MIT/IL
Apollo Guidance and Navigation
System Test Group Memo No. 1016

To: Ain Laats

From: Warren Prince Jr.

Date: 18 May 1967

Subject: Supplement to Gyro Drift Test

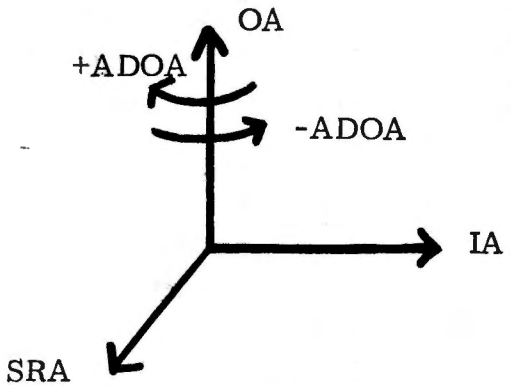
Reference: MIT/IL STG Memo No. 380, Revision B

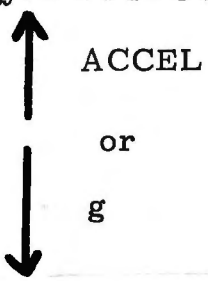
Block I Apollo G&N System

This memo contains a description and operating procedure for measuring the ADOA terms in the Gyro Drift Test. This program is part of the IMU Performance Tests incorporated in the 501 Mission Program Assembly.

In addition to nine IRIG drift terms which are defined in System Test Group Memo No. 380, Revision B, there are three additional terms which should be considered:

ADOA (X, Y, Z): defined as acceleration sensitive drift due to a case acceleration of one g along the positive gyro OUTPUT axis. A positive ADOA, due to an acceleration along the positive OUTPUT axis (or gravity acting along the minus OUTPUT axis) will cause a negative torque about the gyro OUTPUT axis





The equations for positions 1, 2, 3, which in the present test measure the NBD terms should be changed to include the ADOA terms:

POSITION 1 $D_{H_1} = W_H + NBDY + ADOAY$

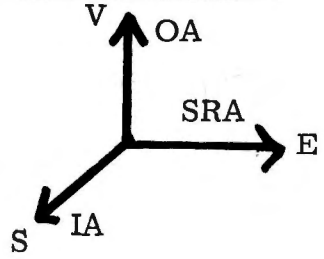
POSITION 2 $D_{H_2} = -W_H + NBDZ - ADOAZ$

POSTION 3 $D_{H_3} = -W_H + NBDX + ADOAX$

Since each equation contains two unknowns it is necessary to define a new set of equations which will be designated $D_{H_{1a}}$, $D_{H_{2a}}$, $D_{H_{3a}}$. Three corresponding positions 1a, 2a, 3a will be incorporated into the test to measure these terms, which will place the respective gyro output axis in opposite direction, with the input axis maintained in the same direction.

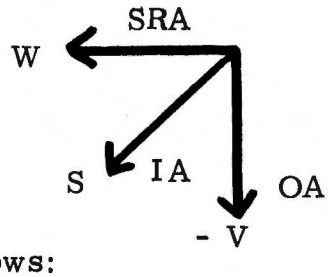
SM CONFIGURATION FOR POSITION 1 & 1 a

POSITION 1



Y GYRO

POSITION 1 a



Equations for the three new positions are as follows:

POSITION 1 $\quad D_{H_{1\,a}} = -(W_H + NBDY - ADOAY)$

POSITION 2 a $\quad D_{H_{2\,a}} = -(-W_H + NBDZ + ADOAZ)$

POSITION 3 a $\quad D_{H_{3\,a}} = -(-W_H + NBDZ - ADOAX)$

Minus signs outside parentheses are present because of the out of phase orientation of the monitoring pipa. ??

The three ADOA and NBD terms can then be calculated as follows:

$$ADOAY = \frac{D_{H_1} + D_{H_{1\,a}}}{2}$$

$$NBDY = D_{H_1} - W_H - ADOAY$$

$$ADOAZ = -\frac{(D_{H_2} + D_{H_{2\,a}})}{2}$$

$$NBDZ = D_{H_2} + W_H + ADOAZ$$

$$ADOAX = \frac{D_{H_3} + D_{H_{3\,a}}}{2}$$

$$NBDX = D_{H_3} + W_H - ADOAX$$

OPERATING PROCEDURE

1. Prior to initialization of test, operator should load the entire following erasable memory routine:

POSITION 1 a, XDN, Y SOUTH, Z WEST

1600	CAF HALF	34522
1	TS YSM + Z	51434
2	COM	40000
3	TS XSM	51424
4	TS ZSM + 4	51444
5	TC PROG	07546

POSITION 2 a, XUP, Y EAST, Z NORTH

1606	CAF HALF	34522
7	TS XSM	51424
1610	TS YSM + 4	51436
1	COM	40000
2	TS ZSMTZ	51442
3	TC PROG	07566

POSITION 3 a X NORTH, Y EAST, Z DOWN

1614	CAF HALF	34522
5	TS YSM + 4	51436
6	COM	40000
7	TS XSM + Z	51426
1620	TS ZSM	51440
1	TC PROG	07606

2. Having initialized and completed POSITION 1 of test, operator should observe VO6, N66 flashing and record contents of R1, R2, and R 3. This data should be recorded as D_{H_1}.

3. Depress V 33 E

4. Operator should observe V06 N66 flashing and verify:

R 1	Navigation base tilt angle in degrees (+ 00032)
R 2	Test index number (+ 00000)
R 3	Position number (+ 00002)

5. At this point, operator should depress

V 21 N 01 ENTER 1 2 2 3 ENTER X X X X X ENTER

For position 1 a	load 72051
2 a	load 72057
3 a	load 72065

6. Operator should verify V 06 N 66 flashing

R1, R2 same as step 4

R 3 should contain the following:

-03030 corresponding to position 1 a
-03024 corresponding to position 2 a
-03018 corresponding to position 3 a

7. Depress V 33 E. Prior to the coarse align routine program will jump to an erasable routine to calculate SM orientation.

8. Approximately 18 minutes later, operator should observe V 06 N 66 flashing and record contents of R1, R2 and R3 for position 1 a as $D_{H_{1\,a}}$; for position 2 a as $D_{H_{2\,a}}$; for position 3 a as $D_{H_{3\,a}}$.

9. Depress V 33 E

10. Operator should run following sequence:

1. POSITION 1 = D_{H_1}
2. POSITION 1 a = $D_{H_{1\,a}}$
3. POSITION 2 = D_{H_2}

4. POSITION 2 a = $D_{H_{2\,a}}$

5. POSITION 3 = D_{H_3}

6. POSITION 3 a = $D_{H_{3\,a}}$

The above operations were verified in the System Test Laboratory with the Solrum 55 program.

Warren Prince, Jr.

WP:dfh
Distribution:
A. Laats
R. Lones
J. Miller
D. Sheridan
G. Silver
R. McKern
J. Beauregard
MIT/IL at KSC
MIT/IL at NAA
MIT/IL at GAEC
MIT/IL at MSC
J. Lawrence
W. Coleman
STG IL 7 File
STG IL 11 File
J. Feldman