

BAKER NUNN

The Baker-Nunn camera, a special satellite tracking camera named for James G. Baker who designed the optical system and Joseph Nunn who designed the mounting and mechanical systems, provides one of the world's most sensitive optical means of observing artificial earth satellites. It is approximately 8 feet high, 10 feet wide and weighs approximately 3 tons. The camera combines an extremely fast optical system with a film transport using 55 mm, Royal-X film. The exceptional light-gathering capacity of the Baker-Nunn camera permits it to record star images 3000 times fainter than those seen by the unaided eye. The camera is capable of photographing a 6 meter sphere at the distance of the moon.

The first Baker-Nunn camera was put into operation in 1957 in time to photograph the first man-made satellite, SPUTNIK I, less than two weeks after launch. The Baker-Nunn cameras have photographed the first VANGUARD satellite, a 6-inch sphere, at a range of 3500 miles and the larger Orbiting Geophysical Observatory (OGO) at 23,000 miles. The Smithsonian's Baker-Nunn system photographed the firing of the apogee-kick motor on SYNCOM II, mirror reflections from TELSTAR, and the tumble flashes from the PEGASUS satellite.

Since the launching of SPUTNIK I, the SAO Baker-Nunn cameras have taken a total of 364,015 photographs of man-made objects in space. The breakdown of photographs by years is as follows:

*1957 -	14	1963 -	34,255
1958 -	866	1964 -	45,633
1959 -	6,523	1965 -	62,146
1960 -	12,250	1966 -	71,057
1961 -	19,520	1967 -	54,807
1962 -	27,257	1968 -	29,587 (thru October)

Since early 1967, the Smithsonian Observatory's camera network has been augmented by three laser ranging stations located at Mt. Hopkins, Arizona; Maui, Hawaii and Athens, Greece.

*Three month period with one camera in operation.

SUCCESSFUL SATELLITE LAUNCHINGS

<u>YEAR</u>	<u>US</u>	<u>USSR</u>	<u>FRANCE</u>	<u>US/UK</u>	<u>US/CAN</u>	<u>US/ITALY</u>	<u>US/FRANCE</u>	<u>US/AUST</u>	<u>ANNUAL TOTALS</u>
1957	0	2							2
1958	7	1							8
1959	11	3							14
1960	16	3							19
1961	29	6							35
1962	50	20		1	1				72
1963	38	17							55
1964	55	30		1		1			87
1965	61	48	1		1		1		112
1966	73	44	1						118
1967	56	66	2	1		1		1	127
1968	38	68							106
GRAND TOTALS	434	308	4	3	2	2	1	1	755
LUNAR IMPACT	9	4							
LUNAR LANDING	5	2							
LUNAR ORBIT	5	4							

SATELLITE BOX SCORE

As of 0900 UT December 1, 1968 there were 1486 man-made objects in space. There have been a total number of 3577 objects catalogued since 1957.

