FACILITY FORM 602

N65-18269
(ACCESSION NUMBER)

22
(PAGES)

TMX-55153
(NASA CR OR TMX OR AD NUMBER)

(THRU)

1
(CODE)

31
(CATEGORY)

X-640-64-349

NASA TM X-55153

SHADES OF POGO

BY

H. MONTGOMERY
C. HERRON

GPO PRICE $ _____

OTS PRICE(S) $ _____

Hard copy (HC) $1.00

Microfiche (MF) $0.50

NOVEMBER 1964

GODDARD SPACE FLIGHT CENTER
GREENBELT, MARYLAND

SHADES OF POGO

by

H. Montgomery
C. Herron

LIST OF FIGURES

Figure		Page
1	Body Coordinate System	4
2	Main Box Shadow History	5
3	OPEP Shadow History	6
4	Experiment Package Shadow History	7
5	Solar Heat Inputs to Main Box	8
6	Earth Emitted Heat Inputs to Main Box	9
7	Solar Reflected Heat Inputs to Main Box	10
8	Solar Heat Inputs to OPEP 1 and 2	11
9	Earth Emitted Heat Inputs to OPEP 1 and 2	12
10	Solar Reflected Heat Inputs to OPEP 1 and 2	13
11	Solar Heat Inputs to Experiment Packages	14
12	Earth Emitted Heat Inputs to Experiment Packages	15
13	Solar Reflected Heat Inputs to Experiment Packages	16
14	Solar Heat Inputs to Solar Array	17
15	Earth Emitted Heat Inputs to Solar Array	18
16	Solar Reflected Heat Inputs to Solar Array	19

SHADES OF POGO

by

H. Montgomery
C. Herron

I. INTRODUCTION

The Orbiting Geophysical Observatory (OGO) consists of a main box, the solar array, and the orbital plane experiment package (OPEP). Experiments may be appended to any of the three main component parts either directly or on booms. As many as fifty experiment packages may be carried on the OGO spacecraft. The solar array and the OPEP may rotate relative to the main box. The main box and the solar array are considered as casting shadows and carrying experiments; the OPEP is considered only as carrying experiments. Heat inputs include direct solar, reflected solar, and Earth emitted heat flux. If the experiment is shielded from the Sun by the Earth, the main box, or the solar array, the solar input to that particular experiment is set to zero. If an experiment is in the eclipse of the Earth, the reflected solar (as well as the direct solar) heat input is set to zero. However, the effects of shadowing of an experiment from the Earth by the main box or by the solar array is not considered in the computation of the solar reflected or Earth emitted heat inputs to that particular experiment. Shadow data are presented for the S-50 (POGO) for a launch date of March 14, 1965, at 14.5 hours U.T. The heat input data are for an EPOCH time of September 12, 1965, at 1.5 hours U.T. ~~The injection elements are from Reference 2. The S-50 geometry is identical to the S-49 geometry given in Reference 1.~~

II. NOTATION

Notation is identical to that given in Reference 1, page 3.

III. ASSUMPTIONS

A. Initial Conditions

The initial conditions are given in Reference 2. They are:

geocentric latitude	=	22.558° N
terrestrial longitude	=	-120.266° W
geocentric height	=	326.444 kilometers
vehicle speed	=	7.85314 kilometers/sec.
azimuth	=	175.672° from North
flight path angle	=	1.7987°

B. Restraints on Launch Time

The results presented in this report are for launch times consistent with POGO perigee restraints. See Reference 3.

C. S-50 Spacecraft Geometry

The assumed geometry is identical to S-49 EGO. See Reference 1.

IV. RESULTS AND DISCUSSION

Figures 2 through 4 present the amount of time per orbit that the S-50 POGO experiments spend in the shadow of the earth, the shadow of the main satellite structure (the main box), or the shadow of the solar array. These data are for the three main box faces $+z_B$, $-z_B$, and $-y_B$, for the boom or appendage mounted experiments (E. P. 1 through E. P. 6), and for the orbital plane experiment package (OPEP 1 and 2). The coordinates for the sides of the main box and the experiments are shown in Section III of Reference 1.

Figures 5 through 16 present the heat inputs to the main box faces ($\pm x_B$, $\pm y_B$, $\pm z_B$), appendage or boom mounted experiments (E. P. 1 through E. P. 6), the solar array, and the orbital plane experiment packages (OPEP 1 and 2).

V. REFERENCES

1. Montgomery et al., Shades of Ego, NASA Report X-640-64-19, Goddard Space Flight Center, Greenbelt, Maryland.

2. Preliminary POGO Ascent Trajectory (6801), letter from Mr. J. L. Shoenhair, Lockheed Missiles and Space Company to Dr. S. C. Himmel, Lewis Research Center, 14 August 1964.

