

Mission Planning and Analysis Division
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
MANNED SPACECRAFT CENTER
HOUSTON, TEXAS 77058

REPLY TO
ATTN OF: FMI3 (72-9)

JAN 07 1972

MEMORANDUM

TO: Distribution

FROM: FMI3/Mission Planning Support Office

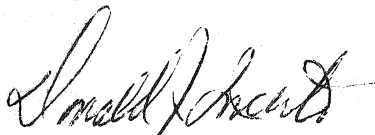
SUBJECT: Spacecraft SIM BAY Attitude Hold During Apollo 15
Lunar Orbits

Apollo 15 postflight trajectory and attitude data that had been generated for the Principal Investigators show that the spacecraft SIM BAY attitude hold was not nominal. During -X forward attitude hold ($P = 180^\circ$ with $\pm 5^\circ$ db) using program P20, the actual postflight data shows the spacecraft pitch attitude with respect to the local horizontal, to be approximately 174° with a dead band much less than the planned $\pm 5^\circ$. The consensus seems to be that the spacecraft is cycling at one end of the dead band due to the gravity gradient. The Mass Spectrometer Principal Investigator was not aware of this offset in real time and it does effect his instrument readings and his postflight analysis. It is understood that for Apollo 16 the dead band during the SIM BAY attitude hold periods will be $\pm 3^\circ$. This $\pm 3^\circ$ is supposed to reduce the gravity gradient effect and also cause the CSM to cycle across the dead band and not hang up at one side of the dead band as was experienced on Apollo 15.

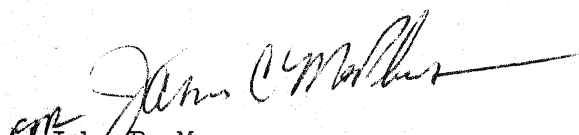
In response to several inquiries, time history plots during the SIM BAY attitude hold periods were generated showing the CSM local horizontal pitch, yaw, and roll attitudes during lunar orbits on Apollo 15. The actual time history plots are contained in the enclosure. The plots also contain the nominal CSM local horizontal attitudes that were specified in the flight plan. It can be seen from the plots, that the +X forward SIM BAY attitude hold with the smaller planned $\pm 1.5^\circ$ dead band, the CSM attitudes are nominal. The -X forward SIM BAY attitude hold with the larger planned $\pm 5^\circ$ dead band shows the CSM attitudes are offset slightly without cycling completely through the planned $\pm 5^\circ$ dead band.

The intent of this memorandum is not to analyze program P20, the gravity gradient or RCS considerations but to present the actual attitude hold profiles for review by certain Guidance and Control (G&C), RCS personnel and certain Principal Investigators. The postflight trajectory

and attitude pointing data are available for all lunar orbits if required for analysis. Please contact Don Incerto at extension 4091.


Donald J. Incerto

APPROVED BY:


John P. Mayer
Chief, Mission Planning
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Enclosure

