

*R. Larson*

MIT Management Development Plan Meeting #20

Held on 27 February 1968

1. SUNDISK

Post-CARR Activities

The following objectives have been outlined:

1. Rerun and document all post 267 tests on revision 282
2. Initialization data review and rerun of all level 5 tests
3. Mission sequence verification using the Hybrid, Digital, and engineering simulators. Hybrid and engineering simulations are on mission "C" until 4/15 then on mission "D".
4. Error runs to test:
  - a. Navigation with a bad W-Matrix
  - b. P40 restart during a deorbit burn
5. Generation of a Pad load and inflight recovery loads
6. Guidance System Operation Plan final review against the program - publish late March.
7. Verification of constants
8. Apollo Operations Handbook review and signoff
9. Mission Rules and Flight Plan reviews.

PCR Activities:

PCR 62 has been given a visibility impact of 4-6 weeks.

MIT is submitting a PCR describing how PCR-25 (Change of  $\theta$  and  $\phi$  displays to 0 to 360) was implemented, and asking for a GSOP change to reflect the computation.

2. FLOW CHARTS

The flow chart schedules included in the development plans indicate deliveries of some initial charts well after "A" release. NASA (C. Kraft) understands the limited resources available for this work and the danger to quality in trying to expedite the charts, however they are important to many people and any improvement in schedule through submission of preliminaries, etc. could be useful. NASA will recommend priorities which could, if available personnel can be so utilized, be helpful to them.

3. APOLLO - 6

The final runs on the erasable load should be completed next week (4-8 March). Some questions on vehicle characteristics still require resolution from NASA.

MIT should make arrangements for D. Lickly to go from KSC to MSC after lift off to participate in supporting the flight.

4. COLOSSUS

The FACI is now scheduled for 7/2 although the end of level 4 remains at 6/21. This difference is the result of PCR action which cannot yet be reflected into the level 4 tests but which will be used up as the testing progresses. The level 3 and 4 slippages to date forecast a heavy loading on the testing near the end which requires the assignment of additional personnel and most likely some schedule time.

In response to a NASA question on the application of Sundisk program notes to Colossus; the program supervisor for Colossus has the responsibility for correlating these notes.

NASA will provide MIT with the AMS baseline and need dates for inclusion in the development plans.

NASA (G. Sabionski) requested the minutes of the Erasable Committee on a regular basis. Action: A. Kosmala. NASA also requested an update of the AGC word storage on a regular basis.

5. SUNDANCE

MIT and NASA weighed the alternatives of stretching level 5 to 17 1/2 weeks or going ahead with all assigned personnel and completing in 10 weeks. The stretch would permit the re-assignment at Sundance FACI of some 5 experienced people to Luminary. NASA (C. Kraft/T. Gibson) were unanimous in completing Sundance level 5 at the earliest possible date (6/10<sup>15</sup>) by keeping the full 13 people assigned. NASA wants to consider Sundance for all Earth Orbital missions and wants Luminary to be

fully checked out for the lunar mission.

GSOP Chapter 3 ready in rough on 3/8 - 7 copies to NASA.

NASA Action - MIT needs to know minimum ranges to which the G&N rendezvous program will be required to operate.

The Luminary programs in the Sundance assembly will not be locked out under present plans, i. e., they can be called by the Astronaut if he desires.

#### LUMINARY

The new development plan is based on obtaining 5 people from Sundance level 5 at FACI.

Action - MIT (G. Cherry) - Inform NASA (C. Kraft) of Luminary schedule if level 5 of Sundance retains all 13 people for the necessary 10 weeks.

GSOP Chapter 2 scheduled for 3/15.

The training tapes for the LMS will be delivered on 3/1.

NASA Action - (T. Gibson) to clarify with W. Tindall the P22/P12 change desired.

PCR 33 - NASA agreed to change direction from "detailed evaluation" to "implement and provide detailed evaluation".

#### 6. CHANGE CONTROL

A. Kosmala presented the history to date on Sundance (handout attached).

#### 7. IBM - 360

Dr. J. S. Miller presented the attached viewgraphs to indicate the present situation on the digital computation facilities. MIT is putting together a justification for an additional IBM-360 of a configuration which will relieve the load being forecast. A minimum configuration at about 60 K per month may suffice; this and the period of time are being studied.

