Response to the NSF Committee of Visitor's Report
Upper Atmosphere Research Section
Division of Atmospheric Science
Directorate of Geosciences
July 22-24, 2008

First, the Upper Atmosphere Research Section wants to thank every member of the COV for his or her hard work and thoughtful contributions to this report. We especially thank Dr. Tamas Gombosi, the COV Chair, for his skill in leading the panel and organizing the report and its findings.

UARS is genuinely delighted with the COV report. It is insightful, challenging, and constructive. We are very appreciative, indeed, of the many positive findings of the COV. Thank you for your kind words recognizing the talents and efforts of the UARS staff. I feel it is a very favorable report that justifies my pride in the work and accomplishments of the Section. I am particularly pleased the Committee found the UARS program to be "well balanced, well managed, and highly respected by the space science community" as well as "forward looking" and "trend setting".

The COV did make some overarching recommendations for the entire Section. Our responses are attached below. A few specific responses to individual programs are also attached. UARS, like all of NSF, is continually seeking community guidance on ways to improve performance. The COV process is the centerpiece of that guidance and we truly appreciate the opportunities your report provides us.

Richard Behnke

Richard Behnke
Head, UARS

Response to the UARS Committee of Visitors

MAIN FINDINGS AND RECOMMENDATIONS

a. Program Balance

Overall, the UARS program is well balanced. The COV is satisfied with the balance between the sub-disciplines, but notes that Space Weather is a distinct cross-cutting area and it might make sense to create a new program element for space weather. The balance between the observational programs (including major UARS facilities and smaller instruments like magnetometer chains, optical instruments and neutron monitors) is relatively stable, but the COV recommends that a UARS-wide review of this balance be carried out....

Discussion

UARS continuously assesses and evaluates the balance among various programmatic elements. We have discussed creating a new program element for space weather, but the funding level set aside for this activity is still insufficient for a sustained program. So far, the space weather program solicitations have yielded unique and exciting scientific results (the AMPERE project, for example).

ACTION

UARS is committed to maintaining the momentum in this important area of research and we continue to seek opportunities to expand the program.

As for the balance between large and small observing instruments, we are starting to assess current and future needs, beginning with a workshop on September 23-24, 2008, held at MIT/Haystack Observatory. The purpose of the workshop was to discuss those aspects of instrumentation awards that contribute to their being treated as facilities as opposed to individual PI investigations. The workshop was also an opportunity to determine what level of support is needed for current and future observing instruments. The next step in this assessment is to review the information collected and begin discussing a strategy that will maintain a healthy balance of support between large and small facilities. This exercise must also consider the balance between facility support and the grants programs to ensure that individual PI research efforts are not compromised. Advice from the research community, particularly through the CEDAR, GEM, and SHINE Steering Committees, will be an important part of the strategic planning process.

b. FDSS

The COV considers the Faculty Development in Space Sciences program the most important new initiative in UARS. It grew out of the recommendations of the NRC Decadal Study for Solar and Space Physics (NRC 2003). While it is too early to judge the success of this program, the early results are very promising. All eight positions were filled with talented young scientists and they are nicely progression toward their tenure review. Some of the new hires are rising stars in their communities and starting to take

leadership positions in the CEDAR, GEM and SHINE communities. The COV strongly recommends the continuation of the FDSS program in a staggered manner at the discretion of UARS...

Discussion
UARS is very pleased with the initial success of the FDSS program and appreciates the COV findings of its importance.

ACTION
UARS will continue to monitor the success of each of the candidates as they progress towards securing tenure. We plan to organize a series of meetings starting next summer that bring together all the candidates. These will provide a forum in which to exchange and discuss experiences between the candidates and will highlight common as well as individual challenges and best practices.

UARS will plan for the continuation of the program in a staggered manner as the first set of awards starts to wind down within the next few years and funds become available.

c. Interdisciplinary research
The new frontiers of science and engineering are clearly at the intersection of several traditional disciplines. This trend is well recognized by the NSF leadership and the Agency is creating several high profile, well funded agency-wide initiatives (like MRI, MREFC, CMG or CDI). It is very important to keep informing the community of funding opportunities that lie outside of UARS. The program directors are doing this, but we stress that they should continue to inform and educate the community about these funding opportunities offered by agency-wide programs.

