Skylab, Shuttle, and Mir have revealed how the risks of the space environment (radiation, cold, isolation, and distance) and the weakening effects of gravity's absence (loss of blood and muscle strength, weakening of the heart, and bone loss) might be overcome. But a full understanding of the mechanisms and the mitigation of those risks has yet to be completely developed.

Several panels of outside investigators and experts, including the Institute of Medicine, have analyzed the mission-threatening risks to humans on exploration missions. Their analysis has revealed four critical areas in which life science research is needed to enable future long-duration spaceflights to be successful:

1. Protection from and treatment for the effects of extremely high levels of radiation that are encountered outside of low Earth orbit.
2. Countermeasures to prevent the de-conditioning of bone, muscle, and cardiac function.
3. A complete understanding of the psychological issues associated with long-term isolation that would be experienced by a crew in a small spacecraft on an 18-mo mission to Mars.
4. Development of greater capability for medical and surgical care onboard the spacecraft as the remoteness of long duration missions will require more independent function with no ability to perform a medical evacuation.

Our understanding of these areas is still incomplete, and the only platform where the effects can be studied in long-term weightlessness is on board the ISS. Much of this research may have application on Earth as well, such as in the treatment of osteoporosis and in providing medical care to remote rural areas.

Understanding the human response to spaceflight requires two things. The first is long-duration spaceflight, as we need months of exposure to the weightlessness in space to observe and to understand how to neutralize the physiological effects of spaceflight. The second critical element is a laboratory with room for a number of human investigators who will use dedicated equipment to perform life science experiments. ISS can provide both if the funding for science and technology is also provided.

It is critically important that this research be funded and performed at this time, as the ISS will be complete in 2011 and after several years may no longer be available, due to its limited design lifetime. NASA's Constellation Program is planning longer-duration and more remote spaceflight missions beginning as early as 2018. These missions will entail long stays on the lunar surface (lunar base) and eventually future exploration missions (Mars expedition). Therefore, a time window exists to perform meaningful life science research on board the ISS, but this window may start to close in 10 yr.

NASA's recent decision to cut funding to most of the research that had been planned for the U.S. portion of the ISS may lead to a "shortfall in station utilization" that will leave 50% of the U.S. part of the ISS laboratory empty. The U.S. Congress has designated the American segment of the ISS a National Laboratory, which will allow its use for commercial and academic research without any access fees. The hope is that the National Institutes of Health, the Department of Defense, or private

This Policy Statement was adopted by the Aerospace Medical Association as prepared by the Executive Committee of the Space Medicine Association. Members of the SMA Executive Committee are: Mark R. Campbell, Chair; Eugenia A. Bopp, Vernon McDonald, John B. Charles, Michael R. Chandler, Alyson Calder, Douglas Hamilton, Jan Stepanek, James D. Polk, Scott E. Parazynski, Dwight Holland, Smith L. Johnston, Jon Clark, and Arthur Arnold.

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research entities (commercial or academic) will fund the hardware, launch costs, and on-going operation of research projects that will utilize the ISS. This approach will not insure the attention to specific areas of concern for humans in space that can be answered only with the reinstatement of funding. The first priority of the spaceflight mission of the nation and NASA should be to support the life science research that will enable exploration missions, and commercial research should be a secondary objective. If these entities do not utilize the ISS, then it could spend much of its operational life empty and not being used to support the science that it was designed to support. We also strongly support similar or tandem action by the other International Partners to maximize life science research funding on board the ISS during this critical time period.

The Aerospace Medical Association strongly recommends that adequate funds for life sciences research planned for the International Space Station be fully restored as rapidly as possible and ensured by all of the participating international partners. The Vision for Space Exploration requires that we protect the valuable national assets that will be invested in the journey to other planets; our astronauts. We believe that only a narrow window is available to perform this research before access to the ISS is lost, and this time deadline elevates this issue to a crisis situation.

The protection of astronaut health through applied research in space medicine will be the critical key to success of the Vision for Space Exploration and this research requires resources and capabilities that only the ISS provides.