

JOB NUMBER CF09B, MAXIMUM RUNNING TIME 005 MINUTES, MAXIMUM OUTPUT 060 PAGES.

JOB RUN APR 24, 1962

TIME 12 05 A.M.  
\* FORTRAN

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<sup>print out</sup>  
This ~~program~~ is another  
example of my gravit. thrust  
trajectory program. It was run  
April 24 1962.

note the addition of the  
planetary approach  
parameters (i.e., planetary  
encounter aim points which  
define the hyperbolic passing trajectory)

$$\vec{B}, \vec{B} \cdot \vec{T} \text{ \& } \vec{B} \cdot \vec{R}$$

Read Gene Ballman's letter to me  
of April 16 1962

C TEST PROGRAM FOR THE DETERMINATION OF INTERPLANETARY ROUND TRIP  
 C TRAJECTORIES FOR FREE FALL SPACE VEHICLES  
 1 FORMAT(F7.1,F9.6,F11.6,F11.6,F11.8,E14.6,F9.6)  
 2 FORMAT(6E12.6)  
 3 FORMAT(F6.0,9F7.0)  
 4 FORMAT(F6.2,9F7.2)  
 5 FORMAT(E6.1,4E8.1)  
 515 FORMAT(E12.7,3E14.7)  
 518 FORMAT(56H INCLINATION OF TRAJECTORY TO PLANE OF ECLIPTIC LEAVING  
 1 I2,10H PLANET = F6.3 )  
 6 FORMAT(I2)  
 7 FORMAT(I0I5)  
 8 FORMAT(1H1,80H THIS IS REC  
 IONNAISSANCE MISSION NUMBER I2)  
 9 FORMAT(1H )  
 10 FORMAT(35H TRAJECTORY PARAMETERS FOR MISSION I3,26H CORRESPONDING  
 1 TO LAUNCH = F9.3,33H AND FIRST PLANETARY INTERCEPT = F9.3)  
 11 FORMAT(1H ,F9.3,F13.6,2F11.6,F14.3,F10.3,F16.3,F13.6,2F11.6)  
 12 FORMAT(1H ,F8.3,F9.3,E14.5,E12.5,E14.5,2E12.5,E14.5,2E12.5)  
 13 FORMAT(32H DISTANCE OF CLOSEST APPROACH = F10.2,32H VELOCITY AT C  
 ILOSEST APPROACH = F7.3,30H ENERGY AT CLOSEST APPROACH = F8.3)  
 14 FORMAT(60H ASYMPTOTIC LAUNCH VECT  
 IOR = 3E15.6)  
 15 FORMAT(28H INJECTION ENERGY = F8.3,31H INJECTION  
 I VELOCITY = F6.3,30H TOTAL FLIGHT TIME = F8.3)  
 16 FORMAT(39H TRAJECTORY PARAMETERS FOR LAUNCH DATE F10.3,13H OF M  
 ISSION I2,23H ARE BEING CALCULATED )  
 17 FORMAT(119H LAUNCH INTERCEPT RETURN THETA12 THETA23 A12  
 I A23 IE IV TISI DOCA VOCA DA TT )  
 18 FORMAT(1H ,F9.3,2F10.3,2F8.2,2F9.5,F8.2,F7.2,F7.3,F11.2,F8.2,F7.2,  
 IF9.3)  
 181 FORMAT(12H B VECTOR = F10.3,2F10.3,25H LENGTH OF B VECTOR = F1  
 I1.3,11H B.T = F10.3,11H B.R = F10.3)  
 182 FORMAT(119H LAUNCH PX 1 PY 1 PZ 1 T  
 I12 THETA12 I INTERCEPT PX 2 PY 2 PZ 2 )  
 183 FORMAT(7H C3LI2,6H V1LI2,5H A2I1,6H E2I1,9H EX2I  
 I1,12H EY2I1,12H EZ2I1,14H HX2I1,12H  
 I HY2I1,12H HZ2I1 )  
 184 FORMAT(9H TESI2,9H RIAYI2,7H RIAY I1,6H RIAZ I1,9H T  
 IINSI2,4H DA I1,10H TLS I1,9H RILX I1,6H RILY I1,5H RILZI2)  
 185 FORMAT(9H TESI2,9H RAX I2,6H RAY I2,6H RAZ I2,9H V  
 I1AI2,5H V1LI2,10H TLS I1,7H RLXI3,6H RLYI3,6H RLZI3 )  
 186 FORMAT(9H TESI2,9H RSAXI2,6H RSAYI2,6H RSAZI2,9H P  
 ISAI2,5H PSLI2,10H TLS I1,8H RSLXI2,6H RSLYI2,6H RSLZI2)  
 187 FORMAT(9H TESI2,9H VIAXI2,6H VIAYI2,6H VIAZI2,9H R  
 I1AI2,5H RILI2,10H TLS I1,8H VILXI2,6H VILYI2,6H VILZI2)  
 188 FORMAT(9H C3AI2,4H VIAI2,4H AI2,7H EI2,10H EX I1  
 I1,6H EYI2,7H EZI2,9H HXI2,7H HYI2,7H HZI2 )  
 189 FORMAT(9H TCAI2,7H PXI2,6H PYI2,6H PZI2,9H T  
 I2I1,6H THETA2I1,9H TCAI2,7H PXI2,6H PYI2,6H PZI2 )  
 190 FORMAT(9H C3AI2,4H VIAI2,4H A2I1,6H E2I1,9H EX2I1  
 I1,6H EY2I1,6H EZ2I1,8H HX2I1,6H HY2I1,6H HZ2I1 )  
 19 FORMAT(1H0,66H INJECTI  
 ION ALTITUDE = F6.2,4H KM )  
 201 FORMAT(1H0,72H LAUN

