

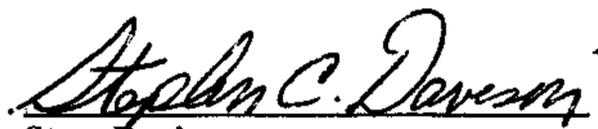
National Aeronautics and Space Administration

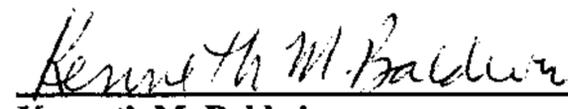
Office of Life and Microgravity Sciences and Applications

**LIFE AND MICROGRAVITY SCIENCES AND
APPLICATIONS ADVISORY COMMITTEE**

October 19-20, 2000
NASA Headquarters
Washington, DC

MEETING REPORT


Steve Davison
Executive Secretary


Kenneth M. Baldwin
Chair

**LIFE AND MICROGRAVITY SCIENCES AND APPLICATIONS ADVISORY COMMITTEE
NASA Headquarters, Washington, DC
October 19-20, 2000**

**Meeting Minutes
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**LIFE AND MICROGRAVITY SCIENCES AND APPLICATIONS ADVISORY COMMITTEE
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Thursday, October 19

Welcome and Introductions

Dr. Kenneth Baldwin, Chair of the Life and Microgravity Sciences and Applications Advisory Committee (LMSAAC), called the meeting to order and welcomed the members and attendees. The LMSAAC noted the recent retirement of Dr. Joan Vernikos. The Committee formally expressed its appreciation for the major contributions of Dr. Vernikos in furthering the NASA life and microgravity sciences mission, as a premier scientist who has created important new knowledge, and as an outstanding administrator, leader, and facilitator of scientists and scientific endeavors. Dr. Vernikos' career has been marked by unique and invaluable services to NASA.

Status of Code U Reorganization, Research Plans, and Advisory Committees

Dr. Kathie Olsen discussed the status of the Code U reorganization. She emphasized the importance of strong advisory committees—strong committees make strong programs—and thanked the members for their contributions. The structure of an organization is only as good as the people selected to lead it; there will be a number of opportunities for people to come to Headquarters to serve in the new Enterprise, and she asked for the advisory committee's assistance in this endeavor. Dr. Baruch Blumberg is coming to NASA Headquarters to serve as the Senior Advisor to Mr. Goldin as well as the Director of the Astrobiology Institute. He will provide guidance for the new Enterprise and assure that it is successful in building bridges to the community and convincing OMB and Congress of the importance of an integrated Enterprise in biological and physical sciences. Dr. Olsen briefly reviewed the new structure, which reflects the Administrator's vision of biology at NASA—an interdisciplinary program focused on biology, bringing together physics, chemistry, biology, and engineering. The Office of Biological and Physical Research (OBPR) will have five divisions: Physical Sciences; Fundamental Space Biology; Biomedical and Human Support Research; Research Integration; and Policy and Program Integration. These divisions will not be "stove pipes", but will be integrated and programs will have linkages across organizational lines. Dr. Olsen described the program elements in each of the divisions. The Division of Physical Sciences includes fundamental microgravity research, biomolecular physics, and biotechnology and Earth-based applications. The Division of Fundamental Space Biology will encompass space genomics and cellular function, adaptation and response to space, and the space biology of complex systems. The Division of Biomedical and Human Support Research encompasses space biomedical research, management of the National Space Biomedical Research Institute (NSBRI), space medicine research, spacecraft habitability, environmental health, and space systems technology. This Division is not responsible for the delivery of medical care or certification of crew health.

Dr. Swain discussed the question of research—the Office of Space Flight (OSF) is responsible for the health and safety of the crew. The research that leads up to those recommendations is the responsibility of Code U. It is essential to have an integrated plan—from basic science all the way through to clinical trials. Clinical research is an important part of what NASA does and needs to be overseen by people with the skills and training for that research. It is then presented as a tool to be used by those people responsible for clinical care. All research will now be the responsibility of Code U. Previously, the oversight for clinical trials was in Code M. Clinical research projects will come under the oversight of Code U and will be integrated with other projects. Code U will work very closely with Code M. The new Office of the Chief Medical Officer (Code AM) will provide overarching policy. What is critical is to have the right people in the leadership positions and effective communications.

The commercial activity planning and the commercial programs are presently included in the Division of Space Research Integration. One idea is to give commercial outreach more attention by moving it under the Deputy Associate Administrator (AA). Ms. Porter noted that the Commercialization Advisory Subcommittee (CAS) is recommending that the commercial activities be encased in a separate division.

The Commercial Space Centers (CSC's) are industry driven; they are not research driven. These programs need more emphasis and understanding. The CAS is concerned that if commercial activities are tacked on as a staff office to the Deputy AA, they may not get the appropriate attention. Dr. Olsen indicated that there need to be mechanisms that link the commercial research with the research in the other Divisions. Dr. Faeth agreed that commercial programs need to be raised in visibility, and that NASA should seriously consider creating a Division of Commercial Programs.

Dr. Baldwin noted that there is a lot of uncertainty on how the Non-Governmental Organization (NGO) will interface with the Division of Research Integration. Dr. Olsen indicated that in her view, the role of the Federal government is to set the science and research policy; part of that role is determining priorities on science, selection of science, and oversight of the science. She sees the NGO as being managed in Code U; the NGO could be advantageous in the optimization of the research (after selection). Another issue should be how to restructure and enhance the Centers to be more effective and timely. Dr. Coriell added that the Microgravity Research Advisory Subcommittee (MRAS) felt very strongly that the selection of research should not go to the NGO. The roles and responsibilities among Code AM, Code U and Code M relating to the AMOHAS and its areas of focus have not yet been settled. Dr. Olsen noted that the new leadership will be fine-tuning the organization and the advisory committee structure and membership. The LMSAAC needs to help with that. With respect to personnel, the Enterprise leadership will be provided by a combination of permanent civil service and rotational positions (IPA and federal detailees).

Dr. Guy Fogleman noted that there was an augmentation request last year for Bioastronautics. There were additional budget requests to support the Critical Path Roadmap developed by JSC. There is a detailed plan on the resources needed to address the critical questions, and there has been approval from Congress to go forward with a part of that (about one-third). The Division will continue to pursue resources to carry out the plan. Because not all of the resources are available, the tasks in the plan will be prioritized and the delivery schedule will be revised.

Dr. Eugene Trinh indicated that there has been substantial redirection of the microgravity program. Areas applicable to exploration research have been identified. In the area of expansion, this is a good time for physical science expansion to support biomolecular system research. The Division is looking for ways for physical science to link to nanotechnology, which is oriented toward crew health for exploration. Technology for robotic exploration and supporting astrobiology objectives are other areas of focus. The Division is looking at application of biomolecular systems to the Astrobiology Institute at ARC. Initially, the microgravity program was oriented about 90% toward acquiring basic knowledge; the Division is trying to get to a balance of 50% goal-oriented research and 50% basic research.

