NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
RESEARCH AND TECHNOLOGY RESUME

TITLE

Goldstone Solar System Radar

PERFORMING ORGANIZATION

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INVESTIGATOR'S NAME

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DESCRIPTION *(a. Brief statement on strategy of investigation; b. Progress and accomplishments of prior year; c. What will be accomplished this year, as well as how and why; and d. Summary bibliography)*

a. **Strategy**: (1) Planning, direction, experimental design, and coordination of data-acquisition and engineering activities in support of all Goldstone planetary radar astronomy. This work demands familiarity with the various components of a planetary radar telescope (transmitter, receiver, antenna, computer hardware and software) as well as knowledge of how the entire system must function as a cohesive unit to meet the particular scientific objectives at hand in a given observation. (2) Support radar data-processing facilities, currently being used for virtually all Goldstone data reduction: a VAX 11/780 computer system, an FPS 5210 array processor, terminals, tape drives, and image-display devices, as well as a large body of data-reduction software to accommodate the variety of data-acquisition formats and strategems.

b. **Accomplishments**: (1) Successful 113-cm radar observation of Callisto (led by R. M. Goldstein) and the near-Earth asteroid 1981 Midas (led by S. Ostro), and Goldstone/VLA radar observations of Saturn's rings (led by D. O. Muhleman). [Note: Enlargement of Goldstone's 64-m antenna to 70 m during 10/87-6/88 precluded observations during that period.] (2) Completion of quick-look verification programs for data taken with phase-coded cw (i.e., ranging) waveforms, applicable to Venus, the Moon, and small bodies. (3) Management of the radar data-processing facilities described above. (4) Definition of scientific and engineering requirements on instrument performance, radar system configuration, and personnel, for all 1988 Goldstone radar investigations.

c. **Anticipated Accomplishments**: (1) Oversee execution during 1988-89 of observations of various targets, including Venus, Mars, the Martian satellites, the Galilean satellites, and at least two near-Earth asteroids. (2) Completion of verification and analysis software for new data-taking systems to be implemented as soon as the main antenna resumes operation. One of these systems acquires wide-band (up to ~10 MHz), echo power spectra, and as such will be valuable for a variety of cw studies. (3) Write core material for the new Support Instrument Requirements Document (SIRD), which constitutes the technical definition of Goldstone capabilities for NASA. (4) Manage the Radar VAX.

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d. Publications:

Clark, P. E., M. A. Leake, and R. F. Jurgens (1988). Goldstone Radar Observations of Mercury. In Mercury (C. R. Chapman and F. Vilas, eds.), Univ. of Arizona Press, in press.

Jurgens, R. F., M. A. Slade, L. Robinett, S. Brokl, G. S. Downs, C. Franck, G. A. Morris, K. H. Farazian, and F. P. Chan (1988). High-Resolution Images of Venus from Ground-Based Radar. Geophys. Res. Lett., in press.

Jurgens, R. F., M. A. Slade, and R. S. Saunders (1988). Evidence for Highly Reflecting Materials on the Surface of Venus. Science **240**, 1021-1023

Ostro, S. J. (1988). Radar Observations of Asteroids. Chapter in Asteroids II (R. P. Binzel, T. Gehrels, and M. S. Matthews, eds.), Univ. of Arizona Press, in press.

Ostro, S. J., D. K. Yeomans, P. W. Chodas, R. F. Jurgens, R. M. Goldstein, and T. W. Thompson (1988). Radar Observations of Asteroid 1986 JK. Submitted to Icarus.

Roth, L. E., R. S. Saunders, G. S. Downs, and G. Schubert (1988). Radar Altimetry of Large Martian Craters. Submitted to Icarus.