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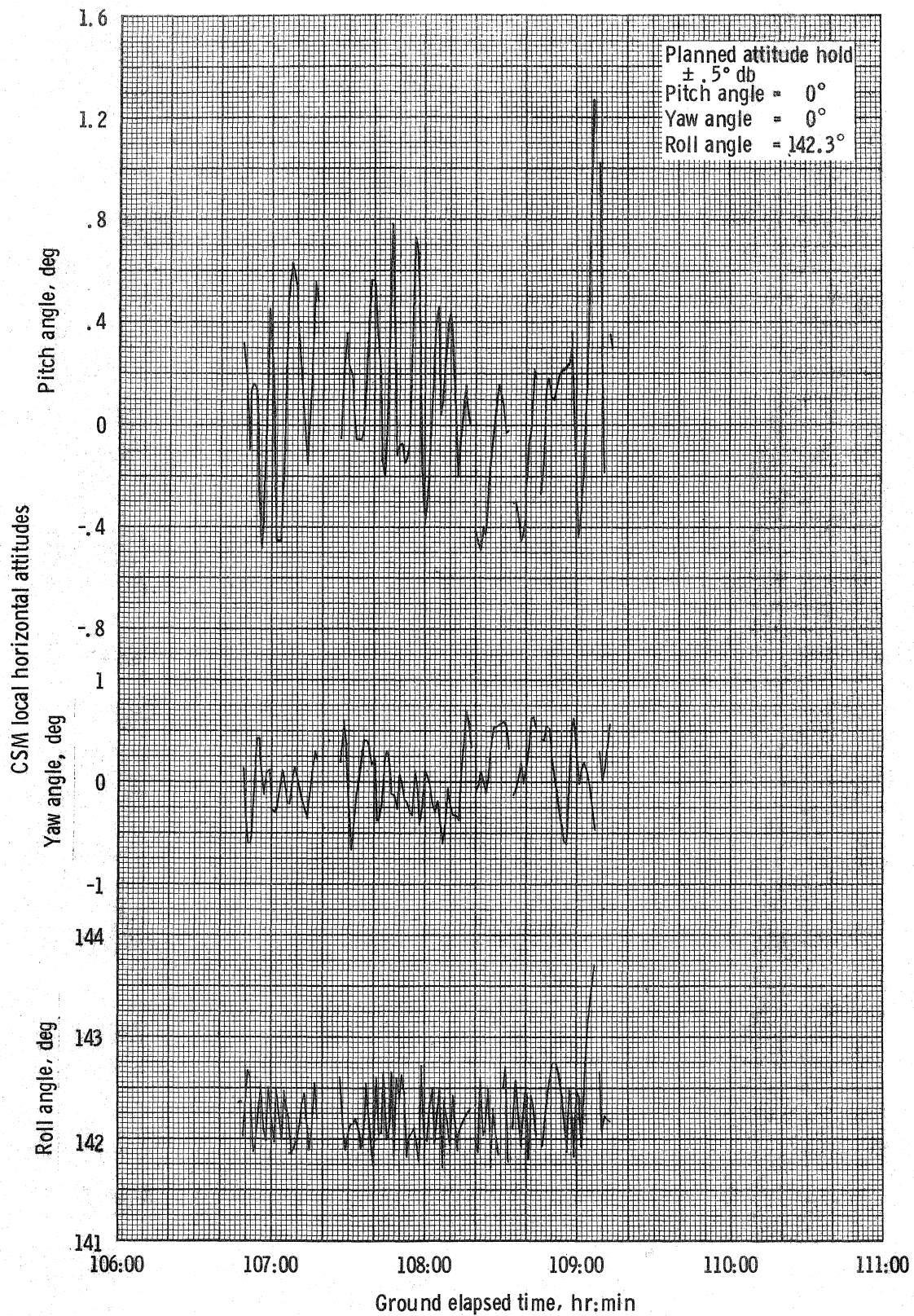
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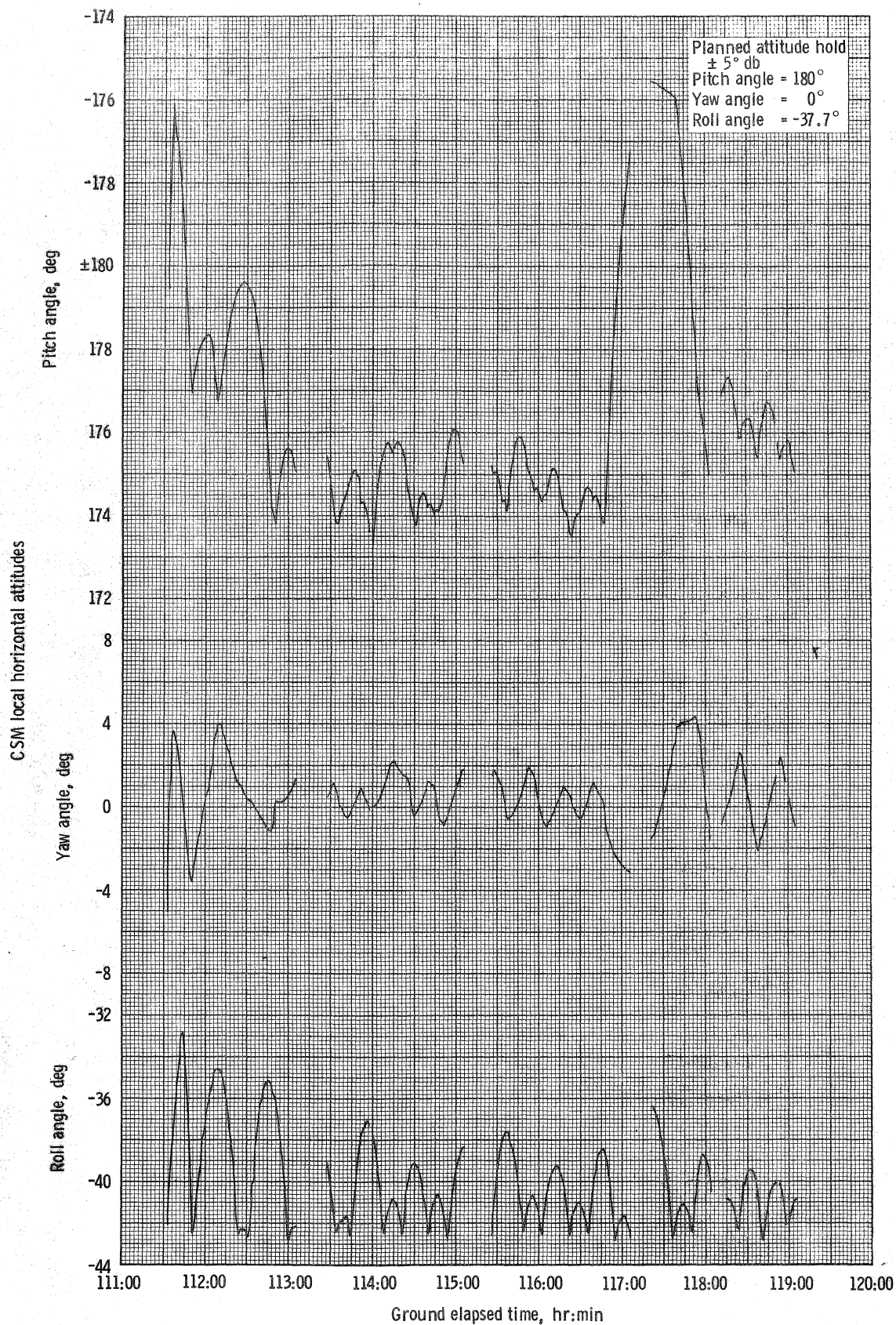
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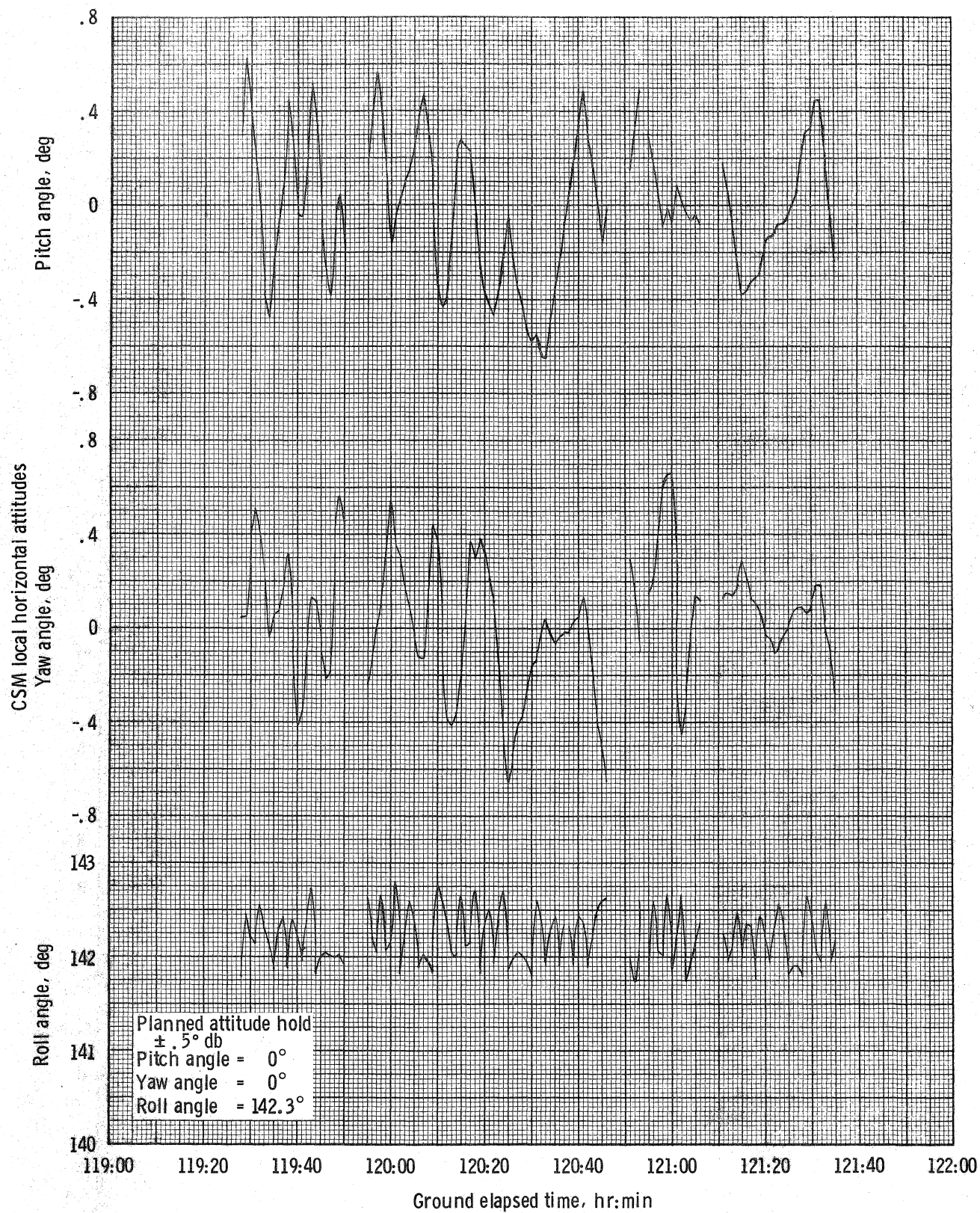
(a) G. e. t. = 106 hr through 111 hr.

