

**Directorate for Geosciences (GEO)**  
**Division of Atmospheric and Geospace Sciences (AGS)**  
**NCAR and Facilities Section (NFS)**

**Response to the Report of the 2015 NFS Committee of Visitors, June 1-2, 2015**

The NCAR and Facilities Section of the Division of Atmospheric and Geospace Sciences thanks the Committee of Visitors for their time and insight and for the many positive findings contained in their report. The section's responses to the specific recommendations of the Committee of Visitors follow below, referenced by the report section.

**I.1. Are the review methods (for example, panel, ad hoc, site visits) appropriate?**

**COV Comments:**

Current review methods are appropriate and sufficient for most programs in NFS. However, there is a need for greater use of peer review of major scientific and educational components of the NFS portfolio. This is especially true given the large level of base funding that supports NCAR. The mid-term site visit team reports provide a good overview of the overall strengths and weaknesses of the activities for each of the NCAR labs. However, these reports also represent the most substantive "review" of individual components and, as such, they do not provide enough detail to evaluate the scientific rigor, accomplishments and future plans. The review information is far less than what one would typically see for an individual peer-reviewed proposal. We recommend NFS consider adopting a more traditional peer review process for evaluating project selection with NSF base funds. This information is important to justify base science and education funding and may help set priorities for funding in a constrained budget climate.

**NFS Response:**

NCAR provides a broad range of services, facilities, and science and education programs designed to support, extend and enhance the atmospheric and geospace sciences community. As a Federally Funded Research and Development Center, NCAR must be managed by a third party, in this case the University Corporation for Atmospheric Research (UCAR), a collective of 105 universities in the U.S. and abroad. Under the terms of the cooperative agreement between NSF and UCAR, UCAR is charged with ensuring that NCAR fulfills its mission to the maximum extent possible subject to the availability of funds and in accordance with federal regulations.

UCAR, in close cooperation with NSF (consistent with the requirement that the funder of a cooperative agreement maintains 'substantial involvement' in the conduct of the award), is responsible for developing NCAR's programs, including the five-year strategic vision and plan and annual program operating plans. In doing so, it utilizes advice and input from a very wide

variety of sources. These include the external advisory committees for each of the NCAR laboratories, the UCAR member institutions, specially convened working groups and the UCAR Board of Trustees, as well as a variety of community engagement efforts, such as town hall sessions at the major scientific conferences and workshops targeting specialist groups, such as users of particular observing technologies. Other forms of engagement include the extensive network of individual researchers and working groups associated with the Community Earth System Model, the external panels that oversee the allocation of computational resources (e.g. <https://www2.cisl.ucar.edu/chap>) and observational facilities (<https://www.eol.ucar.edu/ofap>), and the thousands of scientists and students that visit NCAR to work with the NCAR staff each year. Individual NCAR scientists also collaborate extensively with university researchers in PI-led research projects funded by NSF and other agencies.

AGS and other NSF program officers interact frequently with NCAR management and staff, attending many of the community fora described above. The NCAR strategic plan, annual program operating plan, and annual performance reports must be reviewed and approved by NSF, and the mid-term science and management reviews will each include AGS program officers and teams of external visitors. These will examine multiple facets of the performance of NCAR and UCAR, including the delivery of services and support to the broader research community, the integration of different programs within NCAR, the effectiveness of UCAR's management of the center, and the quality of NCAR's research and facilities. Proposals for the next five-year cooperative agreement for the management of NCAR will be solicited in open competition and will be subject to rigorous external peer review.

We certainly agree with the COV that review by NCAR's stakeholders and peers is essential to ensuring the continued excellence of NCAR's research, facilities and services. This should involve a portfolio of mechanisms tailored according to the specific purpose of the evaluation and the scale and nature of activity being assessed, ranging from individual facilities to multi-disciplinary center-wide programs. In some cases this will be managed directly by NSF while in others it will fall within the responsibilities of the Center's manager. While we appreciate the intent of the COV's recommendation that we make greater use of traditional peer review, it is not consistent with the terms of the cooperative agreement to do so on a per-project basis given the specific role of UCAR, as NCAR's manager, and the stated duties of NCAR's own leadership team. We would also have concerns about the very significant additional burden on the reviewer community. In view of the the myriad ways in which NSF and the scientific community provide input regarding the work carried out at NCAR, we do not feel that appropriate oversight is lacking. We will, however, continue to look at ways to improve and refine the planning, delivery and assessment of NCAR's programs, and targeted peer review is undoubtedly a valuable component of this, and will consider this recommendation carefully in the formulation of the next NCAR management cooperative agreement solicitation.

