

Cyclic Trajectory Concepts

Presented by:

Dr. Buzz Aldrin
Senior Scientist

Aerospace Systems Group
Science Applications International Corporation
Hermosa Beach, CA

to

Interplanetary Rapid Transit (IRT) Study
Status Meeting
Jet Propulsion Laboratory
Pasadena CA

28 October 1985

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"SPACE CYCLERS" FOR CIS-LUNAR/INTERPLANETARY TRANSPORTATION

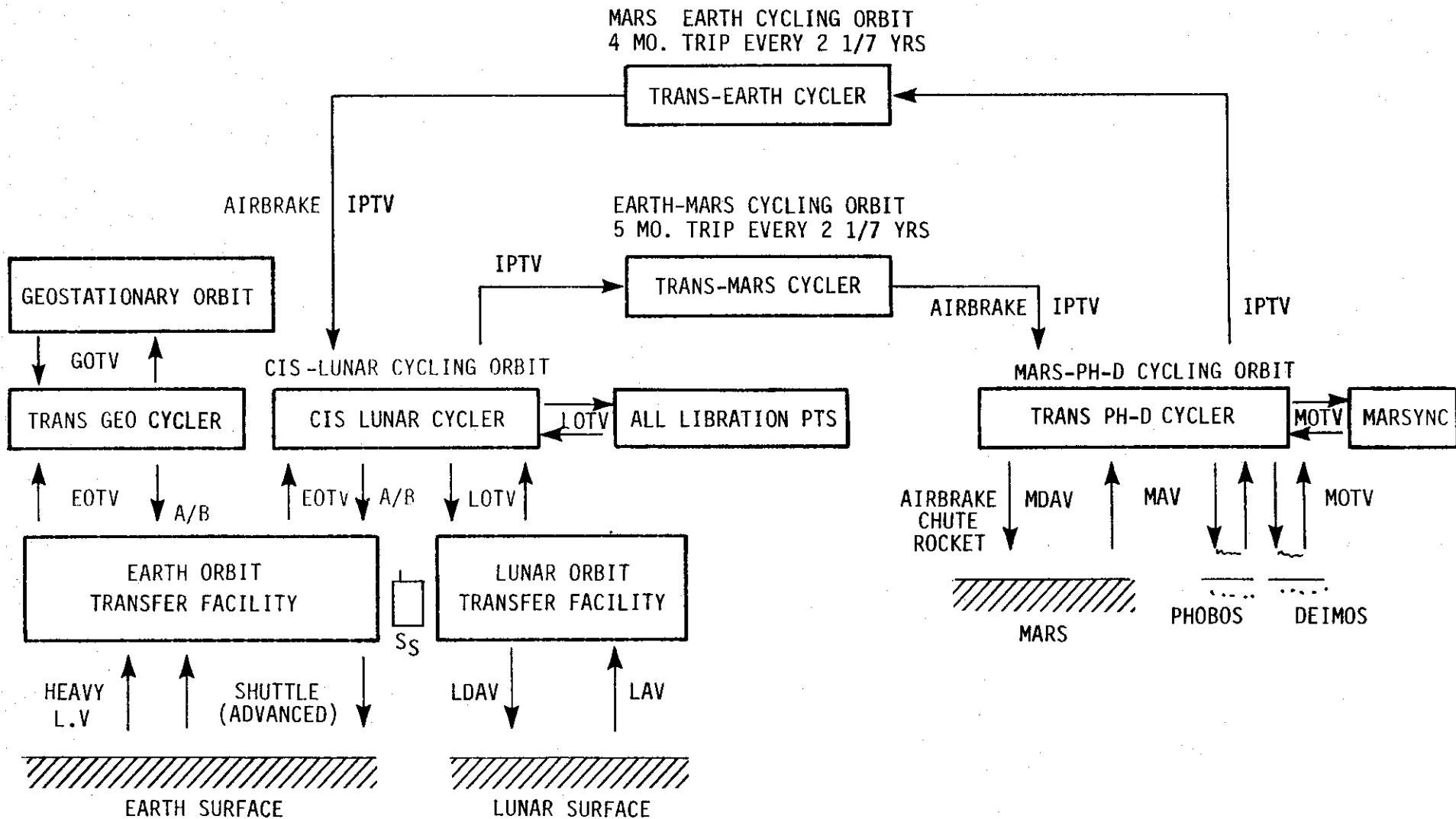
CYCLING: CIRCULATING TRAJECTORIES VIA "GRAVITY-ASSIST" CYCLING
NEAR VICINITY PASSES - SHORTER RENDEZVOUS
HIGHER VELOCITY PASSES - EFFICIENT ESCAPE ΔV s
SCHEDULE REGULARITY
LOW THRUST PROPULSION ORBIT TRIM
LUNAR CYCLING PROVIDES QUICK ACCESS TO RESOURCES
PHD CYCLING PROVIDES QUICK ACCESS TO RESOURCES
COMPATIBLE WITH LIBRATION POINTS/SYNCHRONOUS ORBIT

CYCLERS: MASSIVE AND GROWTH CAPABLE
ARTIFICIAL GRAVITY - TETHER ROTATION
ADVANCED CELSS (WASTE RESIDUE → TAXI HEAT SHIELD ENHANCEMENT)
RADIATION SHIELDING
POWER STRUCTURE GROWTH
FOCUS PROJECT FOR INTERNATIONAL (INCL SOVIET) COOPERATION
LEO EVOLUTIONARY DEVELOPMENT
CIS-LUNAR STAGING/TRAFFIC CONTROL
NEUTRAL INTERPLANETARY WORLD ASSET
NON-SECURITY TECHNOLOGY TRANSFER

(Architecture)