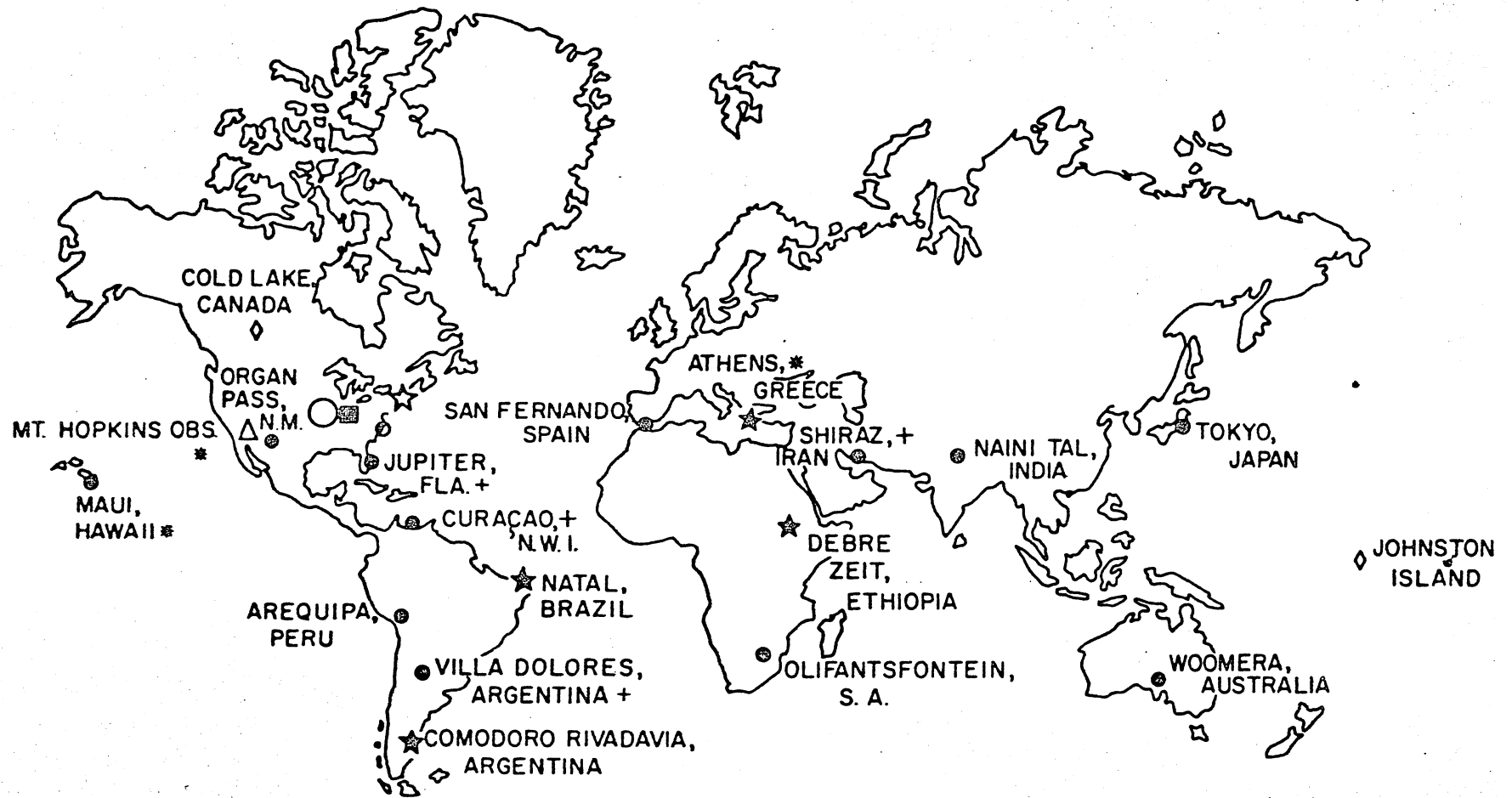
	<u>US</u>	<u>USSR</u>	<u>**ESRO</u>	<u>FRANCE</u>	<u>US/FRANCE</u>	<u>US/UK</u>	<u>US/CAN</u>	<u>US/ITALY</u>	<u>US/AUST</u>
<u>CURRENT CATALOG STATUS</u>									
PAYLOADS	270	65	2	4	1	2	2	0	0
SPACE PROBES	14	14	0	0	0	0	0	0	0
EARTH DEBRIS	*922	148	0	18	3	0	0	0	0
SPACE DEBRIS	<u>20</u>	<u>5</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
TOTAL OBJECTS	1226	232	2	22	4	2	2	0	0
<u>HISTORICAL CATALOG STATUS</u>									
PAYLOADS DECAYED	300	256		0	0	1	0	2	1
DEBRIS DECAYED	<u>467</u>	<u>1052</u>		<u>12</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
TOTAL DECAYS	767	1308		12	0	1	0	2	1

*The large total of U.S. earth orbiting debris is attributed primarily to the break-up of satellites and rocket bodies of which the two most significant are:

217 objects detected from the break-up of the 1961 OMICRON rocket body of which fourteen have since decayed, and; 383 objects detected from the break-up of the TITAN III C-4 (1965-82A). Sixty-seven have since decayed.

**European Space Research Organization (ESRO) consists of the following ten countries: Belgium, Denmark, France, Germany, Holland, Italy, Spain, Sweden, Switzerland and the United Kingdom.

FIELD STATIONS OF SMITHSONIAN ASTROPHYSICAL OBSERVATORY



- ★ HEADQUARTERS, CAMBRIDGE, MASS.
- SMITHSONIAN INSTITUTION, WASHINGTON, D.C.
- ORIGINAL FIELD STATIONS OF THE SMITHSONIAN ASTROPHYSICAL OBSERVATORY (BAKER-NUNN CAMERAS)
- ★ NEW STATION SITES
- PRAIRIE NETWORK

- △ MT. HOPKINS OBSERVATORY, TUCSON, ARIZ.
- SMITHSONIAN RADIO METEOR PROJECT
- ◇ COOPERATING AIR FORCE BAKER-NUNN STATIONS
- * TRACKING LASER INSTALLATIONS
- + NO LONGER OPERATING