Figure 1. - CSM local horizontal attitudes versus time during Apollo 15 lunar orbits.



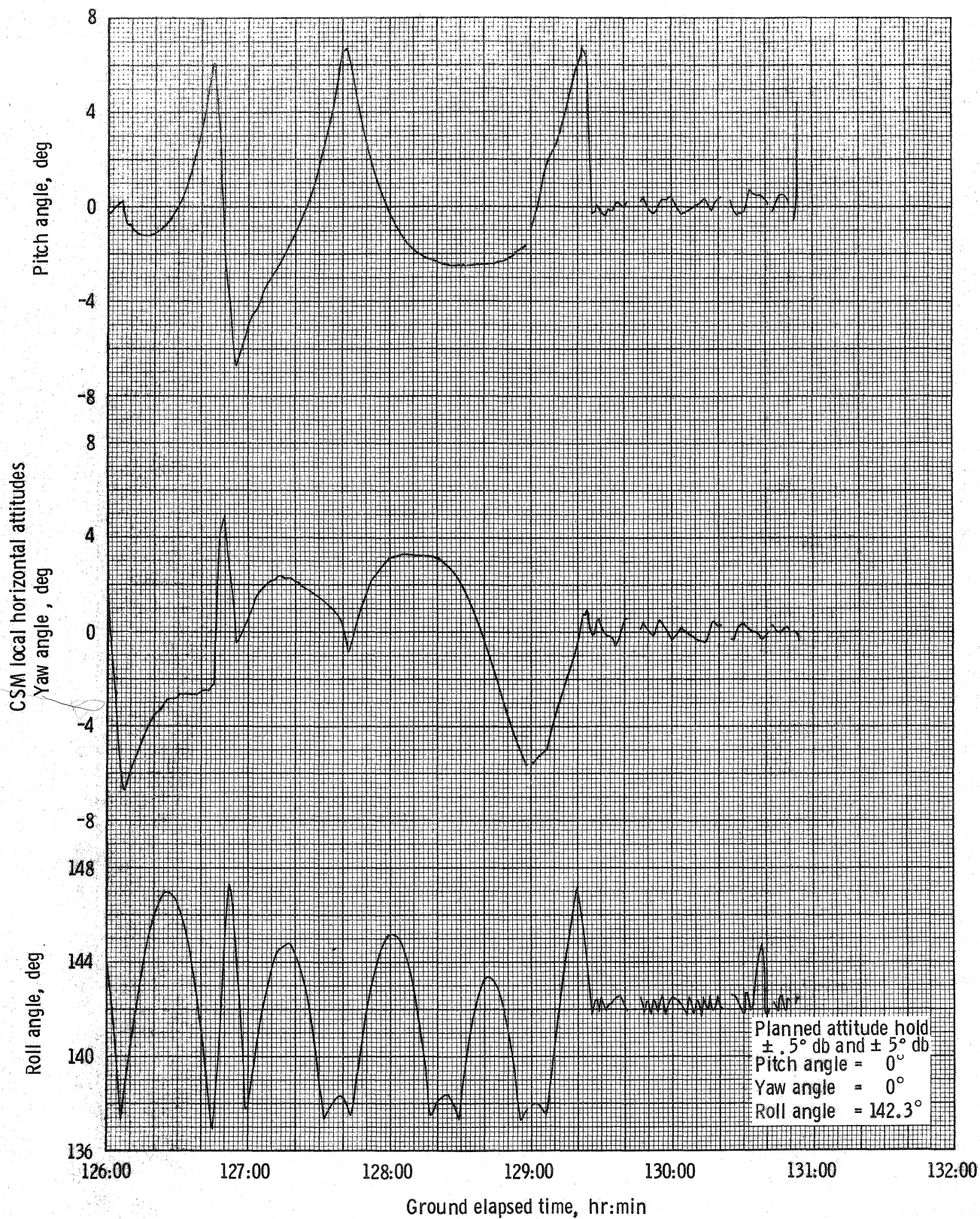
(b) G.e.t. = 111 hr through 120 hr.

