

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
CAMBRIDGE 39, MASSACHUSETTS

DEPARTMENT OF METEOROLOGY

10 November 1959

Dr. M. A. Farrell
Vice President for Research
Pennsylvania State University
University Park, Pennsylvania

Dear Mike:

Enclosed is the original copy of our proposal to NSF in finally (I hope) revised form. If you see no objections will you sign it and perhaps impress it with the great seal of UCAR and then send it on to NSF. To expedite matters I suggest that you mark it for the attention of Dr. Earl G. Droessler, Program Director for the Atmospheric Sciences. We will send directly to NSF 15 mimeographed copies of this proposal for their internal use. I will also send one to each Trustee including you, of course.

I first revised the proposal in accordance with the suggestions made at Cornell and then sent it to NSF for informal review. I have now incorporated as many of their suggestions as I felt able to and have also taken the opportunity to make certain other revisions of my own. In all of this I hope and believe that I have not made any substantive changes. In the interests of speed and because I am not sure that I could bring myself to revise it again, I decided not to send it to the Trustees before submission to NSF.

With my best regards,

Yours sincerely,



Henry G. Houghton

11/16/59

Proposal from
the University Corporation for Atmospheric Research
to
the National Science Foundation

Title: Planning of Program and Facilities for Atmospheric Research.

Background: This proposal is the direct outgrowth of the extensive studies of the requirements for a more adequate national program of atmospheric research that have been carried on for several years by the Committee on the Atmospheric Sciences of the NAS-NRC, the University Committee on Atmospheric Research and other groups. Discussions and events of the past year have served only to strengthen the convictions of the community of atmospheric scientists concerning the validity of the conclusions contained in the First Interim Report of the NAS-NRC Committee and the First and Second Progress Reports of the University Committee on Atmospheric Research.

There appears to be complete agreement that it is in the national interest to substantially strengthen and expand the atmospheric research effort. It is further recognized that the universities should play the leading role in developing the national program of atmospheric research. The deficiencies in the present program that must be overcome if we are to mount a larger and more effective research effort are now well-understood. It is clear that the support for research at the universities must be substantially increased and must be placed on a more stable basis

and made less subject to immediate operational demands. Some progress in these directions is being made and must continue in parallel with the activities which are the subject of the present proposal.

Progress on many of the large and important problems of the atmosphere requires the use of services and facilities on a scale that is not appropriate to individual universities. Modern scientific tools to probe the atmosphere are not generally available for atmospheric research and, in many cases, this deficiency has made it impossible to undertake effective research on some of the most significant atmospheric problems. The atmospheric scientists themselves have expressed a present need for a variety of facilities, including instrumented aircraft, electromagnetic probes (including radar), spectroscopic equipment, high-speed digital computers of large capacity, automated data-handling equipment, an instrument development laboratory and other specialized laboratories and apparatus. These facilities require the services of a considerable number of support people including both professional and non-professional persons with a variety of skills. It has been emphasized that many of the research problems require that a number of these facilities be brought to bear simultaneously in an integrated fashion. This, together with the problem of the efficient management and operation of the facilities and supporting staff, suggest a central location for all or most of the facilities.

Necessary as adequate facilities are, the success of the research program depends predominantly on the caliber and number of research scientists engaged in the program. There exists an inadequate number of atmospheric

research scientists and they are all active in the present research effort. The number of graduate students now in training is insufficient even to maintain the status quo. Strenuous efforts are being made to increase the number of graduate students in the atmospheric sciences but, to be effective, this program will require a stimulus greater than can be provided by the universities alone. The ultimate success of such recruitment will depend on the provision of attractive career opportunities in basic atmospheric research both at the universities and elsewhere.

It is our firm conviction that, in addition to well-trained atmospheric scientists, mature investigators from physics, mathematics, chemistry and engineering must be encouraged to work on atmospheric problems. The atmospheric sciences are inherently an interdisciplinary area and future progress will be strongly dependent on the interaction and mutual stimulus of those from the basic sciences with the atmospheric scientists. Thus it is necessary to attract mature scientists from the basic sciences not only to provide much of the needed new scientific manpower but also because of the clear scientific need for a truly interdisciplinary attack on the problems of the atmosphere.

From the dominant considerations outlined above there has emerged the concept of an intellectual center which will attract the most capable scientists from the variety of disciplines of which the atmospheric sciences are composed. The interactions of such a group can be expected to lead to new approaches and new concepts and to the design of critical experiments. The physical facilities, discussed earlier, then assume their

proper role of making it possible to carry out the experiments in an effective fashion. It is believed that the combination of such an interdisciplinary research group with adequate and competently-managed facilities will provide an unprecedented stimulus for the exploration of the atmosphere throughout the entire scientific community.

Basis of Proposal: This proposal is directed towards two of the fundamental steps required for the expansion of the atmospheric research program, as outlined in the preceding section. These are (1) the provision of adequate scientific facilities and (2) a means for attracting and providing challenging opportunities for scientists from the variety of disciplines on which the atmospheric sciences are based. A paramount consideration is that the steps taken to achieve these goals shall also support and strengthen the research effort at the universities.

Some three years of detailed consideration, participated in by a large number of competent persons, has led us to the conviction that the concept of what we now prefer to call the University Center for Atmospheric Research as presented in the report, "Preliminary Plans for a National Institute for Atmospheric Research," is the most effective means of accomplishing the desired objectives. A wide variety of alternative proposals has been considered in great detail and each has been found wanting in important respects.