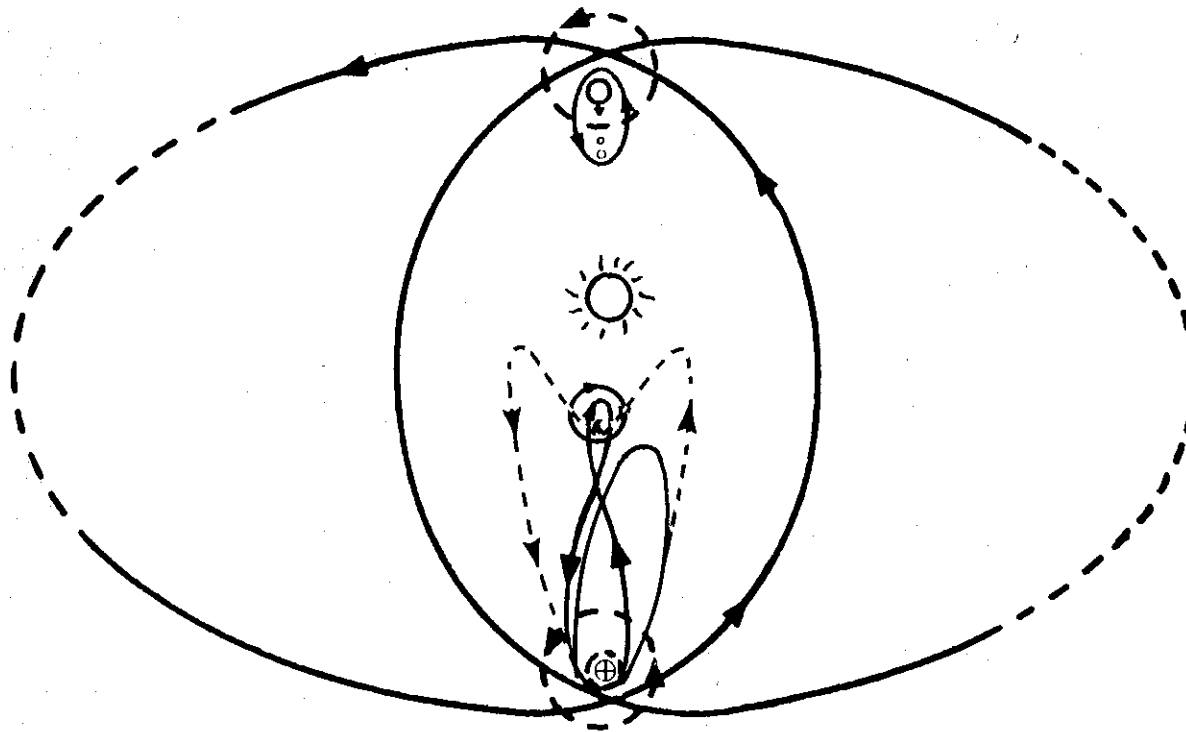
Evolutionary Infrastructure for the 2K Century

