JET PROPULSION LABORATORY *California Institute of Technology • 4800 Oak Grove Drive, Pasadena, California 91103*

February 2, 1982

TO: Dick Simpson

FROM: Dwight Holmes DH

SUBJECT: MANEUVER RECONSTRUCTION

REFERENCE: 1) Letter from P. E. Doms to G. L. Tyler, "Voyager Saturn Encounter Maneuver Reconstructions"

2) VOYAGER - SCT-82-019, "Revised Jupiter RASMA Maneuver Reconstruction", M. Belhadef and R. S. Campbell to G. A. Hanover

Attached is a copy of the memo Peter Doms wrote to accompany the final Saturn reconstruction data tapes. I believe you have already received VU005. VH014 was shipped 1 February, 1982 and should arrive in a matter of a few days. (Note: This is not the same tape ID referred to in Doms' letter.)

I also have some new information. The Spacecraft Team has rerun the maneuver reconstruction program for S/C 31 at Jupiter and has a revised reconstruction. This revised data set is based on an updated value for the + pitch gyro scale factor. The tape will be released by the Spacecraft Team on February 2; therefore, it will be available to the RSST soon after that. I'll send a copy of the revised reconstruction data as soon as we can reformat the tape. In the meantime, I've attached a copy of the memo for the Spacecraft Team, describing new reconstruction.

DH:ap

cc: T. Hagar
C. L. Hamilton
G. F. Lindal
E. A. Marouf
D. N. Sweetnam
G. L. Tyler

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JET PROPULSION LABORATORY

INTEROFFICE MEMORANDUM

VOYAGER-SCT-82-019

26 January 1982

TO: G.A. Hanover

FROM: M. Belhadef, R.S. Campbell

SUBJECT: Revised Jupiter RASMA Maneuver Reconstruction.

REF: 1) VGR-SCT-80-0549, "Revised Jupiter RASMA Maneuver Reconstruction", 6 November 1980.

The S/C 31 maneuver attitude reconstruction during the Radio Science maneuvers at Jupiter has been revised, based on the new information discussed below.

1) The roll turn test program was used to process AGC data during the Mini-ASCAL, yielding S/C attitude at the time of the Mini-ASCAL. This procedure has been used in all subsequent Radio Science maneuver reconstructions, but had not been available for S/C 31 at Jupiter.

2) The "B" gyro +pitch gyro scale factor [GSF (7)] has been recalibrated by means of reconstruction of the A608 KRPT test. The revised value is 0.54% larger than previously used. This change has discernible effect since the maneuver contained about 12 degrees of positive pitch motion. There has also been a slight change (0.29% decrease) in the negative yaw gyro scale factor.

This is the fourth Jupiter RASMA maneuver reconstruction delivered to the RSST. The differences between these four deliveries are summarized below.

1) May 1979: Based on Day 79-101 IFCAL file and MAPS-1 gyro scale factor set.

2) August 1980: Based on Day 79-199 IFCAL file and MAPS-6 gyro scale factor set, +/- gyro scale factors selected incorrectly.

3) October 1980: Based on Day 79-199 IFCAL file and MAPS-6 gyro scale factor set, +/- gyro scale factors selected correctly.

4) January 1982: Based on analysis of AGC at Mini-ASCAL and revised value of +pitch gyro scale factor.

Figure 1 presents a polar plot of the Earth in S/C coordinates at the Mini-ASCAL and at celestial re-acquisition. S/C attitude at these two times is known from analysis of AGC data and from celestial sensor data. The reconstructed S/C attitude at these two times agrees with the independently obtained attitudes to within measurement 3σ uncertainties, shown in Figure 1.

Figure 2 shows how much this reconstruction differs from the previous reconstruction documented in Reference 1. The difference grows to about 0.04° during the +pitch turn following XPOCC I. Thereafter the difference shifts between pitch and yaw as roll turns are executed.

Figure 3 shows how the reconstructed attitude (at zero limit cycle) differs form the design maneuver attitude. Note that in this instance design maneuver means where the HGA should have been pointing based on post-maneuver knowledge of the HGA/roll turn axis/sun sensor geometry. Thus, Figure 3 presents a measure of maneuver execution error. The largest excursions from the design maneuver, out to about 0.055°, are the result of limit cycle turn error during the roll turns.

Gyro drift rates are used as a means to adjust the reconstruction such that it will match the estimates of S/C attitude at the Mini-ASCAL and at celestial re-acquisition. These computed gyro drift rates are shown in the table below.

