TABLE A-II.- UNMANNED APOLLO SPACECRAFT ABORT TESTS[a]

Mission	Type	Launch		Vehicle configuration		Trajectory data		Flight duration, hr:min:sec
		Date	Time, G.m.t., hr:min:sec	Launch vehicle	Spacecraft	Altitude, ft, m.s.l.	Range, ft	
PA-1	Pad abort test	Nov. 7, 1963	16:00:01		Boilerplate command module and launch escape system (BP-6)	9 270	8 220	00:02:45.1
A-001	High-dynamic pressure (transonic) abort test	May 13, 1964	13:00:00	Little Joe II (12-50-2)	Boilerplate command and service module, and launch escape system (BP-12)	29 772	22 400	00:05:50.3
A-002	[b]Maximum-dynamic-pressure abort test	Dec. 8, 1964	15:00:00	Little Joe II (12-51-1)	Boilerplate command and service module, and launch escape system (BP-23)	50 360	32 800	00:07:23.4
A-003	[c]High-altitude abort test	May 19, 1965	13:01:04	Little Joe II (12-51-2)	Boilerplate command and service module, and launch escape system (BP-22)	19 800	18 200	00:05:02.8
PA-2	Pad abort test	June 29, 1965	13:00:01		Boilerplate command module and launch escape system (BP-23A)	9 258	7 620	00:01:52.6
A-004	[d]Power-on tumbling abort test	Jan. 20, 1966	15:17:01	Little Joe II (12-51-3)	Modified Block I command and service module and launch escape system (SC-002)	78 180	113 624	00:06:50.0

[a]All flights were suborbital and were launched from Complex 36 of the White Sands Missile Range, New Mexico. The launch site altitude was approximately 4000 ft above mean sea level.

[b]Canards used for first time to orient and stabilize launch escape vehicle.

[c]Launch vehicle failed structurally prior to achieving desired altitude of 120 000 feet above mean sea level. Low-altitude abort initiated at 12 400 feet.

[d]Tumbling of launch escape vehicle and automatic abort were initiated by pitch-up maneuver of launch vehicle at altitude of approximately 60 000 feet above mean sea level.

TABLE A-III.- UNMANNED APOLLO/SATURN FLIGHTS

Mission	Type (a)	Launch				Vehicle configuration		Flight duration, hr:min:sec
		Site	Complex	Date	Time, G.m.t., hr:min:sec	Launch vehicle	Spacecraft	
[b]AS-201	Spacecraft and launch vehicle development, suborbital	A.F. Eastern Test Range	34	Feb. 26, 1966	16:12:01	Saturn IB (SA-201)	Modified Block I command and service module, adapter and launch escape system (SC-009)	00:37:19.7
AS-203	Launch vehicle development, earth orbital	A.F. Eastern Test Range	37B	July 5, 1966	14:53:17	Saturn IB with nose cone (SA-203)		(c)
AS-202	Spacecraft and launch vehicle development, suborbital	A.F. Eastern Test Range	34	Aug. 25, 1966	17:55:32	Saturn IB (SA-202)	Block I command and service module, adapter, and launch escape system (SC-011)	01:33:02
[d]Apollo 4	A	Kennedy Space Center	39A	Nov. 9, 1967	12:00:01	Saturn V (SA-501)	Block I command and service module, adapter, and launch escape system (SC-017), and lunar module test article	08:37:09.2
[e]Apollo 5	B	A.F. Eastern Test Range	37B	Jan. 22, 1968	22:48:08	Saturn IB (SA-204)	Modified lunar module (LM-1), adapter, and nose cone	[f]07:52:10
[g]Apollo 6	A	Kennedy Space Center	39A	Apr. 4, 1968	12:00:01	Saturn V (SA-502)	Block I command and service module, adapter and launch escape system (SC-020), and lunar module test article	09:57:19.9

[a]Mission types A and B are defined in table B-I.

[b]Initial flight of Saturn IB launch vehicle.

[c]S-IVB stage destroyed after four revolutions.

[d]Initial flight of Saturn V launch vehicle. Spacecraft boosted to apogee of 9769 miles after two revolutions to simulate lunar-return entry conditions.

[e]Initial flight of lunar module.

[f]Final communication with ascent stage prior to impact.

[g]S-IVB failed to restart at end of second revolution. Spacecraft propulsion used to achieve 12 020-mile apogee to simulate lunar-return entry conditions.

TABLE A-IV.- MANNED APOLLO/SATURN FLIGHTS

Mission	Type (a)	Crew (b)	Launch data				Vehicles			Flight duration, hr:min:sec
			Site	Complex	Date	Time, G.m.t., hr:min:sec	Launch vehicle	Description	Name (c)	
Apollo 7	C	Prime: Schirra, Eisele, Cunningham Backup: Stafford, Young, Cernan	A.F. Eastern Test Range	34	Oct. 11, 1968	15:02:45	Saturn IB (SA-205)	Block II command and service module (CSM-101), adapter, and launch escape system	Apollo 7	260:09:03
Apollo 8	C'	Prime: Borman, Lovell, Anders Backup: Armstrong, Aldrin, Haise	Kennedy Space Center	39A	Dec. 21, 1968	12:51:00	Saturn V (SA-503)	Block II command and service module (CSM-103), adapter, launch escape system, and lunar module test article	Apollo 8	147:00:42
Apollo 9	D	Prime: McDivitt, Scott, Schweickart Backup: Conrad, Gordon, Bean	Kennedy Space Center	39A	Mar. 3, 1969	16:00:00	Saturn V (SA-504)	Block II command and service module (CSM-104), lunar module (LM-3), adapter, and launch escape system	CSM-Gumdrop LM-Spider	241:00:54
Apollo 10	F	Prime: Stafford, Young, Cernan Backup: Cooper, Eisele, Mitchell	Kennedy Space Center	39B	May 18, 1969	16:49:00	Saturn V (SA-505)	Block II command and service module (CSM-106), lunar module (LM-4), adapter, and launch escape system	CSM-Charley Brown LM-Snoopy	192:03:23
Apollo 11	G	Prime: Armstrong, Collins, Aldrin Backup: Lovell, Anders, Haise	Kennedy Space Center	39A	July 16, 1969	13:32:00	Saturn V (SA-506)	Block II command and service module (CSM-107), lunar module (LM-5), adapter, and launch escape system	CSM-Columbia LM-Eagle	195:18:35
Apollo 12	H	Prime: Conrad, Gordon, Bean Backup: Scott, Worden, Irwin	Kennedy Space Center	39A	Nov. 14, 1969	16:22:00	Saturn V (SA-507)	Block II command and service module (CSM-108), lunar module (LM-6), adapter, and launch escape system	CSM-Yankee Clipper LM-Intrepid	244:36:25
[d]Apollo 13	H	Prime: Lovell, [e]Swigert, Haise Backup: Young, Mattingly, Duke	Kennedy Space Center	39A	Apr. 11, 1970	19:13:00	Saturn V (SA-508)	Block II command and service module (CSM-109), lunar module (LM-7), adapter, and launch escape system	CSM-Odyssey LM-Aquarius	142:54:41
Apollo 14	H	Prime: Shepard, Roosa, Mitchell Backup: Cernan, Evans, Engle	Kennedy Space Center	39A	Jan. 31, 1971	21:03:02	Saturn V (SA-509)	Block II command and service module (CSM-110), lunar module (LM-8), adapter, and launch escape system	CSM-Kitty Hawk LM-Antares	216:01:58
Apollo 15	J	Prime: Scott, Worden, Irwin Backup: Gordon, Brand, Schmitt	Kennedy Space Center	39A	July 26, 1971	13:34:00	Saturn V (SA-510)	Block II command and service module (CSM-112), lunar module (LM-10), adapter and launch escape system	CSM-Endeavor LM-Falcon	259:11:53

TABLE A-IV.- MANNED APOLLO/SATURN FLIGHTS - Concluded

Mission	Type (a)	Crew (b)	Launch data				Vehicles			Flight duration, hr:min:sec
			Site	Complex	Date	Time, G.m.t., hr:min:sec	Launch vehicle	Description	Name (c)	
Apollo 16	J	Prime: Young Mattingly Duke Backup: Haise Roosa Mitchell	Kennedy Space Center	39A	Apr. 16, 1972	17:54:00	Saturn V (SA-511)	Block II command and service module (CSM-113), lunar module (LM-11), adapter and launch escape system	CSM-Caspar LM-Orion	265:51:05
Apollo 17	J	Prime: Cernan Evans Schmitt Backup: Young Roosa Duke	Kennedy Space Center	39A	Dec. 7, 1972	05:33:00	Saturn V (SA-512)	Block II command and service module (CSM-114), lunar module (LM-12), adapter, and launch escape system	CSM-America LM-Challenger	301:51:59

[a] Mission types defined in table B-I.

[b] Crewmen are listed in order of Commander, Command Module Pilot, and Lunar Module Pilot.

[c] Spacecraft names assigned for identification in radio communication.

[d] Mission aborted prior to scheduled lunar landing.

[e] Backup crewman Swigert replaced prime crewman Mattingly 2 days before launch.

TABLE A-V.- LUNAR SURFACE OPERATIONS

Mission	Crewmen (a)	Landing data					Extravehicular activity			Samples collected, kg	Surface stay time, hr:min:sec
		Area	Latitude	Longitude	Date	Time, G.m.t., hr:min:sec	Traverse vehicle	Distance traveled, km	Duration, hr:min:sec		
Apollo 11	Armstrong Aldrin	Sea of Tranquility	0.7°N	23.4°E	July 20, 1969	20:17:40	None	∿1	[b]02:31:40	21.0	21:36:21
Apollo 12	Conrad Bean	Ocean of Storms	3.2°S	23.4°W	Nov. 19, 1969	06:54:36	None	First: ∿1 Second: 1.3 Total: ∿2.3	First: 03:56:03 Second: 03:49:15 [c]Total: 07:45:18	First: 16.7 Second: 17.6 Total: 34.3	31:31:12
Apollo 14	Shepard Mitchell	Fra Mauro	3.6°S	17.5°W	Feb. 5, 1971	09:18:11	Modular equipment transporter	First: ∿1 Second: 3.0 Total: ∿4.0	First: 04:47:50 Second: 04:34:41 [d]Total: 09:22:31	First: 20.5 Second: 22.3 Total: 42.8	33:30:31
Apollo 15	Scott Irwin	Hadley–Apennine	26.1°N	3.7°E	July 30, 1971	22:16:29	LRV-1	First: 10.3 Second: 12.5 Third: 5.1 Total: 27.9	Standup: 00:33:07 First: 06:32:42 Second: 07:12:14 Third: 04:49:50 [d]Total: 19:07:53	First: 14.5 Second: 34.9 Third: 27.3 Total: 76.7	66:54:53
Apollo 16	Young Duke	Descarte	9.0°S	15.5°E	Apr. 21, 1972	02:23:35	LRV-2	First: 4.2 Second: 11.1 Third: 11.4 Total: 26.7	First: 07:11:02 Second: 07:23:11 Third: 05:40:03 [d]Total: 20:14:16	First: 29.9 Second: 29.0 Third: 35.4 Total: 94.3	71:02:13
Apollo 17	Cernan Schmitt	Taurus–Littrow	20.2°N	30.8°E	Dec. 11, 1972	19:54:57	LRV-3	First: 3.3 Second: 18.9 Third: 11.6 Total: 33.8	First: 07:11:53 Second: 07:36:56 Third: 07:15:08 [d]Total: 22:03:57	First: 14.3 Second: 34.1 Third: 62.0 Total: 110.4	74:59:40

[a]Crewmen listed in order of Commander and Lunar Module Pilot.

[b]Based upon times of hatch opening and closing.

[c]Based upon times of egress and ingress.

[d]Based upon times at which cabin pressure reached 3.0 psi during depressurization and repressurization.

