NATIONAL ASTRONOMY AND IONOSPHERE CENTER

Arecibo Observatory

NEWSLETTER

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Upgrade Project Status

Don Campbell

Structural Work and the Reflector System:

There has been major progress in the last six months in all areas of the telescope Upgrading Project. Installation, and the initial tensioning, of the twelve new support cables was completed in February. The initial tensions of about 120,000 lbs. will be increased in steps as more weight is added to the platform, to final tensions of between 600,000 and 700,000 lbs. The structural contractor, COMSAT-RSI, has installed two large work platforms on trolleys under the feed arm and a crane on top of the platform to help with the installation of the new azimuth outriggers (y-shaped yokes attached to the feed arm to hold the new azimuth drive trolleys) and the reinforcement of most of the beams on the sides and bottom of the feed arm. This work is now the pacing item to meet the scheduled December lift date for the dome housing the Gregorian reflector system.

Construction of the 86-ft.-diameter dome has been completed by TEMCOR, a sub-contractor of COMSAT-RSI, and the feed tower interior to the dome is almost completed. The secondary reflector back-up structure is approaching completion at COMSAT-RSI's plant in Sterling, Virginia, and production has begun of the 415 panels for the secondary. A trial assembly of the collar truss (the large torus ring that is attached to the elevation trolleys and supports the dome and secondary reflector) with the upper sections of the dome and secondary reflector back-up structure took place at

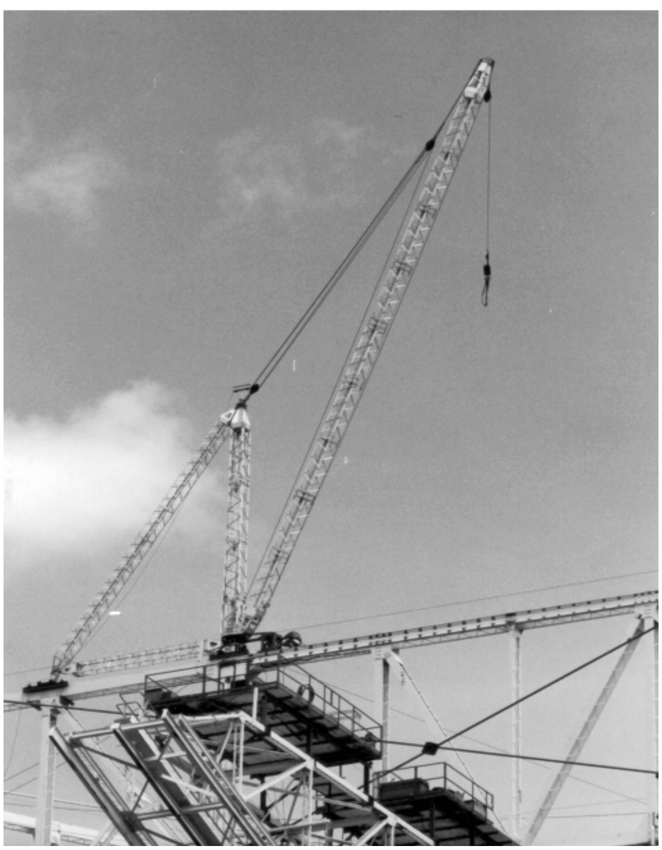

Photo by Tony Acevedo.

The temporary crane on top of the platform.

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The **NAIC** is operated by **Cornell University** under a Cooperative Agreement with the **National Science Foundation.**

COMSAT-RSI's plant in Mexia, Texas in late May. After finishing work, the collar truss, dome and back-up structure will be shipped to Arecibo for the beginning, in early July, of the dome assembly on a 100 ft. x 100 ft. platform that has been constructed in the bottom of the bowl over the primary reflector. The complete secondary reflector will be installed in the dome prior to its scheduled lift in December. The 8-m tertiary reflector will be installed after the dome is lifted to the feed arm.