The concept that has been developed is not unalterably tied to the size, architectural features, research program or facilities presented in the report referred to above. What is vitally important is the concept of an

intellectual center that will attract competent scientists because of the challenging research problems, the opportunity to work with colleagues from other fields and the availability of modern, and often unique, research tools.

The facilities envisaged for the proposed Center are those requisite to an exploration of the atmosphere on a scale that is not appropriate for a single university to undertake. Duplication of large and costly facilities is uneconomic and their proper management, including their necessary technical and professional support, is most effectively accomplished by a central organization. It will often, or usually, be necessary to employ a number of the facilities in a closely integrated fashion in a given investigation. This need will be most effectively served if the facilities are centrally managed and located. Necessary as they are, facilities must not be an end in themselves. Properly planned and organized they should stimulate scientific workers to turn their attention to the atmosphere along promising but hitherto unexplored avenues. The facilities must be designed and operated so as to complement and augment those available at individual universities and so to support and strengthen the atmospheric research program at all universities.

It is our conviction that research programs must be planned by those who will lead the research. For this reason specific research projects suggested in the referenced reports should be considered only as examples. The research program will fall within the framework of four broad categories; (1) atmospheric motions, (2) energy exchange processes in the atmosphere, (3) water substance in the atmosphere and (4) physical phenomena in the

atmosphere. Work on only a fraction of the major unsolved problems can be prosecuted at any one time and this is the choice that must be made by the director and staff of the University Center for Atmospheric Research. When the program is selected decisions on the facilities and staff required will follow in logical order. In spite of this intentional uncertainty at this stage, it is believed that the magnitude of the effort required and the nature of the major facilities to be needed are accurately reflected in the reports referred to on the first page of this proposal.

It is evident that the first step must be the employment of a director and a staff nucleus. With the assistance of university scientists this group should begin at once to develop plans for a research program, with particular emphasis on problems that are not appropriate for a single university to undertake. Since facilities are expensive, a number of such problems should be explored with the aim of providing facilities that will be useful for a variety of investigations. Since many of these research problems have hitherto received little attention because of the lack of the essential facilities, it is believed that the central group will need to conduct exploratory research before reaching a decision. It is also appropriate that the staff scientists be given reasonable freedom to conduct research along the lines of their own interests. Since many of the staff will be from the basic sciences and engineering it is appropriate that they undertake research to explore the application of techniques and concepts from their own fields to atmospheric problems. It is believed that something like a year of such activity should precede final decisions on an initial

research program and on the kinds of facilities required.

During this period of the order of a year it will be necessary to provide suitable rented quarters, laboratory facilities and rental of large facilities of the general sort that may eventually be purchased. This would include aircraft of various types, data-handling equipment, high-speed digital computers and the like.

The plan that is presented below and that is reflected in the proposed budget is based on a staff build-up at a linear rate during the year, reaching a total of 8 to 10 research scientists at the end of the year. This is necessarily tentative because it is impossible to be certain in advance of the time required to assemble a group of scientists of the caliber required. It should be pointed out that this group of scientists includes the director and his key staff so that the mean salary is considerably higher than the average of a large laboratory. Further, without knowing the research interests of the staff, only a reasonable estimate can be made of the type of facilities and the number of supporting people they will require. Although actual expenditures will deviate in detail from those shown it is believed that the total is reasonably accurate.

Specific Steps Proposed: In summary, it is proposed to undertake the following during a period of one year from the inception of the proposed contract.

1. Employ a Director.
2. Employ senior scientific staff, as available, with expectation of having 8 to 10 at end of year.

3. Establish suitable office, laboratory and shop facilities in rented space.
4. Plan a research program in consultation with university scientists and others.
5. Undertake exploratory research as required to determine feasibility of, and methods of approach to, selected research projects.
6. Undertake research involving the application of techniques from the basic sciences and engineering to problems of the atmosphere.
7. Recommend a research program for the University Center for Atmospheric Research for the immediate future.
8. Recommend, in specific terms, the facilities required, their location and the physical plant required.
9. Make general recommendations regarding future requirements for facilities, buildings and personnel.

Proposed Budget for First Year

	<u>Operating</u> <u>Expenses</u>	<u>Capital</u> <u>Costs</u>
<u>Salaries and wages*</u>		
10 scientists (including Director)	\$ 85,000	
12 technical and professional	50,000	
10 support people	25,000	
Staff and employee security program	24,000	
<u>Scientific operations</u>		
<u>Flight facility</u>		
Rental of aircraft	15,000	
Insurance on flight personnel	1,500	
<u>Computer facility</u>		
Rental on outside machine	40,000	
Programming services	10,000	
<u>Laboratory operations</u>		
Acquisition of laboratory equipment		\$ 50,000
Expendable equipment and supplies	50,000	
<u>Shops</u>		
Acquisition of equipment		50,000
Materials and supplies	10,000	
<u>Travel and transportation</u>	15,000	
<u>Plant operations</u>		
Rental and modification of office and lab space	20,000	
Purchase of office equipment		5,000
Purchase of motor vehicles		7,000
<u>Management allowance</u>		
Including travel of trustees and necessary administrative salaries and expenses	47,000	
Totals	\$392,500	\$112,000
Grand Total	\$504,500	

* The numbers of persons are the planned complement at the end of the year. Assuming a steady build up over the year the salaries are based on an average employment period of one-half year.

Respectfully submitted
University Corporation for Atmospheric Research
By order of the Board of Trustees

(signed)
Henry G. Houghton
Chairman of the Board of Trustees

(signed)
M. A. Farrell
Secretary and Treasurer