TABLE A-VI.- MANNED ORBITAL OPERATIONS AND INFLIGHT EXTRAVEHICULAR ACTIVITY

Mission	Earth revolutions	Earth orbital extravehicular activity		Lunar revolutions	Command Module Pilot solo operations		
		Crewmen (a)	Duration, hr:min		Pilot	Lunar revolutions	Transearth extravehicular activity, hr:min:sec (b)
Apollo 7	163	—	—	—	—	—	—
Apollo 8	[c]1	—	—	10	—	—	—
Apollo 9	151	Scott Schweickart	[e]1:01 1:07	—	—	—	—
Apollo 10	[c]1	—	—	31	—	—	—
Apollo 11	[c]1	—	—	30	—	—	—
Apollo 12	[c]1	—	—	45	—	—	—
Apollo 13	[c]1	—	—	—	—	—	—
Apollo 14	[c]1	—	—	34	—	—	—
Apollo 15	[c]1	—	—	74	Worden	36	00:39:07
Apollo 16	[c]1	—	—	64	Mattingly	40	01:23:42
Apollo 17	[d]2	—	—	75	Evans	39	01:05:44

[a]Crewmen listed in order of Command Module Pilot and Lunar Module Pilot.

[b]Extravehicular activity time based upon times at which cabin pressure reached 3.0 psi during depressurization and repressurization.

[c]Translunar injection performed over Pacific Ocean before completion of second revolution.

[d]Translunar injection performed over Atlantic Ocean.

[e]Extravehicular activity durations shown are based upon times at which cabin pressure reached 3.0 psi during depressurization and repressurization. Durations based on other events are as follows.

(1) Hatch open to hatch closed: CMP - 47 min, LMP - 1 hr 1 min.
(2) Egress to ingress: LMP - 47 min 3 sec.
(3) Arrive at and leave EVA station: LMP - 37 min.

TABLE A-VII.- RECOVERY DATA

Mission	Landing data							Time required for uprighting, min	U.S.S. recovery ship
	Date	Time, G.m.t., hr:min:sec	Ocean	Latitude (a)	Longitude (a)	Distance from target, mi. (a)	Command module flotation attitude		
Unmanned Missions									
AS-201	Feb. 26, 1966	16:49:20	Atlantic	8°11'S	11°09'W	∿45	Upright	—	Boxer
AS-202	Aug. 25, 1966	18:48:34	Pacific	16°07'N	168°54'E	∿200	Upright	—	Hornet
Apollo 4	Nov. 9, 1967	20:37:10	Pacific	30°06'N	172°32'W	10.3	Upright	—	Bennington
Apollo 6	Apr. 4, 1968	21:57:21	Pacific	27°40'N	157°55'W	∿36	(b)	∿2	Okinawa
Manned Missions									
Apollo 7	Oct. 22, 1968	11:11:48	Atlantic	27°38'N	64°09'W	1.9	Inverted	[c]12	Essex
Apollo 8	Dec. 27, 1968	15:51:42	Pacific	8°06'N	165°01'W	1.4	Inverted	6.0	Yorktown
Apollo 9	Mar. 13, 1969	17:00:53	Atlantic	23°13'N	67°59'W	2.7	Upright	—	Guadalcanal
Apollo 10	May 26, 1969	16:52:23	Pacific	15°04'S	164°39'W	1.3	Upright	—	Princeton
Apollo 11	Jul. 24, 1969	16:50:35	Pacific	13°18'N	169°09'W	1.7	Inverted	7.6	Hornet
Apollo 12	Nov. 24, 1969	20:58:25	Pacific	15°47'S	165°09'W	2.0	Inverted	4.5	Hornet
Apollo 13	Apr. 17, 1970	18:07:41	Pacific	21°38'S	165°22'W	1.0	Upright	—	Iwo Jima
Apollo 14	Feb. 9, 1971	21:05:00	Pacific	27°01'S	172°40'W	0.6	Upright	—	New Orleans
Apollo 15	Aug. 7, 1971	20:45:53	Pacific	26°08'N	158°08'W	1.0	Upright	—	Okinawa
Apollo 16	Apr. 27, 1972	19:45:05	Pacific	0°42'S	156°13'W	3.0	Inverted	4.5	Ticonderoga
Apollo 17	Dec. 19, 1972	19:24:59	Pacific	17°53'S	166°07'W	1.0	Upright	—	Ticonderoga

[a]The coordinates shown are the best estimate of the actual command module landing point and may be based upon recovery ship position data, command module computer data, or trajectory reconstruction.

[b]Command module was upright when sighted; however, loss of VHF recovery beacon for a period of 2 minutes indicated that the command module had probably been inverted prior to sighting.

[c]Uprighting bag inflation was not initiated until approximately 8 minutes after landing.

APPENDIX B - APOLLO MISSION TYPE DESIGNATIONS

TABLE B-I.- APOLLO MISSION TYPE DESIGNATIONS

Type	Mission assignment	Trajectory	Purpose
A	Apollo 4 Apollo 6	Earth orbital	Launch vehicle and spacecraft development.
B	Apollo 5	Earth orbital	Lunar module unmanned flight evaluation.
C	Apollo 7	Earth orbital	Command and service module manned flight demonstration.
C'	Apollo 8	Lunar orbital	Command and service module manned flight demonstration.
D	Apollo 9	Earth orbital	Lunar module manned flight demonstration.
E	—	Earth orbital	Lunar module manned flight demonstration, augmenting mission type D objectives.
F	Apollo 10	Lunar orbital	Lunar module manned flight demonstration.
G	Apollo 11	Lunar landing	Manned lunar landing demonstration.
H	Apollo 12 Apollo 13 Apollo 14	Lunar landing	Precision manned lunar landing demonstration and systematic lunar exploration.
J	Apollo 15 Apollo 16 Apollo 17	Lunar landing	Extensive scientific investigation of moon on lunar surface and from lunar orbit.

APPENDIX C - APOLLO SPACECRAFT WEIGHTS

TABLE C-I.- APOLLO SPACECRAFT WEIGHTS[a]
(Unmanned Flights)

Mission phase/assembly	Spacecraft/mission					
	CSM-002 A-004	CSM-009 AS-201	CSM-011 AS-202	CSM-017/LTA-10R Apollo 4	LM-1 Apollo 5	CSM-020/LTA-2R Apollo 6
Spacecraft at launch:						
[b]Command and service modules	(c)	33 805	44 385	51 591	-	55 420
[b]Lunar module or test article	-	-	-	29 500	31 528	26 001
Spacecraft/lunar module adapter	(c)	3 691	3 725	3 880	(d)	3 886
Launch escape system	(c)	8 334	8 611	8 710	-	8 886
Total weight:	32 680	45 830	56 721	93 681	31 528	94 193
[b]Command module at entry interface	-	-	-	11 949	-	12 508
[b]Command module at landing	[e]10 286	(c)	(c)	10 540	-	11 260

[a]All values in pounds.

[b]Propellants and other expendables included.

[c]Data not available.

[d]Adapter was considered part of launch vehicle.

[e]Based on measured weights at launch.

TABLE C-I.- APOLLO SPACECRAFT WEIGHTS[a] - Continued

(Apollo 7 through Apollo 12)

Mission phase/assembly	Spacecraft/mission					
	CSM-101 Apollo 7	CSM-103/LTA-B Apollo 8	CSM-104/LM-3 Apollo 9	CSM-106/LM-4 Apollo 10	CSM-107/LM-5 Apollo 11	CSM-108/LM-6 Apollo 12
Spacecraft at launch:						
Command and service modules	32 586	63 531	59 086	63 567	63 508	63 578
Lunar module or test article	-	19 900	32 132	30 735	33 297	33 587
Spacecraft/lunar module adapter	3 852	3 951	4 012	3 970	3 951	3 962
Launch escape system	8 874	8 890	8 869	8 934	8 910	8 963
Total:	45 312	96 272	104 099	107 206	109 666	110 090
Spacecraft after lunar orbit insertion:						
Command and service modules	-	46 743	-	38 697	38 743	38 751
Lunar module	-	-	-	30 732	33 295	33 584
Total:	-	46 743	-	69 429	72 038	72 336
Lunar module at lunar landing:						
Ascent stage	-	-	-	-	10 914	10 827
Descent stage	-	-	-	-	5 239	5 737
Total:	-	-	-	-	16 153	16 564
Lunar module ascent stage at lunar lift-off	-	-	[b]10 216	[b]8 273	10 777	10 750
[c]Lunar module ascent stage at jettison	-	-	[d]5 616	[d]5 243	5 463	5 437
Command module at earth entry interface	12 356	12 171	12 257	12 137	12 096	12 277
Command module at landing	11 409	10 977	11 094	10 901	10 873	11 050

[a]All values are in pounds and include propellants and other expendables.

[b]At staging.

[c]Unmanned.

TABLE C-I.- APOLLO SPACECRAFT WEIGHTS[a] - Concluded

(Apollo 13 through Apollo 17)

Mission phase/assembly	Spacecraft/mission				
	CSM-109/LM-7 Apollo 13	CSM-110/LM-8 Apollo 14	CSM-112/LM-10 Apollo 15	CSM-113/LM-11 Apollo 16	CSM-114/LM-12 Apollo 17
Spacecraft at launch:					
Command and service modules	63 812	64 464	66 955	67 010	66 953
Lunar module	33 502	33 652	36 222	36 255	36 279
Spacecraft/lunar module adapter	3 947	3 967	3 964	3 961	3 961
Launch escape system	8 991	9 037	9 108	9 167	9 104
Total:	110 252	111 120	116 249	116 393	116 297
Spacecraft after lunar orbit insertion:					
Command and service modules	-	38 174	40 109	41 395	40 264
Lunar module	-	33 649	36 220	36 252	36 276
Total:	-	71 823	76 329	77 647	76 540
Lunar module at lunar landing:					
Ascent stage	-	10 898	10 960	10 958	10 989
Descent stage	-	5 474	7 215	7 250	6 819
Total:	-	16 372	18 175	18 208	17 808
Lunar module ascent stage at lunar lift-off	-	10 780	10 915	10 958	11 005
[b]Lunar module ascent stage at jettison	(c)	5 307	5 325	5 306	5 277
Command module at earth entry interface	12 361	12 704	12 953	13 015	13 140
Command module at landing	11 133	11 481	11 731	11 995	12 120

[a]All weights are in pounds and include propellants and other expendables.

[b]Unmanned.

[c]The lunar module was docked to the command module until just prior to entry. At that time, the weight of the lunar module ascent and descent stages was 24 647 lb.

APPENDIX D - MANNED SPACE FLIGHT RECORDS ESTABLISHED DURING THE APOLLO PROGRAM

The records listed in tables D-I, D-II, and D-III were obtained from the record dossiers of the National Aeronautic Association. The presently held records are officially recognized by the Federation Aeronautique Internationale (F.A.I.). Special conditions are that a record must be applied for in advance and must exceed the existing record by 10 percent for a new record to be established. For these reasons, not all of the Apollo performances were documented, even though better performances were attained in some cases. The English unit of measurement for distance in the tables is statute miles.

TABLE D-I.- ABSOLUTE WORLD RECORDS

Record	Apollo mission								
	7	8	9	11	12	13	14	15	17
[a]Altitude above surface of the earth, km (mi.)		377 668.9 (234 672.5)							
[b]Greatest mass lifted to altitude, kg (lb)	14 769 (32 566)	127 980 (282 197)							
[c]Total time outside spacecraft for one crewman, hr:min:sec			00:47:01 Schweickart	02:31:40 Armstrong	07:37:52 Conrad		09:12:27 Shepard	18:18:26 Scott	[d]21:49:24 Cernan
Accumulated space flight time, hr:min:sec		572:10:16 Lovell				[e]715:04:57 Lovell			

[a]Maximum difference in radii of geocentric spheres intercepted by vehicle.