3. Memo to R. K. Squires from W. E. Scull, subject: Work Statement for OGO Launch Window Analysis, 13 February 1964.

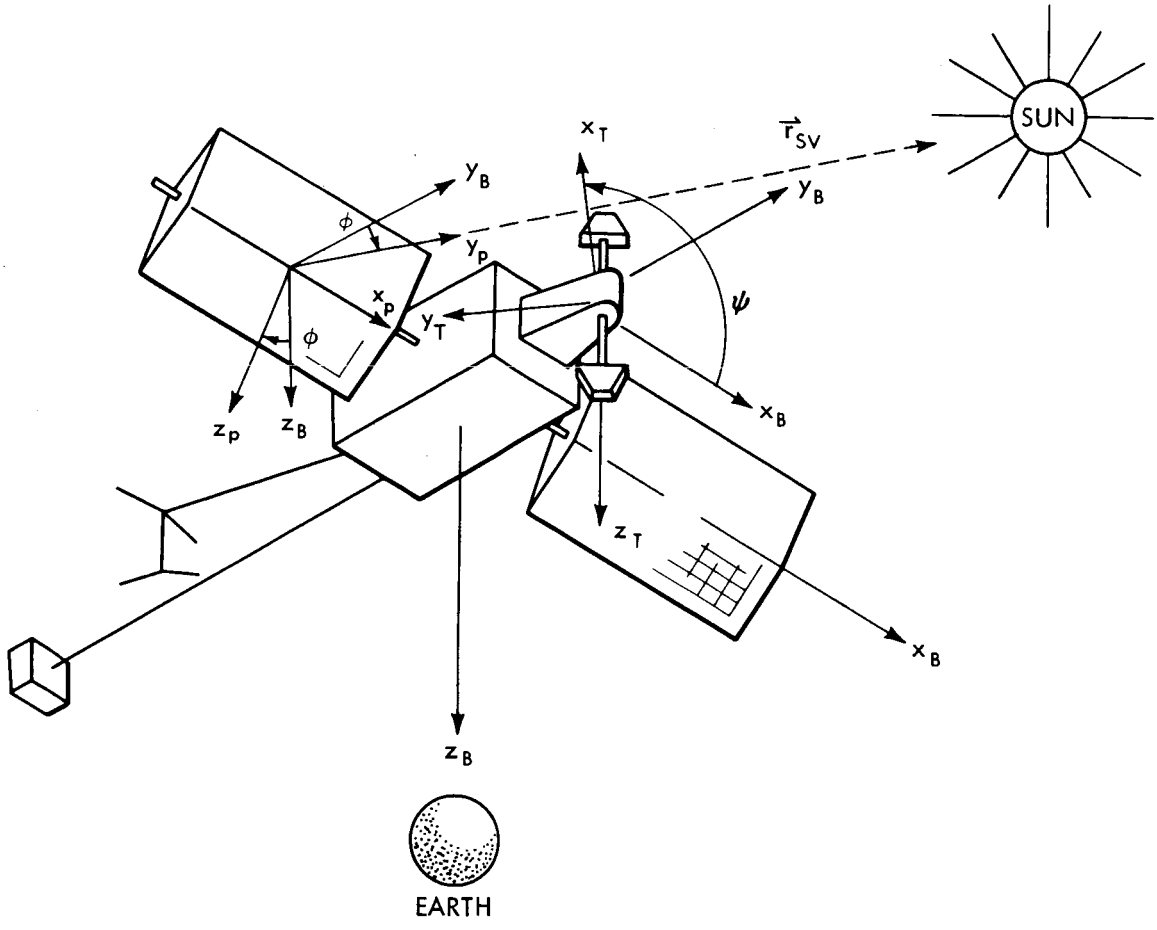

Figure 1–Body Coordinate System

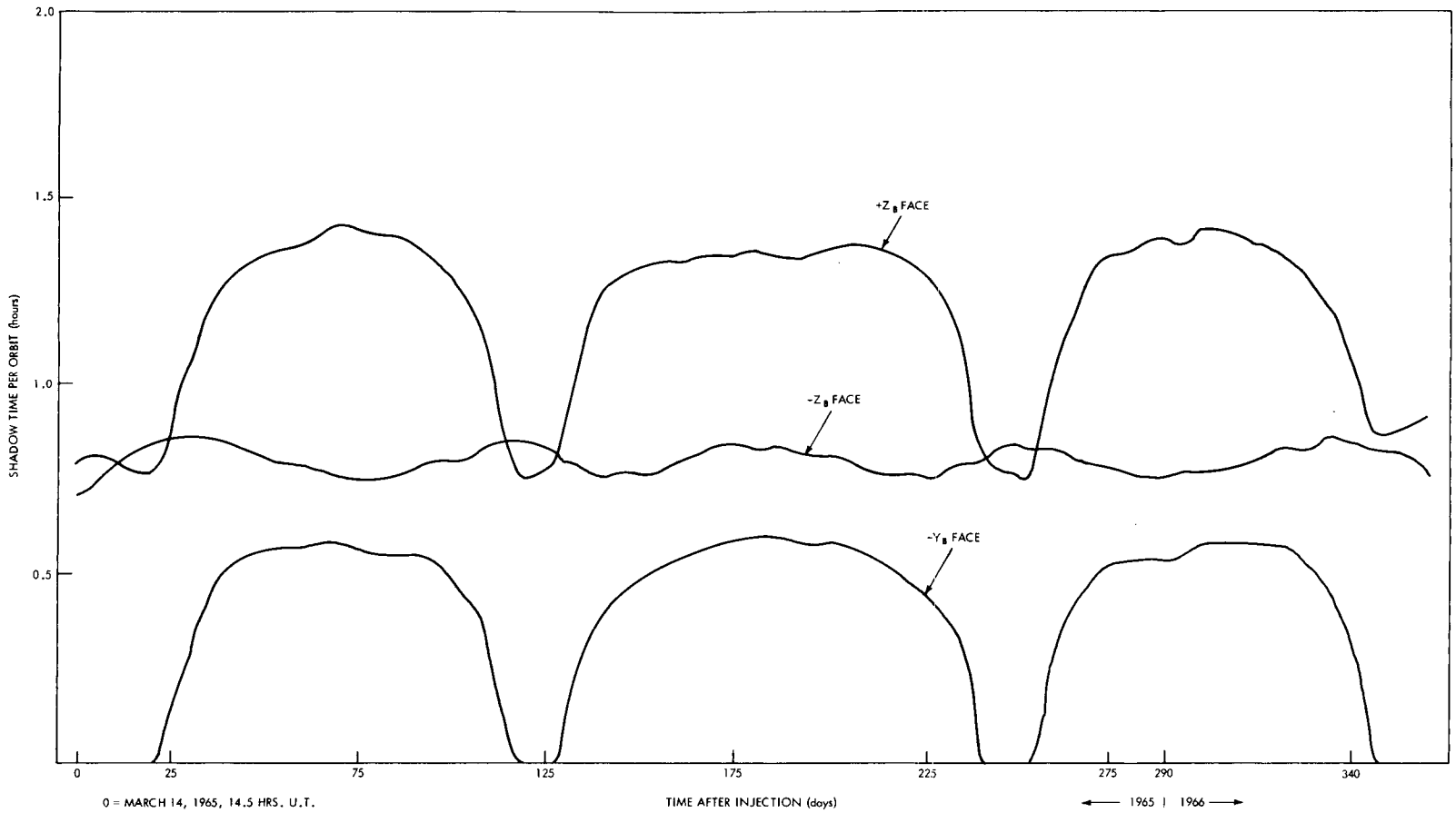

