

## Chapter One

### Visual Observations of Satellites

In July 1956, the Smithsonian Astrophysical Observatory (SAO) issued its first *Bulletin for Visual Observers of Satellites* as an introduction to amateur astronomers registered in its then unnamed visual observing program. Eventually called MOONWATCH, the program was initiated to assist the SAO in the preliminary tracking of satellites launched during the International Geophysical Year. Although Baker-Nunn telescopes were at that time under development for photographic tracking, the initial orbital path was needed before the Baker-Nunns could be employed. Radio tracking was also used when possible, although the failure of instrument packages was expected, and optical techniques were employed to relocate "lost" satellites. Optical observations of satellites were thus a necessary part of early satellite tracking.

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The advent of the Soviet Union's Sputnik in October 1957 showed how valuable the MOONWATCH program really was. In its *Bulletin* for March 1958, its Associate Director, J. Allen Hynek (best known, ironically, for his involvement in "UFO" research) commented that "the unexpected appearance of the Russian Sputniks and their high inclinations to the equator have made it necessary for MOONWATCH teams to act as interim tracking stations until our full complement of precision satellite tracking cameras is in position".<sup>1</sup> In fact, the problem was somewhat more complicated. The Russian launches were at precisely the "wrong" orbital inclination for many MOONWATCH stations and those Baker-Nunn cameras already in position. Stations were thus quickly set up to accommodate the higher orbital inclinations.

Optical observations tend to be more accurate in principle than radio measurements because of ionospheric distortion, although compensatory mechanisms are used for radio tracking. Removing human error from observation greatly improves the accuracy, of course, so the development of Baker-Nunn cameras was a major step forward. The MOONWATCH program, however, was not officially disbanded until June 30, 1975, having

been phased out in stages over the years. MOONWATCH provided a wealth of valuable data during its operation; probably the most notable was the observation of the re-entry and the recovery of Sputnik 4 on September 5, 1962, over Wisconsin. Other data for MOONWATCH came from the Volunteer Flight Officers Network, whereby airline personnel made over 4,000 observations of satellites and meteors.<sup>2</sup>

At its termination, MOONWATCH still had 100 active stations. It was described as the least expensive part of the space program, utilizing only \$14 million for the duration of its operation. This is significant, especially since it was originally intended to operate for only 18 months. Instead it operated for 18 years, giving valuable information on satellites throughout its existence.<sup>3</sup>

Some note should also be made of the amateur radio tracking of satellites, carried on by various groups. The most successful of these has been a group in Kettering, England, which has been monitoring satellite telemetry and interpreting its meaning for several years. The Kettering group showed exactly how valuable an amateur tracking operation could be when it discovered the secret Russian Plesetsk launch site, something Western experts had only guessed at. What is more, the group accomplished this with only store-bought shortwave receivers.<sup>4</sup>

<sup>1</sup> See Hynek, J.A. *Bulletin for Visual Observers of Satellites*, no. 8, May 1958. In: *Sky and Telescope*, V. 17, no. 3, Sept. 1975, pp. 160-163.

<sup>2</sup> A history of the MOONWATCH program is given by J. Cornell, "The MOONWATCH Era Ends", *Sky and Telescope*, V. 50, no. 3, Sept. 1975, pp. 160-163.

<sup>3</sup> Many Canadian astronomers participated in the MOONWATCH program. Details on the participation of the Winnipeg Centre of the Royal Astronomical Society of Canada, for example, are given in Hladiuk, D., "Project MOONWATCH", in: Belfield, P., ed. *A History of the Winnipeg Centre, RASC, 1911-1977*, Ch. 3, RASC, Winnipeg, 1977.

<sup>4</sup> The Kettering group has received considerable attention recently. A summary of its activities and biographic reviews can be found in: Peebles, C. "Satellite Radio Tracking for the Amateur", *Spaceflight*, V. 25, Dec. 1983, pp. 459-60; and Solomon, S. "Eavesdropping on Soviet Satellites", *Science Digest*, V. 92, no. 1, Jan. 1984, pp. 32, 36, 81.