[b]Includes mass of crew.

[c]Time spent outside spacecraft using an autonomous life support system. Time begins and ends at crossing of vehicle outline when exiting and entering the spacecraft.

[d]Consists of 17 min 40 sec using the astronaut maneuvering unit for life support during the Gemini IX-A mission and 21 hr 31 min 44 sec of lunar surface extravehicular activity during the Apollo 17 mission.

[e]Record subsequently surpassed by Skylab crews.

TABLE D-II.- WORLD CATEGORY RECORDS - ORBITAL MISSIONS (K-2) WITH TWO TO FOUR ASTRONAUTS

Record	Apollo mission		
	7	8	9
[a]Greatest mass lifted into earth orbit, kg (lb)	14 769 (32 566)	127 980 (282 197)	
[a,b]Greatest mass of vehicles in group flight while linked, kg (lb)			[d]28 429 (62 675)
[c]Duration in group flight, hr:min:sec			[e]26:32:59
Duration in group flight while linked, hr:min:sec			[d]21:36:31
Distance in group flight while linked, km (mi.)			[d]523 458 (325 318)

[a]Includes mass of crew.

[b]With CSM and LM manned.

[c]Vehicles must remain within 100 kilometers of each other for at least one revolution.

[d]Record subsequently surpassed by Skylab crews.

[e]Record subsequently surpassed by U.S.S.R. (Soyuz 7 and 8) crews.

TABLE D-III.- WORLD CATEGORY RECORDS - LUNAR AND PLANETARY MISSIONS (K-3) WITH TWO TO FOUR ASTRONAUTS

Record	Apollo mission							
	8	10	11	12	14	15	16	17
[a]Altitude above surface of the earth, km (mi.)	377 668.9 (234 672.5)							
[b]Greatest mass placed into lunar orbit from the earth, kg (lb)		31 410 (69 429)				34 593 (76 278)		
Duration of lunar mission, hr:min:sec	147:00:42	192:03:23		244:36:25				301:51:57
[c]Duration of stay in lunar orbit, hr:min:sec	20:06:48	61:34:39	59:27:50 Collins	88:56:01 Gordon			125:46:50 Mattingly	147:41:13 Evans
[b]Greatest mass landed on the moon, kg (lb)			7 326.9 (16 153.0)				8 257.6 (18 208.0)	
[b]Greatest mass lifted to lunar orbit from lunar surface, kg (lb)			2 689.2 (5 928.6)	2 705.9 (5 965.6)				
Duration of stay on lunar surface, hr:min:sec			21:36:21 Armstrong Aldrin	31:31:12 Conrad Bean			71:02:13 Young Duke	
[d]Total time outside spacecraft for all crewmen while on lunar surface, hr:min:sec				14:02:25 Conrad Bean	17:33:29 Shepard Mitchell		39:04:03 Young Duke	
[d]Total time outside spacecraft for one crewman while on lunar surface, hr:min:sec			02:31:40 Armstrong	07:37:37 Conrad		18:18:26 Scott		21:31:44 Cernan
[e]Distance traveled from spacecraft while on lunar surface, m (ft)					1 454 (4 770) Shepard Mitchell	5 020 (16 470) Scott Irwin		7 370 (24 180) Cernan Schmitt

[a]Maximum difference in radii of geocentric spheres intercepted by vehicle.

[b]Includes mass of crew.

[c]Computed from termination of thrust for lunar orbit insertion to beginning of thrust for transearth injection.

[d]Time spent outside spacecraft using an autonomous life support system. Time begins and ends at crossing of vehicle outline when exiting and entering the spacecraft.

[e]Distance measured radially from spacecraft and along mean surface.

APPENDIX E - FLIGHT SPACECRAFT CHECKOUT HISTORY

TABLE E-I.- BLOCK I FLIGHT COMMAND AND SERVICE MODULE CHECKOUT HISTORY

Test/operation	Spacecraft/mission					
	CSM-002 A-004	CSM-009 AS-201	CSM-011 AS-202	CSM-012 Apollo I	CSM-017 Apollo 4	CSM-020 Apollo 6
Factory						
Individual and combined systems test completed	Sept. 3, 1965	Sept. 19, 1965	Mar. 1, 1966	June 13, 1966	[a]Nov. 27, 1966	Oct. 10, 1967
Integrated systems test completed	Sept. 30, 1965	Oct. 19, 1965	Apr. 2, 1966	July 14, 1966	Dec. 3, 1966	Oct. 27, 1967
Ready to ship:						
Command module	Oct. 8, 1965	Oct. 24, 1965	Apr. 15, 1966	Aug. 25, 1966	Dec. 22, 1966	Nov. 22, 1967
Service module	Oct. 6, 1965	Oct. 22, 1965	Apr. 9, 1966	Aug. 9, 1966	Dec. 19, 1966	Nov. 9, 1967
[b]Launch Site						
Delivered:						
Command module	Oct. 10, 1965	Oct. 26, 1965	Apr. 18, 1966	Aug. 26, 1966	Dec. 24, 1966	Nov. 23, 1967
Service module	Oct. 7, 1965	Oct 27, 1965	Apr. 11, 1966	Aug. 10, 1966	Dec. 21, 1966	(c)
[d]Command and service modules mated	Oct. 29, 1965	Nov. 27, 1965	May 11, 1966	Aug. 29, 1966	Dec. 28, 1966	Dec. 5, 1967
[d]Combined systems test completed	-	Dec. 6, 1965	May 14, 1966	Sept. 14, 1966	(e)	-
[d]Altitude tests completed	-	Dec. 20, 1965	June 11, 1966	Nov. 29, 1966	-	-
Command and service module moved to launch complex	Oct. 29, 1965	Dec. 27, 1965	July 2, 1966	Jan. 6, 1967	-	-
Command and service module moved to vehicle assembly building	-	-	-	-	June 20, 1967	Dec. 8, 1967

TABLE E-I.- BLOCK I FLIGHT COMMAND AND SERVICE MODULE CHECKOUT HISTORY - Concluded

Test/operation	Spacecraft/mission					
	CSM-002 A-004	CSM-009 AS-201	CSM-011 AS-202	CSM-012 Apollo I	CSM-017 Apollo 4	CSM-020 Apollo 6
Command and service module integrated systems test completed	Nov. 8, 1965	Jan. 18, 1966	July 5, 1966	Jan. 11, 1967	June 28, 1967	Dec. 30, 1967
Command and service module electrically mated to launch vehicle	Nov. 19, 1965	Jan. 19, 1966	July 21, 1966	(c)	July 23, 1967	Jan. 12, 1968
Overall test completed	[f]Nov. 22, 1965	Feb. 2, 1966	July 24, 1966	[g]Jan. 27, 1967	Aug. 2, 1967	Jan. 24, 1968
Assembled space vehicle moved to launch complex	-	-	-	-	Aug. 24, 1967	Feb. 5, 1968
Flight readiness test completed	Jan 13, 1966	Feb. 13, 1966	Aug. 9, 1966	-	Oct. 24, 1967	Mar. 12, 1968
Countdown demonstration test completed	-	Feb. 10, 1966	July 29, 1966	-	Sept. 27, 1967	Mar. 31, 1968
Final phase of countdown and launch	Jan. 20, 1966	Feb. 26, 1966	Aug. 25, 1966	-	Nov. 9, 1967	Apr. 4, 1968

[a]SM-017 was destroyed during testing on 10/25/66. The service module was replaced with SM-020, and SM-014 was assigned for use with CM-020.

[b]CSM-002 launched from White Sands Missile Range, New Mexico. All other flight command and service modules launched from Air Force Eastern Test Range or Kennedy Space Center.

[c]Data not available.

[d]Conducted in Operations and Checkout Building.

[e]No testing in the Operations and Checkout Building was planned for CSM-017 and CSM-020; however, because of the Apollo I fire, an integrated systems test was performed on CSM-017 in the Operations and Checkout Building, after which modifications were made. CSM-017 was then moved to the vehicle assembly building and the scheduled checkout was resumed.

[f]Interface/integrated test.

[g]Spacecraft destroyed by fire on January 27, 1967, during "plugs out" portion of overall test.

TABLE E-II.- BLOCK II FLIGHT COMMAND AND SERVICE MODULE CHECKOUT HISTORY
(Apollo 7 through Apollo 12)

Test/operation	Spacecraft/mission					
	CSM-101 Apollo 7	CSM-103 Apollo 8	CSM-104 Apollo 9	CSM-106 Apollo 10	CSM-107 Apollo 11	CSM-108 Apollo 12
Factory						
Individual and combined systems test completed	Mar. 18, 1968	June 2, 1968	July 20, 1968	Sept. 8, 1968	Oct. 12, 1968	Jan. 20, 1969
Integrated systems test completed	Apr. 29, 1968	July 21, 1968	Aug. 31, 1968	Oct. 19, 1968	Dec. 6, 1968	Feb. 3, 1969
Ready to ship	May 29, 1968	Aug. 11, 1968	Oct. 5, 1968	Nov. 24, 1968	Jan. 22, 1969	Mar. 27, 1969
Kennedy Space Center						
Delivered	May 30, 1968	Aug. 12, 1968	Oct. 6, 1968	Nov. 25, 1968	Jan. 23, 1969	Mar. 28, 1969
[a]Command and service modules mated	June 11, 1968	Aug. 22, 1968	Oct. 8, 1968	Nov. 26, 1968	Jan. 29, 1969	Apr. 2, 1969
[a]Combined systems test completed	June 19, 1968	Aug. 27, 1968	Oct. 24, 1968	Dec. 16, 1968	Feb. 17, 1969	Apr. 21, 1969
[a]Altitude tests completed	July 29, 1968	Sept. 22, 1968	Nov. 18, 1968	Jan. 17, 1969	Mar. 24, 1969	June 9, 1969
Command and service module moved to launch complex 34	Aug. 9, 1968	-	-	-	-	-
Command and service module moved to vehicle assembly building	-	Oct. 7, 1968	Dec. 3, 1968	Feb. 6, 1969	Apr. 14, 1969	June 30, 1969
Assembled space vehicle moved to launch complex 39	-	Oct. 9, 1968	Jan. 3, 1969	Mar. 11, 1969	May 20, 1969	Sept. 8, 1969

TABLE E-II.- BLOCK II FLIGHT COMMAND AND SERVICE MODULE CHECKOUT HISTORY - Continued
(Apollo 7 through Apollo 12)

Test/operation	Spacecraft/mission					
	CSM-101 Apollo 7	CSM-103 Apollo 8	CSM-104 Apollo 9	CSM-106 Apollo 10	CSM-107 Apollo 11	CSM-108 Apollo 12
[b]Command and service module integrated systems test completed	Aug. 27, 1968	Nov. 2, 1968	Dec. 11, 1968	Feb. 13, 1969	Apr. 22, 1969	July 7, 1969
[b]Command and service module electrically mated to launch vehicle	Aug. 30, 1968	Nov. 4, 1968	Dec. 26, 1968	Feb. 27, 1969	May 5, 1969	July 16, 1969
[b]Overall test completed	Sept. 4, 1968	Nov. 6, 1968	Dec. 27, 1968	Mar. 3, 1969	May 6, 1969	July 17, 1969
Flight readiness test completed	Sept. 25, 1968	Nov. 11, 1968	Jan. 18, 1969	Apr. 7, 1969	June 1, 1969	Sept. 29, 1969
Countdown demonstration test completed	Sept. 17, 1968	Dec. 5, 1968	Feb. 12, 1969	Apr. 29, 1969	June 26, 1969	Oct. 23, 1969
Final phase of countdown and launch	Oct. 11, 1968	Dec. 21, 1968	Mar. 3, 1969	May 18, 1969	July 16, 1969	Nov. 14, 1969

[a]Performed in Operations and Checkout Building (renamed Manned Spacecraft Operations Building).