Discussion
UARS agrees with the COV that it is important for us to work with the community to make the best possible use of the opportunities for cross-cutting funding.

ACTION
UARS will continue and strengthen our efforts to ensure that our community is well aware of and represented in all relevant current and upcoming agency-wide programs. UARS will make a concerted effort to emphasize this in our programmatic presentations at meetings and workshops as well as through community newsletters such as the electronic AGU-SPA newsletter.

d. Panel versus mail reviews
There is a general concern in the UARS community (also expressed by the 2005 COV) that there is a tendency to have more review panels. They are appropriate for focused areas, but not necessarily for the broad core programs. The community has more trust in the integrity of the Program Directors and it favors mail reviews.

...It is also recommended that potential reviewers be contacted before proposals are assigned to them. In our view this would make the reviewers more accountable and they would feel more obligated to finish the reviews on time.

Discussion
Review panels are currently used only for the special program solicitations with deadlines (CEDAR, GEM, SHINE, Space Weather, and CubeSats). We agree with the COV that it is beneficial to make a request to potential reviewers before assuming that they will provide reviews. This is in fact the intent of the standard review request letter being used routinely in UARS. Some Program Managers also make personal requests to potential reviewers to get their acceptance to serve as reviewer before sending them the more formal request letter. This is a powerful but very time consuming way to ensure an adequate provision of reviews.

ACTION
UARS will continue to use panel reviews when appropriate for focused research areas and special programs. We will edit the standard review request letter (email) to make its intent to ask about availability and willingness to provide reviews (to which we expect a yes/no answer) more clear.

e. College of Reviewers
An additional suggestion is to form a "College of Reviewers" with rotating one or two year membership. Each member of the "College of Reviewers" would agree to carry out 5 to 10 mail reviews a year. This would make the mail review process more manageable and would provide a clear "community service" for the members that can be listed in promotion or tenure materials.

Discussion
This idea is similar to the "peer review college" of the British National Environment Research Council (NERC). We see many advantages to this approach.

ACTION
UARS will explore the possibility of establishing an entity like this within GEO.

f. Submission deadlines
The COV is concerned about the effect of rolling submission deadlines on the core programs. There were a few very highly rated proposals (including one with all Excellents) that were declined due to the lack of available funds. The COV recommends that UARS should consider the possibility of annual submission deadlines to the core programs (this can be different for the different programs).

Discussion
UARS acknowledges that the rolling submission for the core programs may have some undesirable consequences, especially under the current circumstances of strongly increased proposal pressure.

ACTION
UARS will examine carefully the potential benefits as well as possible disadvantages of introducing deadlines for some of the core programs that are suffering most from increased stresses.

g. Additional Program Director
UARS presently has five Program Directors. The COV is extremely pleased with their devotion, integrity, professionalism and enthusiastic support of the UARS community. On behalf of our community the COV wishes thank all of them (and needless to say, the Section Head too) for the excellent job they are doing. It appears to the COV that due to increased proposal pressure in the very successful CubeSat and Space Weather competition areas it would be very beneficial to have one more PD in UARS. This would also make it possible for the PDs to conduct independent research and maintain closer contacts with their communities.

Discussion
UARS shares this assessment and the concern has already been brought up with ATM management. An additional PD for the Aeronomy program has high priority in the current ATM hiring plans.

ACTION
UARS will continue to pursue this request with ATM management.

h. Make UARS a Division
The COV recommends that the Upper Atmosphere Section be changed and a new Division be created within the Geosciences Directorate...

...The Atmospheric Sciences Division has served the UARS community well over the last decades, but recent developments (such as the success and growth of the National Space Weather Program) necessitate the consideration of creating a Division of "Geospace Sciences" within the Geosciences Directorate. The scope of UARS is clearly much broader than just the upper atmosphere. A much more appropriate name would be "Division of Geospace Sciences."