Drive Systems:

The "new" telescope will have six drive systems: the azimuth drive with four driven wheels on each side of the feed arm, the dome and Carriage House I elevation drives, the feed-room turret drive, the two-axis tertiary reflector control system, and the system for controlling the tension in the three vertical "tie-down" cables that will hold the platform horizontal and at a constant height as the temperature varies and as the partly uncompensated 90-ton weight of the dome moves in azimuth and elevation.

A contract has been let for the azimuth and dome elevation drives with an option, depending on the availability of funds, to include a new Carriage House I drive system. NAIC will be installing the system. The specifications for the positional accuracies with which the azimuth and dome encoders can be positioned corresponds to 1.5 arc seconds on the sky. This should allow an overall pointing accuracy of close to 5 arc seconds.

The turret, tertiary, and tie-down control systems are being designed and constructed by NAIC personnel. Turret motion will be possible at any time with a positional accuracy of 0.5 mm at the radius of the focus corresponding to a turret pointing accuracy of < 1 arc second. The tertiary will be movable in the symmetry plane of the tertiary and secondary reflectors. Continuous control of the tensions in the tie-down cables will hold the platform horizontal and at a constant height to a design specification of 1 mm to allow good baseline subtraction in the presence of a platform/reflector standing wave.

S-Band Transmitter:

Continental Electronics has completed construction of the 1-megawatt 12.6-cm wavelength transmitter at their plant in Dallas, and the system is currently being debugged. The only serious problem to date has been defective 1-megawatt dummy loads. It will take approximately four months to procure replacements and this will delay the final full-power factory acceptance tests. The current plan is to ship the transmitter to Arecibo in time to commence installation in January, shortly after the scheduled lift of the Gregorian dome to the platform.

Technical issues related to the effect of a transmitter crowbar short circuit delayed the procurement of the 2.5-megawatt turbine generator needed to provide the prime power for the transmitter. These difficulties have been resolved and an order has been placed with Solar Turbines for the generator. Delivery will be in late '95/early '96.

Schedule:

COMSAT-RSI's current schedule calls for the lift of the Gregorian dome in December 1995 and completion of all remaining tasks in May 1996. NAIC will have beneficial access to the dome starting in January, allowing us to install support equipment, horns, receivers, etc. The tertiary reflector is scheduled to be installed in March and the drive systems in April. Under this schedule, "first light" should be in late April/May of next year. Installation of the S-Band transmitter should be completed in May, with final acceptance tests late in that month.

Atmospheric Science Highlights

Craig Tepley

Studies in the atmospheric sciences at Arecibo since the last Newsletter consisted of several investigations that ranged from high to low altitudes. At the upper end of our observational capability, Sixto González (NAIC) measured the topside ionosphere in late December of 1994. Jonathan Friedman (NAIC) supplemented these radar results with neutral-wind measurements at the base of the exosphere using Fabry-Perot interferometer observations of the atomic-oxygen 630-nm emissions. They coordinated the observations with similar measurements at the Millstone Hill Observatory in Massachusetts and the incoherent scatter radar facility located in Kharkov, Ukraine.

The Arecibo topside observations were of O^+, H^+, and He^+ concentrations, as well as temperatures and ion velocities. Additional photometric observations of Hα emissions were made during this period providing key neutral-hydrogen concentrations of the exosphere to compare with the proton distribution throughout this region. The investigators plan to compare these experimental results with the theoretical predictions made by the Sheffield, U.K. model of the upper ionosphere. The topside observational program continued through early 1995 with the April participation of Bob Kerr, Xiangqun He, John Noto, and Genene Fisher (Boston U.) who monitored the seasonal behavior of ion distributions for this solar-minimum period.

Three sets of World Day observations were scheduled during the early part of 1995, but one set of February experiments did not take place due to a disconnected waveguide. For the other two periods in late February and late March, we made good, fundamental ionospheric measurements even though the pointing was restricted to a single look direction. Optical observations filled in the gaps in the radar measurements.

Deeper into the atmosphere, Qihou Zhou's (NAIC) meteor observations focused on two key areas. His first concern was to make fine-range-resolution observations of meteor echoes and, secondly, to observe these echoes using multiple filters to help resolve existing measurement ambiguities. The fine-range-resolution meteor data will be used by graduate student Kyle Hunter (Penn State) to test a generalized radar