Figure 1.- Continued.



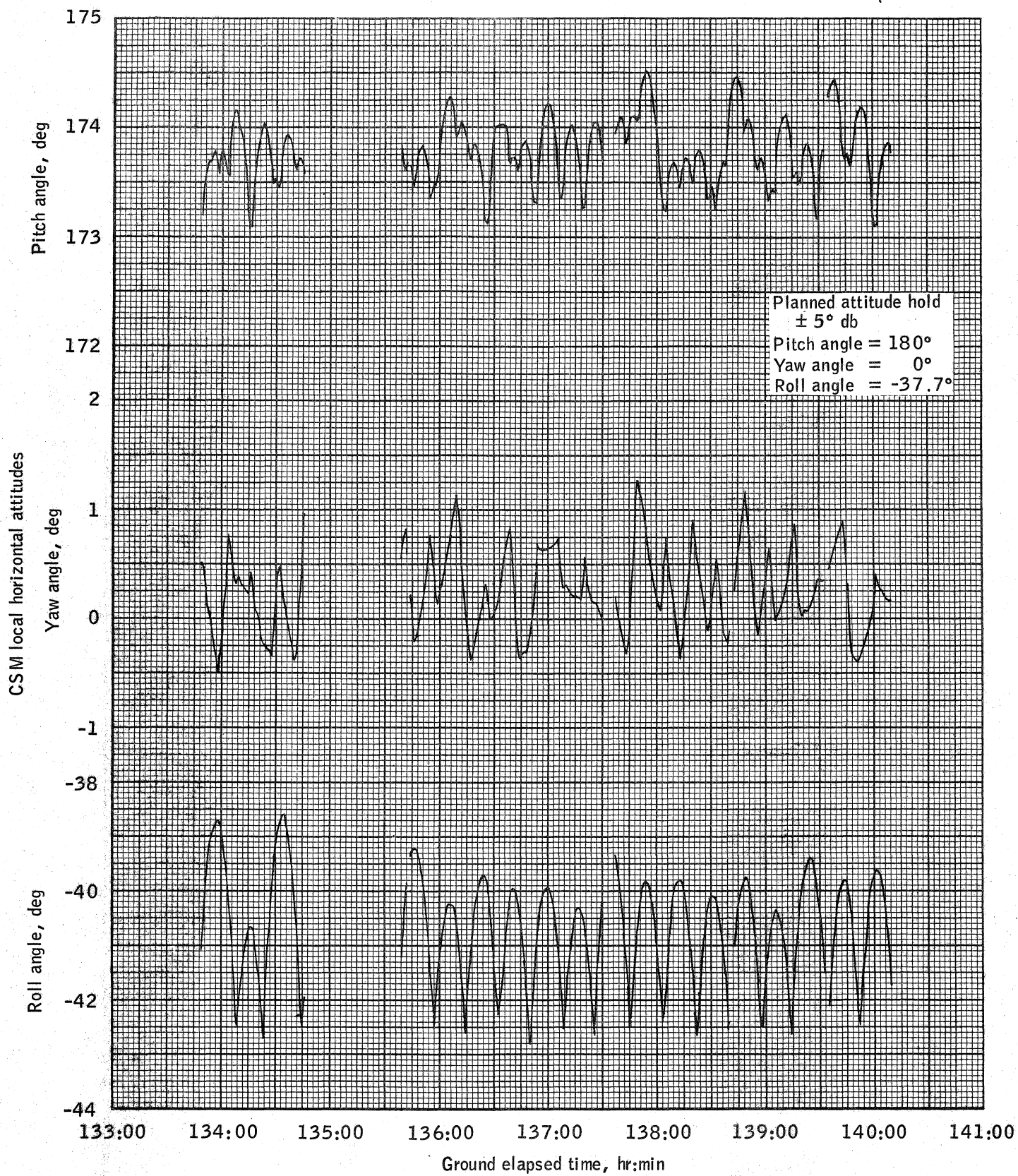
(c) G. e. t. = 119 hr through 122 hr.

Figure 1. - Continued.



