Massachusetts Institute of Technology
Instrumentation Laboratory
Cambridge, Massachusetts

COLOSSUS Memo #140, Rev. 2

TO: Distribution
FROM: Fred H. Martin
DATE: March 5, 1969
SUBJECT: Final Content of COLOSSUS 2 (Comanche, Rev. 45)

The COLOSSUS 2 assembly (Comanche, Rev. 45) is a modification of COLOSSUS 1A, Rev. 249 and COLOSSUS 2 (Comanche, Rev. 44). The new coding is authorized in one of three ways:

a) PCR/PCN's

b) COLOSSUS Anomalies (COL XX) or (COM XX) requiring no PCR; i.e., requiring no specification change.

c) Assembly Control Board authorization (ACB XX), requiring no PCR; i.e., not an anomaly fix but a program improvement.

This Memo records these changes.

TABLE A: List of PCR/PCN's, affected CSOP sections, and precipitating Anomalies, where applicable.

TABLE B: List of Anomalies, requiring no PCR/PCN's.

TABLE C: List of ACB's.

TABLE A

List of PCR/PCN's

PCR NO.	TITLE	PCN	CORRES-PONDING ANOMALY	GSOP SECTION					
				SEC 1	SEC 2	SEC 3	SEC 4	SEC 5	SEC 6
251	Saturn Polynomial Takeover					√	√	√	
254.1	CDH time at 1/2 Periods						√	√	
255	R36 Option						√	√	
256	Remove R35 & Landmarks				√		√	√	
261	Auge-Kugel Override P37						√	√	
266	Downlink for P32/33				√				
572	IMU Pulse Torque						√		
619	Remove P23 Recycle	Yes	#52				√		
627.1	Load Check On N81 (P34)	Yes	#30		√		√		
638	Limit G-Load in Entry							√	
655	Limit Auge-Kugel							√	
656	Uprated TVC DAP				√	√	√		
660	Neg. W. L. Alarm		#62				√		
661	Origin Check at End of Step	Yes	#61					√	
662	Load Check on N99	Yes	#31		√		√		
663	ΔV MAG for P37						√	√	
665	Improve R31, R34						√	√	
666	Blank for R41	Yes	#62				√	√	
667	Define AMOONFLG	Yes	#62		√			√	
668	Eliminate R·VΔt Sphere Check	Yes	#74					√	
659.1	Suppression of X-modulo	Yes	#75					√	
733	Entry Vel. Limit in P37							√	

TABLE A (Continued)

PCR NO.	TITLE	PCN	CORRESPONDING ANOMALY	CSOP SECTION					
				SEC 1	SEC 2	SEC 3	SEC 4	SEC 5	SEC 6
675	Units for Planets	Yes					√		
678	V96 Indication	Yes			√				
680	P22 Load Protect	Yes					√		
681	CSI/CDH						√	√	
682	00 to P23						√		
684	400K alarm for P37	Yes					√	√	
685	Prevent P01 Select	Yes			√		√		
686	Precision Integration in P52						√		
687	OPerator Error in 50's						√		
689	SKIPVHF FLAG	Yes	85		√				
690	Slow down P37				√			√	
691	Correct ΔV (LV) P37				√			√	
692	POODOO for Conics	Yes					√	√	
693	P21 FLAG	Yes			√				
694	POODOO for Sub-Surface	Yes					√	√	
576	Backward Integration > 1 Rev.	Yes						√	
664	Second body in P23	Yes	56					√	
683	P23 Noon Limits	Yes					√		
711	Issue SIV-B Cut-off				√	√	√		
712	Entry DAP Dead Zone Documention	Yes				√			
713	Entry DAP D'Link Documentation	Yes	68			√			
714	Prohibit P11 from P07	Yes		√					

TABLE A (CONTINUED)

PCR NO.	TITLE	PCN	CORRESPONDING ANOMALY	GSOP SECTION					
				SEC 1	SEC 2	SEC 3	SEC 4	SEC 5	SEC 6
724	Launch Gravity for REFSMMAT	Yes	#88					√	
726	Correction to Entry DAP Doc.	Yes				√			
728	Altitude in N62 above moon, P47						√		
729	K_1 & FANG in Erasable, IMPULSE Burn							√	
730	H, V, γ in P2 (N73)						√		
734	New K_2, K_3 fixed constants for Impulse	Yes						√	
735	Powered list for P11, Pact/Yact on Coast/Align List				√				
269	Large Sec. 2 Update	Yes			√				
725	Large Sec. 4 Update						√		
746	Entry Roll Error on Downlist				√				
747	Remove TVCDAP Initial Attitude Errors					√			