Figure 2—Main Box Shadow History

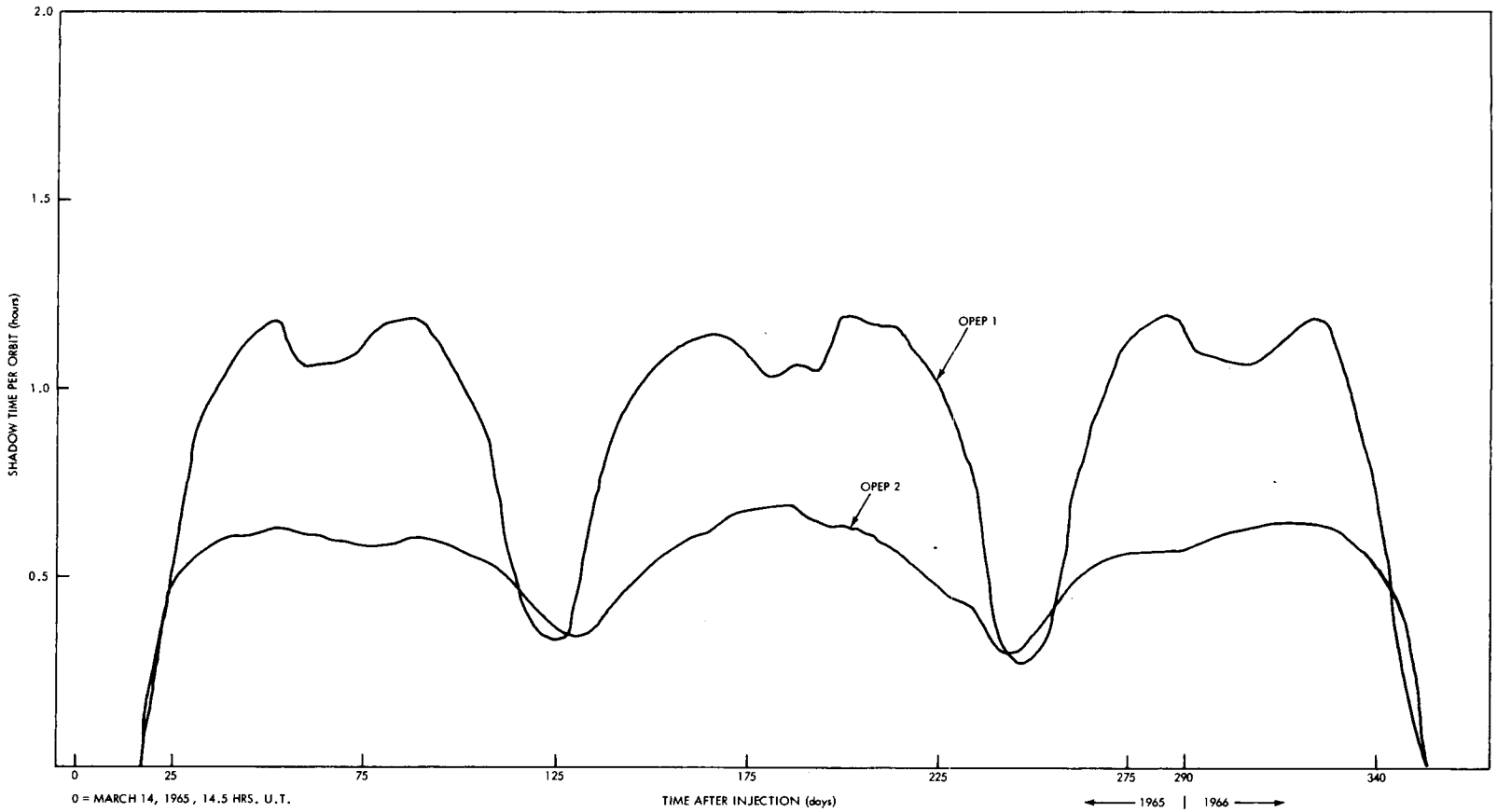

Figure 3–OPEP Shadow History

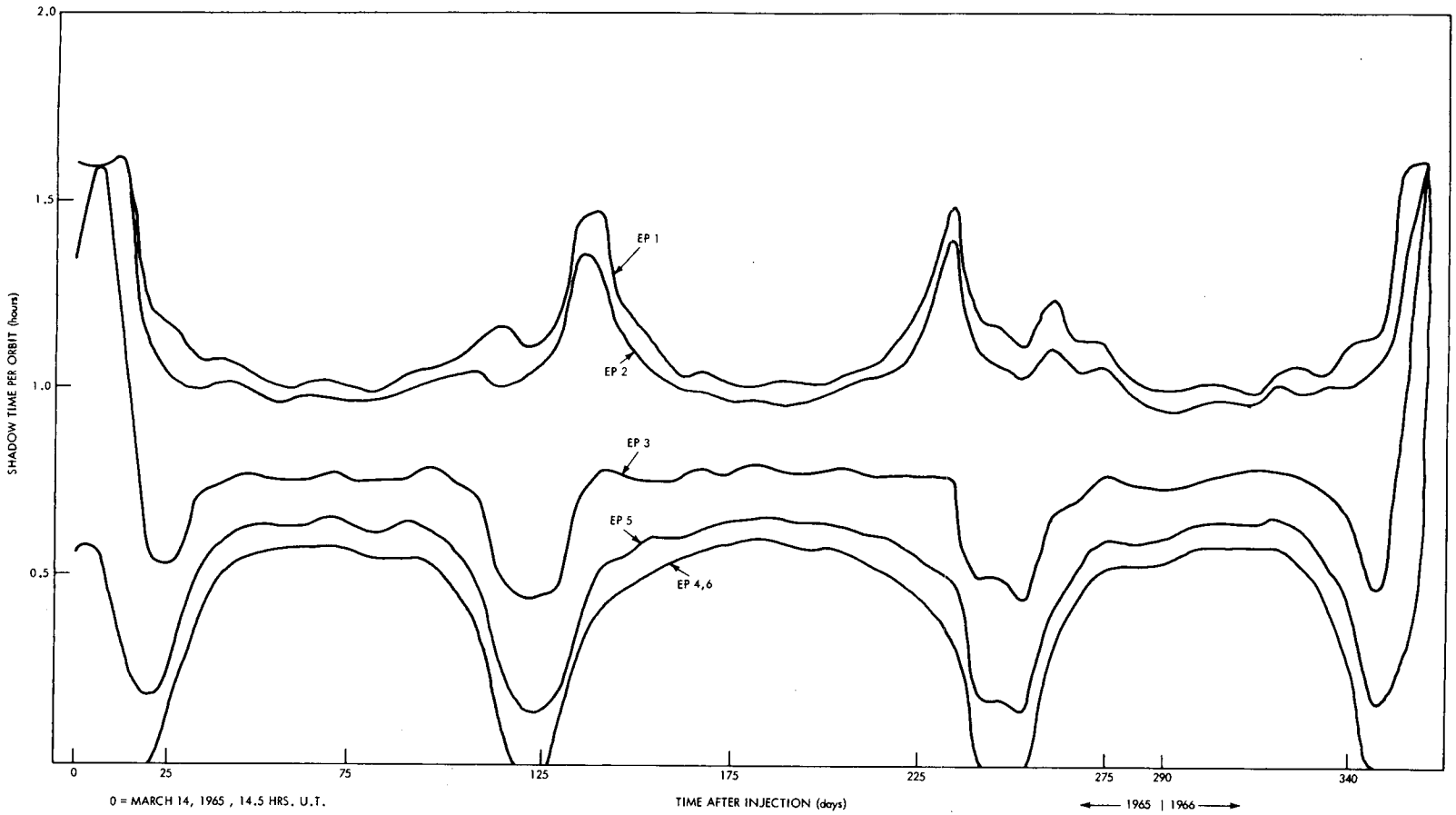

Figure 4–Experiment Package Shadow History