**I.3. Do the individual reviewers giving written reviews provide substantive comments to explain their assessment of the proposals?**

**COV Comments:**

Most reviewers provide important and critical review information, however not all reviewers provide a useful or critical review of the proposals they are evaluating. For example, there was a general lack of critical review of a computational infrastructure proposal by the majority of reviewers. Another instance of an insufficient review was found for a large center award. Inadequate reviews should be returned to the reviewer for modification or additional reviewers should be sought.

**NFS Response:**

For all of the NFS programs - and commonly throughout NSF - proposals are evaluated by review panels, with a subset of members asked to submit written reviews before the panel meets. Inevitably, the written reviews vary in the amount of detail provided, but these serve as a precursor for the full panel discussion in which all non-conflicted members (including those who submitted written reviews) assess each proposal from their multiple individual perspectives. A consensus recommendation, representing the collective findings of the panel, is recorded in the panel summary. The written reviews and panel summary are then considered by NSF program officers as we develop our funding recommendations. Therefore, while some written reviews may be relatively short on detail, these are only the first stage of the review process, with the larger panel discussion forming the substantive external evaluation. As a practical matter, if a less-than-useful written review is submitted quite close to the time the panel meets, this would have to be addressed during the panel meeting. With sufficient notice, we agree that an additional review should be solicited.

**I.6. Does the documentation to the PI provide the rationale for the award/decline decision?****COV Comments:**

With respect to the merit review of REU proposals, in most cases we found the program officers provided the PI with clear documentation and the rationale guiding an award/decline decision. The decisions explicitly relate to the two NSF review criteria, Intellectual Merit and Broader Impacts, and are made in the context of the REU site program criteria. Although the types of individual documents and correspondence in the Communications section of the jackets varies, all reviewed proposals contain some level of correspondence to the PI, including a context statement, that guided evaluation of the proposals.

For some of the declined awards, the documents available in the Communications area of the jacket did not include a copy of a direct e-mail to the PI stating the review decision, however, all the Review sections of the jackets consistently contain the Review Analysis, Reviews, and Panel Summary guiding the final assessment of the proposal.

**NFS Response:**

We regret this oversight. Emails were sent to the PIs of each of the declined REU proposals shortly after the completion of the evaluation process. These emails have now been uploaded into the respective proposal jackets.

### **II.1. Did the program make use of reviewers having appropriate expertise and/or qualifications?**

#### **COV Comments:**

Generally, we found reviewers were appropriate subject matter experts for most proposals. Program managers are making a concerted effort to solicit reviews from a diverse population of experts. For the most part reviewers provided substantive reviews.

An exception was a computational infrastructure award, where there was a lack of critical review by the majority of reviewers. In addition to a technical review, this program may also need some review of its management structure to justify the costs.

#### **NFS Response:**

Program agrees that the written reviews of the computational infrastructure award could have been more critical. However, as is the case for our other proposal evaluations, the reviewers also served as panelists. The panel's discussions provided more substantive comments, which were incorporated into the panel summary. Program officers use both the written reviews and the panel's consensus findings when considering funding recommendations.

We are satisfied with the input we receive about the management structure of the program in question, since it includes significant input from external advisory and user groups, and we consider it carefully. While NSF does not have 'substantial involvement' in the management of grants (unlike cooperative agreements), we follow the conduct of our grants quite closely and maintain regular contact with the project teams. The cost of this particular award is evaluated on a continuous basis as it relates to the needs of the atmospheric sciences community.

### **III.2. Responsiveness of the program to emerging research and education opportunities.**

#### **COV Comments:**

It is important for program managers to balance investment between truly innovative (high risk/high payoff) research efforts and long-term commitment to difficult problems. One metric of this is portfolio "turnover." The Facilities Program described several good efforts in this regard.