TABLE B

List of Anomalies

COL 59	SPS Exhaust Velocity for P37 Biasing
COL 63	Proper data on P23 downlink
COL 64	Allow V34 on FL V51 in P51, P52, P22, P23
COL 65	Error Light for Illegal Channel Read/Write
COL 67	Proper restart protection for R50 (Coarse Align)
COL 69	Remove R36 displays from V97/V99 responses
COL 76	Allow P76 use across sphere
COL 78	Eliminate conflict between priority R60 and VHF
COL 79	Allow extended verbs in P62
COL 80	Prevent monitor of illegal nouns
COL 82	Do not light Tracker Fail when Update Flag's reset
COL 83	Avoid simultaneous usage of extended verbs
COL 84	Put correct Apogee/Perigee on downlink
COL 86	If P40 is exited before TIG +. 4 sec. optics problem
COL 87	SPS gimbal trim incorrect after burn $\leq$ 0.4 sec.
COL 89	Correct rectification criterion on first integration step
COL 90	OFFSET RLS incorrectly computed in P22
COM 4	P30 VGMAG not transferred to P40, P41 properly.

TABLE C

List of Assembly Control Board Requests

Number	ACB Description
1	Priority of I/GYRO raised to PRIO21.
2	Order of integration in AVETOMID changed from W, LM, copy RN and VN into CM to W, copy RN and VN into CM, LM.
3	Leave CMOONFLG, LMOONFLG, SURFFLAG, and REFSMFLG alone in Fresh Start.
4	Terminate response (V34E) to V06 N49 in P23 changed to go to FL V37 (GOTOPOOH).
5	Store LOC and BANKSET into erasables LOCALARM and BANKALRM on every ALARM or ABORT.
8	Change value of JCAXIS in P23.
9	PINBALL does automatic Key Release after data load.
13	Clear overflow in entrances to CONIC routines.
14	Provide additional SWINIT (for Flagwrd 11).
19	Clear proper channel bits in V37.
20	Use base vector for P21 integration to save time.
21	Check for -0 value in VHF range input register.
17	Zero R_2 and R_3 of V06 N60 at 1st appearance in P37.
18	Multiply star vector by $\frac{1}{\sqrt{3}}$ before taking UNIT in R53.
22	Store pertinent debugging information in last VAC area on any restart, POODOO, or BAILOUT.
23	Use DP value for N88.
24	Change REGODSPR to REGODSP in P11.
25	Prevent 180 sec wait between gyro compensations.
26	Prevent negative waitlist loop at ENGINOFF.
27	Prevent AGC lock-up possibility due to FRESTORE logic.
30	Restart protect storing of initial TVC DAP attitude errors.

MIT/IL SOFTWARE ANOMALY REPORT

1.1 ORIGINATOR: T. CROCKER	1.2 ORGANIZATION: MIT	1.3 DATE: 2/20/69	1.4 ORIGINATOR CONTROL NO.	REPORT NO. COM 1 PROGRAM: Colossus 2 PROGRAM REVISION: Comanche Rev 44

1.5 DESCRIPTION OF ANOMALY:

In lunar environment, velocity and flight path angle are incorrect in N73 associated with P21 (see PCR 730).

CONTINUED ON PAGE 2

1.6 DESCRIPTION OF RUN:

Level 3 Lunar orbit, P21 test

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- MIT ANALYSIS -

2.1 CAUSE: In lunar environment, coding uses velocity scaled at 2^9 m/sec instead of 2^7. Velocity appears 4x actual value. Flight path angle is smaller than time value.

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2.2 RECOGNITION:

Velocity too great for lunar trajectory conditions.

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2.3 MISSION EFFECT:

None.

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2.4 AVOIDANCE PROCEDURE:

None

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2.5 RECOVERY PROCEDURE:

Divide velocity result by 4 for true value. Multiply flight path angle by 4 (for small angles $\sim 5^\circ$).

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2.6 PROGRAM CORRECTION:

Use scaling of 2^7 m/sec for this display.

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2.7 RECOMMENDED DISPOSITION (Fix, Work-around, etc):

Fix for Colossus 2A.

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2.8 RECOMMENDED RE-TESTING:

Level 3 test

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2.9 MIT/IL SIGNATURE: [signature] Martin — **2.10 DATE:** 2/20/69

3.1 NASA DIRECTION:

FIX FOR COLOSSUS 2A

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4.1 CLOSING ACTION TAKEN: CLOSED

MIT will fix for Colossus 2A.