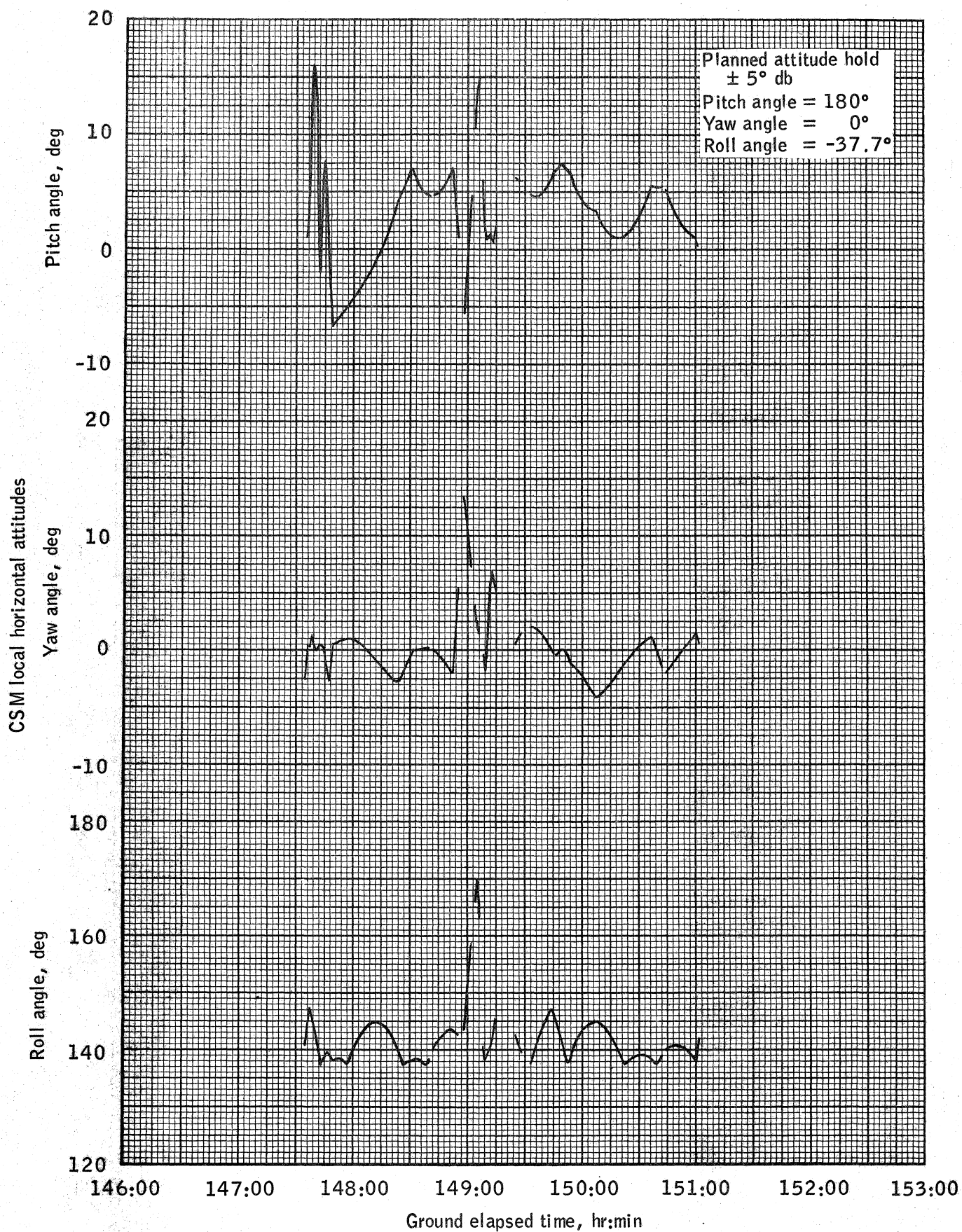
(d) G.e.t. = 126 hr through 132 hr.

Figure 1.- Continued.



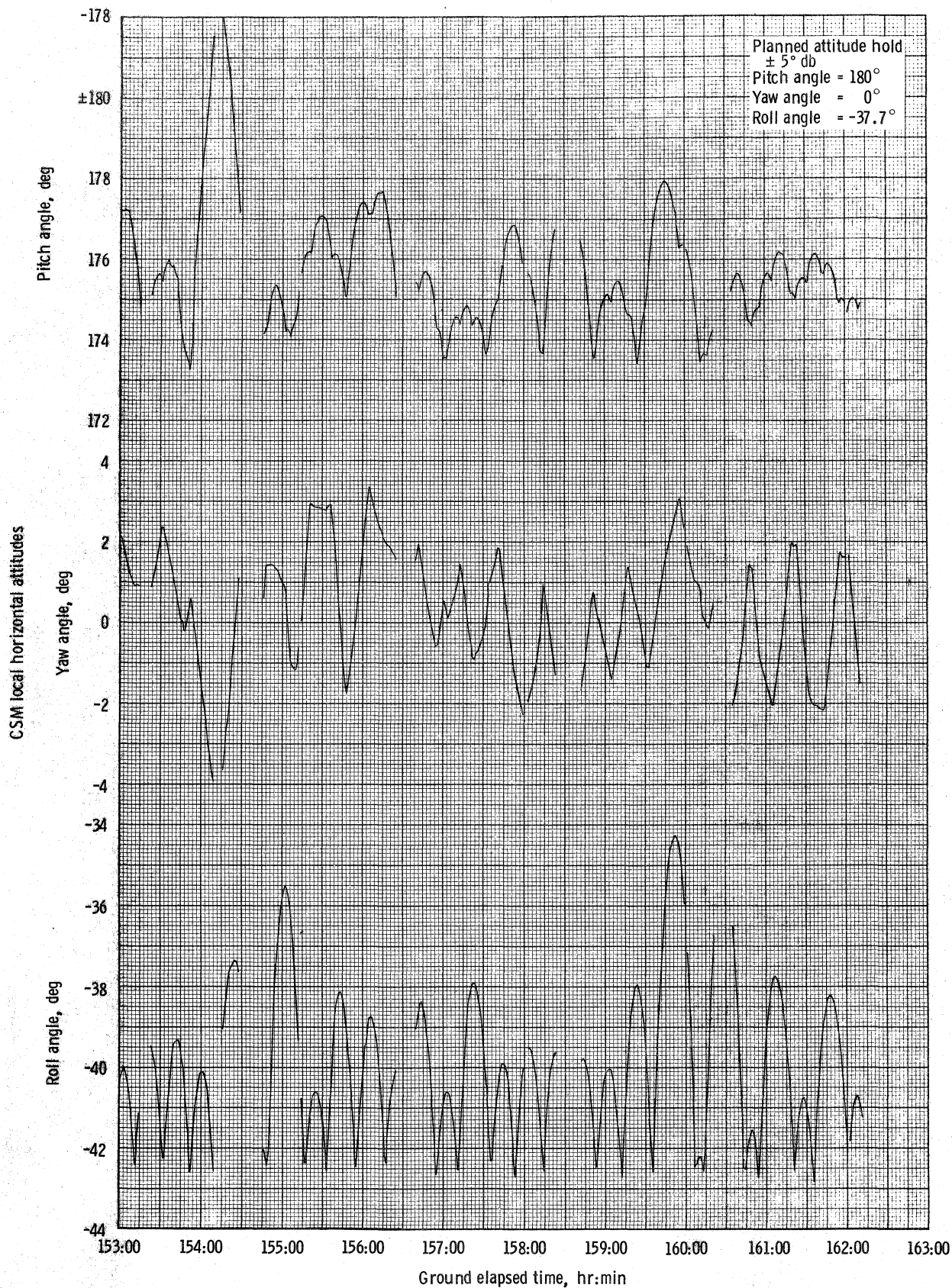
(e) G.e.t. = 133 hr through 141 hr.