	Observed Gyro Drift Rate (Deg/Hr)	Computed Gyro Drift Rate (Deg/Hr)	Initial Attitude Offset (Deg)
Pitch	-0.011	+0.0060	0.0
Yaw	-0.011	+0.0044	0.0

Thus, the reconstructed attitude matches the independently obtained attitudes at the Mini-ASCAL and at celestial re-acquisition with only modest changes to the observed gyro drift rates and with no tweaking of the reconstruction initial attitude. This indicates a more accurate reconstruction than previously obtained.

MB/RS:js

Attachments

Distribution

Voyager Division 34 MOS 1 & 2 List
P.E. Doms
D.P. Holmes

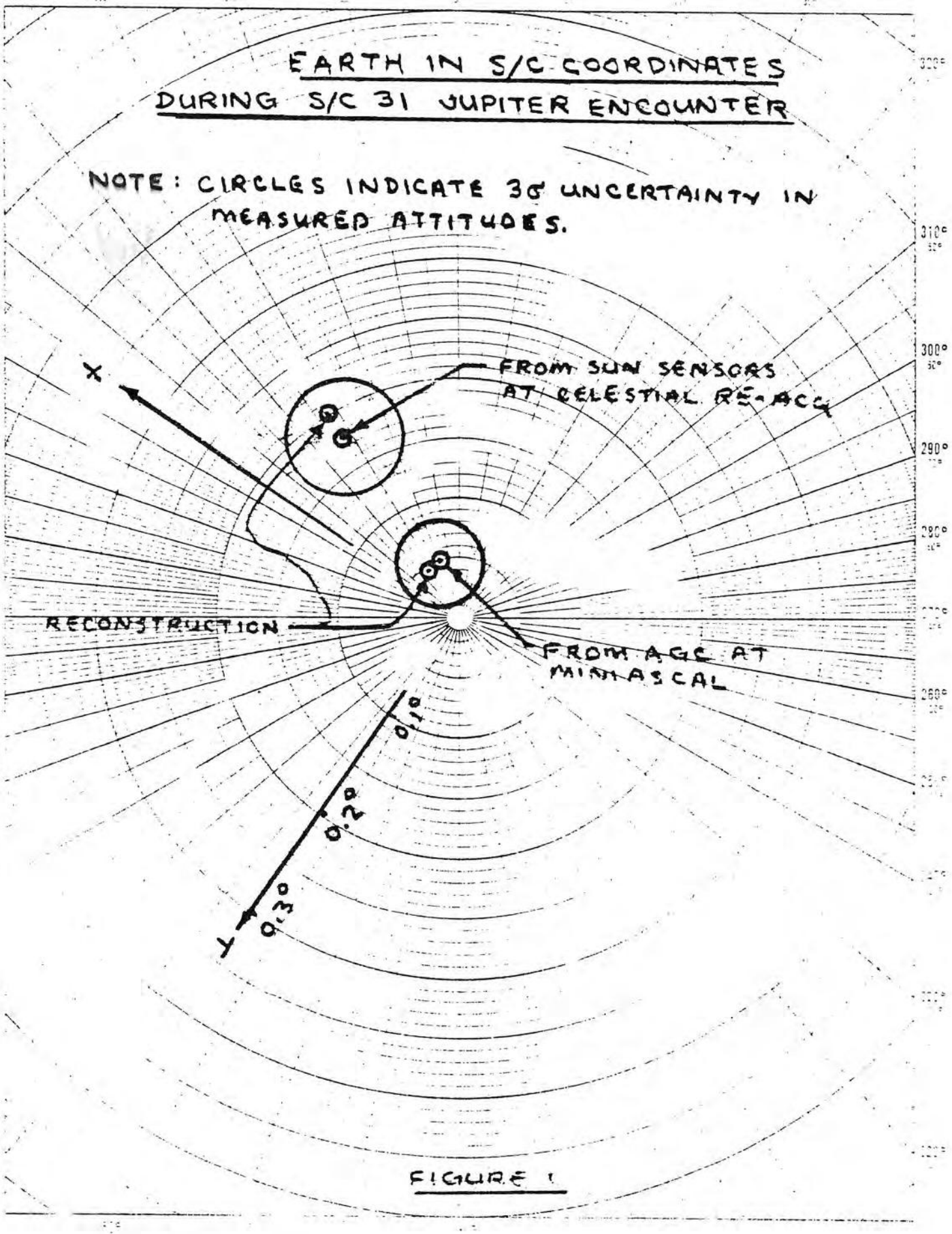
EARTH IN S/C COORDINATES
DURING S/C 31 JUPITER ENCOUNTER
NOTE: CIRCLES INDICATE 3σ UNCERTAINTY IN MEASURED ATTITUDES.
X
FROM SUN SENSORS AT CELESTIAL RE-ACQ
RECONSTRUCTION
FROM AGE AT MIMASCAL
Y
0.1°
0.2°
0.3°
310°
300°
290°
280°