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```
      1CH PLANET = MERCURY )
202  FORMAT(1H0,72H           LAUN
      1CH PLANET = VENUS   )
203  FORMAT(1H0,72H           LAUN
      1CH PLANET = EARTH  )
204  FORMAT(1H0,72H           LAUN
      1CH PLANET = MARS   )
205  FORMAT(1H0,72H           LAUN
      1CH PLANET = JUPITER )
206  FORMAT(1H0,72H           LAUN
      1CH PLANET = SATURN )
207  FORMAT(1H0,72H           LAUN
      1CH PLANET = URANUS )
208  FORMAT(1H0,72H           LAUN
      1CH PLANET = NEPTUNE )
209  FORMAT(1H0,72H           LAUN
      1CH PLANET = PLUTO  )
211  FORMAT(1H0,62H
      1  MERCURY )
212  FORMAT(1H0,62H
      1  VENUS   )
213  FORMAT(1H0,62H
      1  EARTH   )
214  FORMAT(1H0,62H
      1  MARS    )
215  FORMAT(1H0,62H
      1  JUPITER )
216  FORMAT(1H0,62H
      1  SATURN  )
217  FORMAT(1H0,62H
      1  URANUS  )
218  FORMAT(1H0,62H
      1  NEPTUNE )
219  FORMAT(1H0,62H
      1  PLUTO   )
221  FORMAT(1H0,72H           ARRI
      1VAL PLANET = MERCURY )
222  FORMAT(1H0,72H           ARRI
      1VAL PLANET = VENUS   )
223  FORMAT(1H0,72H           ARRI
      1VAL PLANET = EARTH  )
224  FORMAT(1H0,72H           ARRI
      1VAL PLANET = MARS   )
225  FORMAT(1H0,72H           ARRI
      1VAL PLANET = JUPITER )
226  FORMAT(1H0,72H           ARRI
      1VAL PLANET = SATURN )
227  FORMAT(1H0,72H           ARRI
      1VAL PLANET = URANUS )
228  FORMAT(1H0,72H           ARRI
      1VAL PLANET = NEPTUNE )
229  FORMAT(1H0,72H           ARRI
      1VAL PLANET = PLUTO  )
      DIMENSION A(4,517,9)
      COMMON A
      DIMENSION G(7,9)
```

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```
DIMENSION EX(9),EY(9),EZ(9),HX(9),HY(9),HZ(9)
DIMENSION NP(10,10)
DIMENSION TCA(10),BLI(10),TL(10,10),ELI(10),TL1(10,10),NNM(10)
DIMENSION PP(10),PPX(10),PPY(10),PPZ(10)
DIMENSION VPX(10),VPY(10),VPZ(10)
DIMENSION EA(10),EE(10),EL(10),EH(10),THETA(10)
DIMENSION EHX(10),EHY(10),EHZ(10),EEX(10),EEY(10),EEZ(10)
DIMENSION VLX(10),VLY(10),VLZ(10),VAX(10),VAY(10),VAZ(10)
DIMENSION VILX(10),VILY(10),VILZ(10),VIAX(10),VIAY(10),VIAZ(10)
DIMENSION VILS(10),VIAS(10),C3L(10),C3A(10),VAS(10),VLS(10)
DIMENSION D(3),B(3),E(3),VIAVS(10),VIA(10),VIL(10),CSOL(10),TT(3)
DIMENSION VILU1(10),VILU2(10),VIAU1(10),VIAU2(10),TI4(10)
DIMENSION HA(10),HE(10),HH(10),DOCA(10),TINS(10),TOT(10)
DIMENSION TI3(10),TIM(10),DEFA(10),NPM(10),NA(10,10),NL(10)
DIMENSION HEX(10),HEY(10),HEZ(10),HHX(10),HHY(10),HHZ(10)
DIMENSION R1AX(10),R1AY(10),R1AZ(10),R1LX(10),R1LY(10),R1LZ(10)
DIMENSION R1A(10),R1L(10),R1AU2(10),R1LU2(10)
DIMENSION TS(2,10),PPS(2,10),RSX(2,10),RSY(2,10),RSZ(2,10)
DIMENSION TTIP(10),ALTINJ(10),TI(10),TIO(10),DIO(10)
DIMENSION C3CA(10),V1CA(10),V1CAU1(10),V1CAU2(10)
DIMENSION RAX(10),RAY(10),RAZ(10),RLX(10),RLY(10),RLZ(10)
DIMENSION HBX(10),HBY(10),HBZ(10),HB(10),PHI(10)
DIMENSION HTX(10),HTY(10),HTZ(10),HRX(10),HRY(10),HRZ(10),HBHT(10)
1,HBHR(10)
```

```
READ INPUT TAPE 5,1,((G(I,J),I=1,7),J=1,9)
DO 20 K=1,9
```

```
20 READ INPUT TAPE 5,2,EX(K),EY(K),EZ(K),HX(K),HY(K),HZ(K)
```

```
READ INPUT TAPE 5,3,(BLI(M),M=1,10)
```

```
READ INPUT TAPE 5,4,(TI3(M),M=1,10)
```

```
READ INPUT TAPE 5,4,(TI(M),M=1,10)
```

```
READ INPUT TAPE 5,4,(TIO(M),M=1,10)
```

```
READ INPUT TAPE 5,6,NM
```

```
READ INPUT TAPE 5,5,D1,D2,D3,D4,D5
```

```
READ INPUT TAPE 5,515,U,CF1,CF2,CF3
```

```
READ INPUT TAPE 5,6,NTAPE
```

```
READ INPUT TAPE 5,7,((NP(IP,M),IP=1,10),M=1,NM)
```

```
READ INPUT TAPE 5,7,(NNM(M),M=1,10)
```

```
READ INPUT TAPE 5,4,(TI4(M),M=1,10)
```

```
READ INPUT TAPE 5,4,(TIM(M),M=1,10)
```

```
READ INPUT TAPE 5,7,(NPM(M),M=1,10)
```

```
READ INPUT TAPE 5,7,((NA(IP,M),IP=1,10),M=1,NM)
```

```
READ INPUT TAPE 5,7,(NL(M),M=1,10)
```

```
READ INPUT TAPE 5,3,(ALTINJ(M),M=1,10)
```

```
REWIND NTAPE
```

```
READ TAPE NTAPE,A
```

```
DO 130 M=1,NM
```

```
WRITE OUTPUT TAPE 6,8,M
```

```
WRITE OUTPUT TAPE 6,9
```

```
I5=NP(1,M)
```

```
I6=NPM(M)
```

```
I61=I6-1
```

```
GO TO (231,232,233,234,235,236,237,238,239),I5
```

```
231 WRITE OUTPUT TAPE 6,201
```

```
GO TO 270
```

```
232 WRITE OUTPUT TAPE 6,202
```

```
GO TO 270
```