Dr. Buzz Aldrin
Architect and Cyclist

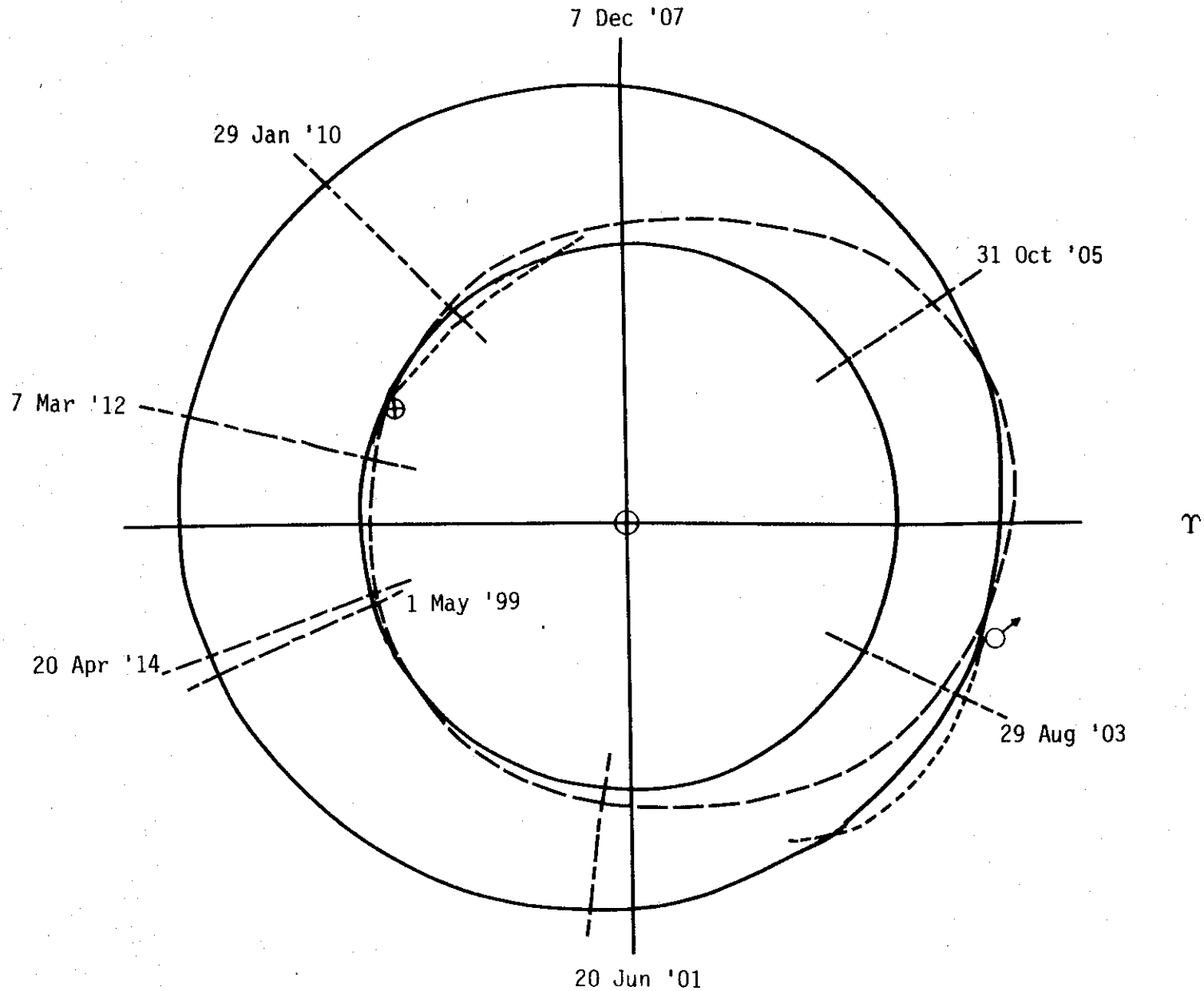


EARTH TO MARS AND BACK WITH CYCLING ORBITS

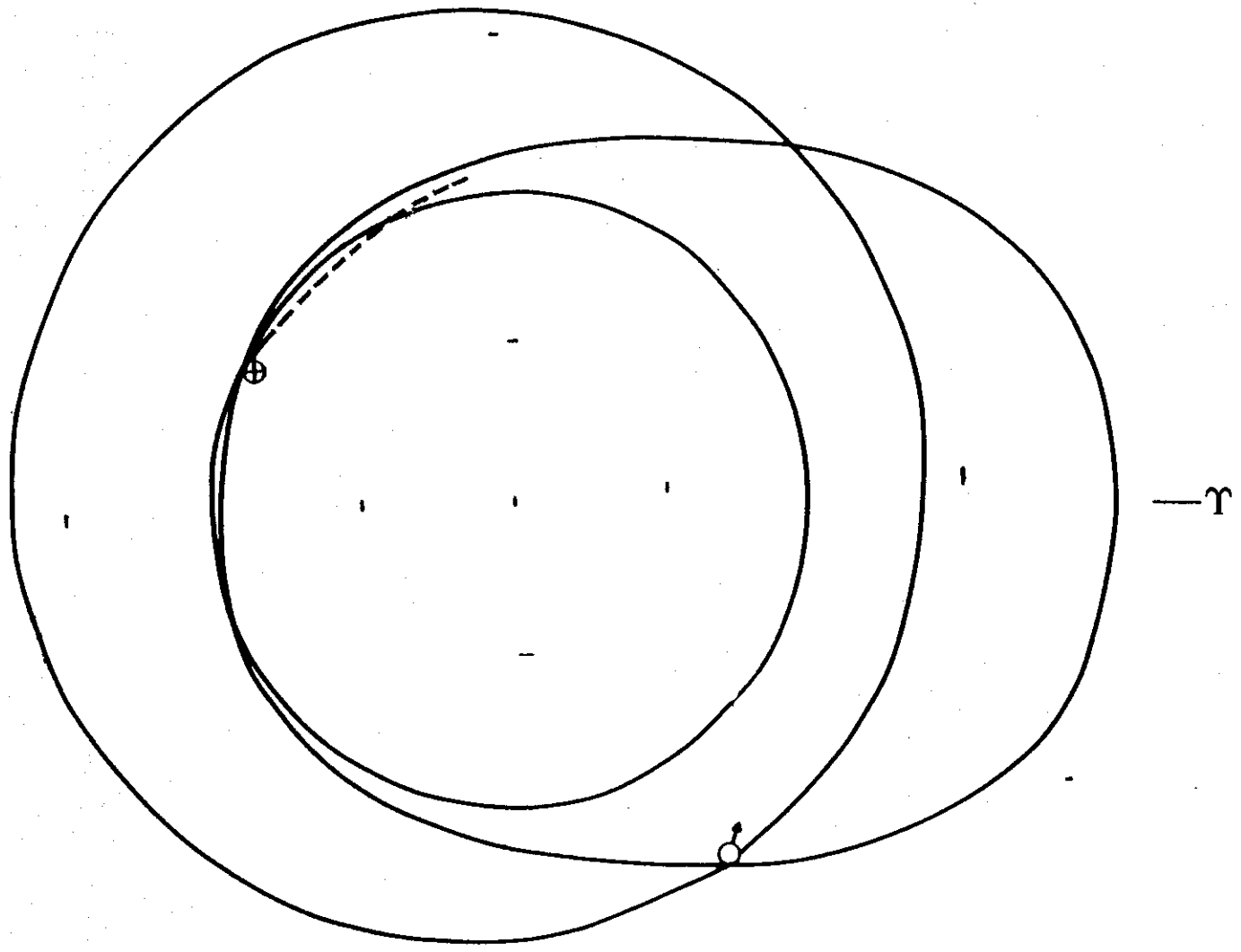
LEO → CIS LUNAR CYCLER → TRANS MARS CYCLER → TRANS Ph.D. CYCLER
→ Ph.D OR MARS → Ph.D. CYCLER
TRANS EARTH CYCLER → LUNAR CYCLER → MOON, EARTH



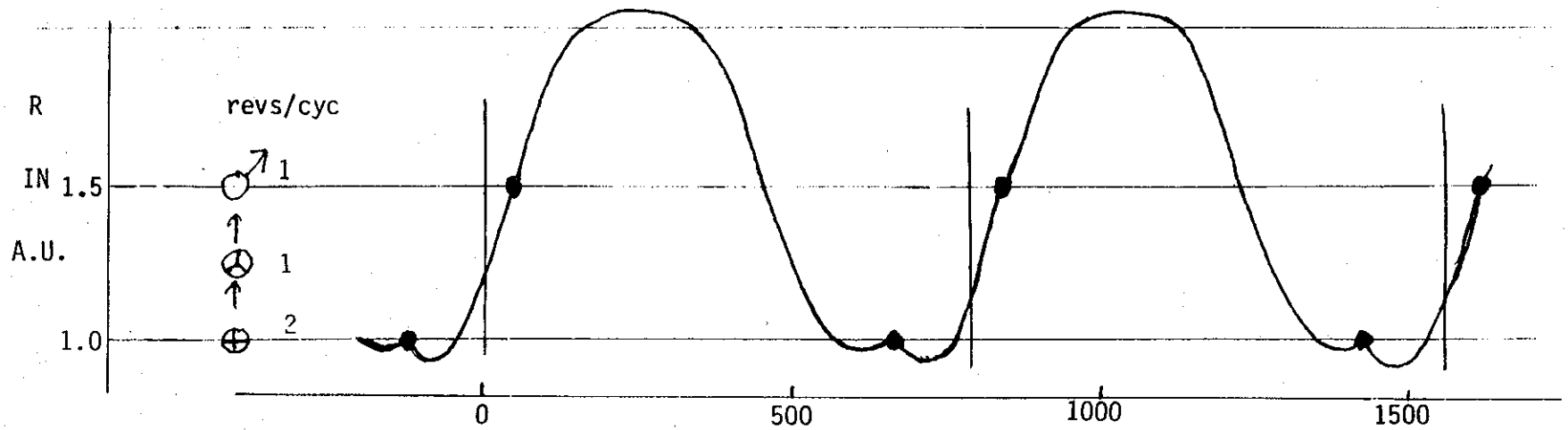
Rotation of Oppositions and \therefore Cyclic Orbit Apsides by Decreasing ($-f$) True Anomaly