Discussion
There are several recent developments that have brought the upper atmosphere and lower atmosphere closer together scientifically such as the growth of NCAR's WACCM (Whole Atmosphere Coupled Community Model). Nevertheless, UARS represents a well-defined intellectual community that is quite distinct from most of atmospheric sciences and this community needs to be adequately represented at NSF. The creation of a Division would certainly raise the visibility of space physics at NSF and broaden the perceived purview of GEO by the community. This is a major and far reaching recommendation that also needs to be considered in light of "critical mass" – both in staffing and budget.

ACTION
UARS will develop an overarching plan for how such a Division would function within GEO and then present this plan to Directorate leaders for further consideration.

ADDITIONAL FINDINGS AND RECOMMENDATIONS

aa. Broader impact
The panel found it difficult to judge the broader impact of some proposals and urges the UARS to extract further information on this aspect from successful proposers in their annual reports.

Discussion
UARS acknowledges the difficulty of measuring broader impacts of NSF investments in a systematic and meaningful way. However, this is a general, NSF-wide issue.

ACTION
UARS will examine annual reports more closely to ensure that the broader impacts being proposed are, indeed, being carried out.

bb. CISM legacy
The Center for Integrated Space weather Modeling is the largest and most visible grant in UARS. It is completely "new" money that is coming from the NSF-wide Science and Technology Centers program. It represents a ~10% temporary increment to UARS budget. It is in its 6th year of funding, with 4 more years of eligibility remaining. The COV considers it very important to clearly define the scientific legacy of CISM: what are the science and/or technology innovations that were accomplished by CISM that could not have been achieved without this major new funding. The COV also suggests that UARS should consider the consequences of a sudden ~10% funding drop when CISM ends. It is also suggested that UARS develop a strategy that may preserve the funding level.

Discussion
As part of the renewal process for the Science and Technology Centers, each STC is required to clearly state what its legacy will be at the end of the ten years. This legacy statement is reviewed as part of the renewal proposal as well as annually thereafter by external site visit panels. The main element of the CISM legacy is to work with the broader community toward establishing a community-driven space weather modeling program. Another important aspect of the CISM legacy is to produce a generation of young space weather scientists who are trained in studying the Earth-Sun system as a single, integrated entity with all parts strongly linked by well understood physical processes.

To help CISM achieve its legacy of establishing a community-driven space weather modeling program, UARS helped organize a workshop last summer on the weekend

between the CEDAR and GEM/SHINE meetings in Utah. This was a well-attended workshop that provided a forum to discuss various aspects of a community-based space weather modeling program. This workshop has inspired much subsequent discussion and plans are underway for a follow-on workshop.

ACTION
UARS will continue to encourage community-wide discussions on this topic, eventually leading to a report that would present a strategy for how to maintain momentum in space weather modeling post-CISM. Although the CISM funds will be removed from GEO's budget after the 10 year period, we feel it is vital to have a carefully formulated plan in place in this area of space weather research.

cc. Satellite data
There is a perception in the UARS community that UARS does not fund work that is primarily focused on analysis of satellite data. Although there are some proposals submitted and funded that use data from current and past satellite mission, the numbers are small compared to the proportion of published papers that analyze satellite data. Due to the evolving funding situation, the traditional support of satellite research by NASA has declined in recent years. This situation leaves a funding gap in this important area. We encourage UARS to clarify this question to the broader community.

Discussion
We agree with the COV that observations from space constitute an important resource for all of the research areas in UARS. As the COV correctly notes, UARS does not actively either discourage or encourage the use of satellite data in proposals but is completely open to their use if the science proposed benefits from such data..

ACTION
UARS will continue our efforts to support the highest quality research over a broad spectrum of research areas. We will continue to allow the use of satellite data for scientific research being proposed – as this is a completely appropriate resource for many of our proposals. We will advice the community at the annual AGU meeting the use of satellite data for research is allowable,

dd. Student pipeline
The COV noted that about 200 students participate in the annual CEDAR, GEM and SHINE meetings. In particular, the typical student attendance at CEDAR is ~100. A fraction of the student participants are undergraduates, but the majority is PhD students. The COV applauds the participation of undergraduates as it is very important for ensuring a healthy pipeline of domestic students in the space sciences. While it is clearly understood that not all space science PhD students will end up in academia or at research institutions, we are wondering if a somewhat smaller number of PhD students at these events would be desirable. The COV recommends that UARS conduct a survey of recent PhDs to see if there is real problem with the student pipeline.

