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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION RESEARCH AND TECHNOLOGY RESUME	
TITLE <p style="text-align: center;"><b>PLANETARY ASTRONOMY P.I. RESEARCH SUMMARY</b></p>	
PERFORMING ORGANIZATION <p style="text-align: center;"><b>Planetary-Crossing Asteroid Survey (PCAS)</b></p>	
INVESTIGATOR'S NAME <p style="text-align: center;"><b>Eleanor F. Helin</b>          Planetology and Oceanographic Section          Jet Propulsion Laboratory          Pasadena, California 91109</p>	
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)	
<p><b>A. STRATEGY:</b>          A systematic survey for near-Earth and planet-crossing asteroids is being conducted with the 0.46m Schmidt at Palomar to increase the number of known asteroids and establish improved estimates of their populations and size distribution. Access to a limited number of PSS11 plates from the 1.2m Schmidt are used also to search for unusual objects. Field pairs from the 0.46m are photographed and inspected with a stereomicroscope; new objects are detected and followed to establish definitive orbits. When near-Earth asteroids are discovered, other astronomers are informed so that physical observations can be obtained. With remote sensing results, possible generic relationships are suggested. Population refinements can be accomplished by increasing the number of known asteroids under well-established conditions of search.</p>	
<p><b>B. ACCOMPLISHMENTS:</b>          From 13 observing runs made at Palomar, 215 new asteroids were discovered and reported with good orbits determined for 90. Significant discoveries are Apollo 1988 EG, Amor 1987 QB, and an unusual high inclination asteroid, 1988 EO. Other discoveries of importance include 12 Mars-crossers, 6 Hungarias, and 13 Phocaeas. The discovery of short-period comet Helin, 1988w, which makes a close approach to Saturn, is also notable. The International Near-Earth Asteroid Survey (INAS) continues to produce numerous discoveries which are published in the MPC's. Our Bulgarian colleagues discovered Apollo 1987 SB with confirming Palomar follow-up. Prime mission candidate (3757) 1982 XB, unique Mars-crosser, (3800)1984 AB and (3752)1985 PA, our high inclination INAS discovery, have been recovered and numbered. 1986 LA and 1986 PA are the latest recoveries of faint NEA's and await numbering.</p>	
<p><b>C. ANTICIPATED ACCOMPLISHMENTS:</b>          Monthly observing runs with the 0.46m Schmidt will continue. When possible, PSS11 plates will be reviewed for objects of interest. Newly discovered objects will be routinely followed for as long as possible to ensure later recovery. INAS will complement these efforts, both in follow-up, independent and expanded sky coverage. Plans are set for a intensive search for the recovery of 1982 DB using the 1.2m Palomar and U.K. Schmidt telescopes.</p>	
<p><b>D. PUBLICATIONS:</b>      Attached.</p>	

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## PUBLICATIONS

### Planet-Crossing Asteroid Survey (PCAS)

- Helin, E. F. (1987), Near-Earth Asteroid Searches: Status and Prospects, from the Evolution of the Small Bodies of the Solar System, 1897, *XCVIII, Corso. Soc. Italiana di Fisica*, Bologna, Italy.
- Sekanina, Z., S. M. Larson, G. Emerson, E. F. Helin and R. E. Schmidt (1987) The Sunward Spike of Halley's Comet, *Astron. and Astrophys.*, **187**, 645-649.
- Helin, E. F., S. C. Singer-Brewster, J. T. Alu (1987), Near-Earth Asteroid Discoveries from the Palomar Sky Survey II, 1987 AAS/DPS Meeting, Pasadena, CA, *Bull. Amer. Astron. Soc.*, **19**, No. 3, 840 (abstract).
- Bamberg, R. J., B. A. Goldberg, E. F. Helin (1987), Development and Application of New Digital Image Processing Techniques to Groundbased Observations, AAS/DPS Meeting, Pasadena, CA, *Bull. Amer. Astron. Soc.*, **19**, No. 3, 851 (abstract).
- Helin, E. F., S. Singer-Brewster, J. T. Alu (1987), Planet-Crossing Asteroid Search, JPL Highlights, 1987.
- Helin, E. F. (April, 1988), Gli Asteroidi Vicini, *Astronomia*, No. 76, 30-38.
- Helin, E. F. (1988), Discover, Recovery and Physical Observations of (3757) 1982 XB: A Prime Mission Candidate, Asteroids II Conference, Tucson, AZ (abstract).

### Discovery and Astrometric Position Publications

#### International Astronomical Union Circulars:

1987: P/Comet Helin, 1987w, IAU Circ Nos 4448, 4449; 1987 QB, IAU Circ Nos 4451, 4455; 1987 SB, IAU Circ No 4464; 1987 OA, IAU Circ No 4436; 1987 PA, IAU Circ No 4437; 1987 OA, IAU Circ No 4441

1988: 1988b, IAU Circ No 4548; 1988 EG, IAU Circ No 4565, 4571 and 4573

#### Minor Planet Circulars:

1987: MPC Nos 11489-490, 11597-601, 11707-710, 11809-811, 11923-924, 12039-040, 12180-181, 12285-286, 12411-412, 12519-520

1988: MPC Nos 12652, 12766, 12910, 13019-020, 13035, 13105-107, 13109, 13130-13133