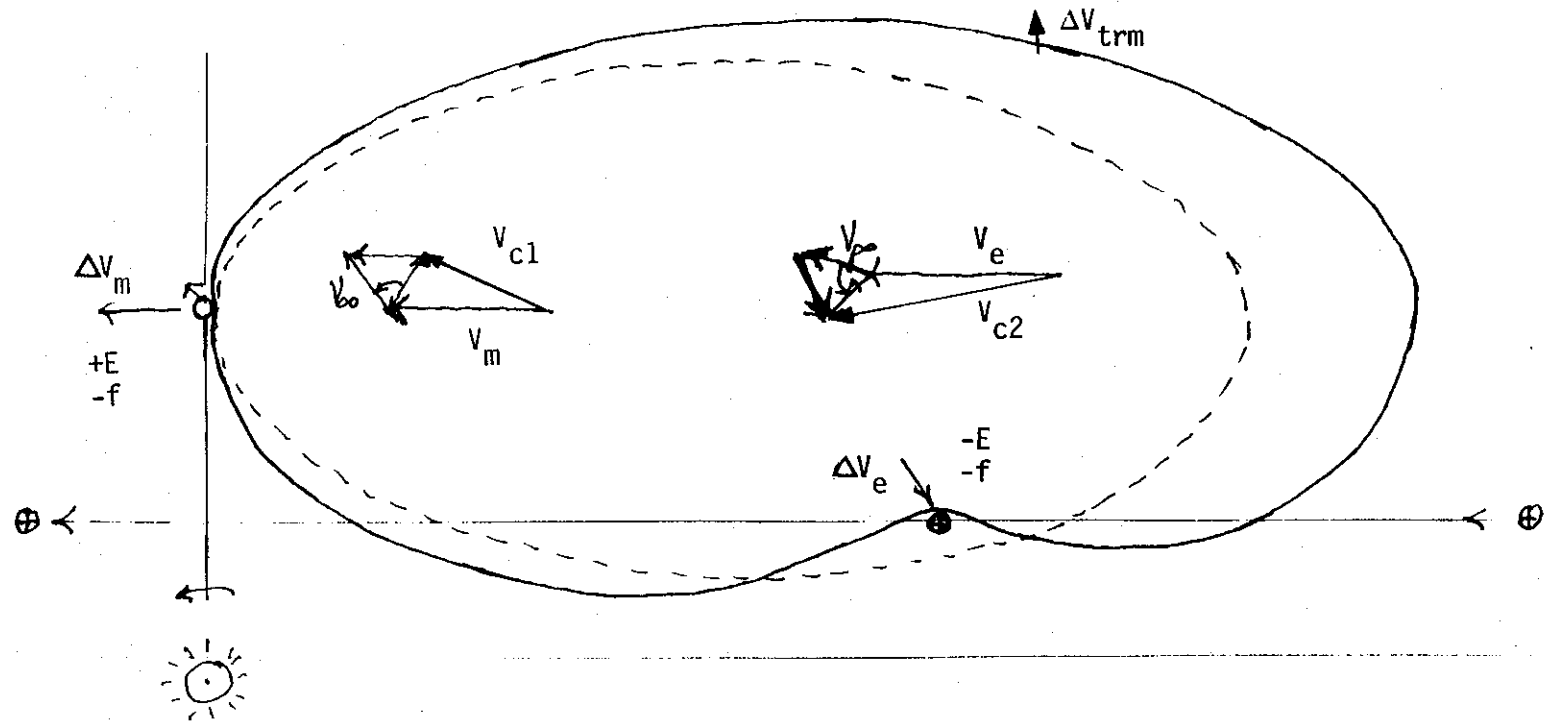
Earth to Mars Cycling Orbit (2-1-1)



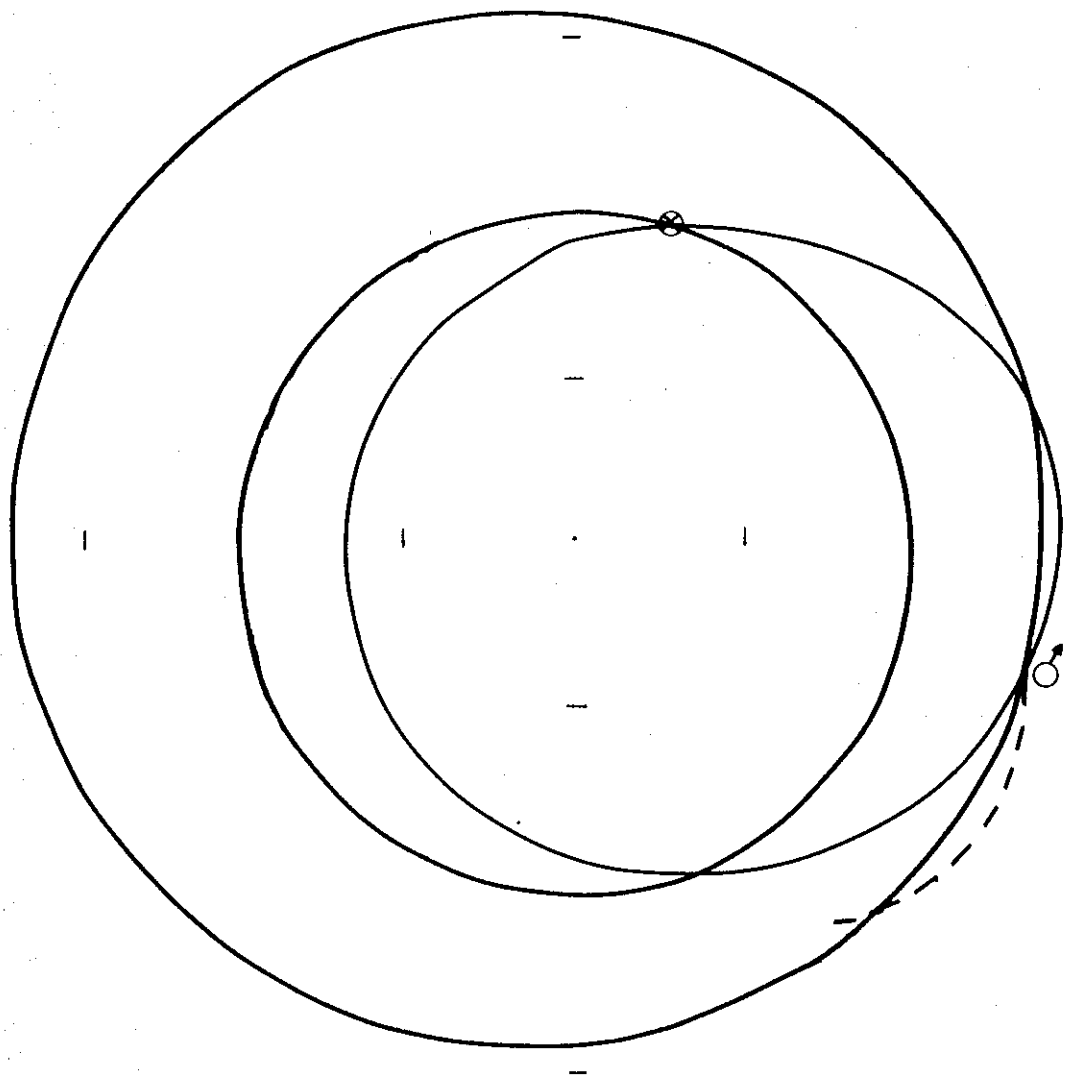
TRANS-MARS CYCLER (1)