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```
233 WRITE OUTPUT TAPE 6,203
    GO TO 270
234 WRITE OUTPUT TAPE 6,204
    GO TO 270
235 WRITE OUTPUT TAPE 6,205
    GO TO 270
236 WRITE OUTPUT TAPE 6,206
    GO TO 270
237 WRITE OUTPUT TAPE 6,207
    GO TO 270
238 WRITE OUTPUT TAPE 6,208
    GO TO 270
239 WRITE OUTPUT TAPE 6,209
    GO TO 270
270 DO 280 I7=2,I61
    I8=NP(I7,M)
    GO TO (241,242,243,244,245,246,247,248,249),I8
241 WRITE OUTPUT TAPE 6,211
    GO TO 280
242 WRITE OUTPUT TAPE 6,212
    GO TO 280
243 WRITE OUTPUT TAPE 6,213
    GO TO 280
244 WRITE OUTPUT TAPE 6,214
    GO TO 280
245 WRITE OUTPUT TAPE 6,215
    GO TO 280
246 WRITE OUTPUT TAPE 6,216
    GO TO 280
247 WRITE OUTPUT TAPE 6,217
    GO TO 280
248 WRITE OUTPUT TAPE 6,218
    GO TO 280
249 WRITE OUTPUT TAPE 6,219
280 CONTINUE
    I9=NP(I6,M)
    GO TO (251,252,253,254,255,256,257,258,259),I9
251 WRITE OUTPUT TAPE 6,221
    GO TO 290
252 WRITE OUTPUT TAPE 6,222
    GO TO 290
253 WRITE OUTPUT TAPE 6,223
    GO TO 290
254 WRITE OUTPUT TAPE 6,224
    GO TO 290
255 WRITE OUTPUT TAPE 6,225
    GO TO 290
256 WRITE OUTPUT TAPE 6,226
    GO TO 290
257 WRITE OUTPUT TAPE 6,227
    GO TO 290
258 WRITE OUTPUT TAPE 6,228
    GO TO 290
259 WRITE OUTPUT TAPE 6,229
290 CONTINUE
    DO 299 N=1,2
```