Dr. David Liskowsky talked about the growth for Fundamental Space Biology. The Program provides a continuum of research from cell systems to more complex systems. The reorganization fits in well with where the Fundamental Biology Program was trying to go, and will help it fill out the full continuum of research. Another key element is the need for better interactions and integration across the new Enterprise and across the Agency. The new Division will help facilitate these interactions.

Dr. Gerard Faeth noted that there is a strong biological focus in Code U; however, the Astrobiology Program is in another Code. Dr. Faeth encouraged NASA to look at a merger of that activity. Dr. Liskowsky indicated that the issue of the location of Astrobiology was discussed extensively. There were concerns related to the implementation of that program. One of the concerns was about decoupling the Astrobiology Program from space platforms being developed by Code S. The Agency did not want to perturb the use of the Astrobiology Institute in the Space Science work. The work that Code U does can be used in other organizations. The new Enterprise should enhance interactions that have not occurred in the past. Dr. Baldwin noted that image and perception is critical with respect to the biological initiative. There is a lot of skepticism in the community. A significant change in where biology fits in the grand scheme (e.g., by consolidating programs) would help the perception. He noted that the NASA-NIH and LSAS were also concerned about the Astrobiology Program remaining in another Code.

With respect to the budget, Ms. Kathryn Havens presented the "worst case" scenario. The Appropriations Conference report was \$316.9 million (above the request of \$302 million). There will be a \$7 million

transfer to Code S and a contribution of \$3.3 million toward the general reduction for the Agency. This leaves Code U with \$306.6 million. There are a total of \$33.5 million in earmarks, bringing the total for Code U programs to \$273.1 million. This leaves Code U with a shortfall of about \$22 million. The Agency has a larger number of earmarks (without funding) than ever before. Ms. Havens reviewed the earmarks. Potential solutions to fund the earmarks include (in order of priority): a 10% reduction to all existing grants to the university community; a 50% reduction to all planned FY 01 new PI investigations; reducing the budget for the NSBRI participation in the Bioastronautics initiative; and reducing the budget for ground research supporting facilities. Ms. Havens reviewed the reporting obligations that are in the FY 01 Space Appropriations language.

Access to Space—STS 107 and R2 missions

Mr. Roger Zwierko provided an update on the STS-107 and the R2 missions. STS-107 is an extended duration mission (13-16 days) with a scheduled launch of June 14, 2001. Dual shift mission operations are planned. This will be the first flight of the Spacehab Research Double Module. The OBPR total current baseline is about 5600 lbs. The crew has been named except for the pilot and the commander, and crew training activities have begun. There are a couple of outstanding issues/concerns on the mission—cabling/wiring problems and a potential launch slip to the September or later timeframe. OBPR has a liability in cost for the launch slip. Triana has been de-manifested and replaced by Fast Reaction Experiment Enabling Science, Technology Applications & Research (FREESTAR)—a collection of six experiments, two of which are Code U. The Spacehab module is multidisciplinary research consisting of 38 payloads comprising 59 experiments. It includes a risk mitigation payload for the International Space Station (ISS). Mr. Zwierko showed the final payload manifest. The middeck area is very limited in terms of resources.

The R2 mission is currently scheduled for the April 2002 timeframe. In terms of parameters, it will be a clone of the STS-107 mission. It is about 88% NASA. The mission is capped at \$50 million. Initial candidate payload lists have been developed by the discipline divisions. An analytical integration effort has been funded and is underway at SHI/Boeing. This will allow the discipline divisions to define a prioritized candidate payload complement prior to the normal Mission Complement Analysis activity. Triana is currently considered as the primary unpressurized payload in the Orbiter bay. R2 is the last Shuttle sortie research mission being planned.

Science Talk: Fundamental Physics

Dr. Nicholas Bigelow gave a lunch-time science talk on fundamental physics, including some interesting work in laser cooled atomic physics. Studies of interest involve relatively small molecular velocities so that molecular interactions are affected by gravity; therefore, offering a new and fundamentally different space-time coordinate for physics.

NRC: Space Studies Board (SSB) Update

Dr. Joe Alexander briefed the Committee on recent SSB activities. New reports include: “Microgravity Research in Support of Human Exploration and Development of Space and Planetary Bodies,” and “Review of NASA’s Biomedical Research Program.” Ongoing studies of interest to the Committee include: a study on certification and curation of Martian samples, a report on the April 2000 Workshop on Life-Detection Techniques, and a study just beginning on the availability of usefulness of data from NASA’s science missions (report to be delivered around the end of 2001 or early 2002). There are several studies under consideration: an integrated strategy for microgravity research; life and microgravity research on the ISS, and robotic studies of Mars in support of human exploration missions. Dr. Alexander noted that the board will be hearing about the reorganization from Dr. Swain. Dr. Swain noted the OBPR needs the NRC report on utilization of ISS.

ISS Non-Governmental Organization Status

Mr. Mark Uhran distributed a copy of the report to the Administrator to the Committee members and discussed the status of the NGO. This has been a slow and deliberate activity. There is a tremendous amount of stakeholder participation and momentum is building. He reviewed the background for consideration of a NGO. Three objectives for a NGO were developed and agreed to in March 2000: (1) to facilitate the pursuit of flight research and make the complex operating environment associated with ISS

transparent to the end user; (2) to reduce the end-to-end cycle time associated with the announcement, selection, development, flight, and achievement of results for research and development on the ISS; and (3) to increase the long-range productivity of research and development by effectively integrating academic, government, and industry use of the ISS. It is not the intent to have the NGO “manage” the research. The actual research program will proceed under NASA direction.

Mr. Uhran reviewed the actions completed in FY 00—two external studies, an internal study plan for detailed definition of a NGO concept, and a parallel ISS Operations Architecture Study. If the action proceeds with a NGO, it will be through a competitively procured, direct contract. There are several actions planned for FY 2001. Three study products, started under the NASA internal study the previous year, are planned for completion this fall: a workbook on total functionality associated with research and utilization of the ISS at the WBS/SOW level of detail; recommendations from each of the nine affected NASA organizations on which functions to transition to a NGO; and a statement on the current projected costs associated with the functions of ISS utilization and research program management. The cost of the total functionality, as currently performed, is about \$500 million per year. No changes to the current baseline are anticipated until all of these are fully defined and understood by all affected parties. Following completion of the internal study, NASA senior management will make a firm go/no go decision on the potential procurement of a NGO. In the event of a “go” decision, an acquisition strategy meeting will be conducted (targeted for January 2001). The earliest schedule would be a draft RFP in early CY 2001 and a final RFP in the summer of CY 2001 for an award in the fall. International partners will not be put on the critical path, but NASA has agreed that it will not take action without discussion with the International Partners. NASA is keeping them advised of progress. The NGO must be upward compatible with a global scale of operations.