The acquisition of a new storm penetration aircraft (A-10) is a good example of a necessary new community resource and we hope NFS overcomes the current challenges of bringing it on line. The process for deciding which facilities should be phased out (e.g. CHILL) is also appropriately driven by community research requirements. This type of periodic review and replacement/elimination should continue regularly. APAR is perhaps another example of an

innovative potential new facility instrument, but was described as being unaffordable within current budgets. Concept development can continue, at a low level, but at some point a decision (with community input on the research requirements) will need to be made. If community interest and feasibility are established, then a plan to resource such a facility should be developed and prioritized relative to other items in the facilities portfolio.

We emphasize again the need for more scientifically driven peer-review process for NCAR as the community needs to understand the clear role and justification for a national center that consumes a large share of the community resources.

We notice that instrument development receives a fairly small level of support. We recommend that NFS engage with the SBIR/STTR programs at NSF to compete for the potentially large resources available through those programs to provide more substantial investment in instrument development. Other opportunities for community instrument development and support could be provided through NCAR and/or the academic community. For example, NCAR, academic institutions and/or private business could be contracted to provide high end instrumentation to the atmospheric chemistry community for short term uses. This would alleviate the challenge that individual PIs have for incorporating expensive instrumentation into field programs.

**NFS Response:**

We thank the COV for their positive comments on the processes used to manage the life-cycle of the observing facilities. With regard to APAR (Airborne Phased-Array Radar), we are working with NCAR to develop materials and plans, based on the processes and procedures used by the NSF Large Facilities Office, that will ultimately lead to a decision point on further NSF investment in this technology.

Please see the response to question I.1 regarding the use of peer review for NCAR programs and services.

We are aware that some Federal agencies leverage SBIR/STTR funding for the development of operational observing facilities for use by researchers. The focus of the NSF SBIR/STTR program is somewhat different from those of other agencies, as it is intended to catalyze the private sector commercialization of technological innovations with support for start-ups and small businesses. This being the case, it is not possible to utilize the SBIR/STTR program to meet this kind of operational need. However, the community can, of course, apply to the SBIR/STTR programs as appropriate.

**III.3. Program planning and prioritization process (internal and external) that guided the development of the portfolio.**

**COV Comments:**

Program Management in a resource constrained climate requires appropriate management techniques. Prioritization becomes especially important so that high-risk, high-payoff innovation does not suffer relative to maintaining the status quo. A process may sometimes be required to eliminate lower-priority efforts in the NFS portfolio. Unfortunately such decisions may need to be made quickly in response to unforeseen budget pressures. Prior strategic planning is essential to support decision making either for opportunities or cuts. Of the techniques described to us (community workshops, mid-term reviews by SVT's, NAS panels, etc.), it appears to the COV that NFS has made relatively little use of peer-review in the traditional NSF style to prepare for anticipated or unforeseen budget cuts or opportunities.

**NFS Response:**

We share the COV's concerns about prioritization and planning, especially in a budget-constrained environment. AGS is currently engaged in a strategic planning effort that we anticipate will incorporate a community comment period as well as a formal review through the National Academy that will help inform future decisions about the NFS portfolio. Typically, community expert opinions and priorities are gauged through the reports of relevant National Academy studies, mid-term site visits to supported facilities, external reviews of FFRDC laboratories, community workshops and reports from laboratory external advisory committees. It is not clear how traditional NSF-style peer-review, which focuses on review of specific proposals, would factor into a prioritization process.

**III.4. Responsiveness of program to previous COV comments and recommendations.**

**COV Comments:**

NFS clearly took the comments from the previous COV seriously and, in general, the comments and recommendations were thoughtfully addressed. The inclusion of emerging requirements in the newly negotiated cooperative agreement, and in particular the requirement for a comprehensive strategic educational plan, including the hiring of a Director of Education and Outreach, is to be commended.

One of the recommendations from the previous committee was to increase the input from the user community. This broad comment could include input from the facility user community, input from academic partners and/or the education community. This recommendation was interpreted narrowly by NFS staff and they might reconsider their response in the broader context given above.

The COV would like further clarification on:

- Whether debriefings and surveys provide sufficient means to get full community feedback;
- The extent of engagement by the academic community in NCAR programs;

- e How and whether feedback from debriefings and user facility surveys is incorporated into improvement of services.e

**NFS response:**

The recommendation from the previous COV regarding additional community input was the motivation for incorporating a requirement for post-field campaign debriefings in all of the facility cooperative agreements, three of which have been conducted since that recommendation was made. In general, all PIs in a field campaign are invited to participate in the debriefings and several of the facilities additionally circulate surveys to all participants. We consider this to be a satisfactory approach to soliciting and receiving feedback for field campaigns and we monitor the feedback and the facilities' own responses quite carefully.