EARTH TO MARS CYCLING ORBIT (2-1-1)

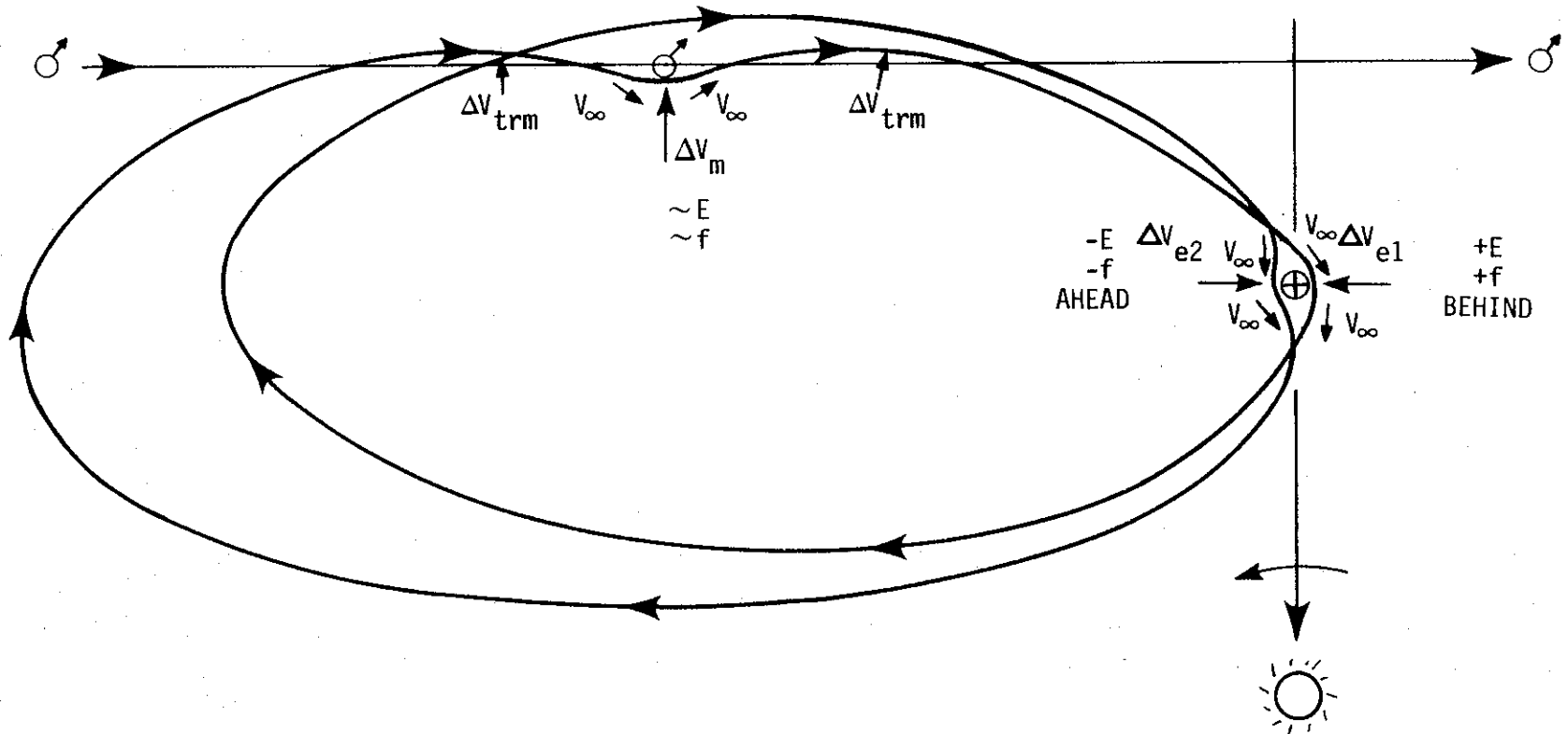
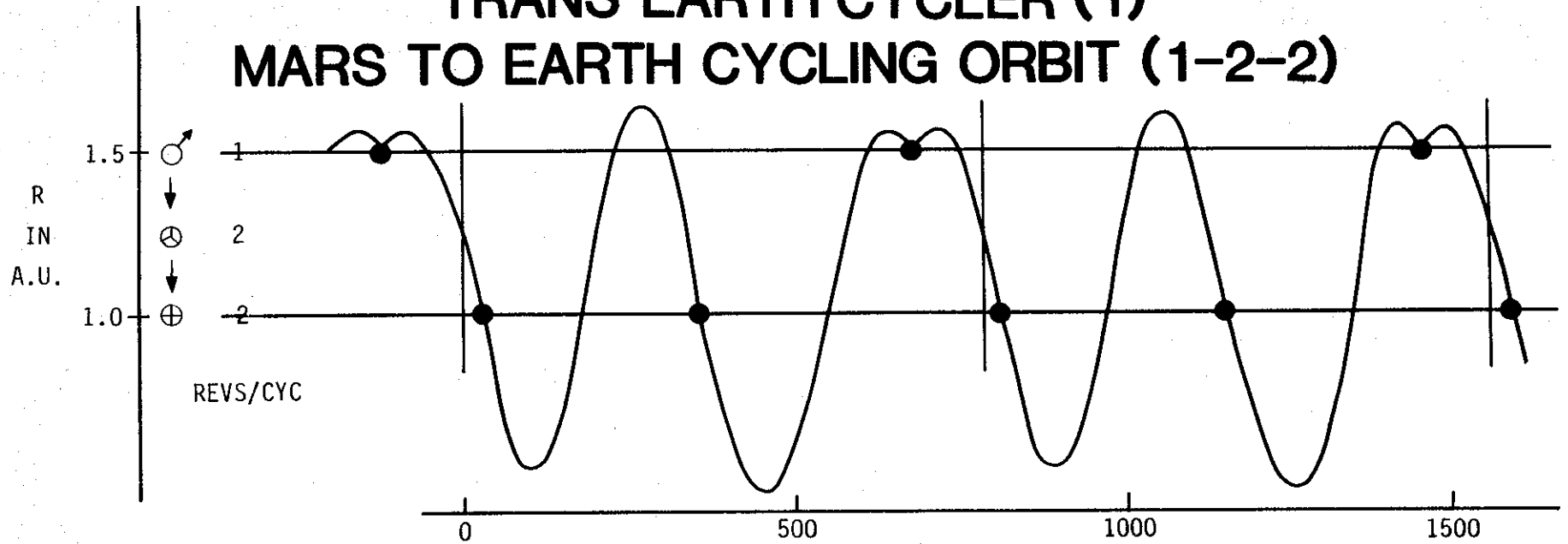