The Authorizations Conference Report specifically directs the Administrator to enter into an agreement with a NGO and to submit an implementation plan by September 2001. On the Appropriations side, there is a provision (under consideration) that NASA may not expend any funds on an NGO prior to December 2001. With respect to the ground infrastructure, NASA has a \$600 million investment in payload integration. In the coming years, NASA must make decisions on how much is necessary to upgrade the infrastructure. The evolution is in the direction of distributed remote facilities. In response to a question, Mr. Uhran reviewed the history of the Space Station utilization budget. The budget has been kept consistent with the ISS schedule. Since the U.S. Laboratory will be going up next spring, it is time to change that paradigm. The LMSAAC felt that the budget authority should be transferred to Code U. In response to a request, Mr. Uhran indicated that the ISS Operations Architecture Study report will be sent to the LMSAAC members as soon as it goes to Congress. The general Operations and Maintenance (O&M) for the ISS will continue to be a contracted activity reporting to NASA. Dr. Baldwin noted that at the Subcommittee level, there was a debate concerning whether the NGO would have a research mission associated with it. Mr. Uhran indicated that there would be some limited research capacity in-house. However, limits would be put on that type of research (similar to the Space Telescope Institute model).

Radiation Health and Safety

Dr. Swain noted that the radiation problems in space are from solar particle events and from galactic cosmic rays. This is the single most important problem to solve before we go out of low Earth orbit (LEO). It is the showstopper in the critical path to human exploration. It is even a problem in LEO at polar inclinations, higher altitudes, and in the South Atlantic anomaly. On the Mars mission, it is estimated that under present technology, every cell in the body would be traversed by a high energy particle (DNA damage potentially leading to cancer, genomic cell instability, etc.). There are three solutions: operational (get there faster); shielding (high density hydrogen); and changing people. Ethically, there are three things that can be done regarding the latter: screen for sensitivity; gene therapy or genetic manipulation; or pharmacological (pre- or post-treatment). A major effort will be launched in the radiation area in the next few months and a radiation roadmap is needed. A group has been formed to look both at materials (shielding) and a biological solution. Dr. Swain invited LMSAAC participation or nominations for people who could participate.

The NRC has stated that there should be radiation countermeasure research components at NSBRI as well as a separate NASA Research Announcement (NRA). NASA is developing a plan to go to Brookhaven

and Loma Linda to evaluate how the radiation money is being spent at those facilities, and how to get better products out of both. The Administrator has directed that there be an initial plan on what needs to be done to get ready. Space radiation is a national problem that should be administered by NASA Headquarters. The most revolutionary shielding concept would be to design spacecraft with humans in mind. Dr. Swain noted that she is the point of contact for any input. The LMSAAC requested an update on the radiation activity at its next meeting in February.

OLMSA Performance Against FY 2000 Targets

Mr. Chris Flaherty noted that the FY 2002 targets are being updated and revised to include inputs from the LMSAAC. Scores on the FY 2000 targets will be presented by the LMSAAC Chair to the NASA Advisory Council (NAC). OLMSA has rewritten its Strategic Plan in order to meet Code Z's requirements to fit into the Strategic Plan for the Agency. In February, the LMSAAC will see the proposed process for the Committee to participate in the development of the next Strategic Plan.

Dr. Walter Hill discussed the results of the Life Sciences Advisory Subcommittee (LSAS) scoring of the life sciences performance metrics. There were six targets; the LSAS rated all of the targets "green." Mr. Flaherty noted that the Principal Investigator (PI) count is preliminary at this point (fiscal year closeout count is still in process), but it is expected to meet the target. The tallies will be finalized before reporting to OMB.

Dr. Sam Coriell reported on the MRAS scoring of the microgravity sciences targets. There were three targets: one was scored green; one was scored blue; one was scored red. One of the microgravity rocket experiments (combustion) was postponed and one (fluid physics) failed to return data due to a hardware problem. The LMSAAC discussed the specifics of this target. It is not clear whether the failed experiment will be reflown. The Committee felt that there were circumstances beyond the control of the Division and voted to score this target a yellow rather than red. The Committee vote was: seven for yellow; two for red; one abstention.

Ms. Elsa Porter reported on the CAS scoring of space product development. There were three targets: two of the targets were transferred to Code UL, but they were accomplished (green). The real accomplishment out of the first target was the development of a new process for selecting CSCs, which is much more robust. The third target (utilization of 30% of the Space Shuttle capabilities) was achieved and was scored "green."

Subcommittee Reports

Space Station Utilization Advisory Subcommittee (SSUAS)

Dr. David Larson gave the report for the SSUAS. He reviewed the seven recommendations from the Summer Workshop:

1. Research Vision—NASA should improve its grants management service in stability and magnitude of funding, firm commitment to timelines, and improving relationships with the grants management offices.
2. Crew Training as a Limiting Resource—The Payloads Office should work with other elements of the ISS program and payload developers and investigators to better understand and define realistic and detailed requirements for crew training. This is a real problem.
3. Payload Integration—NASA should develop a requirements/documentation benchmark for hardware development and integration; an interim outline should be provided in 90 days.
4. External Sites—The ISS Payloads Office should report on the ramifications of accelerating the launch of the external payloads.
5. Integrated Testing for External Payloads—The external payloads should be subjected to end-to-end testing to the greatest extent possible. This has high relevance.
6. MELFI/Cryo Resource—Evaluate a smaller transfer system; reevaluate the size and mass of cryopreserved samples; continue studies on concepts that could relieve this constraint.
7. Flight Experiment Upgrades—Clarify the mechanism that would allow update or incorporation of changes to experimental plans within the scope of the original investigation, but without impacting the length of the flight authorization process or compromising the enabling peer review. There should be a policy in place to deal with positive results.

In addition, there were a series of action items for the next meeting: a briefing on the peer review and selection process; an update on internal environments; a status report on the CRV and alternatives; a briefing on the methodology for telecommunication of data; and an update on “Dreamtime.” The next Workshop will focus on telecommunications.

The LMSAAC decided to adopt three of these recommendations—Crew Training, Internal Testing for External Payloads, and Flight Experiment Upgrades—to carry forward as LMSAAC recommendations to the OBPR AA.

NASA/NIH Advisory Subcommittee and LSAS

Dr. Hill gave the report of the joint meeting of NASA/NIH Advisory Subcommittee and LSAS.