[b]Integrated systems test, electrical mate and overall test were conducted in the vehicle assembly building on the Apollo 9, 10, 11 and 12 vehicles. These operations were conducted at the launch site on the Apollo 7, 8, 13, 14, 15, 16 and 17 vehicles.

TABLE E-II.- BLOCK II FLIGHT COMMAND AND SERVICE MODULE CHECKOUT HISTORY - Continued
(Apollo 13 through Apollo 17)

Test/operation	Spacecraft/mission				
	CSM-109 Apollo 13	CSM-110 Apollo 14	CSM-112 Apollo 15	CSM-113 Apollo 16	CSM-114 Apollo 17
Factory					
Individual and combined systems test completed	Mar. 16, 1969	Apr. 2, 1969	[c]Nov. 5, 1969	[c]Dec. 3, 1970	May 8, 1971
Integrated systems test completed	Apr. 8, 1969	May 7, 1969	Nov. 24, 1970	Mar. 17, 1971	[d]Aug. 2, 1971
Ready to ship	June 25, 1969	Nov. 17, 1969	Jan. 11, 1971	July 26, 1971	Mar. 17, 1972
Kennedy Space Center					
Delivered	June 25, 1969	Nov. 19, 1969	Jan. 14, 1971	Aug. 1, 1971	Mar. 24, 1972
[a]Command and service modules mated	June 30, 1969	Nov. 24, 1969	Jan. 18, 1971	Aug. 2, 1971	Mar. 28, 1972
[a]Combined systems test completed	July 7, 1969	Feb. 2, 1970	Mar. 8, 1971	Sept. 13, 1971	May 9, 1972
[a]Altitude tests completed	Sept. 12, 1969	[e]Sept. 1, 1970	Apr. 9, 1971	Oct. 21, 1971	June 19, 1972
Command and service module moved to vehicle assembly building	Dec. 9, 1969	Nov. 4, 1970	May 8, 1971	Dec. 7, 1971	Aug. 22, 1972
Assembled space vehicle moved to launch complex 39	Dec. 14, 1969	Nov. 9, 1970	May 10, 1971	Dec. 13, 1971	Aug. 28, 1972
[b]Command and service module integrated test completed	Jan. 5, 1970	Nov. 18, 1970	May 18, 1971	[f]Jan. 3, 1972	Sept. 11, 1972

TABLE E-II.- BLOCK II FLIGHT COMMAND AND SERVICE MODULE CHECKOUT HISTORY - Concluded
(Apollo 13 through Apollo 17)

Test/operation	Spacecraft/mission				
	CSM-109 Apollo 13	CSM-110 Apollo 14	CSM-112 Apollo 15	CSM-113 Apollo 16	CSM-114 Apollo 17
[b]Command and service module electrically mated to launch vehicle	Jan. 18, 1970	Dec. 13, 1970	June 7, 1971	Feb. 21, 1972	Oct. 11, 1972
[b]Overall test completed	Jan. 19, 1970	Dec. 14, 1970	June 7, 1971	Feb. 22, 1972	Oct. 17, 1972
Flight readiness test completed	Jan. 25, 1970	Dec. 16, 1970	June 13, 1971	Feb. 29, 1972	Oct. 19, 1972
Countdown demonstration test completed	Mar. 18, 1970	Jan. 12, 1971	July 7, 1971	Mar. 27, 1972	Nov. 15, 1972
Final phase of countdown and launch	Apr. 11, 1970	Jan. 31, 1971	July 26, 1971	Apr. 16, 1972	Dec. 7, 1972

[a]Performed in Operations and Checkout Building (renamed Manned Spacecraft Operations Building).

[b]Integrated systems test, electrical mate and overall test were conducted in the vehicle assembly building on the Apollo 9, 10, 11 and 12 vehicles. These operations were conducted at the launch site on the Apollo 7, 8, 13, 14, 15, 16 and 17 vehicles.

[c]J-mission modifications and retest were accomplished prior to integrated systems test.

[d]Command and service modules stored at factory for approximately two months prior to shipment.

[e]Cryogenic system modifications and retest performed after altitude test.

[f]Following integrated test, the Apollo 16 spacecraft was moved back to the Manned Spacecraft Operations Building for replacement of a command module reaction control system propellant tank and modification of the docking ring. The spacecraft was then reinstalled on the launch vehicle in the vehicle assembly building and the stack was moved to the launch pad on 2/8/72. Retest was conducted 2/14/72.

TABLE E-III.- FLIGHT LUNAR MODULE CHECKOUT HISTORY
(Apollo 5 through Apollo 12)

Test/operation	Spacecraft/mission				
	[a]LM-1 Apollo 5	LM-3 Apollo 9	LM-4 Apollo 10	LM-5 Apollo 11	LM-6 Apollo 12
Factory					
Integrated test	Mar. 10, 1967	Jan. 31, 1968	May 25, 1968	Oct. 21, 1968	Dec. 31, 1968
Final engineering evaluation acceptance test	June 14, 1967	May 17, 1968	Oct. 2, 1968	Dec. 13, 1968	Feb. 18, 1969
Ready to ship:					
Ascent stage	June 21, 1967	June 12, 1968	Oct. 12, 1968	Jan. 7, 1969	Mar. 23, 1969
Descent stage	June 21, 1967	June 4, 1968	Oct. 9, 1968	Jan. 11, 1969	Mar. 22, 1969
Kennedy Space Center					
Delivered:					
Ascent stage	June 23, 1967	June 14, 1968	Oct. 16, 1968	Jan. 8, 1969	Mar. 24, 1969
Descent stage	June 23, 1967	June 9, 1968	Oct. 11, 1968	Jan. 12, 1969	Mar. 24, 1969
[b]Ascent and descent stages mated	July 13, 1967	June 30, 1968	Nov. 2, 1968	Feb. 14, 1969	Apr. 28, 1969
[b]Combined systems test completed	July 30, 1967	July 1, 1968	Nov. 6, 1968	Feb. 17, 1969	May 1, 1969
[b]Altitude tests completed	-	Sept. 27, 1968	Dec. 6, 1968	Mar. 25, 1969	June 16, 1969
Lunar module moved to launch complex 37	Nov. 20, 1967	-	-	-	-
Spacecraft moved to vehicle assembly building	-	Dec. 3, 1968	Feb. 6, 1969	Apr. 14, 1969	June 20, 1969
Assembled space vehicle moved to launch complex 39	-	Jan. 3, 1969	Mar. 11, 1969	May 20, 1969	Sept. 8, 1969
Lunar module combined systems test completed	(c)	[d]Dec. 7, 1968	[d]Feb. 10, 1969	[d]Apr. 18, 1969	[d]July 5, 1969
Flight readiness test completed	Dec. 22, 1967	Jan. 19, 1969	Mar. 27, 1969	June 2, 1969	Sept. 18, 1969
Countdown demonstration test completed	Jan. 18, 1968	Feb. 12, 1969	Apr. 29, 1969	June 26, 1969	Oct. 23, 1969
Final phase of countdown and launch	Jan. 22, 1968	Mar. 3, 1969	May 18, 1969	July 16, 1969	Nov. 14, 1969

[a]LM-1 was the only unmanned flight lunar module.

[b]Operations were performed in the Operations and Checkout Building (renamed Manned Spacecraft Operations Building).

[c]Apollo 5 launch pad tests prior to flight readiness test consisted of lunar module integrated systems test, simulated mission, and overall tests 1 and 2.

[d]Tests were conducted in vehicle assembly building.

TABLE E-III.- FLIGHT LUNAR MODULE CHECKOUT HISTORY - Concluded
(Apollo 13 through Apollo 17)

Test/operation	Spacecraft/mission				
	LM-7 Apollo 13	LM-8 Apollo 14	LM-10 Apollo 15	LM-11 Apollo 16	LM-12 Apollo 17
Factory					
Integrated test	(e)	(e)	(e)	(e)	(e)
Final engineering evaluation acceptance test	May 18, 1969	Aug. 25, 1969	Sept. 21, 1970	Feb. 24, 1971	May 23, 1971
Ready to ship:					
Ascent stage	June 24, 1969	Nov. 8, 1969	Nov. 4, 1970	May 7, 1971	June 14, 1971
Descent stage	June 25, 1969	Nov. 13, 1969	Nov. 16, 1970	May 1, 1971	June 14, 1971
Kennedy Space Center					
Delivered:					
Ascent stage	June 27, 1969	Nov. 24, 1969	Nov. 6, 1970	May 14, 1971	Mar. 12, 1972
Descent stage	June 28, 1969	Nov. 24, 1969	Nov. 16, 1970	May 6, 1971	Mar. 12, 1972
[b]Ascent and descent stages mated	July 15, 1969	Jan. 20, 1970	Feb. 9, 1971	(f)	May 18, 1972
[b]Combined systems test completed	July 22, 1969	Jan. 22, 1970	Feb. 12, 1971	(f)	June 7, 1972
[b]Altitude tests completed	Sept. 20, 1969	June 22, 1970	Apr. 6, 1971	Oct. 19, 1971	July 25, 1972
Spacecraft moved to vehicle assembly building	Dec. 10, 1969	Nov. 4, 1970	May 8, 1971	Dec. 8, 1971	Aug. 24, 1972
Assembled space vehicle moved to launch complex 39	Dec. 15, 1969	Nov. 9, 1970	May 11, 1971	Dec. 13, 1971	Aug. 28, 1972
Lunar module combined systems test completed	Jan. 5, 1970	Nov. 16, 1970	May 17, 1971	[g]Jan. 4, 1972	Sept. 6, 1972
Flight readiness test completed	Feb. 24, 1970	Dec. 14, 1970	June 10, 1971	Feb. 24, 1972	Oct. 4, 1972
Countdown demonstration test completed	Mar. 18, 1970	Jan. 12, 1971	July 8, 1971	Mar. 27, 1972	Nov. 15, 1972
Final phase of countdown and launch	Apr. 11, 1970	Jan. 31, 1971	July 26, 1971	Apr. 16, 1972	Dec. 7, 1972

[a]LM-1 was the only unmanned flight lunar module.

[b]Operations were performed in the Operations and Checkout Building (renamed Manned Spacecraft Operations Building).

[c]Apollo 5 launch pad tests prior to flight readiness test consisted of lunar module integrated systems test, simulated mission, and overall tests 1 and 2.

[d]Tests were conducted in vehicle assembly building.

[e]Integrated test combined with final engineering evaluation acceptance test.

[f]Data not available.

[g]The Apollo 16 spacecraft was moved back to the Manned Spacecraft Operations Building after combined systems test for command module modifications. The spacecraft was reinstalled on the launch vehicle in the vehicle assembly building and the stack was moved back to the launch pad on 2/8/72.

APPENDIX F - FLIGHT ANOMALIES

This appendix contains abbreviated descriptions of significant spacecraft systems malfunctions as well as other flight hardware problems that were termed "anomalies" and are discussed in the anomaly sections of the Apollo 4 through Apollo 17 Mission Reports. The lists consist of problems which occurred or were noted during flight and, in some cases, after flight. In addition to the statement of the problem, the causes and corrective actions are briefly described. In general, the anomalies pertain to the spacecraft (CSM, LM, and SLA), government-furnished equipment used by the crews (GFE), lunar surface experiments (ALSEP), lunar orbital experiments (SIM), and the lunar roving vehicles (LRV). In cases where the same problem or a closely related problem occurred on more than one mission, the appropriate missions are identified. The reference given for each anomaly is the applicable Mission Report. When more than one reference is given, the additional references are applicable Anomaly Reports that were published for anomalies that were not completely resolved at the time of Mission Report publication.