Figure 1.- Continued.



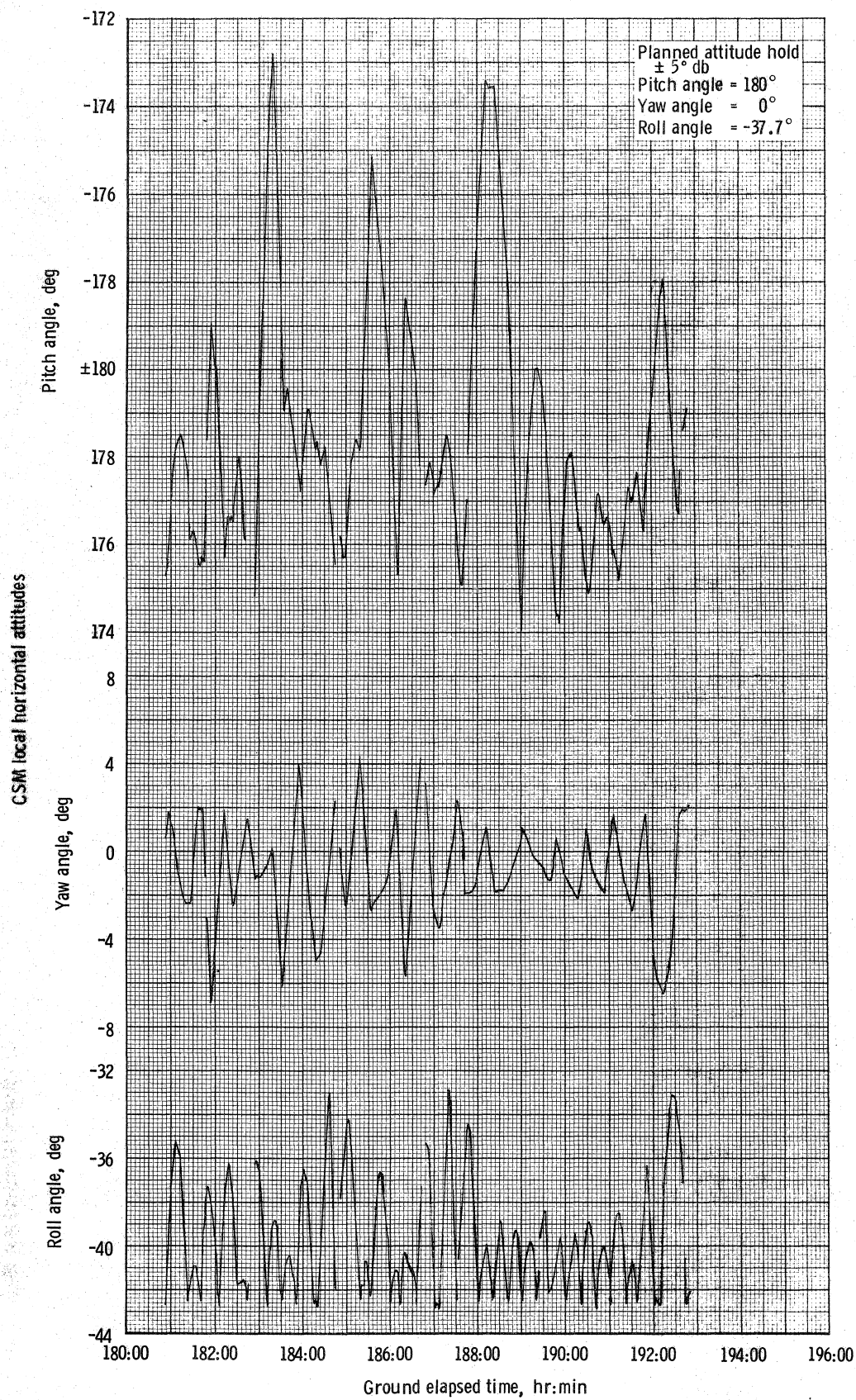
(f) G.e.t. = 146 hr through 153 hr.

Figure 1.- Continued.