1.4.7 SEE ALSO PROGRAM NOTE 1.4.7 SECTION A

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3.2 NASA/MSC SIGNATURE	3.3 ORGANIZATION	3.4 DATE	4.2 SIGNATURE	4.3 ORGANIZATION	4.4 DATE
[signature]	NASA/MSC/FSD	3/17/69	[signature]	NASA/MSC/FSD	3/17/69

MIT Form 1420 (Rev May 68)

N. Brodeur

MIT/IL SOFTWARE ANOMALY REPORT

Report No.	Program	Revision
COM 2 - Rev 3	Colossus 2	COMANCHE 44

1.1 Originator	1.2 Organization	1.3 Date	1.4 Originator Control No.
M. HAMILTON	MIT	4/16/69	

1.5 Description of Anomaly:

If a POODOO abort alarms (1206, 1210, 1302, 1501, 1502, 1521, 1204, 1103, 430, 607, 610) takes place during permanent integration, STATEFLG, and NODOFLAG are not reset with the result that subsequent integrations may cause difficulty.

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1.6 Description of Run:

EYE-BALL

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- MIT ANALYSIS -

2.1 Cause: Coding error: If a POODOO abort occurs during POO integration the NODOFLAG will remain set. For other permanent integrations (e.g. mark incorporation) the STATEFLG will remain set.

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2.2 Recognition: If occurring during POO then all program requests (V37) except for POO (and V96) are locked out. If STATEFLG remains set then any integration (e.g. P21) will behave as a permanent integration & clobber the state vector.

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2.3 Mission Effect:

Mandatory work around if POODOO abort occurs. (See 2.5)

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2.4 Avoidance Procedure:

None.

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2.5 Recovery Procedure:

If a POODOO abort occurs select POO.

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2.6 Program Correction:

Add coding to reset STATEFLG and NODOFLAG in POODOO logic.

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2.7 Recommended Disposition (Fix, work-around, etc):

Fix for COLOSSUS 2A. Use work around in COLOSSUS 1A and COLOSSUS 2.

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2.8 Recommended Re-testing:

Force POODOO abort during integration.

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2.9 MIT/IL Signature: [illegible] **2.10 Date:** 4/18/69

3.1 NASA Direction	4.1 Closing Action Taken
F. FOR COLOSSUS 2A	MIT will fix for COLOSSUS 2A. REWRITE PROGRAM NOTE 3.1.1 SEC A. CLOSED
CONTINUED ON PAGE	CONTINUED ON PAGE

3.2 Signature	3.3 Organization	3.4 Date	4.2 Signature	4.3 Organization	4.4 Date
[illegible]	MSC/FS5	4/24/69	[illegible]	MSC/FS5	4/25/69

MIT/IL SOFTWARE ANOMALY REPORT

1.7 REPORT NO.: COM 3
PROGRAM: COLOSSUS 2
PROGRAM REVISION: COMANCHE 44

1.1 ORIGINATOR	1.2 ORGANIZATION	1.3 DATE	1.4 ORIGINATOR CONTROL NO.
M. Hamilton	MIT	2/27/69	

1.5 DESCRIPTION OF ANOMALY

If a PROCEED response is made to V53 flashing in P53 and P54, the program hangs up as a sleeping job.

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1.6 DESCRIPTION OF RUN

Hybrid run testing out P54.

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- MIT ANALYSIS -

2.1 CAUSE

Coding error.

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2.2 DESCRIPTION After a PRO response to V53 flashing, the DSKY remains blank thereafter.

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2.3 MISSION EFFECT

Requires recovery.

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2.4 AVOIDANCE PROCEDURE

Do not PRO on V53 flashing in P53, P54.

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2.5 RECOVERY PROCEDURE

Select P54 again

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2.6 PROGRAM CORRECTION

Change PRO response to redisplay V53 without doing a CLEANDSP.

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2.7 RECOMMENDED DISPOSITION (Fix, Work-around, etc)

Fix for COLOSSUS 2A.

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2.8 RECOMMENDED RE-TESTING

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2.9 MIT/IL SIGNATURE: [illegible signature] 2.10 DATE: 3/21/69

3.1 NASA DIRECTION

FIX FOR COLOSSUS 2A

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4.1 CLOSING ACTION TAKEN

CLOSED

MIT will fix for COLOSSUS 2A.

SEE ALSO PROGRAM NOTE 1.63 SECTION A

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3.2 NASA/MSC SIGNATURE	3.3 ORGANIZATION	3.4 DATE	4.2 SIGNATURE	4.3 ORGANIZATION	4.4 DATE
[illegible signature]	NASA/MSC/FS5	3/17/69	[illegible signature]	NASA/MSC/FS5	3/17/69

MSC Form 1025 (Rev Aug 68)

MIT/IL SOFTWARE ANOMALY REPORT

1.1 ORIGINATOR: F. MARTIN	1.2 ORGANIZATION: MIT	1.3 DATE: 3/4/69	1.4 ORIGINATOR CONTROL NO.	REPORT NO. COM 4 PROGRAM: COLOSSUS 2 PROGRAM REVISION: COMANCHE 44

1.5 DESCRIPTION OF ANOMALY:

VG magnitude is not transferred from P30 to P40, P41.