APOLLO 4

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
1	Instrumentation 5-Vdc reference voltage decreased after CM/SM separation.	CSM-011 CSM-017	CM/SM separation monitor burned off during entry and wiring is exposed to entry plasma. Arcing did not blow fuse because of wrong fuse size and errors in wiring.	Fuse box wiring errors corrected and inspection procedures changed.	AS-202 Apollo 4	MSC-PA-R-68-1 MSC-PT-R-67-4 (Rev. A)
2	Holes in CM aft heat shield ablator.	CSM-017	Manufacturing and quality deficiency at vendor.	X-rays taken after heat shields completed.	Apollo 4	MSC-PA-R-68-1 MSC-PT-R-67-3
3	Real-time command (RTC) 13 was not transmitted.	MSFN	Operations procedural error - command executed before verification received from previous command.	None.	Apollo 4	MSC-PA-R-68-1 MSC-PT-R-67-10
4	Pyrotechnic battery voltages did not return to open-circuit level.	CSM-017	Leakage current of pyrotechnic initiators after firing.	None required.	Apollo 4	MSC-PA-68-1 MSC-PT-R-67-13
5	CM VHF recovery antenna failed to lock into position.	CSM-017	Marginal deployment spring.	None.	Apollo 4	MSC-PA-R-68-1 MSC-PT-R-67-6
6	Guam lost S-band downlink signal at CM/SM separation.	MSFN	Signal perturbations by RCS thruster plumes and improper reacquisition procedure.	Acquisition data handling procedures reviewed to insure correct data in the antenna position programmer.	Apollo 4	MSC-PA-R-68-1 MSC-PT-R-68-1
7	CSM S-band receiver lost lock.	CSM-017	Nulls in spacecraft antenna pattern.	None.	Apollo 4	MSC-PA-R-68-1 MSC-PT-R-68-4
8	SPS shutdown was late during second firing.	CSM-017	Data delays due to instrumentation, transmission and processing were greater than expected.	Procedures and mission rules changed.	Apollo 4	MSC-PA-R-68-1 MSC-PT-R-68-3
9	State vector update commands not accepted by spacecraft.	MSFN	Poor alignment of updata buffer at ground station caused distortion of transmitted signal.	Signal characteristics incorporated into performance and interface specs.	Apollo 4	MSC-PA-R-68-1 MSC-PT-R-68-10
10	Spacecraft internal heat load was lower than predicted, resulting in lower-than-expected evaporator inlet and outlet temperatures and steam back pressure.	CSM-017	Heat loads were within predictive capability.	Evaporator back pressure control valve setting for Apollo 6 based on updated predictions. Block II design and manual control capability eliminates problem on manned vehicles.	Apollo 4	MSC-PA-R-68-1 MSC-PT-R-68-5
11	Interference between apex cover and RCS engines.	CSM-017	At apex cover jettison, lower lip of apex cover caught on lower left corner of engine mounting panel.	Clearance increased for Apollo 6; block II configuration has adequate clearance.	Apollo 4	MSC-PA-R-68-1 MSC-PT-R-67-14
12	Damage to recovered main parachute.	CSM-017	RCS oxidizer dump during landing sequence.	Oxidizer quantity decreased and/or landing with propellants on board.	Apollo 4 Apollo 15 Apollo 16	MSC-PA-R-68-1 MSC-PT-R-68-9 (Rev. A)
13	Foreign material in cabin pressure relief valve.	CSM-017	H-film ingested during entry.	None required.	Apollo 4	MSC-PT-R-68-11

APOLLO 5

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
1	Premature shutdown of first descent engine firing.	LM-1	Slower-than-normal thrust buildup caused by start at less than full tank pressure.	None.	Apollo 5	MSC-PA-R-68-7 MSC-PT-R-68-13
2	Abrupt change in cabin pressure leak rate.	LM-1	Unknown.	None.	Apollo 5	MSC-PA-R-68-7
3	Out-of-phase indication from descent engine propellant shutoff valves.	LM-1	Possible open or shorted circuit causing shutoff ball valve to close, or possible reed switch malfunction.	Valve packages replaced on Apollo 9 and 10 lunar modules, improved manufacturing techniques, and added emphasis on quality control.	Apollo 5	MSC-PA-R-68-7 MSC-PT-R-69-2
4	Abrupt changes in spacecraft-received UHF signal strength.	LM-1	Intermittent operation of RF stage of the digital command assembly or the coaxial cable connecting the diplexer to the digital command assembly.	New acceptance vibration test levels (planned prior to LM-1 mission).	Apollo 5	MSC-PA-R-68-7 MSC-PT-R-68-15 (Report no. 5)
5	Excessive control engine propellant usage (items 6, 7, 8 and 9 are related).	LM-1	Incorrect configuration of PGNCS digital autopilot after staging. Calculations for thruster "on" time used combined descent/ascent stage inertia constants after descent stage separation.	None required.	Apollo 5	MSC-PA-R-68-7 MSC-PT-R-68-15 (Report no. 4)
6	Discrepant propellant manifold pressure indications.	LM-1	Fuel depletion was obscurred by the effects of bladder leakage and the manifold pressure sensor sensing helium pressure.	None.	Apollo 5	MSC-PA-R-68-7 MSC-PT-R-68-15 (Report no. 4)
7	System A oxidizer shutoff valve unlatched from open position without command.	LM-1	Power was inadvertently applied to the valve close coil for 51 minutes, raising its temperature to 325° F. Subsequent valve opening, vaporization of oxidizer trapped above upper magnet in valve, and crossfeed opening pressure drop unlatched the valve.	None.	Apollo 5	MSC-PA-R-68-7 MSC-PT-R-68-15 (Report no. 4)
8	Thrust chamber of upfiring engine in cluster 4 failed.	LM-1	Excessive thruster activity resulted in operation with low oxidizer manifold pressure and with helium/fuel mixture in fuel manifold. (This condition causes accumulation of explosive residue in combustion chamber.)	None.	Apollo 5	MSC-PA-R-68-7 MSC-PT-R-68-15 (Report no. 4)
9	High engine cluster temperatures.	LM-1	Excessive control engine activity (see item 5).	None.	Apollo 5	MSC-PA-R-68-7
10	Descent stage fiberglass thermal shield failed.	LM-1	High temperature indications from sensors beneath thermal shield at abort staging were probably caused by thermal shield failure.		Apollo 5	MSC-PA-R-68-7
11	No indication of adapter panel deployment.	SLA	Panels deployed but no indication was received from limit switches. Cause unknown.	None required (system not used on manned flights).	Apollo 5	MSC-PA-R-68-7
12	Separation distance monitors did not function during abort staging.	LM-1	Unknown.	None required (not used on manned flights).	Apollo 5	MSC-PA-R-68-7

APOLLO 5

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
13	Five pressure and temperature sensors failed during abort staging.	LM-1	Unknown.	None.	Apollo 5	MSC-PA-R-68-7
14	Rendezvous radar antenna vibration measurement was intermittent.	LM-1	Possible failure of transducer signal wires.	None.	Apollo 5	MSC-PA-R-68-7

APOLLO 6

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
1	An a-c essential electrical load transfer occurred.	CSM-020	Short in cryogenic tank 1 fan circuit.	None required. Fans redesigned for Block II vehicles.	Apollo 6	MSC-PA-R-68-9 MSC-PT-R-68-23
2	Erratic data.	CSM-020	Corona discharge of 3000-volt dc potential of VAC-ION pumps.	VAC-ION pumps disabled on Apollo 7, 8 and 9. Pumps redesigned for Apollo 10 and subsequent.	Apollo 6	MSC-PA-R-68-9 MSC-PT-R-68-36
3	Computer update rejections.	CSM-020	Noise pulses impressed on service module umbilical, probably because of inadequate shielding.	Multi-point grounding used on shields for Block II spacecraft. Uplink blocked on Apollo 7 when not updating. Relay to preclude noise transmission added to spacecraft for Apollo 9 and subsequent.	Apollo 6	MSC-PA-R-68-9 MSC-PT-R-68-40
4	Excessive cabin-to-ambient differential pressure.	CSM-020	No vent hole through boost protective cover at steam duct outlet.	Mandatory inspection points established to assure proper manufacturing and alignment.	Apollo 6	MSC-PA-R-68-9 MSC-PT-R-68-41
5	Oxygen surge tank pressure varied abnormally.	CSM-020	One or both oxygen check valves did not seat properly.	Spring added to assure proper seating at low differential pressure.	Apollo 6	MSC-PA-R-68-9 MSC-PT-R-68-31
6	Abnormal structural performance during launch phase.	SLA	Facesheet bond too weak for internal panel pressures achieved.	Cork covering added to reduce temperature and internal pressure. Panels vented to ambient. Inspection and quality control procedures changed to verify sound construction.	Apollo 6	MSC-PA-R-68-9 MSC-PT-R-68-22
7	VHF recovery beacon or survival beacon signal not received by ARIA.	CSM-020	Postflight analysis showed that survival beacon signal was not received. Cause unknown.	None required.	Apollo 6	MSC-PA-R-68-9 MSC-PT-R-68-26
8	Dosimeter measurements erratic.	CSM-020	Electrical noise on dosimeter output lines.	None required.	Apollo 6	MSC-PA-R-68-9 MSC-PT-R-68-32
9	Propellant valves cross-wired.	CSM-020	Wiring to yaw engines was reversed at terminal boards during engine installation.	Functional tests performed on spacecraft for Apollo 7, 8 and 9. Identification sleeving added on subsequent spacecraft in addition to functional tests.	Apollo 6	MSC-PA-R-68-9 MSC-PT-R-68-29

APOLLO 6

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
10	Low temperature excursions indicated for service module quad C injector.	CSM-020	Probable faulty connection to transducer.	None required.	Apollo 6	MSC-PA-R-68-9 MSC-PT-R-68-37
11	CSM/S-IVB separation transient.	CSM-020	Damage to SLA during boost (see item 6).	None required.	Apollo 6	MSC-PA-R-68-9 MSC-PT-R-68-22
12	One auxiliary battery had low voltage under load and four other batteries had internal shorts postflight.	CSM-020	Overcharging of batteries prior to flight.	Charging procedures revised. Separator material changed for batteries to be used on Apollo 9 and subsequent.	Apollo 6	MSC-PA-R-68-9 MSC-PT-R-68-30
13	Damaged wires in CM/SM umbilical found postflight.	CSM-020	Wires damaged during installation of umbilical - none associated with flight anomaly.	None required. Block II configuration precludes problem.	Apollo 6	MSC-PT-R-68-28

APOLLO 7

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
1	PCM and voice subcarriers lost on secondary S-band transponder.	CSM-101	No abnormalities found postflight; problem may have been caused by improper switching of transponder select switch.	None required.	Apollo 7	MSC-PA-R-68-15
2	Biomedical instrumentation leads broken.	CSM-101	Harness and potting not sufficiently flexible.	Wiring insulation changed from Teflon to polyvinyl chloride and softer potting material used.	Apollo 7	MSC-PA-R-68-15
3	Trigger on water gun stuck.	CSM-101	O-ring swelling caused by sodium hypochlorite in drinking water.	O-ring material changed to ethylene propylene.	Apollo 7	MSC-PA-R-68-15
4	Attitude displayed on FDAI shifted in pitch axis when source switched from G and N to S and C.	CSM-101	Solder ball found in relay may have caused the condition.	All relays involved in critical switching functions were made redundant.	Apollo 7	MSC-PA-R-68-15
5	Rotation hand controller failed momentarily.	CSM-101	Anomaly could not be reproduced postflight; symptoms indicated breakout switch temporarily failed to open when controller was returned within the detent.	None required. Improved design used for Apollo 8 and subsequent.	Apollo 7	MSC-PA-R-68-15
6	Entry monitor system malfunctions.	CSM-101	Quality control problems.	Manufacturing and test procedures improved.	Apollo 7 Apollo 8 Apollo 9 Apollo 10 Apollo 11	MSC-PA-R-68-15 MSC-02417
7	Adapter panel not fully deployed.	SLA	Panel fully deployed initially, but rebounded because retention cable was caught in channel. Retention cable was later released and panel was retained fully deployed.	None required. Panels jettisoned on Apollo 8 and subsequent.	Apollo 7	MSC-PA-R-68-15
8	Windows fogged.	CSM-101	Outgassing of silicone oils from RTV sealing material.	Parts using RTV material precured in vacuum at elevated temperatures, effective on Apollo 9.	Apollo 7 Apollo 8 Apollo 12	MSC-PA-R-68-15 MSC-PT-R-69-1