Discussion

UARS does not feel that too many graduate students are participating in these workshops. In fact, we feel the inclusion of graduate students is essential to the vitality of the programs. While it is true that most of the students do not have the opportunity (or even the desire) to pursue an academic position, UARS does not feel that is a requirement for success. We feel that creating a scientifically expert workforce is also a goal and the graduate students fulfill this goal. We have kept close personal contact with many of the students and we are not aware of any graduating workshop student who has had difficulty finding a job although no detailed survey has been conducted.

ACTION
UARS will request the leadership of the CEDAR, GEM and SHINE initiatives to conduct the recommended survey.

ee. Facilities management
The nature of the Consortium of Resonance and Rayleigh Lidars (CRRL) and SuperDARN require strong cooperation among academic and research institutions and brings together scientific and technical expertise. This innovative concept could be utilized, if proven to be successful, as the model for similar consortia among groups of facilities. Facility consortia could improve scientific and technical productivity while reducing operational costs.

Discussion
We agree that the consortium model for operating facilities has been very successful and shows considerable promise to be more widely used for other facilities. This was a major topic of discussion at the recent facilities meeting at Haystack Observatory. It was clear that SuperDARN and CRRL have benefited from the strong collaborations that accompany this approach to facility operations. Stronger coordination among the incoherent scatter radars has been initiated through the development of a report recommended by a facilities site visit panel chaired by Susan Avery. This report sets the stage for more formal mechanisms for coordination among the facilities. The report will be released in November

ACTION
UARS plans to continue investigating the feasibility of establishing consortia for the operation and management of our facilities. Understandably, this will take some time as the facilities are now at different phases of five-year cooperative agreements. At the Haystack meeting, there was discussion about forming an informal facilities coordination office. If this approach is implemented, we will monitor the activities of this office and help with the coordination efforts when possible, in the hope that this will pave the way toward a more formal consortium approach for the facilities.

ff. Facility lifecycle
It is clear that some of the UARS facilities are aging. In particular, some of the incoherent radars might have critical failures during the next decade that will necessitate either total replacement or major repairs. The COV recommends that UARS start a planning process for the upgrade, replacement or decommissioning of major facilities. As

new facilities (hopefully) come online, the operational costs of all existing facilities might become too high for a balanced program. The COV urges the UARS staff to undertake a long-term planning of the facilities portfolio, including various options.

Discussion

We agree that now is the time to start planning for the future of our facilities. Each of the facilities has undertaken studies for upgrades and replacements, but there has been little effort toward developing a coordinated strategy for all the facilities. The integrated facilities plan noted above touches on some of these strategies, but clearly more work has yet to be done. Of course, these upgrades, and particularly decommissioning, have to be considered in light of the scientific value of the facilities, so parallel efforts to continually assess the scientific contributions of these instruments must also be undertaken.

ACTION

UARS will work closely with the facilities in the development of strategies for upgrades and replacement. We will also ask that the facilities form an internal working group to coordinate strategies, exchange information, and develop a long-range plan. Eventually, perhaps in two years, this will lead to a planning document that will guide facility decision-making in the future.

gg. Data access and archiving

NSF-funded projects have returned a wealth of UARS data sets. The UARS has no stated policy for the archiving and distribution of these taxpayer-funded datasets and should adopt one consistent with NSF and GEO policies, and research community expectations (i.e. free and complete access to data sets and the tools to interpret them). In the absence of such a policy, the data sets may remain inaccessible to the research community, precluding harvest of their full value. Worse, they may be permanently lost upon the retirement or relocation of the PI. The NSF has a designated archive for ionosphere/thermosphere observations known as the CEDAR data center. However, this data center is password protected, does not contain the full range either of individual data sets or data sets acquired with NSF funding, and can be cumbersome to use. Statistics presented at this review indicate that this NSF-funded repository is under utilized.