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1.6 DESCRIPTION OF RUN:

P40 run with P30 targetting. Difference between AGC and ENV central angle = -86.14°. Angle between AGC and ENV Thrust vectors = 43.07°.

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- MIT ANALYSIS -

2.1 CAUSE: VG magnitude (P30) assigned to an erasable cell that is not referenced in P40, P41.

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2.2 RECOGNITION: Possibly large differences between ground and CMC computed gimbal angles at time-of-ignition.

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2.3 MISSION EFFECT: P30 targetted burn will not be in correct direction. An additional corrective burn might be required.

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2.4 AVOIDANCE PROCEDURE:

See attached page

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2.5 RECOVERY PROCEDURE:

Additional burn might be required.

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2.6 PROGRAM CORRECTION: Compute VG magnitude in P40, P41 thereby eliminating need for transfer of this quantity from P30.

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2.7 RECOMMENDED DISPOSITION (Fix, work-around, etc.): Fix for Colossus 2; i.e. remanufacture Module 3 of Comanche 44. New Colossus 2 will be Comanche 45. Also fix for Colossus 2A.

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2.8 RECOMMENDED RE-TESTING:

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2.9 MIT/IL SIGNATURE: [signature] Martin — 2.10 DATE: 3/4/69

3.1 NASA DIRECTION	4.1 CLOSING ACTION TAKEN
FIX FOR COLOSSUS 2 AND COLOSSUS 2A (REMANUFACTURED MODULE 3 FOR COLOSSUS 2)	MIT will fix for Colossus 2 and 2A. CLOSED NO ACTION NECESSARY
CONTINUED ON PAGE	CONTINUED ON PAGE

3.2 NASA/MSC SIGNATURE	3.3 ORGANIZATION	3.4 DATE	4.2 SIGNATURE	4.3 ORGANIZATION	4.4 DATE
[signature]	NASA/MSC/FSD	3/17/69	[signature]	[illegible]	3/17/69

MSC Form 1403 (Rev May 68)

MIT/IL SOFTWARE ANOMALY REPORT

Originator	Organization	Date	Originator Control No.	
F. Martin	MIT	3/4/69		COM 4
				Program: COLOSSUS 2
				COMANCHE 44

2.4 Avoidance Procedure:

Work around procedure for COMANCHE 44 at FL V37 in P30:

V4N1E
3771E
V21E
3653E

then enter quantity display in R_2 into R_1; i.e.

XXXXXE

N. Brodeur

MIT/IL SOFTWARE ANOMALY REPORT

1.1 ORIGINATOR	1.2 ORGANIZATION	1.3 DATE	1.4 ORIGINATOR CONTROL NO.	REPORT NO. / PROGRAM / PROGRAM REVISION
B. BYRNE	MIT	3/13/69		COM 5 / COLOSSUS 2 / Comanche 44 & 45

1.5 DESCRIPTION OF ANOMALY:

Second N88 display (planet option) in P23 requires reload of planet unit vector. With aligned IMU first N88 display is used for auto optics, second N88 verifies actual mark. Information entered in first display is clobbered before second display and requires reload.

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1.6 DESCRIPTION OF RUN:

P23 Level 3 test which included planet option

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- MIT ANALYSIS -

2.1 CAUSE: Use of N88 display registers (STAR, +2, +4) as temporary storage by R52.

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2.2 RECOGNITION: Second N88 display differs from first. If proceeded upon ΔR, ΔV N49 may produce unusually large state corrections.

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2.3 MISSION EFFECT: None, if recognized: 1) load N88 correctly, 2) reject mark; otherwise state vector would be incorrectly updated and would require additional marks correct and/or state vector update.

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2.4 AVOIDANCE PROCEDURE: Load second N88 display with marked planet unit vector.

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2.5 RECOVERY PROCEDURE: If pre-marking state were zapped to LM slots, unzap and start new marking schedule. Otherwise take additional marks and/or obtain state vector uplink. Note that W-matrix initialization may be desirable.

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2.6 PROGRAM CORRECTION: Identify new erasable vector which holds input unit vector through second N88 display.

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2.7 RECOMMENDED DISPOSITION (Fix, work-around, etc): Follow (2.4) for Colossus (Comanche 44, 45). Fix for Colossus 2A.

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2.8 RECOMMENDED RE-TESTING: Rerun above test (1.6).