Feedback from project debriefings has definitely been used in the recent past to improve or refine processes and procedures in subsequent projects.

Community engagement in NCAR programs (e.g. via the UCAR member organizations) is discussed in response I.1. NCAR also provides metrics in its annual report (2014 metrics can be found here: <https://nar.ucar.edu/2014/ncar/2014-metrics>) that quantify collaborations with the university community through measures such as publications and citations, and visits to NCAR by university faculty, staff and students.

Surveys are always challenging as a means of getting feedback because response rates tend to be low (20% or less is not uncommon). And with the advent of easy-to-use instruments such as SurveyMonkey, "survey fatigue" is a growing problem. Nonetheless, a recent community survey related to the ACCORD program at NCAR ACOM received a very large response (literally hundreds of responses).

**COV Comments:**

Another observation from the previous COV is that there is tension at NCAR between the roles of 1) excellent scientific research and 2) service to the community (primarily provision for, and maintenance of, observing facilities and community models). It was recommended that this balance should be explicitly addressed in the review process. The program acknowledges that this tension persists and is "one of the many factors considered during the annual budget discussions between NSF/AGS and NCAR management." We recommend that this be more explicitly addressed in the budgeting process.

**NFS response:**

The balance of funding between facilities, community models, research projects and other programs, such as those promoting increased participation, is appropriately determined primarily at the divisional level (which itself follows NSF's annual budget appropriation). NCAR is a

significant component of the total AGS budget but we do not view it in isolation. AGS is currently undergoing a strategic review in which we expect to address the future path for our portfolio of research, facilities, centers, models and other programs.

**COV Comments:**

Finally, the previous COV noted that the NFS management of NCAR and LAOF is “greatly enhanced by the effective engagement of science discipline program officers” and recommended that UNIDATA and SOARS would benefit from similar involvement. The NFS responded that because the funding model for UNIDATA and SOARS is different (grants instead of cooperative agreements), this type of oversight is not done. The current COV is not clear on why this cannot be implemented. Nonetheless, these programs would benefit from such oversight.

**NFS response:**

We agree that all programs within the NFS portfolio benefit from the involvement of both NFS and science discipline program officers. We seek both formal and informal input from the latter group on a regular basis. The type of award instrument (grant versus cooperative agreement) does affect the type and amount of management or oversight that may be provided. In the case of cooperative agreements, NSF program staff have “substantial involvement”, which allows for oversight of all aspects of complex awards. Grants do not carry the same level of direct engagement by program staff, and awardees are expected to accomplish their activities without detailed involvement by NSF (as is the case for grants awarded to university PIs). Additional involvement in the directions and activities of Unidata and SOARS would be possible under a cooperative agreement funding mechanism rather than through a grant. However, we are satisfied that the use of grants for these two programs still allows us to provide appropriate input related to future directions and major issues that may arise.

**IV. 1. Please comment on any program areas in need of improvement or gaps (if any) within program areas.**

**COV Comments:**

The COV recognizes that Unidata provides an important service to the atmospheric science community by making near-real-time weather data available to universities. However the program appears duplicative of other activities and is relatively expensive. While it is clear that Unidata has evolved to use a wide-range of cyber infrastructure technologies to make atmospheric data easier to access and useful for scientists and educators, it is important that the data is accessible to a broader user base. A step forward would be to make data analysis and visualization available online, similar to NOAA/ESRL websites. We recommend that future reviews of programs of this cost undergo a more rigorous review, to include overall value to the community, reduction of duplication of services and cost effectiveness.



**NFS Response:**

Our section appreciates the COV's comments and understanding of the value Unidata provides to the atmospheric sciences community. Unidata products are used beyond the atmospheric sciences community, as the organization has broadened its services to include all of the geosciences as well as other disciplines where the products may be relevant, such as physics and engineering.

Topics such as the value to the community, cost effectiveness and potential duplication with similar efforts are discussed by the proposal review panel and considered by the program officer(s). This is typically documented in the jacket, and we will endeavor to make sure that in the future this analysis is presented clearly.