The Honeywell 1800 presently installed is being released since the GAP will be ready for the IBM-360 within the remaining period.

8. DAP

GSOP Chapter 3 Sundisk will be distributed on 2/28, however, it will not include NASA (K. Cox) comments due to the lateness of their arrival.

The Sundisk DAP Verification results document will be distributed this week. This is a large (200 page) volume which MIT believes could be summarized in future programs. MIT will plan on a summary type document for Sundance unless NASA voices an objection.

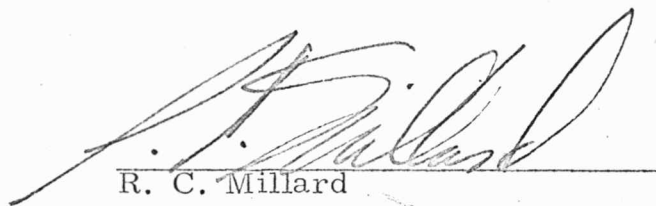
GSOP Chapter 3 Sundance on Xerox 3/8 and is planned for publication on 3/27 and distribution by 4/3.

Dr. W. Widnall stated that the following shortcomings exist in these chapters and must remain until some future updates:

- (a) G&N interface is not well documented
- (b) Mission control programs interaction with the autopilots is lacking.
- (c) Control data in a separate breakout with source reference has not been done.

The following action items and additional information is needed from NASA:

- (a) TWX Action item 2-1: Data exchange request MIT - R-63.
- (b) TWX Action item 11-3.
- (c) NASA desires on gimballing engine in P66 & P67.
- (d) Any information available on the dynamics of the lunar landing.



R. C. Millard

RCM/km

cc: See next page.

ATTENDEES

NASA

C. Kraft  
T. Gibson  
J. Stokes  
G. Sabionski

GAEC

C. Tillman

MIT/IL

R. Ragan  
D. Hoag  
R. Wieser  
N. Sears  
J. Nevins  
J. Vittek  
D. Lickly  
J. Dahlen  
K. Greene  
W. Widnall  
J. Henize

R. Battin  
G. Levine  
L. Larson  
R. Millard  
G. Cherry  
A. Kosmala  
P. Mimno  
F. Glick  
M. Johnston  
R. Larson  
P. Peck  
J. Kernan

cc: Attendees

R. Scholten  
G. Levine  
J. Sutherland  
L. Linehan  
A. Engle  
W. Kupfer

E. Copps  
J. Saponaro  
S. Copps  
R. Morth  
M. Hamilton  
F. Little

W. Marscher  
J. Henize  
J. Nevins  
C. Schulenberg  
D. Dolan  
R. White  
R. Beckham, FS 5(NASA)

## ATTACHMENT A

Massachusetts Institute of Technology  
Instrumentation Laboratory  
Cambridge, Massachusetts

### MEMO

To: R. H. Battin  
From: A. L. Kosmala  
Date: 26 February 1968  
Subject: SUNDANCE Change Control Statistics

As requested by you, this memo summarizes statistics of the SUNDANCE change control procedure over the period 12 December 1967 through 21 February 1968. During these 12 weeks there were authorized 12 approved revisions of the assembly. The revision number increased by more than 12 over this period, because some revisions were made for various non-program change reasons, for example de-cussing to ensure a GOOD assembly for tape manufacturing. In addition the program supervisor, Jim Kernan, has made, with my agreement, several small changes outside the formal change control procedure. The columns of data have the following definitions:

1. Mod. The total number of separate modification reports submitted for that revision. These are made one per assembly log section. One report normally represents one specific change but some do contain anywhere up to 5 separate, unconnected changes.
2. Cards. This is an approximate estimate of the total card deck that was submitted for the revision, as measured by inches of thickness. All cards are counted, including remarks, clerical, log section identifiers, etc.
3. Words. Total net change in actual fixed memory allocations since the previous approved assembly. A statement of total erasable spares was added to the weekly memo summarizing each assembly only very recently.
4. L. Total number of modification reports under Mod that represent LUMINARY-only changes.
5. M. Total number of modification reports that represented mandatory changes. There are those required to fix a non-operative program or routine, or those required to bring the program into agreement with the GSOP. Note that not all disagreements are fixed in the program!
6. D. Total number of mod reports that are in the category of developmental changes. This includes almost all the LUMINARY changes; changes that are judged highly desirable by the Change Control Board; e.g. changes that are associated with techniques that ensure smooth transitions from

## ATTACHMENT A

DANCE to LUMINARY. An example of this latter category is the new flag setting and re-setting routines. Category D naturally would contain any changes that might have the accusation of "diddling" hurled at them.