FIGURE 1

ATTITUDE DIFFERENCE BETWEEN PREVIOUS RECONSTRUCTION AND THIS RECONSTRUCTION

NOTE: ROTATION IS FROM PREVIOUS RECONSTRUCTION TO THIS RECONSTRUCTION

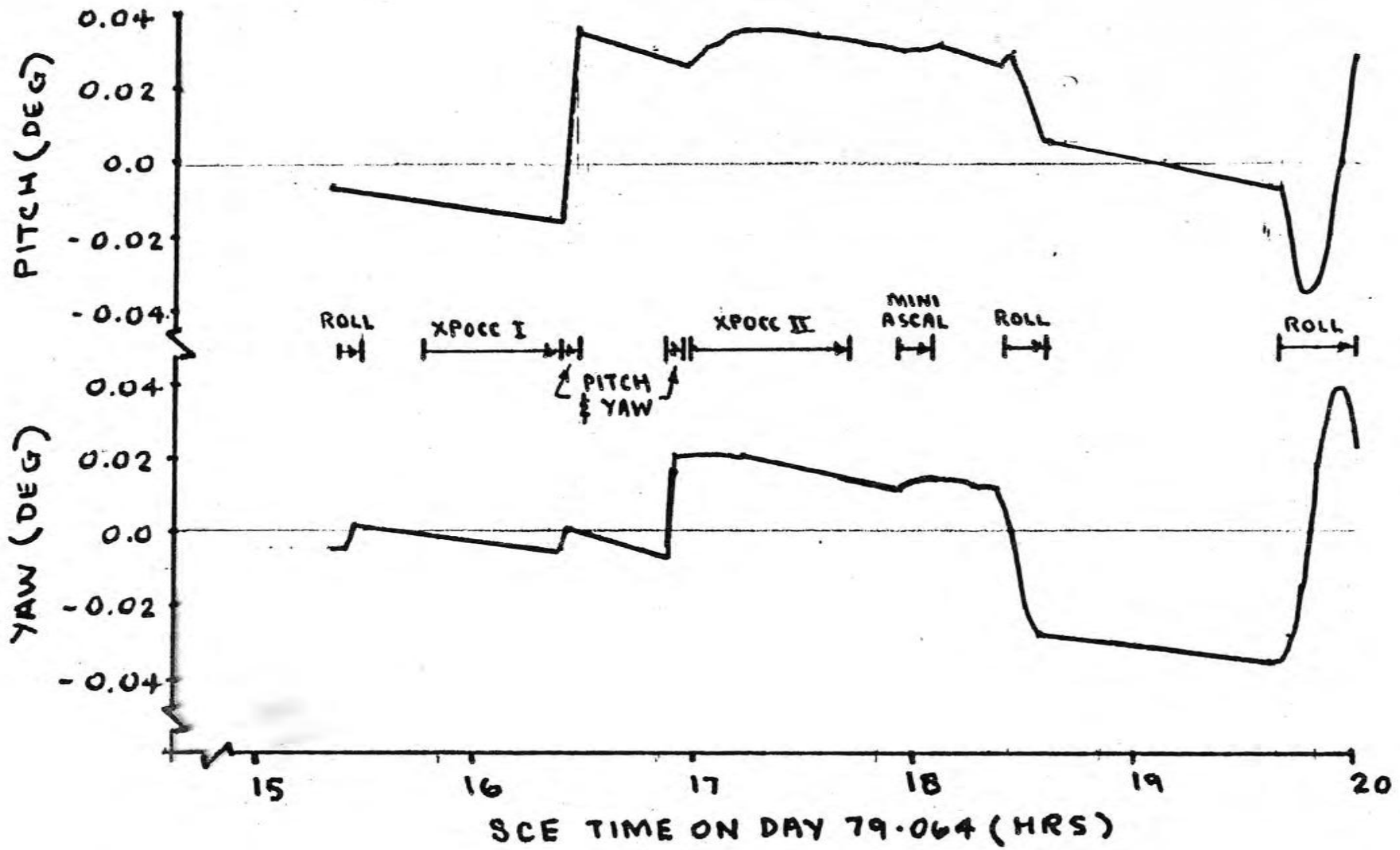

FIGURE 2