**IV.2 Please provide comments as appropriate on the program's performance in meeting program-specific goals and objectives that are not covered by the above questions.****COV comments:**

The COV had some concerns about degree of IAAs within the NCAR portfolio. As the NCAR budget becomes more challenging, PI's will be under increasing pressure to increase external funding. IAAs that involve significant university involvement are certainly welcome, while those involving limited university involvement, or those that compete directly with universities, should be approved only with careful considerations as to the advantages for the entire community.

**NFS response:**

Under the terms of the cooperative agreement between NSF and UCAR, NCAR staff may only receive support from other funders where this supports NCAR's mission, does not interfere with NSF-sponsored activities and does not represent an unfair advantage over university researchers. All proposals involving NCAR staff must meet a strict set of criteria developed jointly by NCAR and NFS program staff, and compliance is monitored by an external panel drawn from UCAR member universities. This panel reports to UCAR and NCAR management, and the report, together with UCAR's response, is provided to NFS. The proposal evaluation criteria were recently revised to clarify their intent and purpose, with the external panel given a somewhat expanded oversight role. Reflecting the importance placed on this issue by NFS, NCAR and the university community, the panel consistently finds that NCAR proposals to other funders meet both the letter and spirit of the NSF requirements.

**COV comments:**

Given the level of resources the NFS manages and the oversight requirements of the CA, the NFS appears to be substantially understaffed. This problem will only get worse if external peer

review or other activities add to the workload. We are encouraged that NFS is recruiting a deputy program director for this Section.

**NFS response:**

As the COV notes, recruitment of an additional program director within the NFS section is underway. As of this writing, it is anticipated that this position will be filled early in FY16.

**IV.3. Please identify agency-wide issues that should be addressed by NSF to help improve the program's performance.**

**COV Comments:**

There is an apparent relative shift of resources in the AGS budget over the past decade from the grants programs to NFS. There is a need for a clear statement and transparency on the overall AGS budgeting priorities so that community has confidence in AGS directions going forward.

We also note that the AGS deployment pool resources are far too limited to support the observational studies required by the AS community. For example those resources pale in comparison to the Ocean Sciences community. NFS should explore ways to increase the deployment pool to a level more appropriate for the modern observing challenges facing the atmospheric sciences.

**NFS response:**

The NFS budget includes support for NCAR, lower atmospheric observing facilities, and community-wide field campaigns. It varies from year-to-year as a percentage of the total AGS budget according to specific needs, which are typically tied to those of other the other AGS programs such as the use of the deployment pool (see below) or the provision of computational support for modelers. For the past ten years, the NFS budget has varied within 41-45% of the AGS total, and has been 44-45% for the past four years. AGS budget priorities for each coming year are discussed in the NSF annual budget request. As noted above, the AGS is currently undergoing a strategic review process that will inform future budget priorities and will include community consultations as well as referencing relevant NRC studies and other sources of advice.

While we appreciate the COV's suggestion that additional resources should be provided to support observational studies in the atmospheric sciences, we note that the limiting factor in recent years has not been resources available within the so-called "deployment pool", but rather funding available within the core science programs to support the researchers carrying out the field campaigns. Unfortunately, the Geosciences are operating within a flat budget environment, and this impedes our flexibility in resource management.

**IV.5. NSF would appreciate your comments on how to improve the COV review process, format and report template.**

**COV Comments:**

NFS has asked the COV to consider a broad range of complex issues for an important part of the AGS portfolio. While we appreciate the fact that the review is limited in time and relatively little is asked of the panel before the meeting, more clarity on the questions being asked and a short list of tasks prior to the meeting would probably increase the insight of the COV review. At minimum, earlier access to the proposal jackets would allow for more thorough review of the record and thoughtful consideration of the issues we are asked to address. The NFS should consider asking at least one member from each previous COV panel to serve on the subsequent panel. This would provide some institutional memory on the process.

**NFS Response:**

We are always very cognizant of the fact that members of NSF review panels and committees face many competing demands upon their time, and as far as possible we seek to minimize the demands we make of them. Nonetheless, we appreciate the COV's feedback that we could have emphasized - perhaps during the pre-visit webinar - the potential benefits of studying more of the material prior to the meeting and will do so in future.

We also agree that there is value in having at least one COV member who has served in the previous visit. We did initially recruit one member from the 2012 COV, but that person had to withdraw at a relatively late stage due to an emerging conflict of interest. We note that one of the 2015 COV members had participated in an earlier COV for our section, and we all benefitted greatly from her participation in both.