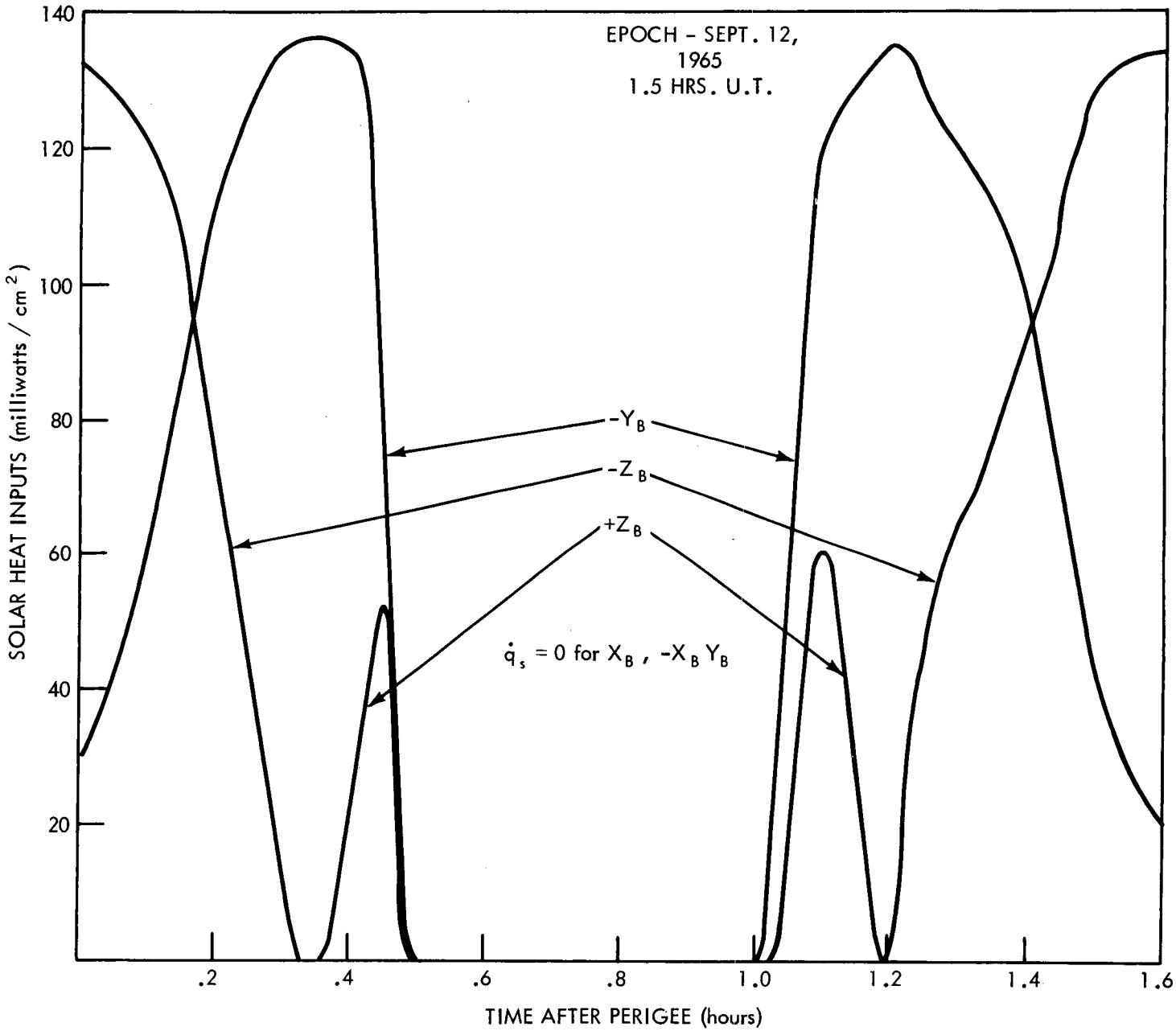

Figure 5–Solar Heat Inputs to Main Box

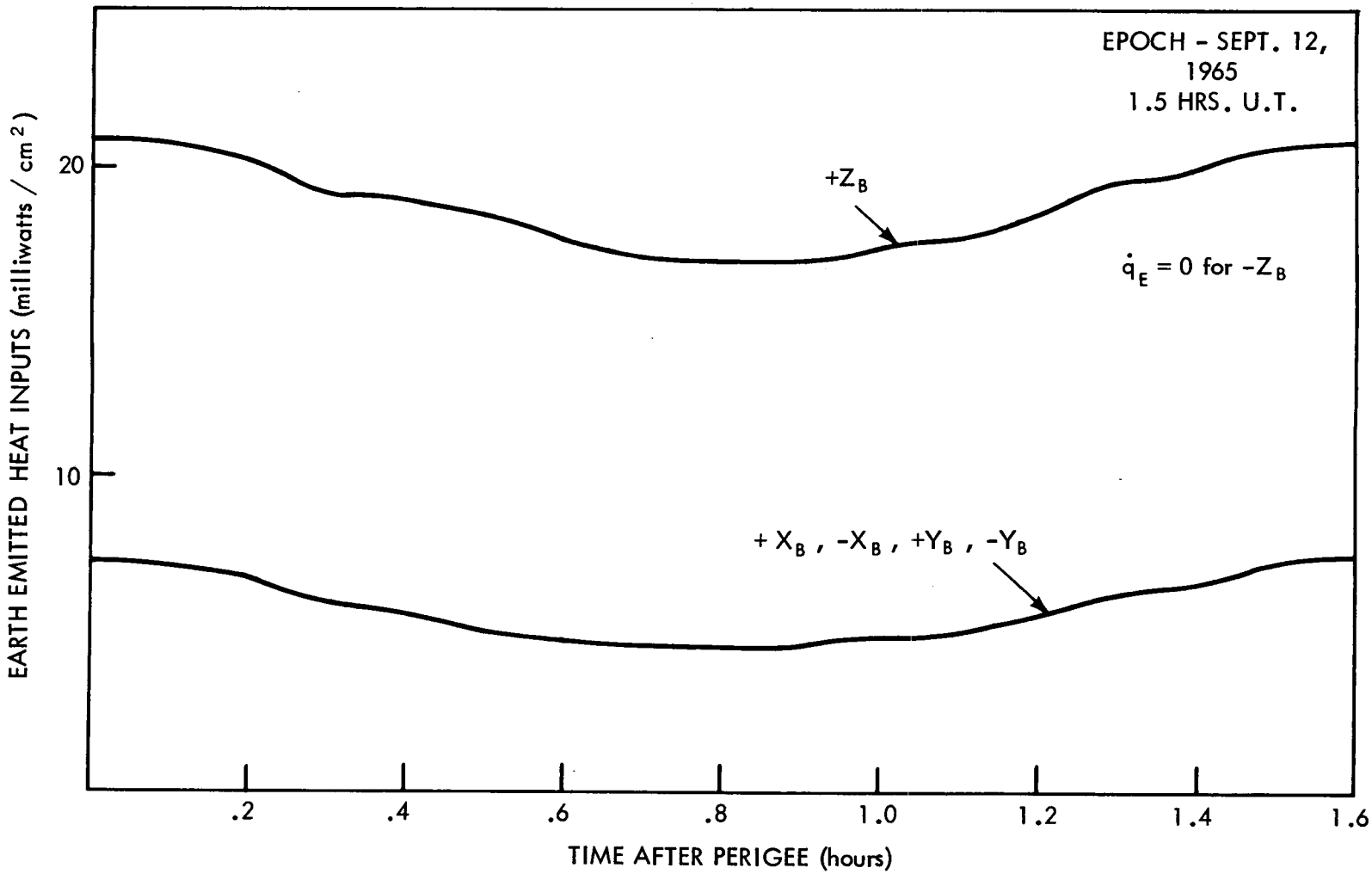

Figure 6–Earth Emitted Heat Inputs to Main Box

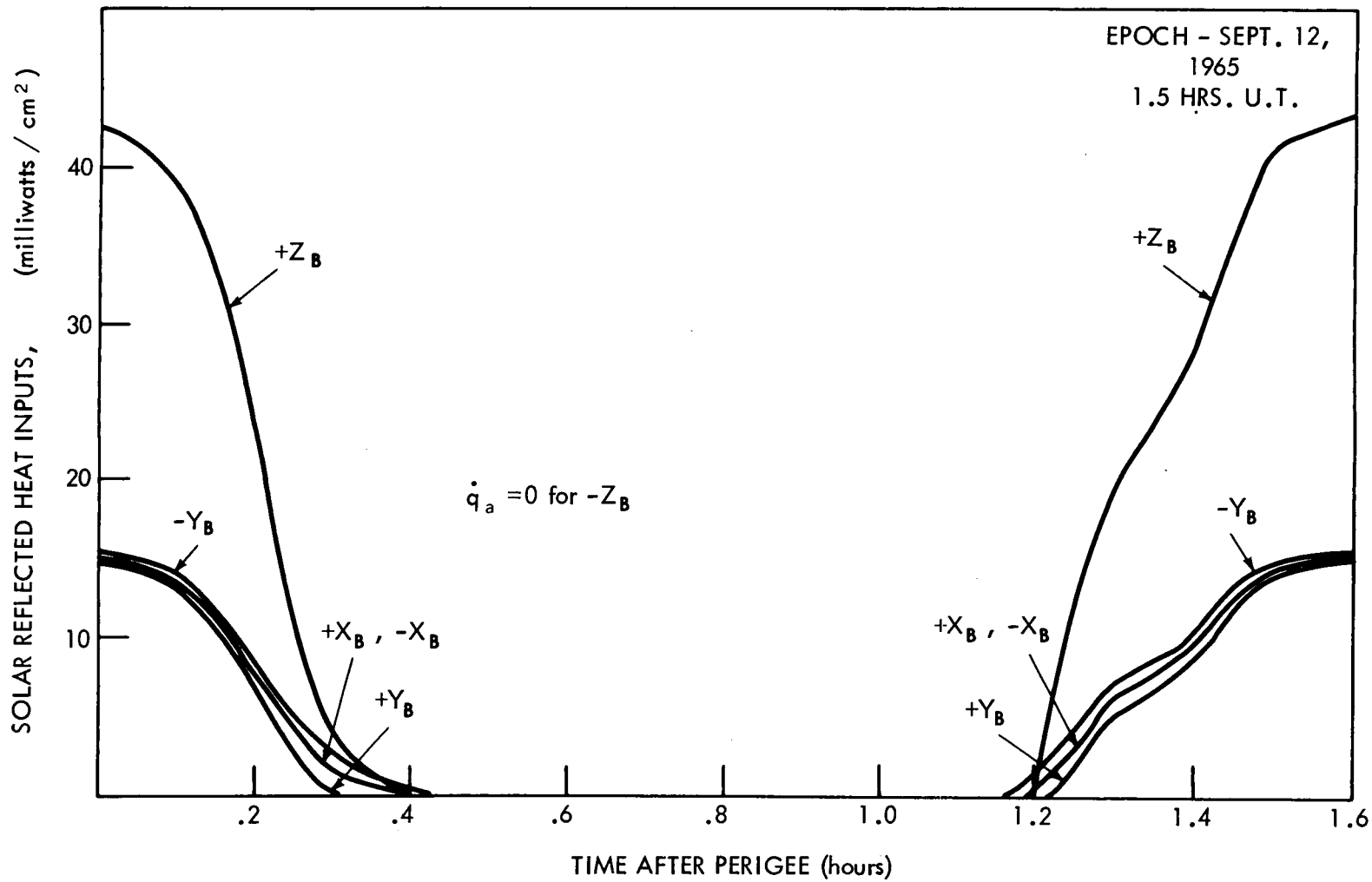