1. NSBRI—No decision regarding expansion of the NSBRI responsibilities should be made until completion of the 3-year review; options for management should consider the need to maximize the opportunity for fair competition for funding.
2. NGO—There were 8 specific recommendations on the NGO; the key recommendations were that the NGO selection should be the responsibility of NASA HQ and not the field centers, and HQ should maintain a vigilant oversight over the NGO; NGO should not determine the research carried out; research selection should be maintained at NASA HQ via peer review process; the NGO should be phased in during assembly and should include design elements that preclude loss of field Center expertise and experience.

Dr. Coriell noted that the MRAS also was not in favor of the NGO reporting to a field Center; it felt that the NGO should report to NASA Headquarters. The NGO is different from the Space Telescope Science Institute (STScI), and caution should be used in applying the STScI model because it is not completely transferable to the NGO. The user community for STScI is more focused. The NGO is multi-discipline; it will be complex; multiple centers are involved. This recommendation was carried forward by the LMSAAC to the AA.

3. NRA Policy—NASA should reconsider the NRA policy to permit research firms to include a fee in their research proposals and to compete with academic and non-profit organizations to conduct necessary research, in particular, to provide specific answers to critical human factors and human performance questions. The LMSAAC agreed to take this forward to the AA; if this is a valid problem, it should go forward to the NAC.
4. Medical Operations/Health Care—NASA should establish a mechanism for integrating flight crew health maintenance and biomedical research; the LSAS requested a report during the next 12 months. The LMSAAC felt that this should be reported at the next meeting.
5. OBPR—There were seven specific recommendations relating to the new Enterprise; the LMSAAC modified the language regarding the transfer of biological programs to Fundamental Space Biology Division and deleted the sixth recommendation. The LMSAAC felt that the recommendations on OBPR should go forward to the AA. The CAS also recommended that OBPR consider a Division for Commercial Programs. This was endorsed by LMSAAC and included in the LMSAAC recommendations.
6. Education—OBPR should enhance the current education and public outreach program.
7. NASA/NIH collaboration—Interactions with NIH and other Federal agencies should be increased.

CAS

Dr. Porter reported on the CAS meeting. As noted earlier, the CAS recommended that the commercial activities, including CSC management and the NGO interfaces, be organized as a separate division of the OBPR, on a par with the other Divisions. The CAS believes that it is important to raise both the visibility of the commercial centers and the understanding of their unique function in securing industry involvement and support. Also, the management of commercial activities requires competencies quite different from the needed for management scientific research. With respect to the ISS, the CAS continues to support the development of a NGO to manage ISS utilization and commercial development. Ms. Porter reported on two important management tools that have been developed for management of the Commercial Program: the principles governing the Space Product Development (SPD) Program in general and the CSCs in particular, and a set of metrics to evaluate commercial product development activities. After a briefing from SPD staff, the CAS recommended moving forward with the formal review process to consider robotics.

MRAS

Dr. Coriell reported on the MRAS meeting. The MRAS discussed the organization and the discipline working groups under the new organization. There were reports on the NGO. The MRAS felt that the NGO should not report to a field Center, but did not prepare a formal recommendation. There was brief discussion of an upcoming NRA.

Education and Outreach

Ms. Havens discussed how to integrate education and outreach in the new Enterprise. OBPR was considering adding a requirement to NRAs regarding the training of undergraduates and graduate students, and that awardees include participation in at least one outreach activity from two categories. The two categories are: (1) K-12 education outreach; and (2) general public outreach. Language was prepared to go into NRAs as an additional element that would be considered in selecting proposals. Some of the disciplines were against this approach. She met with Code S and Code Y representatives to gain an understanding of how they handle education and outreach. Code S proposers are encouraged to include an Education/Public Outreach (EPO) component in the research proposals (much like what OBPR was trying to do). Code Y ties the education and outreach efforts to the mission. Up to 1-2% of the mission budget is embedded in the education program. Code Y has large missions, much like Code S. Education issues its own NRA. The OBPR talked with these Codes about what would be appropriate for Code U, and they suggested that OBPR not go through the NRA process—this would get the least “bang” for the buck. The revised Code U option is to go out with a Cooperative Agreement Notice (CAN) for an external organization that has specific expertise in how to structure an EPO program for a research organization. This entity would conduct a workshop and help develop some strategies for implementation. The Code U program would be developed based upon outcomes from the workshop. The goal is to initiate an Enterprise EPO program for a mixed discipline research organization that will be responsive to public need and produce measurable results. There is a need to get a person into OBPR, external to NASA, to help work on the development of the program. Ms. Haven invited LMSAAC comments on the proposed approach.

Dr. Hill felt that this was a good concept; in addition, PI's should be encouraged to support EPO in their proposals. A mixed portfolio would be a good idea. Dr. Baldwin agreed with Dr. Swain and Dr. Olsen that OBPR needs a senior science education/public outreach individual that can work across the Divisions. Dr. Bula identified two problems—many of the science teachers at the junior and high school level are inadequately trained to teach modern science, and science teachers often have a very low budget for science projects. He suggested that OBPR look at how to upgrade the capabilities of teachers. Dr. Baldwin suggested that OBPR needs to get someone who has the appropriate training and capability to meet the E/PO needs in the organization. The professional societies all have an education and outreach mechanism and OBPR should interact with these societies to learn more about their models. Dr. Swain noted that the priority should be to hire an education specialist who could direct the activity within the Enterprise.

The LMSAAC decided to defer discussion of advisory committee structure to the next meeting, after the new Enterprise is better defined and fine-tuned.

Review of Action Items and Recommendations from Last Meeting

Dr. Davison reviewed the action items from the last meeting: a luncheon presentation by Dr. Bigelow, a radiation briefing, a presentation on the work of some of the CSC's, and the status of the NGO. All of these were addressed at this meeting. The LMSAAC requested another briefing on the radiation issue at the next meeting. Dr. Baldwin noted that he had written a letter to *Science* regarding the article that had appeared in the magazine. The critical roadmap will be discussed at the next meeting.

There were two recommendations last time that went to the NAC—the personnel voids and the documentation and process flow for ISS payloads. The recommendation on dedicated mission themes is being worked by Ms. Bonnie Dalton. NASA is working on having themes for the increments. As the Station matures, the increment payloads will become more stable. STS-107 and R2 will be multidisciplinary research missions. With respect to the NGO, Dr. Olsen is in favor of maintaining the selection of research at HQ. With respect to NSBRI, the first recommendation is still open. There will be

a review of the NSBRI in November and the LMSAAC will get a report at the next meeting. The issue of HQ oversight is tied in with the review. The radiation recommendation is still open (a briefing is scheduled at the next LMSAAC meeting). With respect to the Human Research Facility, a smaller group is being established; this recommendation is still open. The name change issue on the NASA/JSC IRB still needs to be worked with the policy office. Formalizing the governing documents is still in work; this recommendation is still open.