APOLLO 7

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
9	Flight qualification commutator failed.	CSM-101	Probable internal failure of timing sequence logic circuit.	None required. Only other use on Apollo 9 lunar module and failure would not prevent satisfying mission objectives.	Apollo 7	MSC-PA-R-68-15 MSC-PT-R-69-7
10	Water leak near waste water disconnect.	CSM-101	Poor metal-on-metal seal at B-nut connection.	O-ring seal used, effective with Apollo 8.	Apollo 7	MSC-PA-R-68-15
11	Momentary loss of a-c busses.	CSM-101	Overvoltage caused by corona arcing of a-c power within motor-operated cryogenic fan switch.	Manual switching of fans used in order to bypass SM motor-operated switches.	Apollo 7	MSC-PA-R-68-15
12	Unexpected low charge rate on batteries A and B.	CSM-101	Line resistance not considered in predictions.	Individual charger characteristics with associated spacecraft wiring will be checked.	Apollo 7	MSC-PA-R-68-15
13	Undervoltage indications on d-c busses A and B.	CSM-101	Condition resulted from mid-range state of battery charge and low temperature.	Batteries warmed by placing them on main busses 12 minutes prior to CM/SM separation. Fuel cell 2 removed from busses and SPS gimbal motors turned on to lessen transient loads at separation.	Apollo 7	MSC-PA-R-68-15
14	Condenser exit temperature of fuel cell increased.	CSM-101	Secondary bypass valves operated erratically because of contaminants.	Radiator half of Apollo 8 cooling system flushed. Studies made to determine if modification necessary.	Apollo 7 Apollo 8 Apollo 9 Apollo 10 Apollo 11	MSC-PA-R-68-15
15	Propellant isolation valves open with voltage removed.	CSM-101	Valves were in closed position when system was activated. Bellows was damaged from hydraulic hammering.	Proper procedure included in crew checklist AOH and briefings.	Apollo 7 Apollo 12	MSC-PA-R-68-15
16	Voice communications garbled during launch phase.	MSFN	Improper procedures used at ground stations.	Procedures changed so that patching of voice to MCC accomplished only at Goddard.	Apollo 7	MSC-PA-R-68-15
17	Primary evaporator operated erratically in the automatic mode.	CSM-101	Low, variable heat loads.	Sensor response to wick increased by relocation of sensors and removal of sponge material in sensor areas for Apollo 10 and subsequent spacecraft.	Apollo 7	MSC-PA-R-68-15
18	Condensation in cabin.	CSM-101	Condition expected because of uninsulated coolant lines.	Lines insulated on Apollo 10 and subsequent spacecraft.	Apollo 7	MSC-PA-R-68-15
19	Food bags split and food crumbled.	GFE	Bag quality problems and menu choice.	Menu changed and bags inspected for defects.	Apollo 7	MSC-PA-R-68-15
20	Entry battery manifold leak.	CSM-101	Cause not determined; probable under-torqued B-nuts as experienced on 2TV-1.	Check B-nut torques.	Apollo 7	MSC-PA-R-68-15
21	Both primary lamps failed in lower equipment bay floodlights.	CSM-101	Excessive operation with lights dimmed prior to flight caused cathodes to degrade prematurely.	Procedures changed to limit preflight use.	Apollo 7 Apollo 9	MSC-PA-R-68-15

APOLLO 7

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
22	Face glass on mission timers cracked.	CSM-101	Cracks probably resulted from propagation of hairline cracks introduced during bonding of glass to frame.	Manufacturing procedures revised.	Apollo 7 Apollo 12	MSC-PA-R-68-15 MSC-PT-R-69-4
23	Water in docking tunnel after landing.	CSM-101	Interim ball check valve installed in top hatch leaked.	None. Used for Apollo 7 only.	Apollo 7	MSC-PA-R-68-15
24	VHF recovery beacon signal not received during descent.	CSM-101	Cause unknown. Antenna may not have deployed properly until stable I attitude on water was achieved.	None.	Apollo 7	MSC-PA-R-68-15
25	Apparent free water in suit supply hoses.	CSM-101	Water separator operated inefficiently because of reservicing procedure used after altitude run.	Reservicing procedure changed. Water removal capability rechecked prior to flight.	Apollo 7	MSC-PA-R-68-15 MSC-PT-R-69-5
26	Electromagnetic interference problems experienced during ground tests and flight:	CSM-101		None. Hardware changes not warranted.	Apollo 7	MSC-PA-R-68-15
	a. Mission timer started inadvertently.		a. Associated with oxygen fan cycle.			
	b. Computer program alarm.		b. Associated with turning interior lights on bright.			
	c. Central timing equipment reset.		c. Unknown.			

APOLLO 8

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
1	Entry monitor system errors.	CSM-103	Bubble and leak in accelerometer.	Units subjected to tilt-table tests.	Apollo 7 Apollo 8 Apollo 9 Apollo 10 Apollo 11	MSC-PA-R-69-1 MSC-02417
2	Windows fogged.	CSM-103	Outgassing of silicone oils from RTV material.	Cure material prior to installation.	Apollo 7 Apollo 8 Apollo 12	MSC-PA-R-69-1
3	Cabin fans noisy.	CSM-103	Possible resonant condition in ducting.	None. Comfortable environment can be maintained without fans.	Apollo 8 Apollo 15 Apollo 16	MSC-PA-R-69-1
4	Possible entry of sea water into cabin through cabin pressure relief valve.	CSM-103	Water may have been condensation. Postflight tests did not reveal any pressure relief valve abnormalities.	None required.	Apollo 8	MSC-PA-R-69-1
5	Steel cables in recovery loop broke.	CSM-103	Recovery loop had exhibited failures previously and was augmented with an auxiliary nylon loop installed by swimmer.	Steel-cable loop replaced by permanent nylon loop for Apollo 12 and subsequent spacecraft.	Apollo 8	MSC-PA-R-69-1
6	Swimmer interphone inoperative.	CSM-103	Probable incorrect operation of interphone.	Training procedures improved.	Apollo 8	MSC-PA-R-69-1

APOLLO 8

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
7	Potable water tank quantity measurement erratic.	CSM-103	Evidence was found of moisture in indicator housing and oxygen side of tank pressurization system caused by back-up of urine dump in potable water tank oxygen vent line. Moisture may have caused erratic readings.	Tank filled to 80 percent of capacity for Apollo 9. Urine dump/ oxygen vent interface changed for Apollo 10.	Apollo 8 Apollo 12 Apollo 13	MSC-PA-R-69-1

APOLLO 9

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
1	Propellant isolation valve closures.	CSM-104	Pyrotechnic shock.	Valves to be checked after separation of CSM from S-IVB. Valves having no cabin indicators to be cycled after separation.	Apollo 9 Apollo 11 Apollo 12 Apollo 14 Apollo 15	MSC-PA-R-69-2
2	Scanning telescope shaft stuck intermittently and mechanical counter shaft became inoperative.	CSM-104	Pin in "tenths" counter drum dropped out and jammed gear on shaft resolver.	Proper inspection of counters to insure correct tolerances.	Apollo 9	MSC-PA-R-69-2
3	System for automatic control of cryogenic hydrogen tank pressure failed.	CSM-104	Probably an intermittent open circuit in the motor-control circuit.	None.	Apollo 9	MSC-PA-R-69-2
4	Erroneous docking probe indications.	CSM-104	Extend/release-retract switch was not actuated for a sufficient time to allow docking probe to fully extend.	AOH changed to require holding switch in extend/ release position until physical separation.	Apollo 9	MSC-PA-R-69-2
5	Uplink commands not accepted.	CSM-104	Unknown.	Recycle up-telemetry switch to restore operation.	Apollo 9 Apollo 16	MSC-PA-R-69-2
6	Entry monitor system failed to scribe during entry.	CSM-104	Scribe coat hardened on scroll. Stylus holder and bushing contaminated with Lock-tite.	The following were performed for Apollo 10 and subsequent spacecraft. a. Glyptol used instead of Lock-tite. b. Stylus spring load increased. c. Dimension of stylus holder and bushing verified. d. Acceptance tests to verify scribing.	Apollo 7 Apollo 8 Apollo 9 Apollo 10 Apollo 11	MSC-PA-R-69-2 MSC-02417
7	Indications of service propulsion system propellant unbalance.	CSM-104	Electrical zero bias in oxidizer measuring circuit after storage tank depletion.	Master alarms and warnings for this system not required and have been deleted for Apollo 10 and subsequent spacecraft. Procedural change made to minimize electrical zero bias.	Apollo 9	MSC-PA-R-69-2
8	Unexplained master alarms.	CSM-104	Probably caused by external inputs to caution and warning system.	None.	Apollo 9 Apollo 10	MSC-PA-R-69-2

APOLLO 9

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
9	Fuel cell 2 condenser exit temperature outside normal range.	CSM-104	Possible coolant loop contamination buildup in secondary bypass valve.	Procedures developed to damp oscillations if they occur. Secondary bypass valve design changed for Apollo 14 and subsequent spacecraft.	Apollo 7 Apollo 8 Apollo 9 Apollo 10 Apollo 11	MSC-PA-R-69-2
10	Docking spotlight failed	CSM-104	Circuit breaker not closed.	Crew checklist changed to include closing of circuit breaker prior to spotlight deployment.	Apollo 9	MSC-PA-R-69-2
11	Interior floodlight anomalies.	CSM-104	Cathode erosion caused failure of one lamp - broken wire caused second lamp to fail.	Procedures incorporated to insure operation of lamps in full-bright configuration in ground tests and in flight.	Apollo 7 Apollo 9	MSC-PA-R-69-2
12	Computer did not respond to manual entries.	CSM-104	Possible procedural errors.	None.	Apollo 9	MSC-PA-R-69-2
13	Slow repressurization of surge tank.	CSM-104	Valve in wrong position because of misaligned markings.	Proper alignment to be verified on subsequent spacecraft.	Apollo 9	MSC-PA-R-69-2
14	Docking ring separation charge holder came out of channel and extended beyond periphery of tunnel structure.	CSM-104	Holder was not properly retained.	Retention spring installed.	Apollo 9 Apollo 10	MSC-PA-R-69-2
15	Descent propulsion system regulator manifold pressure dropped.	LM-3	Air drawn through manifold into tank heat exchanger during servicing resulting in partially blocked heat exchanger.	Ground support equipment and procedures modified for Apollo 10 and subsequent spacecraft.	Apollo 9	MSC-PA-R-69-2
16	Supercritical helium tank pressure decayed.	LM-3	Probable defective braze in squib isolation valve.	Valve configuration changed for Apollo 10 and subsequent spacecraft.	Apollo 9	MSC-PA-R-69-2
17	Tracking light failed.	LM-3	Probable high-voltage breakdown in pulse-forming network	Additional testing for Apollo 10 light. Modified light used for Apollo 11 and 12.	Apollo 9 Apollo 12	MSC-PA-R-69-2
18	Push-to-talk switches inoperative.	LM-3	Probable broken common wire to switches.	Operating procedures to include troubleshooting procedures to circumvent problem.	Apollo 9	MSC-PA-R-69-2
19	Activation of abort guidance system caused warning indication.	LM-3	Probable open or short in 26-gage wire between abort electronics assembly and signal conditioner electronics assembly.	Trip levels are measured for each vehicle at launch site. Output parameters for abort electronics assembly and transfer functions for signal conditioner electronics assembly measured on bench.	Apollo 9	MSC-PA-R-69-2
20	Binding of forward hatch.	LM-3	Interference by insulation blankets and possible insufficient hatch clearance.	Top hatch shield extended to hatch structure and clearance increased for Apollo 10 and subsequent spacecraft.	Apollo 9	MSC-PA-R-69-2