The COV recommends commissioning of an advisory panel tasked with identifying
1. the most valuable (most requested) data sets acquired by NSF-funded activities,
2. data sets held in the community that are in danger of being lost,
3. suitable repositories (including home institutions linked as virtual observatories) capable of archiving and providing the data sets,
4. suitable technologies for distributing the data set in a manner that would facilitate correlative studies, and
5. the costs involved in transforming the data base into virtual data system easily accessible and usable by the vast majority of users..

Discussion

UARS is working with the NSF-wide Data committee to come up with a policy for how ground-based space physics data can be made available to the community and how it can be archived and curated appropriately. UARS is also coordinating this effort with the NASA Heliophysics Division.

ACTION

UARS will have a meeting where the questions raised by the COV (see questions 1-5 above) can be addressed. Although the NSF-wide data policy revisions have not yet been published, it is expected that the policy will require proposers to specify how they will make their data available to the public and that annual reports will have to address this issue as well.

PROGRAM SPECIFIC RECOMMENDATIONS

AER

1. Concerns that some well funded PIs do not effectively participate in the review process. This should be addressed.
2. The COV has concerns about the size of awards. Graduate student support in individual grants is an increasingly large fraction of a grant reducing senior salary support. Further, the COV have concerns about the apparent increase size of the community relative to overall AER funding. We also note that there is an increased proposal pressure arising from NASA's decreased level of funding in UARS science, a problem NSF UARS needs to address.
3. The program needs to work on its future planning and prioritization and come up with solutions regarding several issues. These include 1) possibilities of imposing a deadline for core proposal submissions, 2) effectiveness of increasing the length of awards, 3) the issues of review panel versus write in proposal reviewing, 4) the continued growth and size of CEDAR, 5) funding the influx of a considerable number of new researchers into the system, and 6) how to achieve balance in funding the program due to unexpectedly rapid growth of several research areas (e.g. atmospheric chemistry and investigation of specialized electrodynamics phenomena).
4. Due to the substantial increase in proposals in the program in recent years, it is necessary to consider more human resources. It appears, however, that the program is working to address this issue to some degree but this must be more carefully evaluated. The difficulty in obtaining mail-in review requests is also a concern.

AER Response

1. We agree that it is important to avoid the perception that some PIs get a "free ride". The problem with finding adequate number of reviewers and the moral obligation of everybody in the community to participate in the peer review process is raised routinely at meetings and workshops attended by the AER community. The point is also brought up specifically with individual PIs. NSF rules and regulations do not support a policy of retribution against non-participating PIs.
2. There has been no decrease in the size of awards during the period covered by this COV or compared to earlier years. The AER Program Director strives to provide the maximum resources possible to awardees and does not routinely reduce proposed budgets. It is correct that the number of proposals to the AER program has increased dramatically during this COV period and this has led to a decrease in funding rate. However, the AER funding rate is still comparable to the funding rates for the other UARS programs.

3. We agree that these are all important issues that UARS and the AER program need to work out. 1) The introduction of an annual or semi-annual deadline for the AER core program is being considered but the potential negative consequences need to be better understood. 2) An increase in the length of awards is an on-going NSF-wide goal that the AER program will continue to pursue. 3) AER will continue to use a mix of panel and mail-in reviews as appropriate and practicable. 4) Planning for the future of the CEDAR program is already underway in the CSSC. 5) AER like all of the other UARS programs has a relatively high proportion of senior PIs which reflects the age distribution in the community. Seen in this light, a significant influx of new PIs is desirable as a means to address the approaching "mass retirement" in the community. 6) We share the COV's concern about how to incorporate emerging research areas into the program without unduly harming existing fields. We continue to seek solutions to the problem, including coordination with the appropriate programs in ATM's lower atmosphere research section if that seems useful.
4. It is correct that the AER Program is more heavily burdened by proposals than the other UARS programs and now exceeds the size that one Program Director can reasonably manage. This problem is being pursued with ATM management.