Dr. Baldwin stated that the action items and recommendations need to be covered at the beginning of each LMSAAC meeting. The Committee members need information packets on these items at least one week before the meeting.

Status of ISS Program

Mr. Michael Hawes discussed the status of the ISS Program. There has been a lot of positive news, but there are still some issues that are being worked. The first four elements are on orbit and performing well. The U.S. hardware development is 90% complete and 2/3 of all of the U.S. built hardware will be at KSC by the end of the year. The Program is moving forward with the contingency plans for propulsion/reboost capability. The U.S. Lab is still headed toward a January launch date. Mr. Hawes discussed the upcoming milestones in the assembly sequence. The Expedition 1 crew going up on October 31 will stay 104 days. Three person crews will rotate about every 90 days. The year ahead will be extremely busy. There are about 14 flights between now and next summer. The Program has tried to maintain delivery of the payload racks as the assembly sequence slipped. The Human Research Facility (HRF) and the first two EXPRESS racks are at KSC. There is a continuing issue of getting middeck lockers for payloads. Any changes to the minimum middeck locker allocation will now have to come to Mr. Holloway. The next year is very tight in terms of reserves, but the Program is still managing within it. The Crew Return Vehicle (CRV) plan will begin in January 2001; the Program has been going through an SEB process to select two or three contractors. The idea is to downselect to a single production contractor in 2002. The plan is to have a CRV in 2005. The overall budget is about \$1.2 billion; 2003 will probably be the peak budget year.

Mr. Uhran delivered the details on the outfitting of the research facility. It included the utilization sequence (outfitting plan) for ISS research based on the Rev F assembly sequence. The objective is to outfit the first ten racks in the U.S. Lab. The document contained a list of experiments manifested on increments 0-3. A lengthier package included a one-page synopsis on the first 30 or 40 experiments.

Update on Alpha Magnetic Spectrometer (AMS)

Dr. Trinh provided a status report on the AMS. The AMS is a basic research, high energy physics experiment. It is an inter-agency and international investigation using the Shuttle and ISS. AMS is a DOE peer-reviewed investigation. NASA has provided one Shuttle flight opportunity and is planning to provide access to and a 3-year residence on an external site on the ISS. The scientific goals of the AMS are to determine the existence or absence of antimatter in the universe, study dark matter, and study the origin and composition of cosmic rays. In 1998, NASA flew AMS-01 on the Shuttle. All of its science objectives were achieved—functional verification in a space environment, measurement of the natural particle environment, and preliminary scientific measurements. It also demonstrated the technical competence of the international team.

Mr. Mark Sistilli, Program Manager for the AMS discussed the next version of AMS (on ISS), which will implement a different kind of magnet. The AMS will launch on UF-4 (September 2003) and be placed on the S3 zenith site. The integration effort is being led by NASA. There were several major potential on-orbit concerns: whether the ISS S3 truss site could structurally accommodate the AMS; whether the ISS avionics or other neighboring attached payloads would be compatible with the AMS magnetic field; whether the ISS S3 truss site could accommodate the volume; whether the AMS mass volume would be compatible with Shuttle UF-4 weight planning; and whether the helium-filled dewar charge could last 3 years. Subsequent analysis has demonstrated that the mass issue is unlikely to be problem. With respect to the magnetic field and volume, these are still open issues. The issues related to Shuttle weight planning and the helium-filled dewar charge have been resolved. The schedule for a 2003 flight is aggressive. The LMSAAC was interested in the development of this project and requested an update on the milestones at the next meeting.

Commercial Space Center Overview

Dr. Al Sacco discussed the Center for Advanced Microgravity Materials Processing (CAMMP). Its mission is to develop industrial interest in microgravity, produce products from microgravity, and improve or enhance materials and the processing on Earth. The specific objectives are to develop a knowledge base to allow US industry to make informed decisions, target “leap-frog” products, develop an infrastructure friendly to commercial development, and promote technologies of use to the HEDS program. CAMMP is involved in the US chemical industry technology vision in the area of materials technology. The scientific rationale for growing materials in space is diffusion limited growth, minimization of secondary nucleation effects, and elimination of sedimentation. CAMMP has developed a nucleation and growth data base, from which there are several technology product areas. There is also an educational component. The fundamental needs are in the areas of speciation chemistry/thermodynamics, nucleation/crystallization kinetics, and fluid physics modeling. Dr. Sacco showed the list of the full members, associate members, and general members. Last year, total NASA funding was \$1.33 million; industrial funding was \$1.84 million; other funding was about \$500,000. The ratio of total dollars to NASA cash is 2 to 1. Dr. Sacco discussed two of the products/projects—nano-crystals (DuPont) and ceramic capacitors (Allied Signal/United Technologies), and highlighted the CAMMP accomplishments in FY 00. He noted several space commercialization challenges: consistent commercial policy, launch costs, consistent funding, space insurance, and international cooperation. Intellectual property is a continuing issue and a big challenge. In response to a question, Dr. Sacco noted that CAMMP will probably fly only about 20% of the products it works on. The LMSAAC was impressed with the very comprehensive presentation.

Discussion of Recommendations

The LMSAAC developed and discussed recommendations on the following topics:

1. The life and microgravity sciences budget
2. The NSBRI
3. The NGO
4. Crew training as a limiting resource
5. Integrated testing for external payloads
6. Flight experiment upgrades
7. NRA policy
8. Medical operations and health care
9. The new OBPR organization
10. Commercial activities in OBPR
11. Education
12. NASA/NIH collaboration
13. Radiation health and safety

Final recommendations are included in Appendix D. The first three recommendations—the life and microgravity sciences budget, the NSBRI, and the NGO—will be carried forward to the NAC. The remaining recommendations are for the OBPR.

The LMSAAC was impressed with the presentations on the status of the ISS program, the AMS, and the Center for Advanced Microgravity Materials Processing. The Committee requested continuing status reports on the ISS and the AMS, and requested that a report from a CSC be put on the agenda at each future LMSAAC meeting. Dr. Merrell offered to brief the Committee on his CSC at the next meeting.

Dr. Baldwin volunteered to give the lunchtime science talk at the next meeting.