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2.9 MIT/IL SIGNATURE: [signature] 2.10 DATE: 3/18/69

3.1 NASA DIRECTION: Fix for Colossus 2A

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4.1 CLOSEOUT ACTION TAKEN: MIT will fix for Colossus 2A.

CLOSED

SEE PROGRAM NOTE 1.1.4 SEC. A

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3.2 NASA/MSC SIGNATURE	3.3 ORGANIZATION	3.4 DATE	4.2 SIGNATURE	4.3 ORGANIZATION	4.4 DATE
[signature]	MSC/MSC/FSS	3/24/69	[signature]	[illegible]/MSC/FS	3/26/69

MSC Form 1408 (Rev May 68)

MIT/IL SOFTWARE ANOMALY REPORT

0.0 REPORT NO.	COM 6
PROGRAM	COLOSSUS 2
PROGRAM REVISION	COMANCHE 45

1.1 ORIGINATOR	1.2 ORGANIZATION	1.3 DATE	1.4 ORIGINATOR CONTROL NO.
P. RYE	MIT	3/7/69	

1.5 DESCRIPTION OF ANOMALY:

Storing of gimbal angles at liftoff for initialization of attitude errors in P11 is not properly restart-protected.

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1.6 DESCRIPTION OF RUN:

Eye-ball

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- MIT ANALYSIS -

2.1 CAUSE:

Restart logic bypasses coding which scales and stores gimbal angles.

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2.2 RECOGNITION:

Restart at liftoff.

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2.3 MISSION EFFECT:

Possible inaccuracy in initial needles display.

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2.4 AVOIDANCE PROCEDURE:

None

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2.5 RECOVERY PROCEDURE:

None

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2.6 PROGRAM CORRECTION:

Move initialization coding so that it is included in restart-protected area.

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2.7 RECOMMENDED DISPOSITION (Fix, work-around, etc.):

Fix for COLOSSUS 2A.

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2.8 RECOMMENDED RE-TESTING:

Restart test of P11.

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2.9 MIT/IL SIGNATURE: [signature] **2.10 DATE:** 3/10/69

3.1 NASA DIRECTION:

FIX FOR COLOSSUS 2A

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4.1 CLOSING ACTION TAKEN:

CLOSED

MIT will fix for Colossus 2A

SEE ALSO PROGRAM NOTE 3.7.1 SECTION A

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3.2 NASA/MSC SIGNATURE	3.3 ORGANIZATION	3.4 DATE	4.2 SIGNATURE	4.3 ORGANIZATION	4.4 DATE
[signature]	NAA/MSC/FSF	3-17-69	[signature]	NAA/MSC/FS	3-17-69

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MIT/IL PROGRAM CHANGE ROUTING SLIP N. Barden

PCR/PCN # ______

ANOMALY # COM 7

- [ ] COLOSSUS 1A
- [ ] COLOSSUS 2
- [x] COLOSSUS 2A
- [ ] COLOSSUS ____
- [ ] LUMINARY 1
- [ ] LUMINARY 1A
- [ ] LUMINARY ____

- [ ] MIT Approved PCN
- [ ] NASA Approved PCR
- [ ] NASA Approved PCN
- [ ] NASA Approved Software Anomaly
- [x] MIT Approved Software Anomaly

A. Coding

(X) Begin coding immediately ACTION: G. Hasbrook

Program Supervisor: Margaret H. Hamilton

( ) Do not code until new GSOP material has been approved by the MIT Mission Design Review Board (MDRB) and distributed.

B. GSOP Preparation

( ) Prepare GSOP revisions for MDRB consideration ACTION: ______

- [ ] Technical Committee Meeting not required.
- [ ] Technical Committee Meeting(s) held on ______ Attendees:

C. KSC Testing and Checkout

( ) Review for possible impact on KSC testing and checkout ACTION: ______

D. Other Programs Affected

(X) Review for corresponding changes in Luminary

ACTION: G. Cherry

Special Instructions

Project Manager: Fred H. Martin

Date 3/20/69

(Rev 1, 2/69)

MIT/IL SOFTWARE ANOMALY REPORT

PERIPHERAL: COM 7
PROGRAM: Colossus 2
PROGRAM REVISION: Comanche 44, 45

1.1 ORIGINATOR: R. A. HASLAM
1.2 ORGANIZATION: MIT/IL
1.3 DATE: 3/20/69
1.4 ORIGINATOR CONTACT NO.

1.5 DESCRIPTION OF ANOMALY:

PROCEED response to V50N25 R145 in P51, P53 (please perform celestial body acquisition) fails to initialize gyro compensation.