7. S. Changes made to save storage. Normally only straightforward changes resulting in significant savings are considered, e.g. deletion of obsolete, unused routines.
8. N. Non-program changes. This category covers
  - a) Remarks cards or program descriptions
  - b) Clerical changes to remove assembly cusses. (These can sometimes involve coding changes, but are then only made by highest authority, i.e. the program supervisor.)
  - c) Bank, setlocs tag redefinition changes usually only made by the supervisor for memory juggling purposes.
9. R. Modifications rejected at change control time. Note that a much larger number of rejections is made by the supervisor before he submits the changes to the Board. We don't keep a record of these.

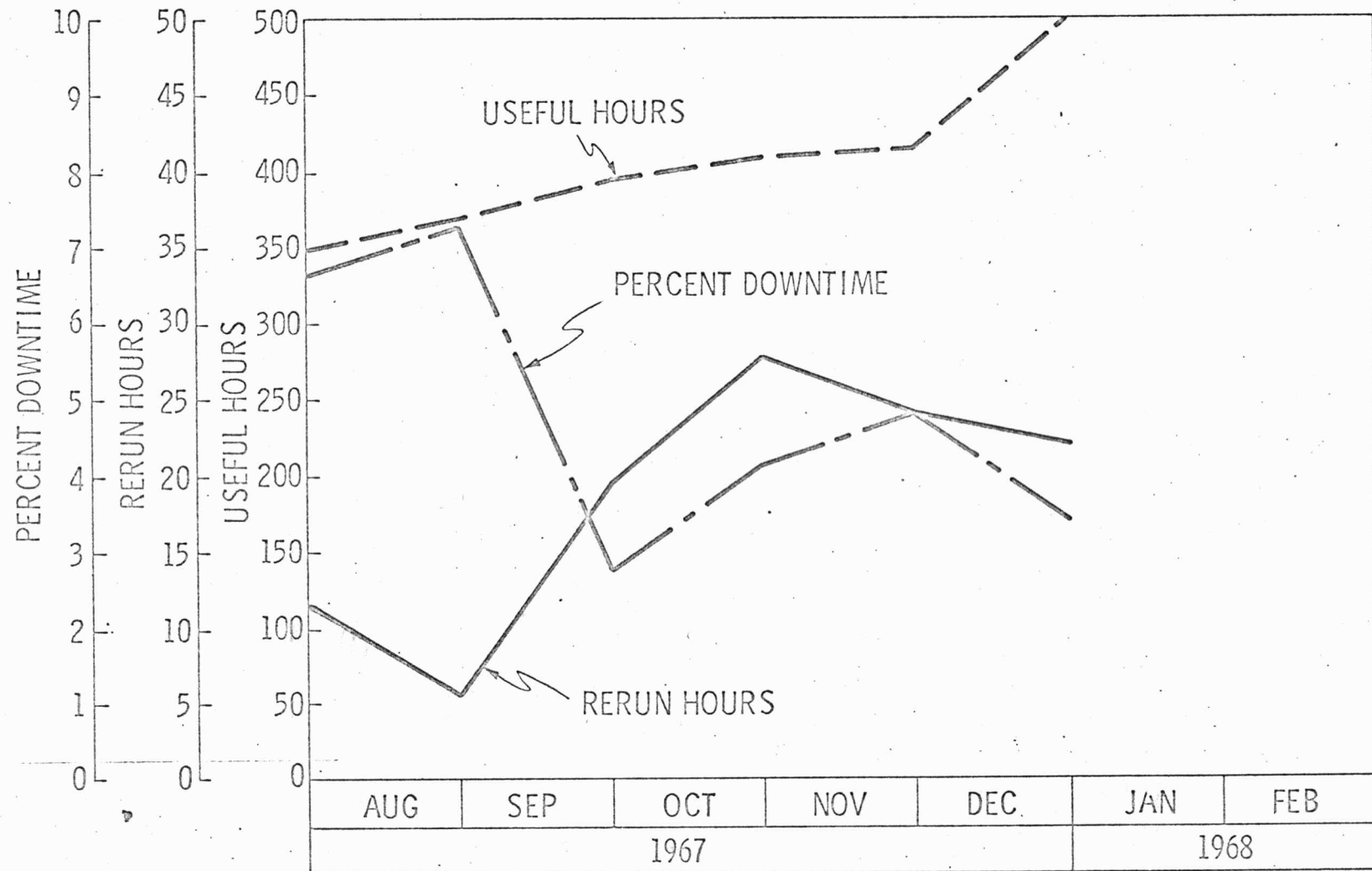
When blanks appear the data was not being tracked at that time.