APOLLO 9

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
21	Forward hatch door stop (snubber) would not hold hatch open.	LM-3	Excessive clearance between snubber and Velcro.	Snubber redesigned for Apollo 11 and subsequent spacecraft.	Apollo 9	MSC-PA-R-69-2
22	Cabin noise level high.	LM-3	Operation of cabin fans, water/glycol pumps and suit compressors during helmets-off periods.	Ear pieces provided and procedures changed. Effective with Apollo 14, muffler added in line at outlet of water/glycol pump assembly.	Apollo 9 Apollo 10	MSC-PA-R-69-2
23	Structural contact at S-IC shutdown.	LM-3	Lateral loads probably caused helium diffuser flange to contact top deck flange.	Loads predicted to be less on Apollo 10. Top deck flange modified on Apollo 11 and subsequent spacecraft.	Apollo 9	MSC-PA-R-69-2
24	Data entry and display assembly operator error light.	LM-3	Possible bent switch leaf or contamination preventing microswitch contact.	Microswitches modified.	Apollo 9	MSC-PA-R-69-2
25	Descent engine firing rough at 27-percent throttle.	LM-3	Suspected helium ingestion into engine by uncovering of zero-g can, due to high ullage.	No detrimental effect.	Apollo 9	MSC-PA-R-69-2
26	Regulated helium pressure to propellant tanks decreased in ascent propulsion system.	LM-3	Possible regulator contamination by backflow during solenoid valve replacement.	Procedures developed for prevention of contamination when replacement of components is necessary.	Apollo 9	MSC-PA-R-69-2 (Mission Rept) MSC-PA-R-69-2 (Anomaly Rept No. 1)
27	Landing radar interference.	LM-3	Interference was produced by pieces of H-film from the base heat shield.	Spray coating of KEL-F plastic substituted for H-film on base heat shield for Apollo 11 and subsequent spacecraft.	Apollo 9	MSC-PA-R-69-2 (Mission Rept) MSC-PA-R-69-2 (Anomaly Rept No. 2)
28	Air bubbles in liquid cooled garment tubes.	GFE	Air ingested through sublimator into coolant loop when PLSS was being connected to liquid cooled garment.	Make-up line on PLSS relocated to upstream side of water shutoff and relief valve for Apollo 11 and subsequent missions.	Apollo 9	MSC-PA-R-69-2
29	Oxygen purge system pallet was difficult to stow.	GFE	Locking pin could not be inserted through bulkhead structure into pallet because of location of hole, angle of insertion and poor lighting.	Oxygen purge system to be stowed in different area and more easily operated locking pins used for Apollo 10 and subsequent missions.	Apollo 9	MSC-PA-R-69-2
30	Background brightness "washed-out" reticle image of crewman optical alignment sight during docking.	GFE	Neutral density filter and reflection from command module.	Two ranges of reticle illumination intensity to be provided and different lighting conditions expected for Apollo 10 and subsequent missions.	Apollo 9	MSC-PA-R-69-2
31	Oxygen purge system checkout light failed.	GFE	Main power switch actuator mechanism did not close switch.	Actuator mechanism modified for Apollo 10 and subsequent missions.	Apollo 9	MSC-PA-R-69-2
32	Communications lost when using lightweight headset and communications carrier.	GFE	Possibly caused by loose airlock sleeve on connector or improper mating of lightweight headset connector to suit harness and T-adapter.	Airlock sleeves to be torqued to between 45 and 50 inch-pounds and Lock-tite applied to secure sleeves to connector.	Apollo 9	MSC-PA-R-69-2

APOLLO 10

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
1	Burst disc in reaction control system ruptured prior to flight.	CSM-106	Overpressurization during preflight checkout.	Caution notes incorporated in procedures. Leak check to be made after propellant servicing.	Apollo 10	MSC-00126
2	Helium manifold pressure in reaction control system decayed.	CSM-106	Low-pressure helium manifold in fuel leg of system A leaked slightly.	System to be pressurized to 100 psia about 30 days prior to flight to insure leaks are detected.	Apollo 10	MSC-00126
3	Rendezvous radar transponder failed to operate temporarily.	CSM-106	Possible intermittent failure in SM wiring, rendezvous radar control box, or transponder; possible improper switch configuration.	None.	Apollo 10	MSC-00126
4	Primary evaporator dried out after a few minutes of operation.	CSM-106	Insufficient travel of water control circuit switch actuator.	Actuator rigging procedures modified to assure proper overtravel.	Apollo 10	MSC-00126
5	Transmissions from LM on VHF simplex-A not received in CM.	CSM-106	Both vehicles were probably not configured simultaneously for communications on simplex-A.	None.	Apollo 10	MSC-00126
6	Crew couch stabilizer left connected during launch.	CSM-106	Stabilizer should have been removed prior to launch to allow stroking of couch struts if an abort had been required.	Mandatory inspection point added to pre-ingress checklist.	Apollo 10	MSC-00126
7	Fuel cell 1 pump package failure.	CSM-106	Phase-to-phase short, probably caused by breakdown of insulation in hydrogen pump.	None. Major redesign of hydrogen pump would be required.	Apollo 10	MSC-00126
8	Hydrogen flow to fuel cell decayed slowly after extended hydrogen purge of fuel cell 1.	CSM-106	Extended purge created low temperatures on regulator and consequent regulator leakage.	Extended hydrogen purges not to be performed and vent line heater to be left on for 10 minutes after termination of hydrogen purge.	Apollo 10	MSC-00126
9	Automatic pressure control system did not turn hydrogen tank heaters off during fuel cell 1 purge.	CSM-106	Pressure transducer shift resulted from cold soak during extended purge.	Extended hydrogen purges not to be performed on subsequent flights.	Apollo 10	MSC-00126
10	Gyro display coupler drift was felt by crew to be excessive.	CSM-106	Drift rates in postflight tests were not indicative of reported performance.	None.	Apollo 10	MSC-00126
11	Data storage equipment lost data.	CSM-106	Cover deformed because of differential pressure. Cover contacted and slowed tape reel.	Relief valves to be used that operate at lower differential pressure.	Apollo 10	MSC-00126
12	Entry monitor system stylus cut through emulsion on scroll during pre-entry tests.	CSM-106	Emulsion had hardened because of chemical reaction.	New manufacturing processes implemented for Apollo 11 and precautionary measures taken to prevent hardening. Different scroll coating to be used for Apollo 12 and subsequent spacecraft.	Apollo 7 Apollo 8 Apollo 9 Apollo 10 Apollo 11	MSC-00126 MSC-02417
13	VHF recovery antenna 1 did not deploy properly.	CSM-106	Ground-plane radial hung up on guide ramp.	None.	Apollo 10	MSC-00126

APOLLO 10

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
14	Potable water contained gas.	CSM-106	Oxygen from pressure system and hydrogen from fuel cells.	Membrane device installed on water gun for Apollo 11 and subsequent spacecraft. Hydrogen separator installed in water system for Apollo 12 and subsequent spacecraft.	Apollo 10	MSC-00126
15	Flow from water gun appeared to be less than normal for about 2 hours.	CSM-106	Excess lubrication from O-ring partially clogged gun.	Process specifications changed to insure that excessive lubricant is not used.	Apollo 10	MSC-00126
16	Tunnel would not vent prior to LM separation.	CSM-106	Incorrect fitting installed on vent prior to flight.	End-to-end test performed on Apollo 11 and subsequent spacecraft to verify system.	Apollo 10	MSC-00126
17	Thermal coating came off forward hatch when LM cabin was pressurized.	CSM-106	Insulation vent holes were obstructed.	Evaluation showed that insulation is not necessary. Single layer of H-film tape applied to hatch ablator for Apollo 11 and subsequent spacecraft.	Apollo 10	MSC-00126
18	Launch vehicle engine warning indicators operated intermittently during preflight testing.	CSM-106	Cold solder joints.	Units screened for Apollo 11 and subsequent spacecraft.	Apollo 10	MSC-00126
19	Digital event timer jumped 2 minutes. At other times, tens-of-seconds failed to advance.	CSM-106	Spurious noise input probably caused 2-minute jump. Tens-of-seconds problem was caused by contamination (paint flakes from units wheel) preventing electrical contact between tab and brush.	Screening test developed.	Apollo 10 Apollo 15 Apollo 16	MSC-00126
20	Docking ring charge holder not captured by retention springs.	CSM-106	Retention spring design marginal.	Improved retention method to be used for Apollo 15 and subsequent spacecraft.	Apollo 10	MSC-00126
21	Fuel cell 2 exit temperature oscillated.	CSM-106	Undetermined.	Block II retrofit secondary coolant bypass valve (Block I valve poppet) used on Apollo 11.	Apollo 7 Apollo 8 Apollo 9 Apollo 10 Apollo 11	MSC-00126 MSC-02426
22	Couch heat strut lockout handle in locked position.	CSM-106	Spring in locking mechanism improperly installed after modification.	Mandatory inspection point added to manufacturing process.	Apollo 10	MSC-00126
23	Recovery flashing light ceased to operate after landing.	CSM-106	Thermally-induced stresses between the flash tube and its encapsulant caused the flash tube to crack.	AOH changed so that light is to be operated only in low-flash-rate mode during descent.	Apollo 10	MSC-00126 MSC-02623
24	Engine pitch gimbal drive actuator fail indication received.	LM-4	An uncommanded gimbal movement probably occurred due to failure of the spring-loaded brake to engage after removal of drive signal.	Brake mechanism was redesigned. Time allowed for uncommanded gimbal movement without causing a fail indication was increased.	Apollo 10	MSC-00126

APOLLO 10

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
25	Master alarms and descent propellant low-level indications during descent phasing maneuver.	LM-4	First master alarm and low-level indication were probably caused by a gas bubble around the propellant low-level sensor. A second alarm probably resulted from an intermittent failure in the master alarm and propellant-level circuits.	Descent propellant low-level indicator removed from master alarm for Apollo 11 and subsequent spacecraft.	Apollo 10	MSC-00126
26	S-band backup down-voice received from LM during revolution 13 was unusable.	MSFN	Operator error within Goldstone station.	None.	Apollo 10	MSC-00126
27	S-band steerable antenna did not track.	LM-4	Track mode switch was probably inadvertently switched to OFF.	None.	Apollo 10	MSC-00126
28	Optical system problems:	LM-4			Apollo 10	MSC-00126
	a. Contamination on reticle of alignment optical telescope.		a. Contamination could have entered through air gap at interface of mirror and telescope housing subsequent to prelaunch cleaning.	a. Reticle and prism were cleaned when sunshade was installed on Apollo 11 spacecraft. Same procedure to be used for subsequent spacecraft.		
	b. Reticle dimmer control required manual holding in bright position.		b. Operation normal.	b. None.		
	c. Stars could not be seen six star diameters from center of reticle.		c. Prism was possibly contaminated during final installation of telescope sunshade.	c. Same as (a).		
29	Drinking water contained gas.	LM-4	Probable source of gas was nitrogen pressurant in tank and air entrapped in water hose, gun and connecting plumbing. Bacteria filter (which helps remove gas) was not used on this mission.	Prelaunch procedures changed to include servicing water hose and connecting plumbing.	Apollo 10	MSC-00126
30	Cabin noise level high.	LM-4	Glycol pump.	Ear plugs provided for sleep periods. Muffler added at outlet of pump for Apollo 14 and subsequent spacecraft.	Apollo 9 Apollo 10	MSC-00126
31	Heater light on oxygen purge system did not come on.	GFE	Unknown. Failure could not be duplicated in postflight tests.	None. Operation without heaters acceptable.	Apollo 10	MSC-00126
32	Recording of LM low-bit rate PCM data in CM ceased before all data received.	CSM-106	CM communications reconfigured from voice and data mode to ranging before completion of dump.	None.	Apollo 10	MSC-00126
33	Yaw-rate gyro output error.	LM-4	Most probably caused by static friction from contamination that may have been introduced during rebuilding.	Apollo 11 gyro history analyzed and no discrepancies found.	Apollo 10	MSC-00126