MAG

1. The reviewers tend to focus on intellectual merit. However, program officer review analyses clearly call out both criteria. The NSF has been the only agency in the United States with a mandate to distribute funding based primarily on scientific merit. While the Broader Impacts are important, the Magnetospheric COV is distressed by the perceived shift away from scientific merit and increased importance placed on the Broader Impacts.
2. The COV viewed with alarm the decrease in the mean and median durations and amounts of new grants over the past three years. Grants of $90K lasting 3 years do not go very far in the present circumstances, particularly when they are supporting researchers on soft money.
3. The COV was concerned that the magnetospheric program is failing to take advantage of the insight that might be gained from studies of phenomena better exemplified in the magnetospheres of other planets. The COV encourages the NSF's magnetospheric program to approach the astronomy division with a view towards encouraging studies of comparative magnetospheres.

4. Due to budget limitations, the MAG program manager has made little use of site visits to evaluate the performance of projects. Site visits would be useful in the evaluation of infrastructure awards such as those for magnetometer arrays and other instruments. There is concern that the instruments be maintained, the data be of high quality and available to the broad community and easily accessible, and that the data be utilized. This may be best evaluated through a site visit. The site visit also shows the PI that the program considers the measurement efforts to be important and accountable. This may also be appropriate for other significant projects or groups in the portfolio, for example the development of new space

research groups resulting from FDSS hires. Management by "walking around" is always a good idea. The COV feels that the program manager is well connected to the community through contact and participation in science meetings; however, visiting the community in their own 'turf' is also advised.

MAG Response:

1. The rules established by the NSB state that the intellectual merit and the broader impacts review criteria are of equal importance. Ideally a successful proposal should not be weak in either area. All MAG proposals are required to be exceptionally strong in the area of intellectual merit.
2. The perceived decrease in the average duration of awards is mostly an illusion. A few awards made in the GEM program have been for durations of less than two years, but these awards were made for the purpose of closing out the activities of a particular GEM campaign. Also, the GEM postdoctoral research awards are only 2-year awards (as specified by the Program Solicitation). In checking the awards funded in the MAG program for the period covered by the COV we find that there were 25 awards that had durations longer than three years.
3. The MAG program has traditionally funded a few proposals that involve comparative studies of Earth's magnetosphere and the magnetospheres of other planets/moons. The number of people doing such research is, however, small and the number of proposals is naturally also small. The MAG program does co-review proposals for comparative magnetospheres with the AST division. It is unfortunate that the wider astronomy community seems to have very little interest in planetary magnetospheres.
4. We agree that conducting more site visits would be a good idea, but this requires adequate program officer time. Given the workloads, time is a major issue and frequent site visits, in addition to participation in major science meetings, are difficult to fit in.

STR

1. While the duration of the projects appears to be appropriate, the COV members feel that the award size is perhaps smaller than what is really required to carry out the project successfully.

2. For the last fiscal year under review, STR seems overly burdened with commitments to the FDSS and CAREER programs. While it is extremely important to support new faculty, some action should be taken to ensure that it is not at the expense of the core program only, as it clearly has been in FY2007, but that the burden is distributed throughout the program.

3. Our concern for the program lies in the fact that because of pre-commitments of money into specific program elements such as SHINE, NSWP and FDSS, there seems to be very little room for proper planning of the core program. While, given

the constraints, the portfolio of awards is balanced with respect to sub-discipline and sub-field, this is not an optimal situation, particularly since the award sizes are forced to be small and there can be very few new awards each year. Thus we feel that pressure on the core program should somehow be reduced.

STR Response:

1. STR awards are always subject to the availability of NSF funding overall. The STR Program Officer strives to provide the maximum resources possible to awardees and does not routinely reduce proposed budgets.
2. UARS considers the career development of young scientists to be important for a robust and vigorous scientific community. Therefore, FDSS and CAREER programs are high priorities within STR. All such FDSS and CAREER awards are recommended as a result of merit review. By necessity, STR awards under the FDSS and CAREEER programs compete with other core proposals and are made using core program funds, since there are no other funds available for this purpose.
3. As stated previously, STR awards are always subject to the availability of NSF funding overall. The STR program will continue to support the interagency National Space Weather Program, the community-driven SHINE program, and important community service programs such as FDSS and CAREER. While increases in STR funding would indeed allow a larger sum to be competed under the core program we consider the present investment portfolio balance to be consistent with the overall NSF and UARS mandate for community service.