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1.6 DESCRIPTION OF RUN:

Eye-ball

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- MIT ANALYSIS -

2.1 CAUSE:

Program code which initializes gyro compensation is bypassed on PROCEED response.

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2.2 RECOGNITION:

Difficult to assess

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2.3 MISSION EFFECT:

Uncompensated drift will degrade subsequent alignment.

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2.4 AVOIDANCE PROCEDURE:

Always perform coarse alignment in P51 (ENTER to V50N25 R1=15)

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2.5 RECOVERY PROCEDURE:

Re-select P51 if coarse align inadvertently bypassed.

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2.6 PROGRAM CORRECTION:

Move compensation initialization procedure to area common to 'ENTER' and 'PROCEED' responses.

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2.7 RECOMMENDED DISPOSITION (Fix, work-around, etc):

2.4 or 2.5 above for COL 2
Fix for COL 2A

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2.8 RECOMMENDED RE-TESTING:

Level 3 P51 test

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2.9 MIT/IL SIGNATURE: R. A. Haslam

2.10 DATE: 3/24/69

3.1 NASA DIRECTION:

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4.1 CLOSING ACTION TAKEN:

MIT will fix for Colossus 2A.

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3.2 NASA/MSC SIGNATURE	3.3 ORGANIZATION	3.4 DATE	4.2 SIGNATURE	4.3 ORGANIZATION	4.4 DATE

MSC Form 1459 (Rev Aug 68)

MIT/IL SOFTWARE ANOMALY REPORT

1.1 ORIGINATOR	1.2 ORGANIZATION	1.3 DATE	1.4 ORIGINATOR CONTROL NO.	REPORT NO.
R. HASLAM	MIT	3/14/69		COM 8
				PROGRAM: COLOSSUS 2
				PROGRAM REVISION: Comanche 45

1.5 DESCRIPTION OF ANOMALY:

The second N88 display in P52, P54 (planet option) requires that the unit planet vector be reloaded. The first N88 load is for the Auto Optics Positioning Routine; the second is for mark verification. The first-loaded vector is overlaid by calculated data before the second N88 appears.

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1.6 DESCRIPTION OF RUN:

Inconvenience illustrated during Mission D.

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- MIT ANALYSIS -

2.1 CAUSE: Use of N88 display registers for multiple purposes (display and temporary storage).

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2.2 RECOGNITION: Second N88 does not contain unit planet vector loaded at first N88.

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2.3 MISSION EFFECT: None, if recognized and unit planet vector is reloaded at second N88. Otherwise, large N05 angular errors are encountered. No effect on P51, P53 use of N88.

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2.4 AVOIDANCE PROCEDURE: Reload unit planet vector at second N88.

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2.5 RECOVERY PROCEDURE: Proceed on "please perform fine align," causing recycle for new mark.

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2.6 PROGRAM CORRECTION: Identify new erasable location which is not shared until second N88 display.

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2.7 RECOMMENDED DISPOSITION (Fix, Work-around, etc): Follow (2.4) above for COLOSSUS 2. Fix for COLOSSUS 2A.

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2.8 RECOMMENDED RE-TESTING: Verify that erasable location (2.6) chosen is not shared because 1st and 2nd N88's.

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2.9 MIT/IL SIGNATURE: [signature] **2.10 DATE:** 3/14/69

3.1 NASA DIRECTION:

FIX FOR COLOSSUS 2A

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4.1 CLOSING ACTION TAKEN:

MIT will fix for COLOSSUS 2A.

CLOSED

SEE PROGRAM NOTE 1.1.5 SEC. A

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3.2 NASA/MSC SIGNATURE	3.3 ORGANIZATION	3.4 DATE	4.2 SIGNATURE	4.3 ORGANIZATION	4.4 DATE
[signature]	NASA/MSC/FSC	3/26/69	[signature]	NASA/MSC/FSC	3/26/69

Form 1402 (Rev May 68)

CANCELLED (3/26/69) M Brodeur

MIT/IL SOFTWARE ANOMALY REPORT

1.1 ORIGINATOR	1.2 ORGANIZATION	1.3 DATE	1.4 ORIGINATOR CONTROL NO.	REPORT NO. / PROGRAM / REVISION
W. OSTANEK	MIT/IL	3/18/69		COM 9 / COL 2 and 2A / COM Rev 45 & 51

1.5 DESCRIPTION OF ANOMALY:

Permanent integration of state vectors without W-matrix integration is not restart proof. One interpretive instruction (an EXIT) is not protected such that if a restart occurs here the permanent state vector will not be updated.

CANCELLED Anomaly does not exist (3/26/69)

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1.6 DESCRIPTION OF RUN:

Eyeball.