MARS TO EARTH CYCLING ORBIT (1-2-2)

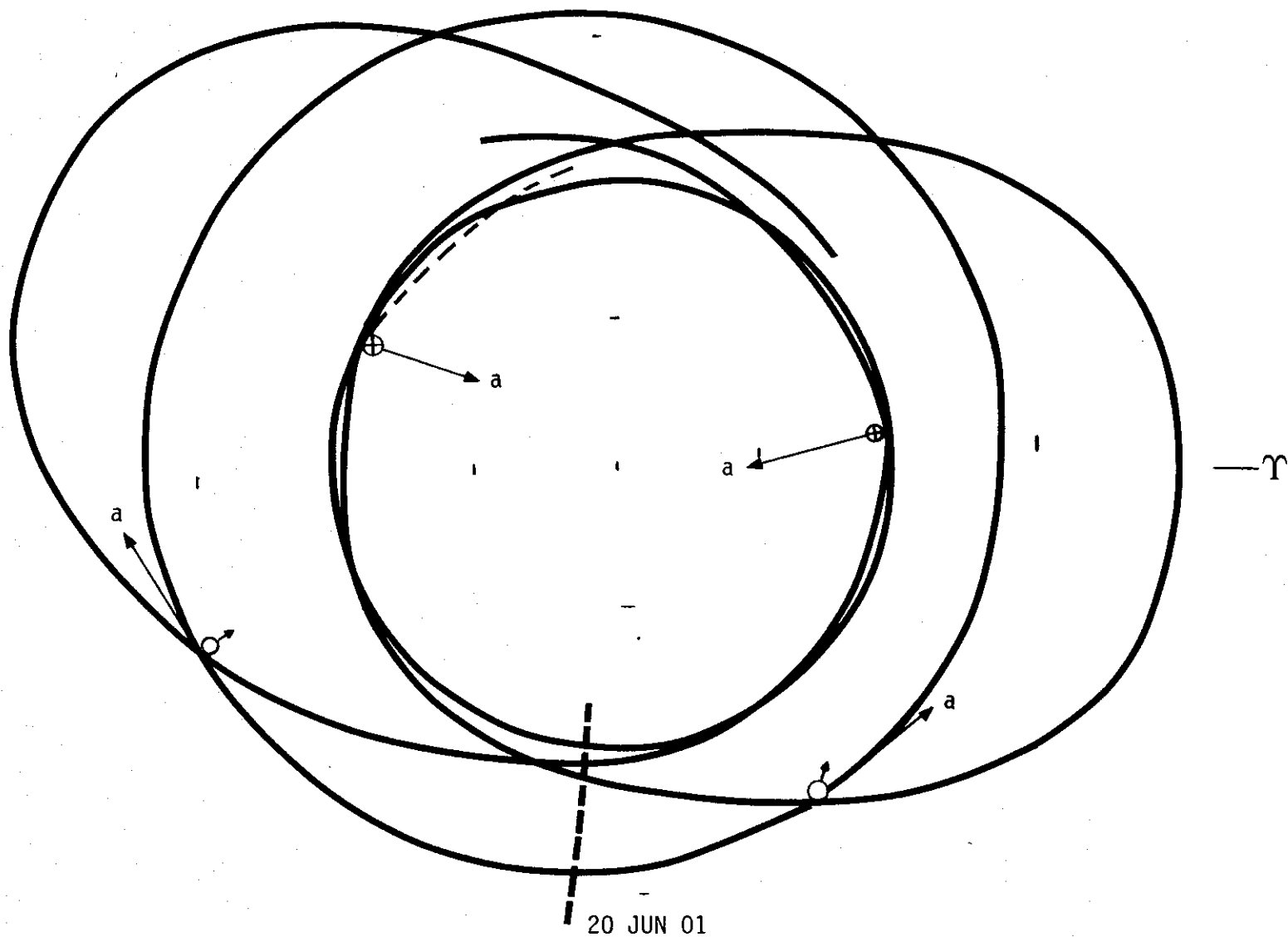


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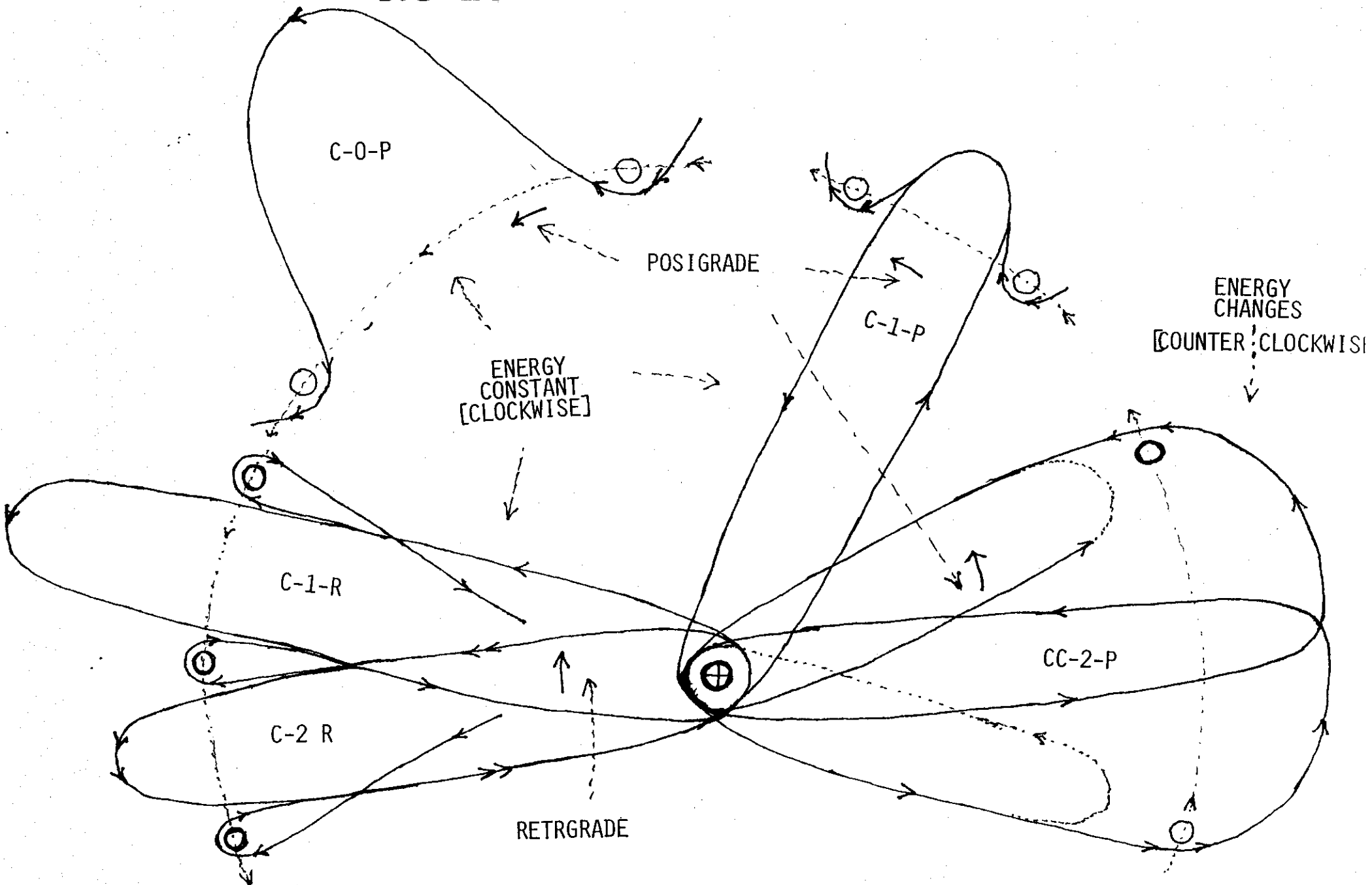
TRANS EARTH CYCLER (1) MARS TO EARTH CYCLING ORBIT (1-2-2)



Trans-Mars Cyclers (2-1-1) and Trans-Earth Cyclers (1-1-2) Close Pass Orientations for Elliptic Cycling Orbits at Earth and Mars



CIS-LUNAR CYCLER OPTIONS

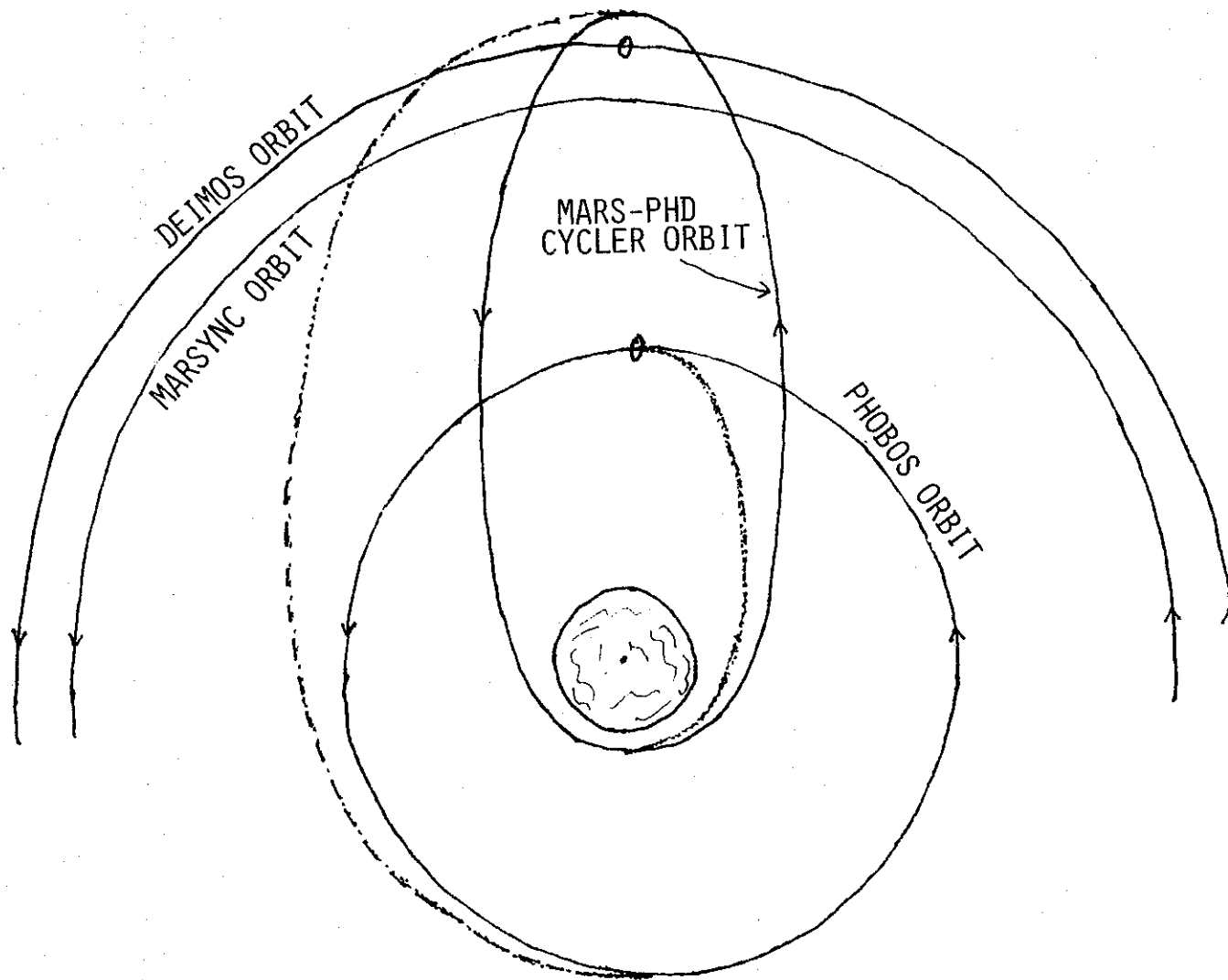


CIS-LUNAR STAGING COMPARISONS

	<u>CIS-LUNAR CYCLER</u>	<u>LIBRATION POINT STATION</u>
CYCLIC PASSES BY EARTH	YES	NO
CYCLIC PASSES BY MOON	YES	NO
TAXI TIME TO TRANS-MARS/EARTH CYCLER	MIN	HIGHER
TAXI TIME TO LEO	MIN	HIGHER
TAXI TIME TO LLO	MIN	HIGHER
STAGING TO GEO	YES	NO
EXPOSURE TO SOLAR FLARES + COSMIC RADIATION	YES	YES
EXPOSURE TO VAN ALLEN BELT RADIATION	YES	NO
ORBIT VARIATIONS FOR SCIENCE OBSERVATIONS	YES	NO
PSYCHOLOGY OF CHANGING VISUAL SCENES	YES	NO
POTENTIAL FOR TOURISM	HIGH	LOWER
NEAR VICINITY SPATIAL INTERFERENCE	MIN	MOD
TRANS-MARS/EARTH CYCLER ENCOUNTER TIME OPTIMUM	PHASE ω + T	?
TRANS-MARS/EARTH CYCLER ENCOUNTER TIME VARIABLE	LESS DIFFICULT	?
ELV RESUPPLY FROM EARTH	EASIER	MORE DIFFICULT