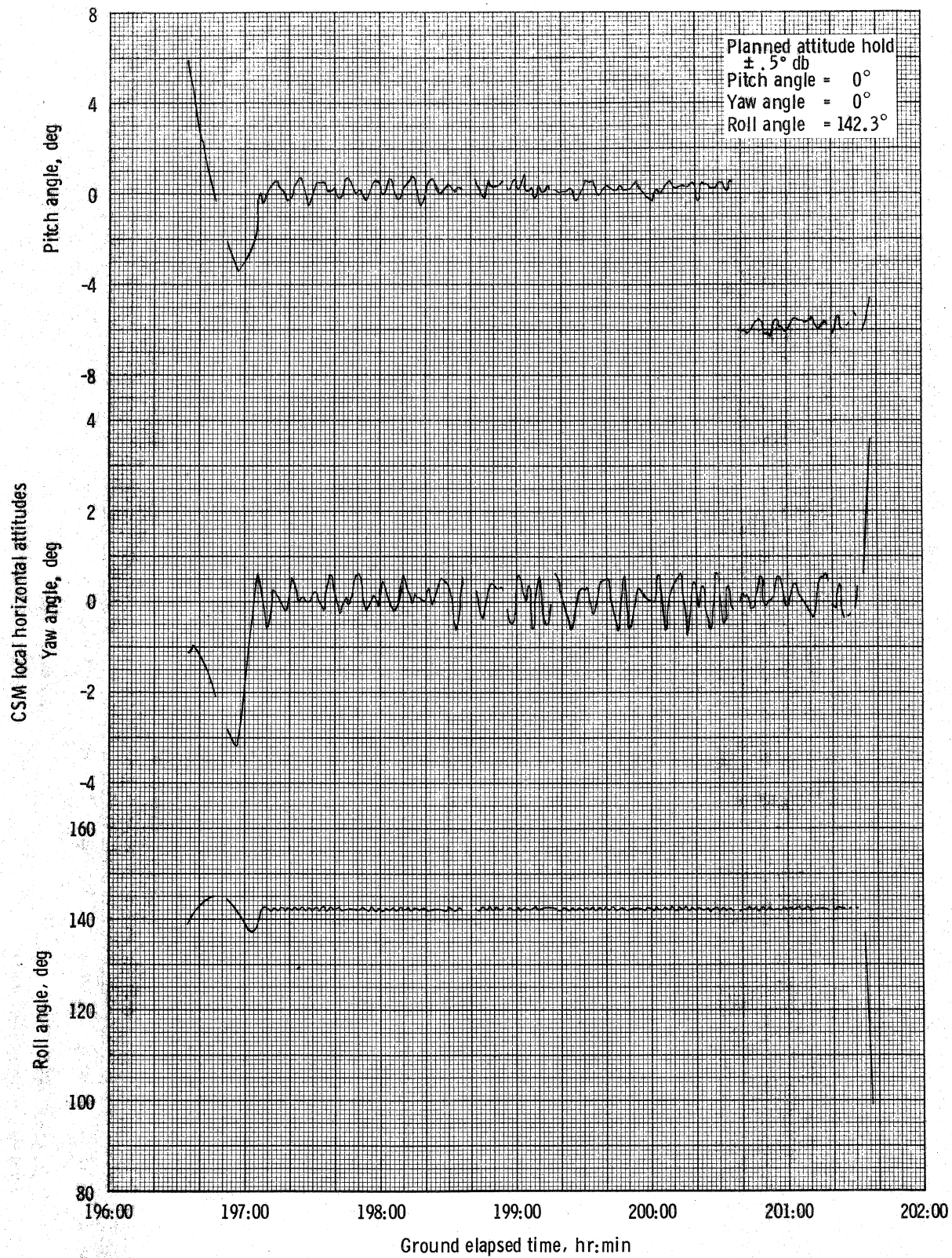


(g) G.e.t. = 153 hr through 163 hr.

Figure 1. - Continued.