Figure 7–Solar Reflected Heat Inputs to Main Box

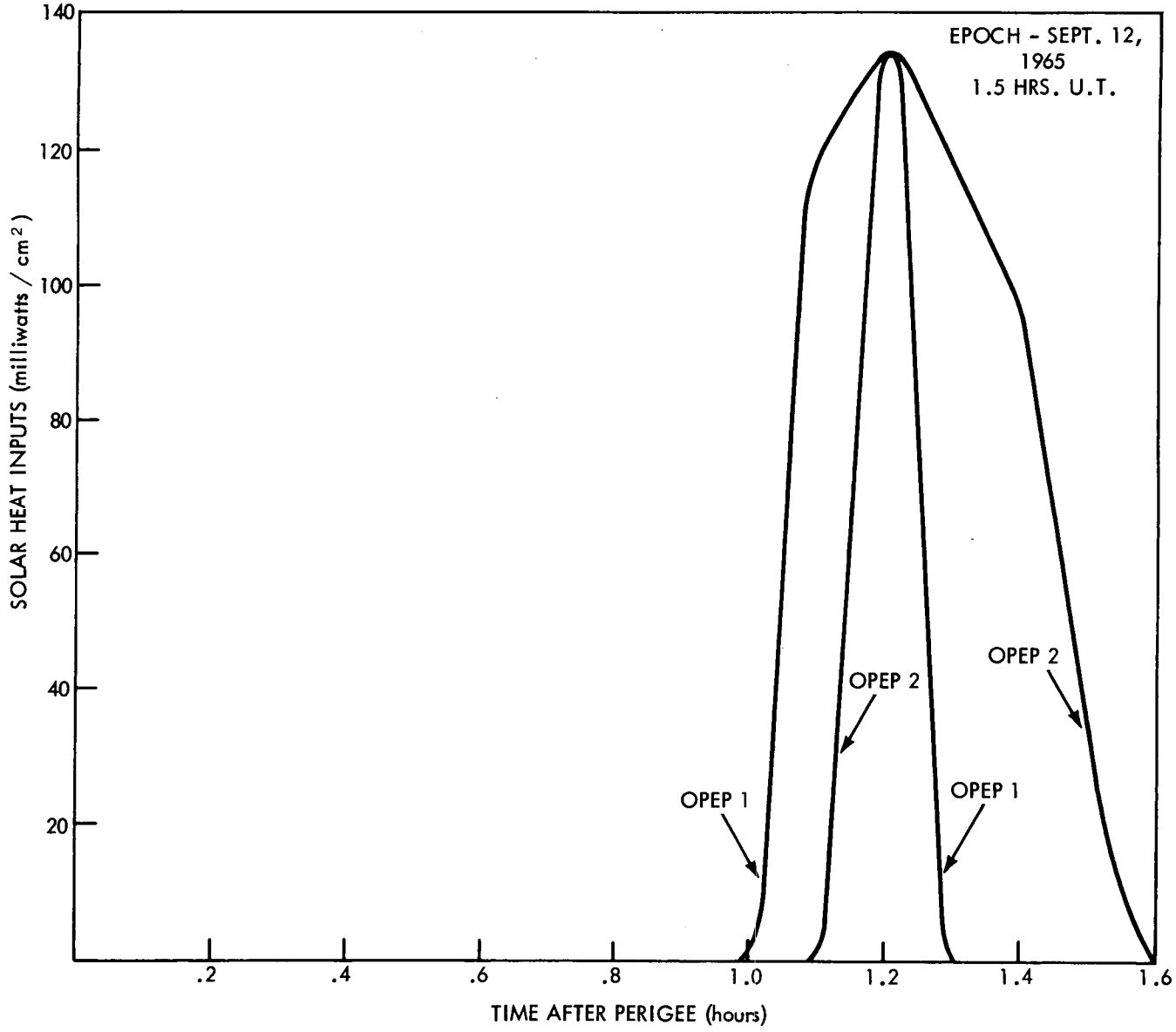

Figure 8–Solar Heat Inputs to OPEP 1 and 2

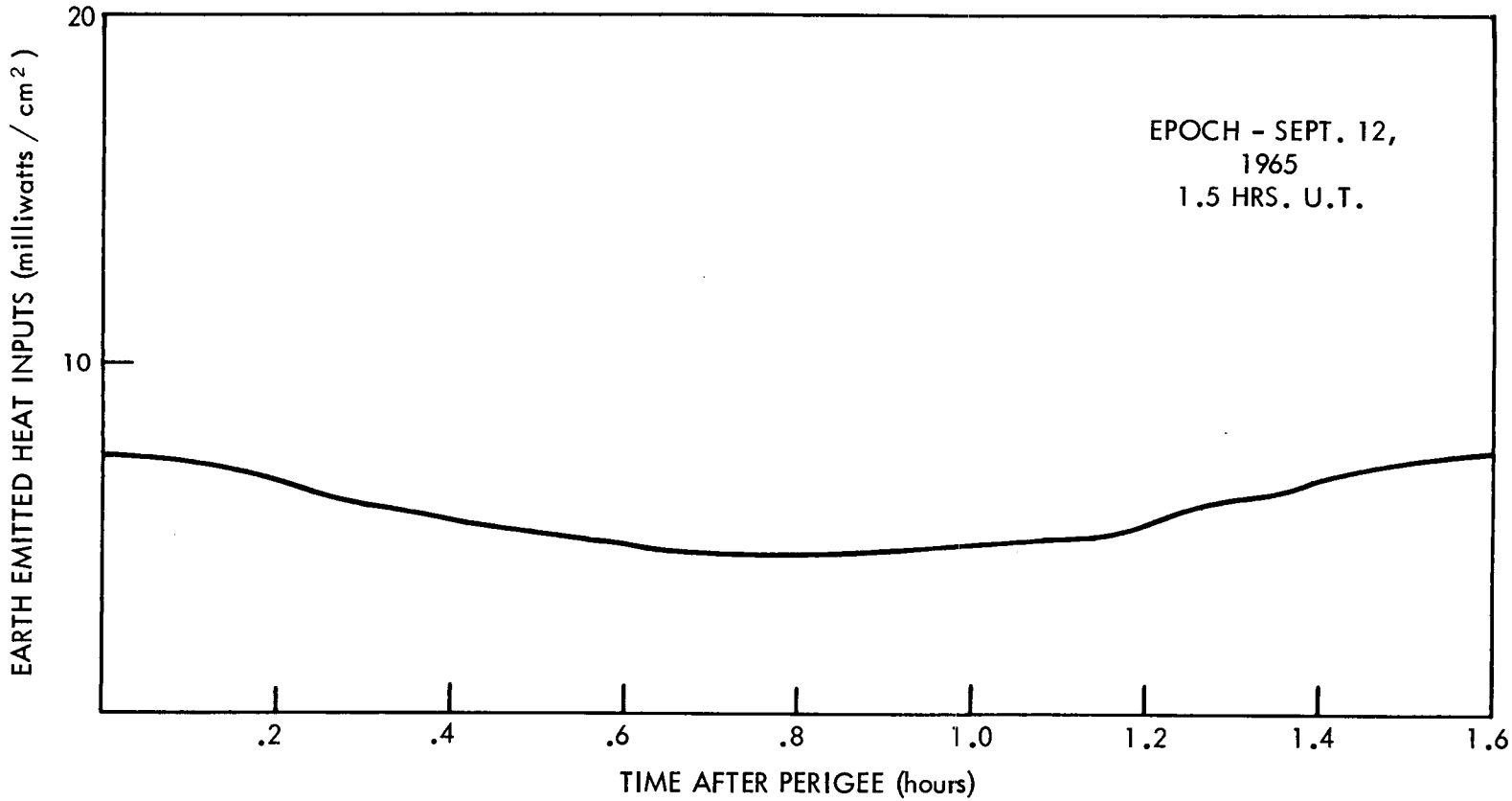

Figure 9–Earth Emitted Heat Inputs to OPEP 1 and 2