CONTINUED ON PAGE

- MIT ANALYSIS -

2.1 CAUSE:

STATEFLG which causes the program to write into permanent state vector storage is cleared before a phase change.

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2.2 RECOGNITION:

Possible large N49 display if restart during navigations.

CONTINUED ON PAGE

2.3 MISSION EFFECT:

Possible erroneous state vector corrections in navigation; possible W-matrix problems due to non-synchronization of state vectors.

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2.4 AVOIDANCE PROCEDURE:

None.

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2.5 RECOVERY PROCEDURE:

Additional marks may be necessary to reestablish proper state vector.

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2.6 PROGRAM CORRECTION:

Reset STATEFLG after phase change.

CONTINUED ON PAGE

2.7 RECOMMENDED DISPOSITION (Fix, Work-around, etc):

Fix in post COLOSSUS 2A.

CONTINUED ON PAGE

2.8 RECOMMENDED RE-TESTING:

Level 2 with restart.

CONTINUED ON PAGE

2.9 MIT/IL SIGNATURE:

2.10 DATE: 3/19/69

3.1 NASA DIRECTION:

CONTINUED ON PAGE

4.1 CLOSING ACTION TAKEN:

CONTINUED ON PAGE

3.2 NASA/MSC SIGNATURE	3.3 ORGANIZATION	3.4 DATE	4.2 SIGNATURE	4.3 ORGANIZATION	4.4 DATE

MSC Form 4005 (Rev May 68)

N. Cochran

CANCELLED (3/26/69)

MIT/IL SOFTWARE ANOMALY REPORT

1.1 ORIGINATOR	1.2 ORGANIZATION	1.3 DATE	1.4 ORIGINATOR CONTROL NO.	1.5 REPORT NO.
W. OSTANEK	MIT/IL	3/18/69		COM 9
				PROGRAM: COL 2 and 2A
				COM Rev 55 & 51

1.8 DESCRIPTION OF ANOMALY

Permanent integration of state vectors without W-matrix integration is not restart proof. One interpretive instruction (an EXIT) is not protected such that if a restart occurs here the permanent state vector will not be updated.

CANCELLED Anomaly does not exist (3/26/69)

CONTINUED ON PAGE

1.9 DESCRIPTION OF RUN

Eyeball.

CONTINUED ON PAGE

- MIT ANALYSIS -

2.1 CAUSE

STATEFLG which causes the program to write into permanent state vector storage is cleared before a phase change.

CONTINUED ON PAGE

2.2 RECOGNITION

Possible large N49 display if restart during navigations.

CONTINUED ON PAGE

2.3 MISSION EFFECT

Possible erroneous state vector corrections in navigation; possible W-matrix problems due to non-synchronization of state vectors.

CONTINUED ON PAGE

2.4 AVOIDANCE PROCEDURE

None.

CONTINUED ON PAGE

2.5 RECOVERY PROCEDURE

Additional marks may be necessary to reestablish proper state vector.

CONTINUED ON PAGE

2.6 PROGRAM CORRECTION

Reset STATEFLG after phase change.

CONTINUED ON PAGE

2.7 RECOMMENDED DISPOSITION

Fix in post COLOSSUS 2A.

CONTINUED ON PAGE

2.8 RECOMMENDED RE-TESTING

Level 2 with restart.

CONTINUED ON PAGE

2.9 INITIAL SIGNATURE | 2.10 DATE: 5/19/69

3.1 NASA DIRECTION

CLOSED

CONTINUED ON PAGE

4.1 CLOSING ACTION TAKEN

CANCELLED

DELETE PROGRAM NOTE 3.4.1

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3.2 SIGNATURE	3.3 ORGANIZATION	3.4 DATE	4.2 SIGNATURE	4.3 ORGANIZATION	4.4 DATE
[signature]	NASA/MSC/FSD	9/10/69	[signature]	NASA/MSC/FSD	9/10/69

MIT/IL SOFTWARE ANOMALY REPORT

1.1 ORIGINATOR	1.2 ORGANIZATION	1.3 DATE	1.4 ORIGINATOR CONTROL NO.	1.5 REPORT NO.
A. ENGEL	MIT/IL	3/28/69		COM 10
				PROGRAM: COMANCHE
				PROGRAM REVISION: 49

1.5 DESCRIPTION OF ANOMALY:

P40 and P41 calculation of central angle V_g rotation for external ΔV burns may be inaccurate.

CONTINUED ON PAGE

1.6 DESCRIPTION OF RUN:

Run C6.5.10 (F - LOI1-B) yielded a .06° central angle error, resulting in about a 3 ft/sec. error in V_g.

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- MIT ANALYSIS -

2.1 CAUSE:

Truncation and round-off error.