The LMSAAC selected dates for its meetings in 2001:

February 15-16

May 17-18 (Subcommittees will meet the day before—May 16)

October 18-19 (Subcommittees will meet the day before—October 17)

AGENDA
MEETING OF THE
LIFE AND MICROGRAVITY SCIENCES AND APPLICATIONS ADVISORY COMMITTEE
(LMSAAC)
NASA HEADQUARTERS, ROOM 3H46 (MIC-3 – WEST SIDE)

THURSDAY – October 19, 2000

| | | |
|------------|---|---|
| 10:00 A.M. | Welcome/Chair's Review of Agenda/Logistics | Dr. Baldwin |
| 10:05 A.M. | Status of Code U Reorganization, Research Plans, and Advisory Committees | Dr. Olsen/ Dr. Swain |
| | NASA Biology Initiatives | |
| | Code U Budget Status and Issues | |
| 11:50 A.M. | Access to Space: 107 and R2 | Mr. Zwierko |
| 12:00 P.M. | Working Lunch: Fundamental Physics Presentation | Dr. Bigelow |
| 1:00 P.M. | NRC: Space Studies Board Update | Dr. Alexander |
| 1:15 P.M. | ISS Non-Governmental Organization Status | Mr. Mark Uhran |
| 1:45 P.M. | Radiation Health and Safety | Dr. Swain |
| 2:15 P.M. | OLMSA Performance Against FY 2000 Targets | Mr. Flaherty/ Subcommittees |
| 3:00 P.M. | Subcommittee Reports Space Station Utilization Advisory Subcommittee (SSUAS) NASA-NIH Advisory Subcommittee (NASA-NIH) Aerospace Medicine & Occupational Health (AMOHAS) Commercial Advisory Subcommittee (CAS) Life Sciences Advisory Subcommittee (LSAS) Microgravity Research Advisory Subcommittee (MRAS) | Dr. Jessup Dr. Borer Dr. Merrell Ms. Porter Dr. Musgrave Dr. Coriell |
| 4:15 P.M. | Committee Discussion/Writing Assignments/ Preliminary Action Items | LMSAAC/ Dr. Baldwin |
| 5:00 P.M. | Adjourn | |
| 6:00 P.M. | Committee Dinner | |

AGENDA
MEETING OF THE
LIFE AND MICROGRAVITY SCIENCES AND APPLICATIONS ADVISORY COMMITTEE
(LMSAAC)
NASA HEADQUARTERS, ROOM 3H46 (MIC-3 – WEST SIDE)

FRIDAY – October 20, 2000

| | | |
|------------|---|-------------|
| 8:00 A.M. | Status of ISS Program | Mr. Hawes |
| 8:40 A.M. | Update on Alpha Magnetic Spectrometer | Dr. Trinh |
| 9:00 A.M. | Outreach and Education: New NRA Language | Ms.Havens |
| 9:20 A.M. | Commercial Space Center Overview | Dr. Sacco |
| 9:50 A.M. | Review of Recommendations and Future LMSAAC Schedule | Dr. Davison |
| 10:00 A.M. | Chair's Comments/Review of Agenda Discussion and Committee Recommendations | Dr. Baldwin |
| 12:00 P.M. | Adjourn | |

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REAPPOINTED: 1/14/98 - 12/22/99
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TERM OF APPT: 3/99 - 3/03

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**LIFE AND MICROGRAVITY SCIENCES AND APPLICATIONS ADVISORY COMMITTEE
NASA Headquarters, Washington, DC
October 19-20, 2000**

MEETING ATTENDEES

Committee Members:

| | |
|---------------------------------------|--|
| Baldwin, Kenneth (Chair) | University of California, Irvine |
| Faeth, Gerard (Vice-Chair) | University of Michigan |
| Bigelow, Nicholas | University of Rochester |
| Bula, Raymond | [not affiliated] |
| Coriell, Sam | National Institute of Standards and Technology |
| Daley, Thomas | Philadelphia Naval Business Center |
| Davison, Steven (Executive Secretary) | NASA Headquarters |
| Freeman, Colette | National Cancer Institute |
| Gross, Leroy | Intel Med, Inc. |
| Harris, Bernard | Spacehab, Inc. |
| Hill, Walter | Tuskegee University |
| McPherson, Alexander | University of California, Irvine |
| Merrell, Ronald | MCV/VCU Department of Surgery |
| Porter, Elsa | Meridian International Institute |
| Sanders, Jay | The Global Telemedicine Group |

NASA Attendees:

| | |
|----------------------|-------------------|
| Ahlf, Peter | NASA Headquarters |
| Askew, Ray | NASA/MSFC |
| Bell, G.P. | NASA Headquarters |
| Charles, John | NASA Headquarters |
| Emond, John | NASA Headquarters |
| Fogleman, Guy | NASA Headquarters |
| Havens, Kathryn | NASA Headquarters |
| Hawes, Mike | NASA Headquarters |
| Herber, Dave | NASA Headquarters |
| Kreykenbalm, Barbara | NASA Headquarters |
| Larson, David | NASA Headquarters |
| Lee, Mark | NASA Headquarters |
| Liskowsky, David | NASA Headquarters |
| Livingston, Candace | NASA Headquarters |
| Lyons, Bonnie | NASA Headquarters |
| Nall, Mark | NASA/MSFC |
| Schimmerling, Walter | NASA Headquarters |
| Schneider, Victor | NASA Headquarters |
| Shortz, Donna | NASA Headquarters |
| Sistilli, Mark | NASA Headquarters |
| Sparnon, Ray | NASA Headquarters |
| Stigberg, Ellen | NASA Headquarters |
| Tomko, David | NASA Headquarters |
| Trinh, Gene | NASA Headquarters |
| Wargo, Michael | NASA Headquarters |
| Weigel, Elsie | NASA Headquarters |
| Zwierko, R. C. | NASA Headquarters |

Other Attendees:

Alexander, Joseph
Graham, Sandra
Nordlund, Frederic
Russell, Pat
Sacco, Al
Stabekis, Perry
Stodieck, Louis
Walker, Charles

NRC/SSB
NRC/SSB
ESA
USA/ASGSB
NEU
Lockheed Martin
University of Colorado
Boeing

**LIFE AND MICROGRAVITY SCIENCES AND APPLICATIONS ADVISORY COMMITTEE
NASA Headquarters, Washington, DC
October 19-20, 2000**

LMSAAC RECOMMENDATIONS

The LMSAAC notes the recent retirement of Dr. Joan Vernikos. The Committee formally expresses its appreciation for the major contributions of Dr. Vernikos in furthering the NASA life and microgravity sciences mission, as a premier scientist who has created important new knowledge, and as an outstanding administrator, leader and facilitator of scientists and scientific endeavors. Dr. Vernikos' career has been marked by unique and invaluable services to NASA.

Life and Microgravity Science Budget (to NAC)

Finding: ISS research utilization for life and microgravity sciences was discussed during the LMSAAC meeting. Currently, the funding for ISS research is allocated by the Office of Space Flight (Code M) and administered by OBPR (Code U). This complicates the utilization and implementation of research for ISS. In addition, it limits Code U's ability to effectively manage the science activity.