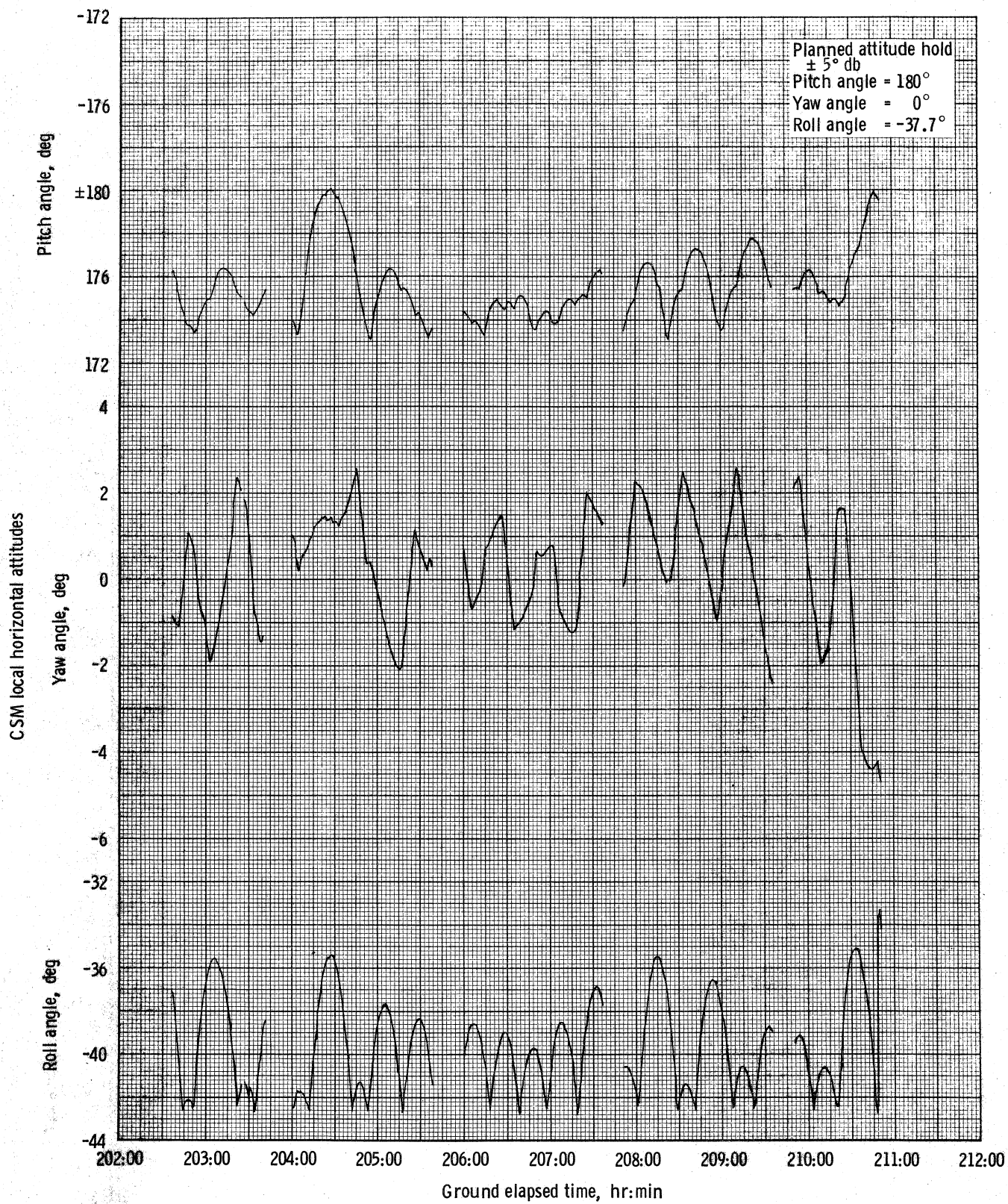


(h) G.e.t. = 180 hr through 196 hr.



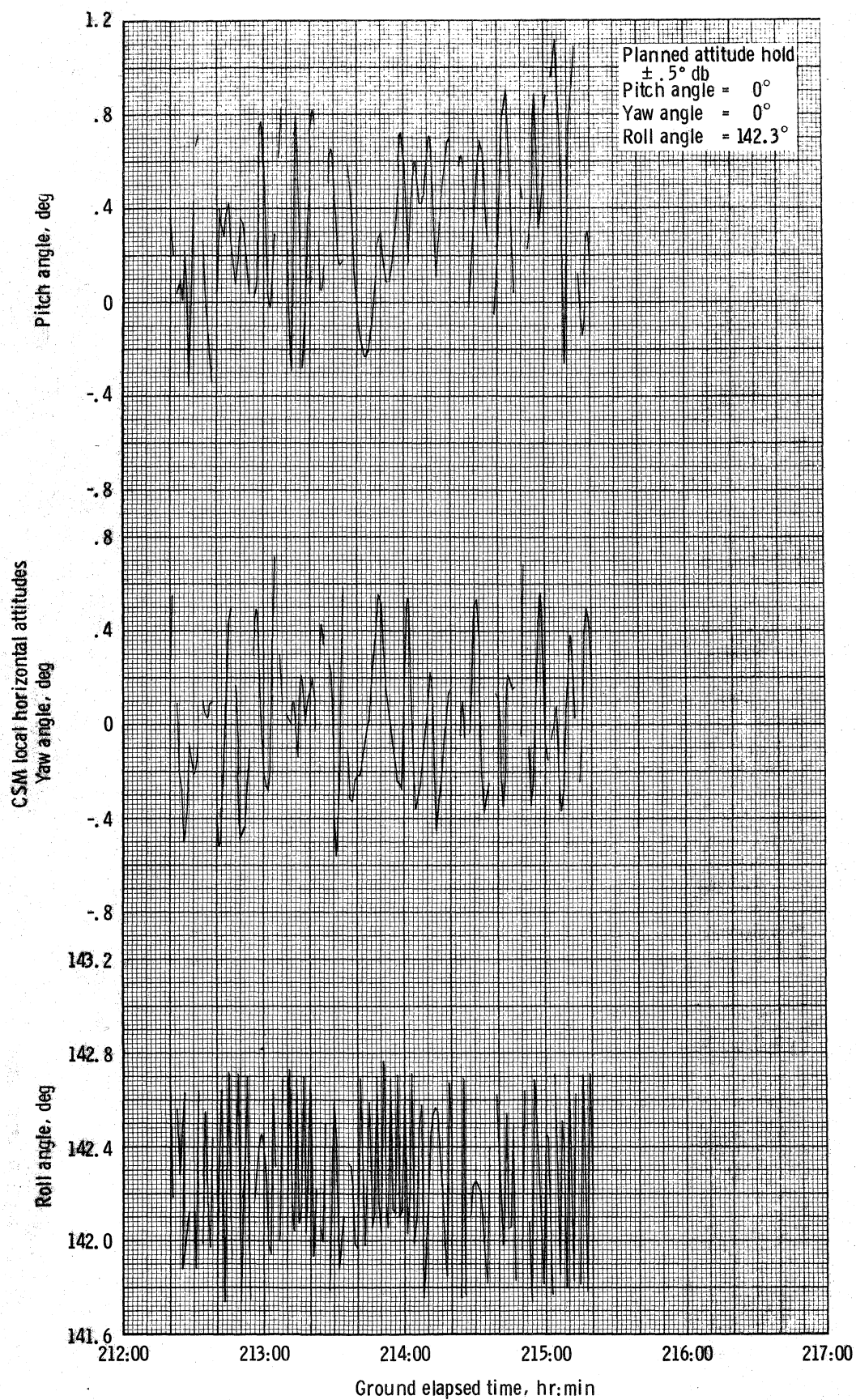
(i) G. e. t. = 196 hr through 202 hr.

Figure 1. - Continued.



(j) G.e.t. = 202 hr through 212 hr.

Figure 1.- Continued.



(k) G. e. t. = 212 through 217 hr.

Figure 1. - Concluded.