ATTITUDE DIFFERENCE BETWEEN RECONSTRUCTION AND PREDICTED MANEUVER

NOTE: ROTATION IS FROM PREDICTED MANEUVER TO CENTER OF RECONSTRUCTED MANEUVER DEADBAND

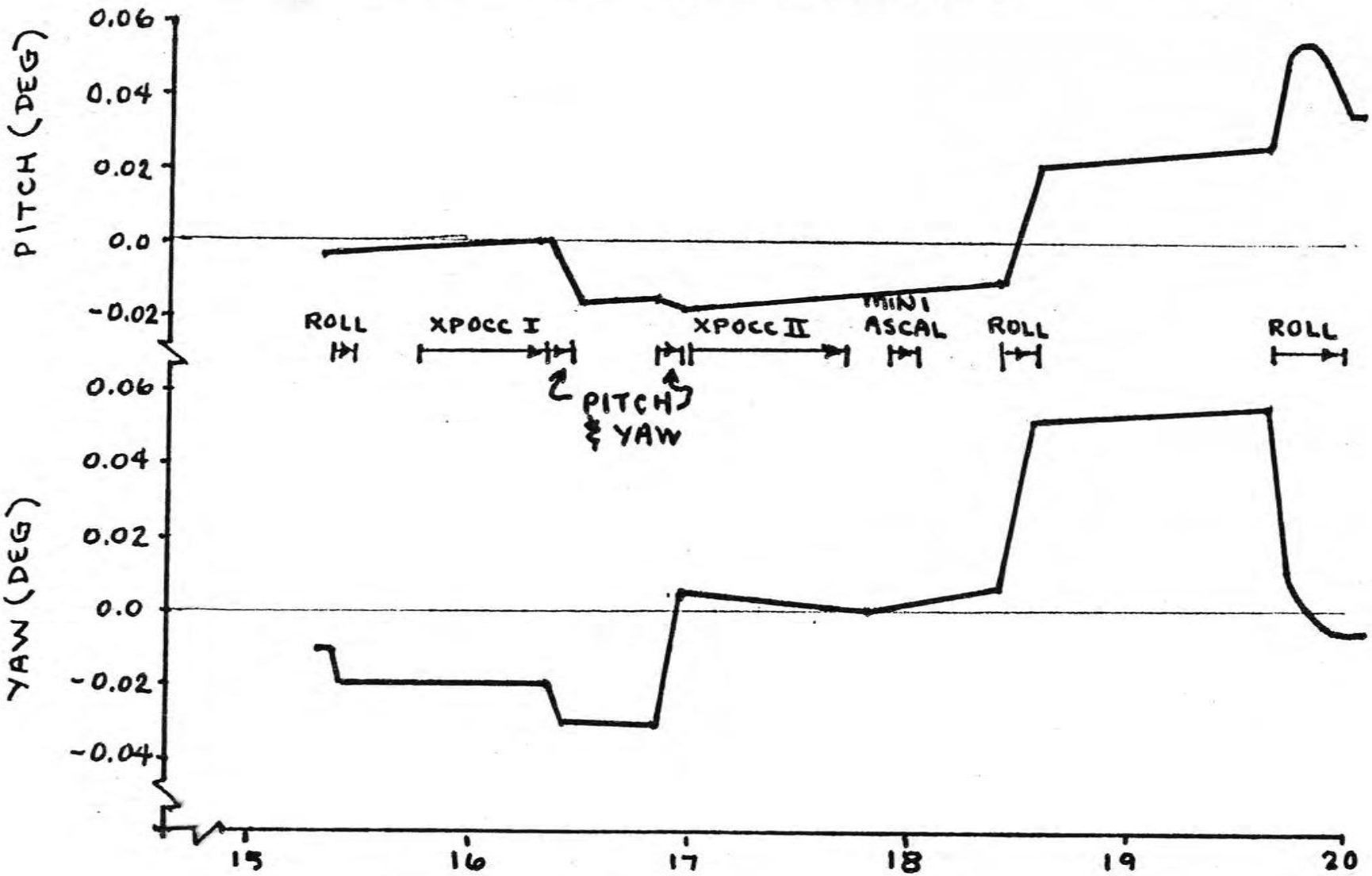

FIGURE 3