Recommendation: LMSAAC recommends that NASA consider consolidating the allocation and administration of the budget/funding for ISS Research Utilization under Code U.

NSBRI (to NAC)

Finding: The LMSAAC was informed of the possibility of extending the NSBRI's research function from its current focus on assessment of high-level-of-readiness countermeasures to further include the management of fundamental research supporting countermeasure development. Since the mandatory 3-year review of NSBRI's performance is scheduled for November 29 – December 1, 2000, the LMSAAC is concerned with enlarging the NSBRI's responsibilities without feedback from the scheduled review. More importantly, the LMSAAC fears that consolidation of management responsibility for fundamental research to a single consortium may unfairly diminish opportunities for funding meritorious research by non-NSBRI connected institutions.

Recommendations:

- 1) No decision regarding expansion of NSBRI responsibilities should be made until completion, reporting, and official recognition of the 3-year NSBRI review.
- 2) NASA needs to rethink the role of the NSBRI based upon the 3-year review, input from advisory committees, and the restructuring of biomedical, biological, and physical sciences research within Code U.
- 3) Fundamental research enabling countermeasures should maximize the opportunity for fair, peer-reviewed competition for funding among all research entities.

NGO to Manage Research Utilization and Commercial Development on ISS (to NAC)

Finding: The LMSAAC appreciates the work done by the NRC's Task Group on Institutional Arrangements for Space Station Research in defining strategic options for an NGO to manage ISS operations and research utilization. However, the LMSAAC is concerned that an NGO management system may not improve upon current management strategies. Further, it is imperative that useful elements (e.g., the field Center facilities and their complementary infrastructure) must not be lost if an NGO strategy is enacted. The LMSAAC understands that, if established, the NGO will be charged solely with implementation of the flight experiments evaluated by external peer review and selected by NASA Headquarters. Finally, an NGO may require several years to become operational.

Recommendations:

The LMSAAC requests that copies of the ISS Operations Architecture Study be distributed to the Committee when released and a report on this study be made by a senior NASA official.

If an NGO is established:

- Its selection should be the responsibility of NASA HQ and not of the field centers. NASA HQ should maintain administrative control of the NGO.
- The NGO should not determine the research carried out; research selection and strategic direction should be maintained at NASA HQ via peer review process.
- It should be phased in during assembly and should include design elements that prevent or minimize loss of field Center expertise and experience.
- Its Director should have a scientific background sufficient to facilitate optimal involvement of the entire research community in ISS activities. Decisions by the Director should be coordinated with the appropriate NASA science codes.
- The NGO must facilitate communications between OBPR and ISS engineering staff to ensure optimization of research.
- It must be given the budget/authority to implement its charge.
- Its location need not be tied to any specific field Center. Sub-components may be located at appropriate field Centers.
- The NGO should have independent advisory boards and undergo periodic review by both NASA and the user community.

Crew Training as a Limiting Resource (to OBPR)

Finding: Only 500 hours of crew time will be available on each ISS increment for crew training and preflight/postflight baseline data collection for experiments. Efficient crew training is critical for optimization of research. Based on requirements provided to the Payloads Office crew training requirements exceed that available by more than a factor of three at assembly complete. Crew training requirements appear to be a limiting resource for research operations. Different experiments require different training approaches, in terms of the mix of time spent on concepts, basic skills, procedures, troubleshooting and proficiency maintenance. Training requirements should be tailored to reflect individual crewmember roles in the experiment (e.g. operator vs. subject). Onboard training may be helpful, but is not a total solution. Computer Based Training (CBT), both ground and onboard versions, may be appropriate for some experiments. There are concerns that not all PIs have cost-effective access to appropriate CBT development resources. It is not clear whether the purchase of the Russian crew research time is coupled with training time and the ability to read and speak English.

Recommendation:

The Payloads Office should work with other elements of the ISS Program and ISS payload developers and investigators to better understand and define realistic and detailed requirements for crew training. Roles and participation of Russian crewmembers should be addressed.

Integrated Testing for External Payloads (to OBPR)

Finding: Although significant end-to-end testing of pressurized payloads has occurred and is planned to continue, no integrated testing of external payloads is currently planned. This lack of payload testing applies to the S-3 truss, the COF external sites, and the JEM-EF. The value of information gained from end-to-end testing, as demonstrated by its application to the pressurized payloads, is very high.

Recommendation:

The external payloads should be subjected to end-to-end testing to the greatest extent that is possible.

Flight Experiment Upgrades (to OBPR)

Finding: Investigators have no flexibility to alter their experimental plan from that originally proposed and approved. Considerable time may lapse between selection of the investigation and the assigned flight. During this period, new knowledge can become available which could improve the originally proposed experimental plan. There are no provisions in the current system for accommodating this new knowledge. As a result, suboptimal experiments may be flown.

Recommendation:

The LMSAAC recommends that NASA expedite the mechanism that would allow update or incorporation of changes to experimental plans within the scope of the original investigation, but without impacting the length of the flight authorization process.

NRA Policy (to OBPR)

Finding: A recent change in NASA's NRA policy prevents commercial organizations (i.e., contract research firms) from including fee (i.e., profit) in proposals submitted in response to NRAs. This policy may exclude research firms from proposing studies that would provide answers to important research questions.

Recommendation:

NASA should reconsider the NRA policy to permit research firms to include a fee in their research proposals and to compete with academic and non-profit organizations to conduct necessary research.

Medical Operations/Health Care (to OBPR)

Finding: With the establishment of the Office of Biological and Physical Research (Code U), the Division of Biomedical and Human Support Research now has responsibility for space medicine research, where it manages flight crew health care delivery research, flight crew health care systems research, and space medicine research. In addition, the activities of the former Office of Health Affairs, which was responsible for Occupational Health and Health Policy, now are under the auspices of the Office of the Chief Health and Medical Officer (Code AM). The responsibility for health care delivery continues to be within the Office of Space Flight (Code M).

The Committee is concerned that issues related to flight crew health, including research, delivery, and policy, are now fragmented because they are distributed among three administrative units.

Recommendation:

The Committee recommends that NASA establish a mechanism for integrating flight crew health maintenance and biomedical research to ensure that research in human subjects is facilitated and health maintenance is optimized by application of the outcomes of biomedical research. The Committee requests a report at the next meeting.

Office of Biological and Physical Research (OBPR) Enterprise (to OBPR)

Finding: The NASA-NIH Subcommittee, LSAS, and LMSAAC were briefed on the formation of NASA's newest Enterprise, the Office of Biological and Physical Research (OBPR), which will consist of five individual, but interactive Divisions: 1) Physical Sciences; 2) Fundamental Space Biology; 3) Biomedical and Human Support Research; 4) Research Integration; and 5) Policy and Program Integration.