## ATTACHMENT A

Rev.	Date	Mod	Cards	Words	L	M	D	S	N	R
249	12/7	63	1650		13					
251	12/14	60	550	+49	14					
252	12/21	38	300	+70	8					
254	12/28	60	1000	+290	8					
256	1/4	26	650	-36	7	8	7	6	5	
258	1/11	34	450	-47	6	12	6	4	12	
259	1/18	52	825	+247	11	16	13	5	16	5
263	1/25	34	500	+234	6	20	9	2	13	0
264	2/1	37	500	+132	7	22	8	1	6	2
265	2/8	38	500	+58	9	15	13	1	8	0
270	2/15	67	800	+449	22	22	18	3	24	0
271	2/21	56	1000	+582	15	15	32	0	9	0



# ATTACHMENT B



## ATTACHMENT B

## IBM 360 USAGE

PRIORITY 12 (NON-APOLLO)

Date	PRIME SHIFT			TOTAL
	No. of Jobs	Avg. Length	Avg. T. A.	No. of Jobs
1/22	33	2.18	3.1	55
1/23	27	1.30	5.3	53
1/24	47	2.15	6.0	65
1/25	28	2.16	7.3	38
1/26	35	1.78	5.4	61
2/12	36	1.54	4.3	48
2/13	36	2.00	3.9	63
2/14	38	1.87	3.3	59
2/15	55	2.20	6.3	57
2/16	31	2.55	4.8	35

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## ATTACHMENT B

## IBM 360 USAGE

PRIORITY 9 (APOLLO PRIORITY B, 2 TO 15 MIN)

Date	PRIME SHIFT			TOTAL
	No. of Jobs	Avg. Length	Avg. T. A.	No. of Jobs
1/22	13	10.5	3.5	16
1/23	4	6.96	4.1	7
1/24	5	5.35	5.8	9
1/25	9	8.01	6.2	16
1/26	13	11.0	5.9	17
2/12	11	5.16	6.9	27
2/13	10	8.05	7.4	27
2/14	15	5.23	5.3	35
2/15	20	3.48	4.4	31
2/16	3	9.03	13.9	19

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## ATTACHMENT B

## IBM 360 USAGE

## PRIORITY II (APOLLO RUNS &lt; 2 MIN)

Date	PRIME SHIFT			TOTAL
	No. of Jobs	Avg. Length	Avg. T. A.	No. of Jobs
1/22	54	1.58	4.1	62
1/23	48	1.19	6.8	67
1/24	80	1.61	4.1	96
1/25	51	1.83	3.9	72
1/26	47	1.26	2.9	63
2/12	66	1.65	2.6	80
2/13	54	1.31	4.6	75
2/14	61	1.49	3.2	90
2/15	85	1.81	2.9	111
2/16	67	1.11	3.8	87

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## ATTACHMENT B

IBM 360 USAGE

PRIORITY 7 (APOLLO PRIORITY C, 2-TO 15 MIN)

Date	PRIME SHIFT			TOTAL
	No. of Jobs	Avg. Length	Avg. T. A.	No. of Jobs
1/22	22	2.79	3.2	89
1/23	19	2.95	6.8	47
1/24	5	8.13	16.2	54
1/25	2	5.50	3.8	62
1/26	18	2.21	3.7	52
2/12	24	4.03	21.7	70
2/13	11	4.25	17.2	57
2/14	-	-	-	62
2/15	7	.58	44.9	50
2/16	5	2.98	21.3	63

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