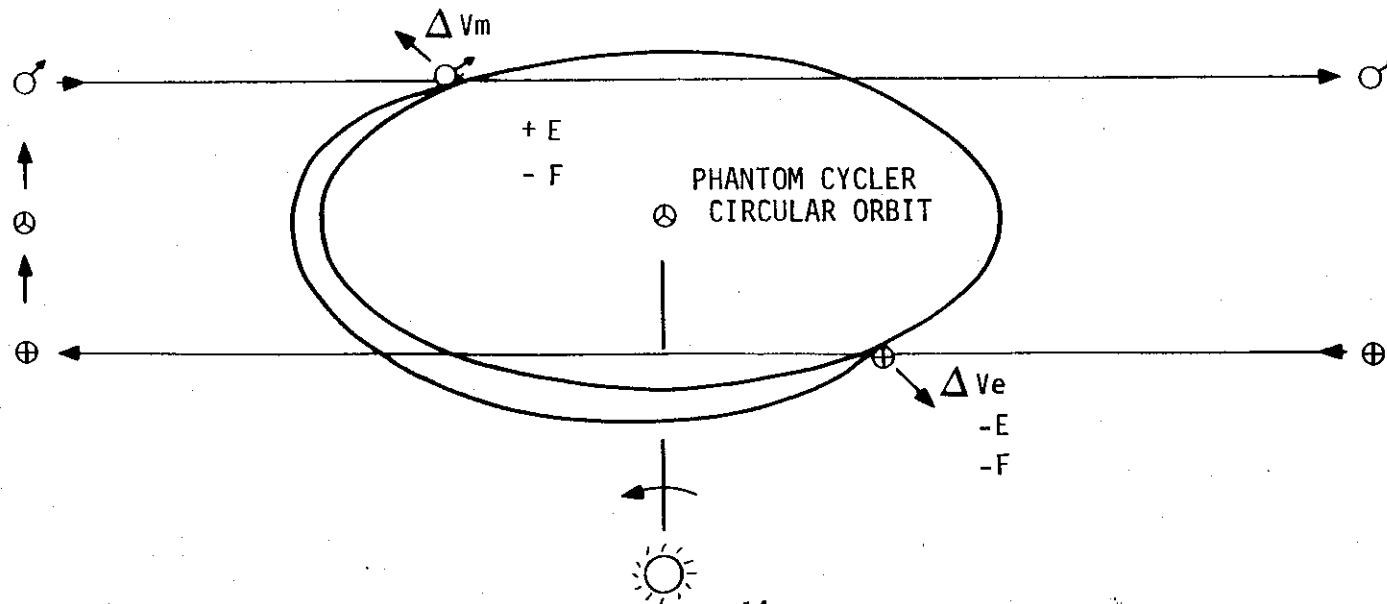
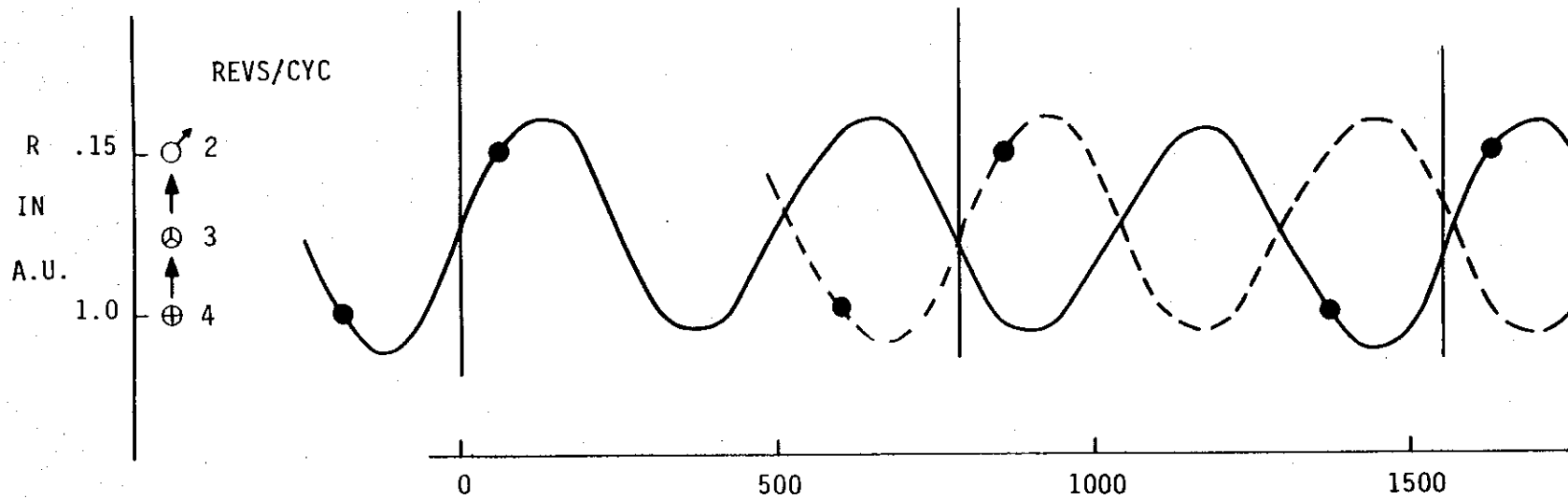
MARS-PHD CYCLER OPERATIONS

CYCLER ORBIT a AND e
AS DICTATED FOR REQUIRED $\dot{\omega}$



TRANS MARS CYCLER (2)

EARTH TO MARS CYCLING ORBIT (4-3-2)



Trans Earth Cyclers (2)

Mars to Earth Cycling Orbit (2-3-4)