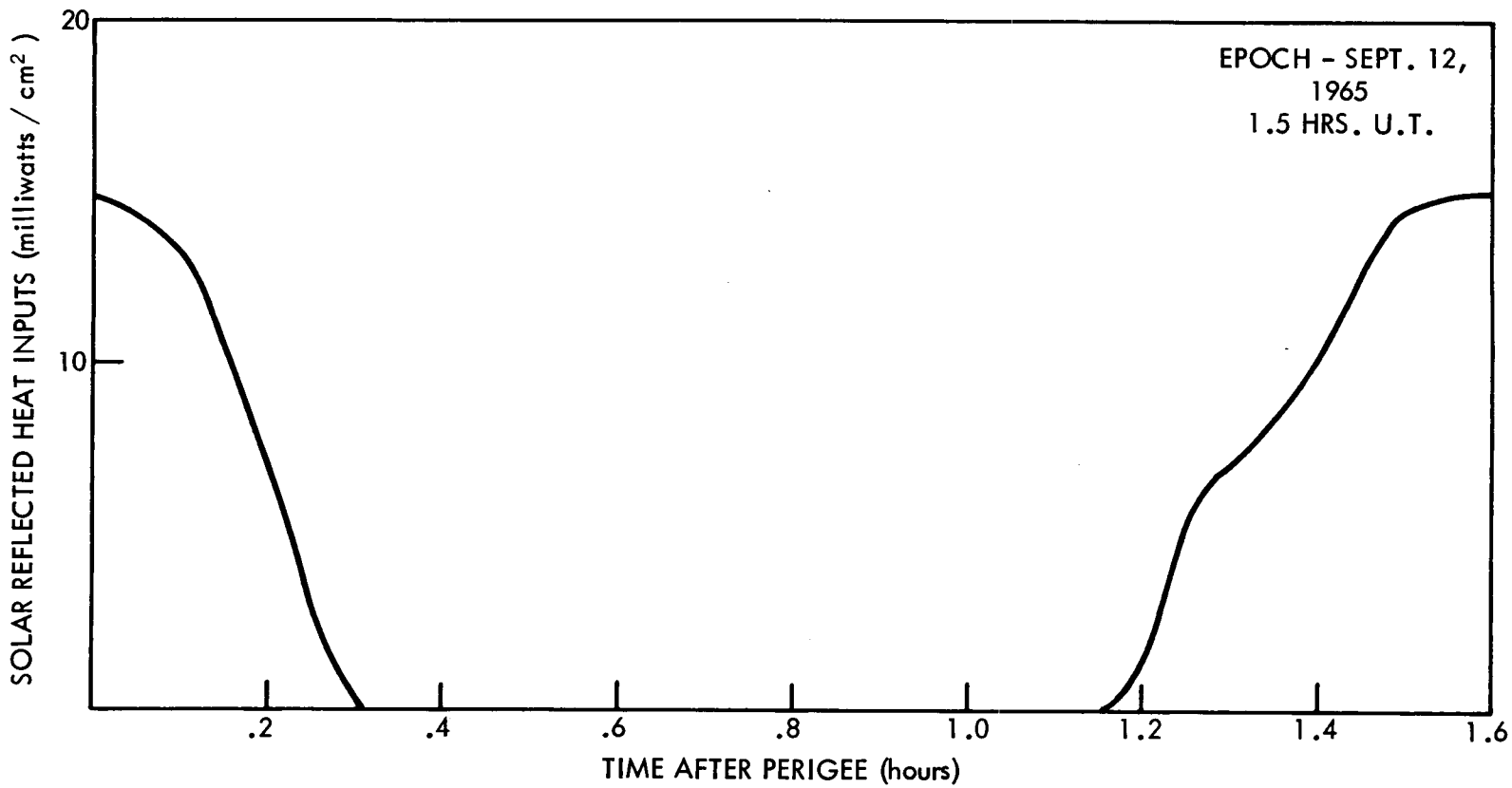

Figure 10–Solar Reflected Heat Inputs to OPEP 1 and 2

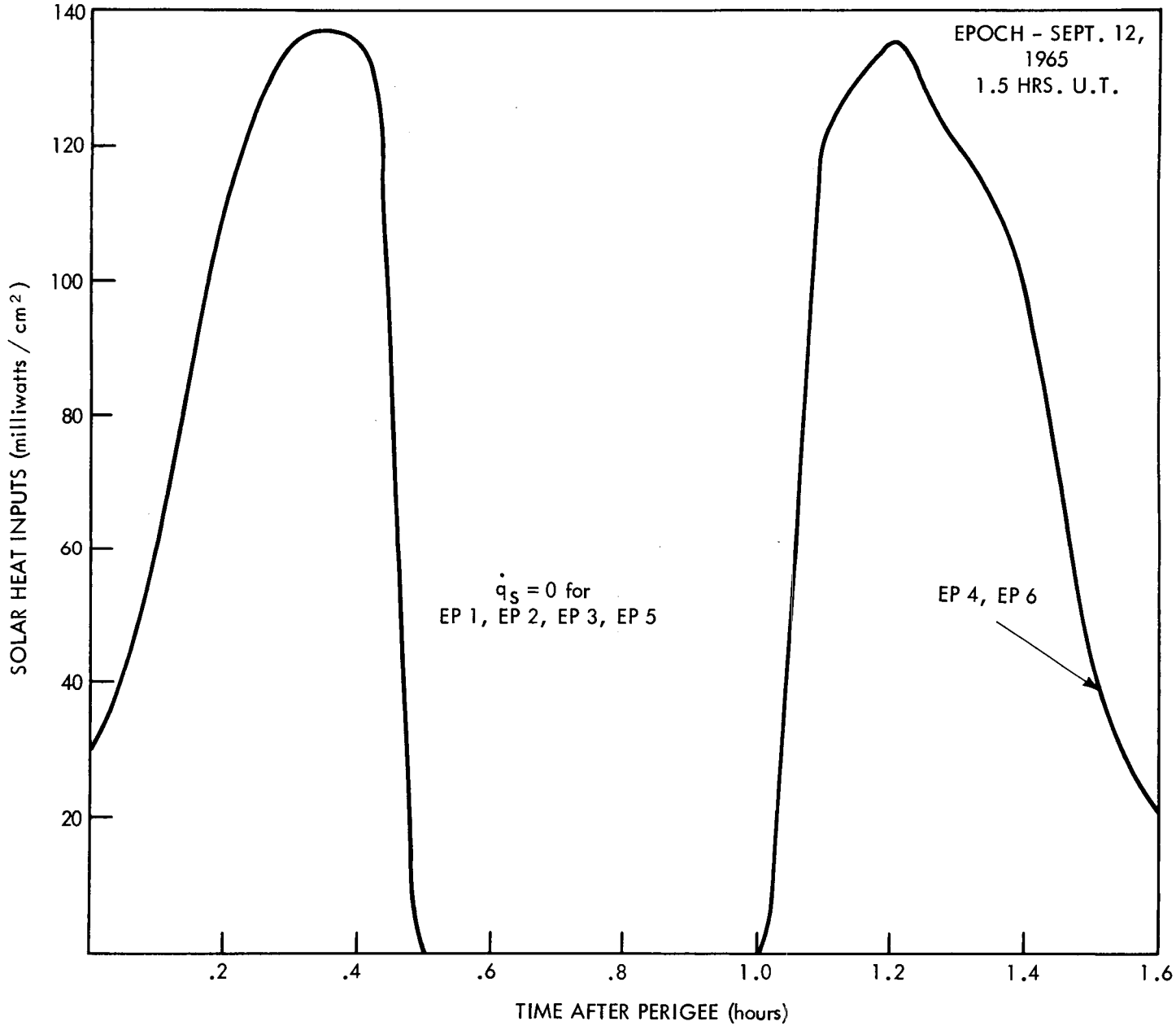

Figure 11–Solar Heat Inputs to Experiment Packages

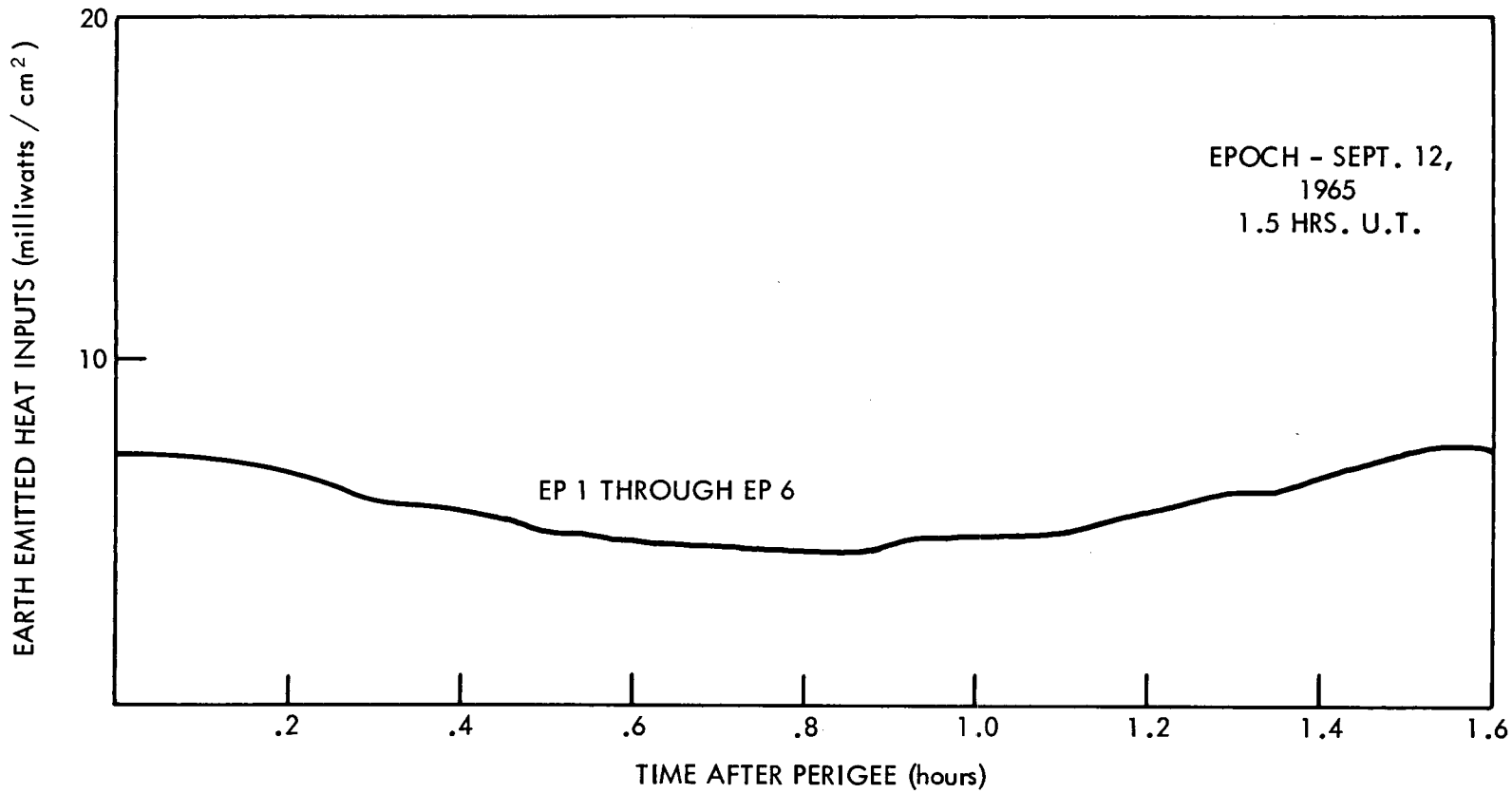