The Subcommittees and LMSAAC applaud NASA's vision and commitment to create a "virtual interdisciplinary program" that links biology, physics, chemistry, and engineering in order to enhance its mission in interdisciplinary research with the biological component serving as the primary focus. The Subcommittees and LMSAAC were also impressed with NASA's formation of five distinct disciplines with a primary objective of fostering close interaction across the Divisions in order to better integrate both fundamental and translational research initiatives involving ground- and flight-based research. However, in spite of NASA's vision to transform biological research within Code U, the LMSAAC is concerned that OBPR does not have currently the necessary resources (e.g., staffing and operational budgets) to achieve its newly defined goals.

Recommendations:

The LMSAAC specifically recommends the following:

- 1) New staffing initiatives required to complete OBPR implementation should be advanced as quickly as possible.
- 2) Consolidating biological science programs currently housed in other codes (e.g., Astrobiology) into the OBPR should be considered as a high priority. In addition, those programs that make up cell biology components of the Physical Sciences Division of Code U should be strongly considered for transfer to the Fundamental Biology Division. This will facilitate coordination of initiatives directly focused on those components of biology that link molecular and cell structure and function to organismal function.
- 3) The structure and composition of the Cross-Disciplinary Science and Technology Working Group requires further definition, identifying how communication and cooperation between divisions will occur.
- 4) NASA must define the relation between OBPR and other codes sponsoring projects with biological elements.
- 5) Budgets should be restructured to support new and existing initiatives in the OBPR, especially those that facilitate interaction with other codes.

Commercial Activities in OBPR (to OBPR)

Finding: The importance of space product development to the entire spectrum of R&D from basic science to applied science to economic development is not reflected in the proposed OBPR. The management of this function requires unique competencies quite different from those needed for managing scientific research. Its currently successful operation would be impaired by folding it into the proposed Division of Space Research Integration.

Recommendation:

We strongly recommend that consideration be given to creating a separate Division within OBPR for commercial activities, including CSC management and NGO interfaces to commercial activities.

Education (to OBPR)

Finding: The current education and outreach program of Code U is not fully integrated and does not utilize all opportunities for transferring core OBPR knowledge to the nation's classrooms and the general public. Optimally, this program should support science literacy and lifelong learning by enhancing public understanding of the synergistic relation among biological, physical, and biomedical space research and the benefits of human exploration of space for people on Earth.

Recommendation:

The Office of Biological and Physical Research (OBPR), in coordination with other appropriate NASA Codes, e.g., Codes P and F, should enhance the current education and public outreach programs among its Divisions, utilizing all appropriate communications media. OBPR should strongly consider hiring a senior science education specialist to coordinate the programs across the office and to initiate new education and outreach activities. The LMSAAC requests a report at its next meeting.

NASA/NIH Collaboration (to OBPR)

Finding: The Subcommittees note the progressive increase of collaborative activities of NASA and the various Institutes of the NIH. Most particularly, the Subcommittees are encouraged by the response of the academic medical community to the NIH PA "Earth-based Research Relevant to the Space Environment" since its release April 6, 2000, as judged by computer-based reviews of the RFA and by submitted applications. Available information suggests that many of the applicants are new to microgravity-oriented research; encouragement of new entrants into the field has been a goal of the joint NASA-NIH program. The Subcommittees strongly support current high quality efforts to expand joint NASA-NIH research, and request regular updates at future meetings.

The goal of the new organizational plan currently being implemented by NASA, "to bring together physics, chemistry, biology, and engineering to foster interdisciplinary research", is relevant to actions by other Federal agencies. NSF has had responsibility for fundamental scientific research including both biological and engineering research. In a broad sense, this parallels NASA's increasing responsibilities in these areas. NIH has a stated goal to encourage application of physical and chemical approaches to biological problems and efforts along these lines have been instituted.

Recommendation:

Interactions with NIH and other Federal agencies should be increased to share experiences in integrating biological and physical science into interdisciplinary research. The LMSAAC requests a report indicating efforts to enhance interactions concerning this specific issue at its next meeting.

Radiation Health and Safety (to OBPR)

Finding: The LMSAAC recognizes OBPR's commitment to aggressively advance research issues in radiation health and safety that are most relevant to the agency's "critical pathway" enterprise.

Recommendation:

The LMSAAC requests a briefing on radiation health research programs and new initiatives at the next meeting.

Status of the ISS Program (to OBPR)

Finding: The LMSAAC was impressed with progress on ISS.

Recommendation:

The Committee requests a periodic (at least annually) update.

Alpha Magnetic Spectrometer (AMS) (to OBPR)

Finding: The LMSAAC was impressed with the progress on AMS and the potential impact of this major attached payload to the ISS, which is a pathfinder program for interagency use of ISS.

Recommendation:

The Committee requests a periodic update.

Commercial Space Center (to OBPR)

Finding: The LMSAAC was impressed with the progress and the development of the Center for Advanced Microgravity Materials Processing (CAMMP)

Recommendation:

The LMSAAC would like to hear from one CSC at each future meeting.

Other Actions:

Dr. Baldwin to give a science talk at the next meeting

Dr. Merrell to give a presentation on his CSC at the next meeting.

**LIFE AND MICROGRAVITY SCIENCES AND APPLICATIONS ADVISORY COMMITTEE
NASA Headquarters, Washington, DC
October 19-20, 2000**

LIST OF PRESENTATION MATERIAL¹

- 1) Office of Biological and Physical Research (Code U) [Olsen]
- 2) LMSAAC: STS 107 and R2 (STS-112) Status Update [Zwierko]
- 3) Space Studies Board Highlights [Alexander]
- 4) NASA Life Sciences FY 2000 Performance Metrics [Hill]
- 5) Space Product Development Program [Porter]
- 6) Microgravity Research Program 2000 Performance Metrics [Coriell]
- 7) Briefing to the Life and Microgravity Sciences and Applications Committee—ISS Summary [Hawes]
- 8) The Alpha Magnetic Spectrometer Experiment [Trinh/Sistilli]
- 9) Center for Advanced Microgravity Materials Processing [Sacco]
- 10) Integration Education/Outreach (E/PO) in Code U [Havens]
- 11) FY 2001 Budget Status [Havens]

Other material distributed at the meeting:

- 1) Status Report to the Administrator: Non-Government Organization (NGO) to Manage ISS Utilization and Commercial Development
- 2) SSUAS Recommendations [Larson]
- 3) Utilization Sequence for ISS Research
- 4) ISS Early Research
- 5) Joint NASA/NIH Advisory Subcommittee on Biomedical and Behavioral Research and Life Sciences Advisory Subcommittee Findings and Recommendations

¹ Presentation and other material distributed at the meeting are on file at NASA Headquarters, Code U, Washington, DC 20546.