CONTINUED ON PAGE

2.2 RECOGNITION:

Comparison of AGC results with mathematical model shows this error.

CONTINUED ON PAGE

2.3 MISSION EFFECT:

About 3 ft/sec. cut off error.

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2.4 AVOIDANCE PROCEDURE:

None

CONTINUED ON PAGE

2.5 RECOVERY PROCEDURE:

None

CONTINUED ON PAGE

2.6 PROGRAM CORRECTION:

Change DMP instruction to DMPR in S40.1 X ΔV logic. This will effect a factor of two improvement.

CONTINUED ON PAGE

2.7 RECOMMENDED DISPOSITION (Fix, Work-around, etc):

Fix for COLOSSUS 2A.

CONTINUED ON PAGE

2.8 RECOMMENDED RE-TESTING:

Rerun of C6.5.10.

CONTINUED ON PAGE

2.9 MIT/IL SIGNATURE: [signature] | 2.10 DATE: 4/1/69

3.1 NASA DIRECTION:

FIX FOR COLOSSUS 2A

CONTINUED ON PAGE

4.1 CLOSING ACTION TAKEN:

Fixed in Colossus 2A

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PROGRAM NOTE

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3.2 NASA/MSC SIGNATURE	3.3 ORGANIZATION	3.4 DATE	4.2 SIGNATURE	4.3 ORGANIZATION	4.4 DATE
[signature]	NASA/MSC/FSD	4/14/69	[signature]	NASA/MSC/FSD	4/14/69

MSC Form 1403 (Rev May 68)

MIT/IL SOFTWAR: ANOMALY REPORT

1.1 ORIGINATOR	1.2 ORGANIZATION	1.3 DATE	1.4 ORIGINATOR CONTROL NO.	PROGRAM / PROGRAM REVISION
J. M. REBER	MIT/IL	3/27/69		COM 11 COL. 2 and 2A 15 and 51

1.5 DESCRIPTION OF ANOMALY

Errors in COLOSSUS 2A fixed constants, viz ω_E , $\dot{B}$, Ω_{20}, $\dot{\Omega}_{20}$, F_0, $\dot{F}_0$

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1.6 DESCRIPTION OF RUN

CONTINUED ON PAGE

- MIT ANALYSIS -

2.1 CAUSE

Error in MAC generation program.

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2.2 RECREATION

Difficult to assess.

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2.3 MISSION EFFECT

See attached table (negligible for G).

CONTINUED ON PAGE 2

2.4 AVOIDANCE PROCEDURE

Absorb errors in lunar constants in libration vector.

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2.5 RECOVERY PROCEDURE

None

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2.6 PROGRAM CORRECTION

Use attached values.

CONTINUED ON PAGE 2

2.7 RECOMMENDED DISPOSITION (Fix, Work-around, etc.)

None required for 2A; fix for subsequent rope release.

CONTINUED ON PAGE

2.8 RECOMMENDED RE-TESTING

CONTINUED ON PAGE

2.9 MIT/IL SIGNATURE: J. M. Reber | 2.10 DATE: 4/10/69

3.0 NASA DISPOSITION

FIX FOR COLOSSUS 2B

CONTINUED ON PAGE

4.0 CLOSING ACTION TAKEN

fix in next final assembly tape

CLOSED

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3.1 NASA/MSC SIGNATURE	3.2 ORGANIZATION	3.3 DATE	4.1 SIGNATURE	4.2 ORGANIZATION	4.3 DATE
[signature]	NASA/MSC/FS	4/16/69	[signature]	NASA/MSC/FS7	4/17/69

MSC Form 1003 (Rev May 68)

2.3 Mission effect, cont'd.

		@July 1969	@July 1970
ω_E	error on Earth surface	0	430 m
$\dot{\Omega}$	error on Moon surface	0	$22(10)^{-8}$ m
Ω_{t_0}	error on Moon surface	0.02 m	0.02 m
$\dot{\Omega}_{t_0}$	error on Moon surface	0	0.03 m
F_0	error on Moon surface	4.1 m	4.1 m
$\dot{F}_0$	error on Moon surface	0	8.2 m

2.6 Program correction, cont'd.

ω_E = 7.292 115 147 $(10)^{-5}$ RAD/SEC

$\dot{\Omega}$ = -7.197 573 418 $(10)^{-14}$ RAD/SEC

Ω_{t_0} = 6.196 536 640 RAD

$\dot{\Omega}_{t_0}$ = -1.070 470 170 $(10)^{-5}$ RAD/SEC

F_0 = 5.209 056 RAD

$\dot{F}_0$ = 2.672 403 256 $(10)^{-9}$ RAD/SEC

(A PCR has been written to make this change in post-Colossus 2A.)