Figure 12–Earth Emitted Heat Inputs to Experiment Packages

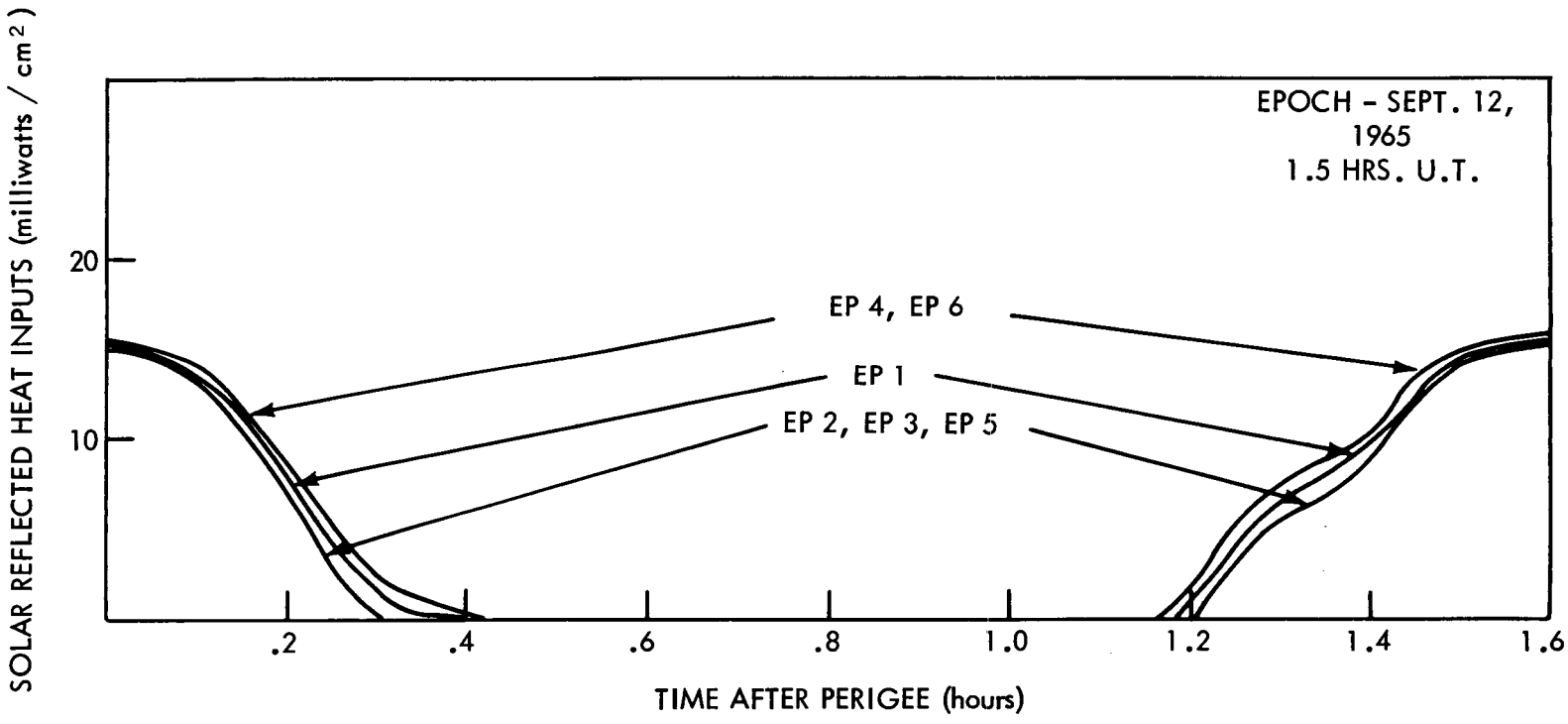

Figure 13–Solar Reflected Heat Inputs to Experiment Packages

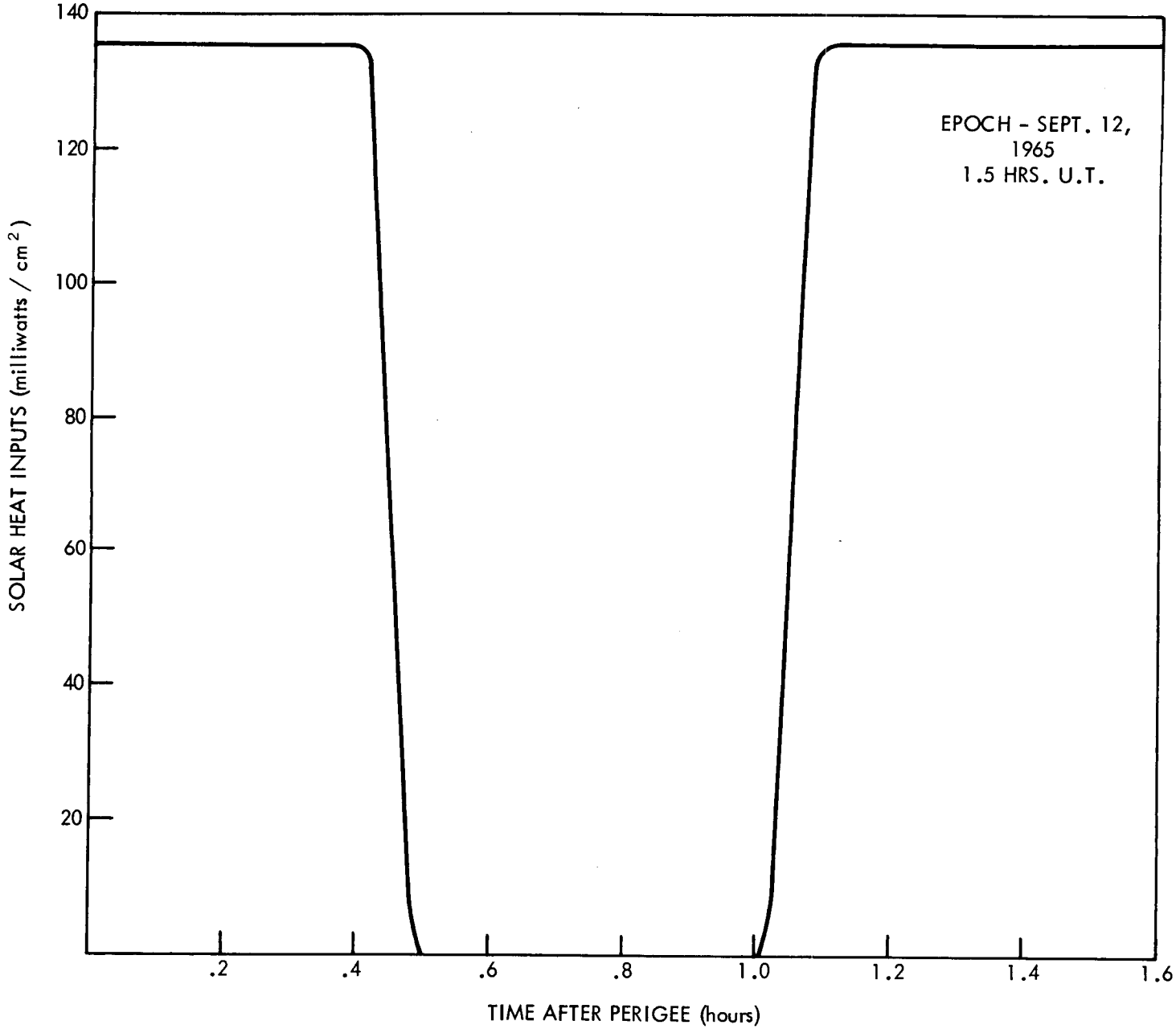

Figure 14–Solar Heat Inputs to Solar Array

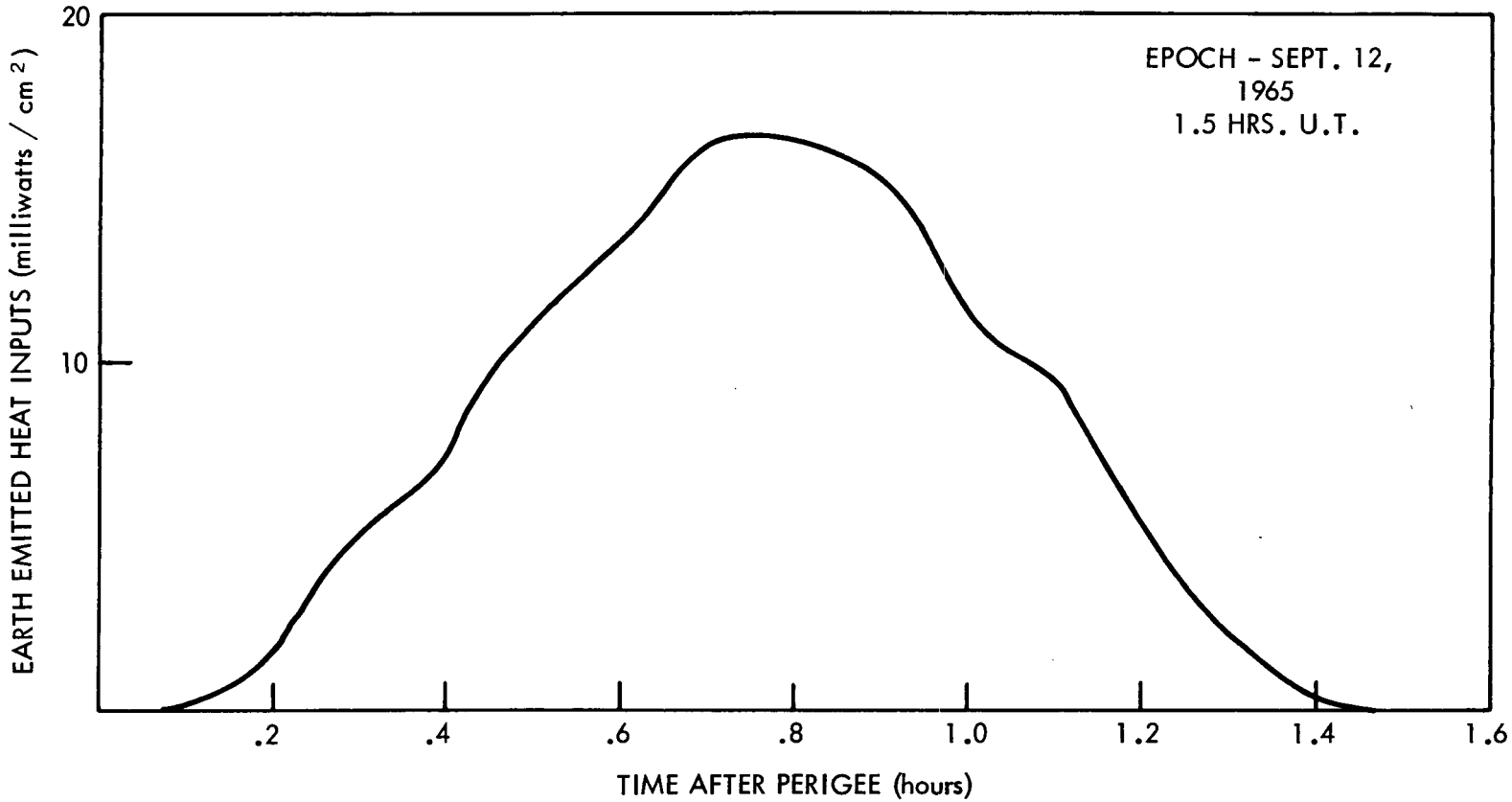

Figure 15–Earth Emitted Heat Inputs to Solar Array

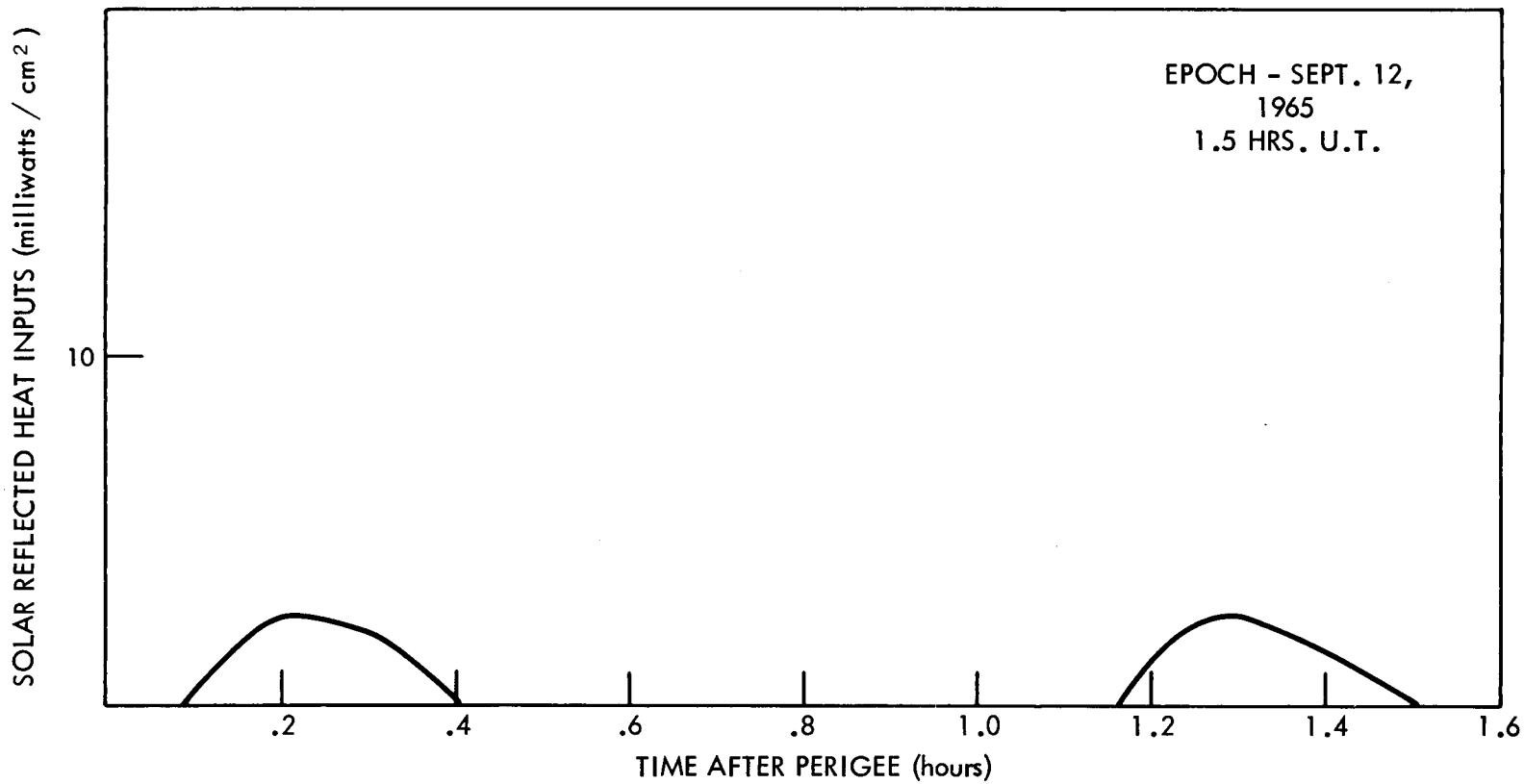

Figure 16–Solar Reflected Heat Inputs to Solar Array