APOLLO 10

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
34	Instrumentation discrepancies:	LM-4			Apollo 10	MSC-00126
	a. RCS chamber pressure switches failed closed.		a. Probably caused by residue under switch diaphragms.	a. None.		
	b. Indicated glycol temperature was zero when pump switch was in pump 2 position.		b. Possible broken jumper across pump switch contacts, or incomplete contact in pump 2 switch position.	b. None.		
	c. RCS manifold pressure indications erroneous.		c. Possible defective connections and calibration shifts.	c. Critical measurements to be instrumented with improved transducer on Apollo 15 and subsequent spacecraft.		
	d. Temperature measurement of thermal shield for radioisotope thermoelectric generator cask incorrect.		d. Probable broken wire, failed transducer, or baroswitch failure.	d. Instrumentation wiring to be checked after final installation.		
	e. Descent oxidizer tank ullage pressure indication in cabin was zero prior to descent engine firing.		e. Probably faulty transducer or wiring between transducer and cabin display.	e. None.		
35	Cabin pressure dropped rapidly after LM jettison.	LM-4	Hatch latch failed because tunnel could not be vented prior to jettison (see item 15).	None required.	Apollo 10	MSC-00126
36	Unexpected carbon dioxide levels in cabin.	LM-4	Probable greater-than-predicted lithium hydroxide cartridge performance variations.	Predictions to be modeled around more realistic operational characteristics.	Apollo 10	MSC-00126
37	Large attitude excursions occurred at staging.	LM-4	Abort guidance mode control switch was inadvertently cycled, followed by an incorrect output of the yaw rate gyro. In reacting to yaw rate gyro problem, the guidance mode control switch was transferred to AUTO, resulting in high rates.	Crew briefing.	Apollo 10	MSC-00126
38	Master alarm and ascent propellant low-level indication during first ascent engine firing.	LM-4	Sensor uncovered by gas bubble.	None. Propellants will be settled when ascending from lunar surface.	Apollo 10	MSC-00126
39	LM 70-mm camera stopped.	GFE	Film was binding in magazine because of damaged film advance mechanism. Drive motor became overloaded and failed.	Preflight inspection to be improved. Fuse to be changed from 1.6 amp to 1.2 amp.	Apollo 10	MSC-00126
40	LM 16-mm camera failed to operate with one magazine.	GFE	Marginal clearance between camera and magazine required extra care to obtain proper alignment.	Magazines to be checked for proper clearances.	Apollo 10	MSC-00126
41	CM 16-mm camera ceased to operate in pulse mode.	GFE	Magazine interlock microswitch failed.	High reliability switches installed in cameras for Apollo 11 and subsequent missions.	Apollo 10	MSC-00126

APOLLO 11

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
1	Nitrogen pressure decayed in secondary service propulsion engine actuation system.	CSM-107	Leakage due to contamination induced failure of solenoid control valve.	Filters installed in Apollo 12 and subsequent spacecraft. Nitrogen facility cleanliness more closely controlled.	Apollo 11	MSC-00171
2	Heater element in oxygen tank 2 inoperative.	CSM-107	Probable open on terminal board in heater circuit. Inoperative condition existed during countdown.	Launch site test requirements changed to specify amperage level to verify that both tank heaters are operational.	Apollo 11	MSC-00171
3	Automatic coil of CM RCS minus yaw engine valve responded erratically to firing commands.	CSM-107	Intermittent terminal board connection.	Records researched and no questionable terminal boards used in critical circuits on subsequent spacecraft.	Apollo 11	MSC-00171
4	Electroluminescent segment on EMS numeric display was inoperative.	CSM-107	Probable short due to punctured insulation.	Insure that remaining units have properly routed wires.	Apollo 7 Apollo 8 Apollo 9 Apollo 10 Apollo 11	MSC-00171 MSC-02417
5	Oxygen flow rate master alarms during initial LM pressurization.	CSM-107	Probable faulty capacitor in alarm circuit.	None. No previous failure history of capacitors.	Apollo 11	MSC-00171
6	Propellant isolation valves closed at CSM/S-IVB separation.	CSM-107	Pyrotechnic shock.	None required other than procedures stated for Apollo 9.	Apollo 9 Apollo 11 Apollo 12 Apollo 14 Apollo 15	MSC-00171
7	Peculiar odor in docking tunnel.	CSM-107	Odor resembled burned wire insulation; however, it was probably caused by outgassing from hatch ablator material. (Higher ablator temperatures may have been experienced because of removal of hatch outer insulation.)	Brief crews.	Apollo 11	MSC-00171
8	Indication of oxygen flow rate was lower than normal.	CSM-107	Transducer negatively biased because of change in heater resistance within flow sensor bridge.	None.	Apollo 11	MSC-00171
9	Tie-wrap knots became untied on forward heat shield mortar umbilical lanyard.	CSM-107	Knots improperly tied.	More detailed procedure developed. All subsequent spacecraft reworked.	Apollo 11	MSC-00171
10	Primary water/glycol evaporator outlet temperature did not stay within normal limits.	CSM-107	A bearing assembly on the worm gear shaft of the temperature control valve actuator failed.	None required. Valve can be manually set.	Apollo 11 Apollo 16	MSC-00171 MSC-03460
11	Service module did not skip out of earth's atmosphere.	CSM-107	Thruster firing times were not optimized for propellant sloshing effects.	Jettison control sequence modified for Apollo 13 and subsequent vehicles.	Apollo 8 Apollo 10 Apollo 11	MSC-00171 MSC-03466
12	Fuel cell 2 exit temperature periodically disturbed.	CSM-107	Probable condenser water retention and periodic release. Not detrimental.	Procedures developed to damp oscillations if they occur.	Apollo 7 Apollo 8 Apollo 9 Apollo 10 Apollo 11	MSC-02426

APOLLO 11

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
13	Mission timer stopped.	LM-5	Probable cracked solder joint associated with cordwood assembly of electrical components.	New timers using integrated circuits and other design changes to be incorporated when available.	Apollo 11 Apollo 12 Apollo 15	MSC-00171
14	Fuel in the descent propulsion system fuel/helium heat exchanger was frozen by helium flowing through the heat exchanger, causing high fuel line pressure when heat soaked back from the engine after landing.	LM-5	Simultaneous venting of propellant and supercritical helium tanks.	Helium solenoid valve to be closed prior to fuel venting and opened some time later.	Apollo 11	MSC-00171
15	Cabin indication of carbon dioxide partial pressure high after ascent.	LM-5	Condensate got into sensor causing erroneous indications.	Drain tank vent line relocated on Apollo 13 and subsequent spacecraft.	Apollo 11	MSC-00171
16	Communications difficult to maintain using steerable antenna.	LM-5	Vehicle blockage and multipath interference.	Operational procedures to be changed to minimize vehicle blockage and multipath conditions.	Apollo 11 Apollo 12 Apollo 14 Apollo 15	MSC-00171
17	Computer alarms occurred during descent.	LM-5	Executive overflow alarms, caused by automatic multiple rescheduling of the same job. The multiple rescheduling was caused by counter interrupts from the rendezvous radar coupling data unit.	Rendezvous radar coupling data unit counter interrupts not processed using Luminary 1B program on subsequent missions. Not as much computer time required for descent monitoring.	Apollo 11	MSC-00171
18	Cabin depressurization time longer than expected.	LM-5	Depressurization through bacteria filter required more time than predicted.	Bacteria filter not used on Apollo 12 and subsequent spacecraft, reducing decompression time.	Apollo 11	MSC-00171
19	Electroluminescent segment on abort guidance system entry and display assembly was inoperative.	LM-5	Probable component or wiring failure.	More comprehensive prelaunch testing required.	Apollo 11	MSC-00171
20	Breakup of voice transmission occurred during extravehicular activity.	LM-5	Probable inadvertent low setting of sensitivity control.	Brief crews.	Apollo 11	MSC-00171
21	Echo received during uplink voice transmissions.	LM-5/MSFN	Inherent in communications system.	Downlink voice inhibited during periods of uplink voice transmission.	Apollo 11	MSC-00171
22	Data storage electronics assembly did not record properly.	LM-5	Probable open in timing signal return line and voice signal line.	Wire harness at connector wrapped with tape to prevent flexure damage on Apollo 12 and subsequent spacecraft.	Apollo 11	MSC-00171
23	Knob on engine arm circuit breaker was broken.	LM-5	Knob was probably broken by impact of oxygen purge system during EVA preparations.	Circuit breaker guards installed on Apollo 12 and subsequent spacecraft.	Apollo 11	MSC-00171
24	Thrust chamber pressure switch had slow response to jet driver commands.	LM-5	Probable particulate contamination in switch inlet passage.	Brief crews to recognize and handle similar problems.	Apollo 11	MSC-00171

APOLLO 11

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
25	Water entered suit through suit half vent duct.	LM-5	Probable leakage through water separator selector valve.	Allowable valve actuation force lowered and inspection for linkage binding incorporated into factory and launch site procedures.	Apollo 11	MSC-00171
26	Reaction control system warning flags observed for three engine pairs.	LM-5	Probable erroneous caution and warning system or display flag operation caused by interruption of 28 Vdc supply or oscillator failure.	None. No history of similar failures.	Apollo 11	MSC-00171
27	Lunar surface television camera cable retained coiled shape.	GFE	Memory is inherent characteristic of cable.	Deployment geometry to be changed.	Apollo 11	MSC-00171
28	Mating electrical connectors from remote control unit to portable life support system was difficult.	GFE	Male connector could not be firmly grasped and aligned.	Male connector redesigned.	Apollo 11	MSC-00171
29	Closing of sample return containers was difficult.	GFE	Flight containers had not been subjected to repeated closings as had the training containers, and lubricant had been removed from latch linkage during cleaning.	Lubricant burnished on after cleaning.	Apollo 11	MSC-00171

APOLLO 12

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
1	Display/keyboard malfunctioned prior to launch - displayed all 8's.	CSM-108	Probable relay contamination.	Fabrication process improved to minimize contamination, screening procedures improved, and malfunction procedure developed to clear condition.	Apollo 12	MSC-01855
2	Hydrogen tank 2 heat leak prior to launch.	CSM-108	Incomplete bond in stainless steel/titanium bimetallic joint.	Apollo 12 tank was removed and replaced. Tanks from lots suspected of having poor quality joints recalled for replacement of joints.	Apollo 12 Apollo 16	MSC-01855
3	Lightning struck spacecraft and launch vehicle resulting in: a. Loss of nine instrumentation measurements. b. Loss of inertial platform reference. c. Disconnection of fuel cells.	CSM-108	Vehicle launched during thunderstorm.	Launch rules changed to specify allowable meteorological conditions. Programming change made to inhibit activation of platform coarse-align mode during launch.	Apollo 12	MSC-01855 MSC-01540 MSC-04112 (Supplement 8)
4	Stabilization and control system circuit breaker was open during postinsertion checks.	CSM-108	Breaker was probably not set during prelaunch checks.	Checks to be made more carefully.	Apollo 12	MSC-01855
5	Propellant and helium isolation valves closed at CSM/S-IVB separation.	CSM-108	Pyrotechnic shock.	Maintain use of procedures developed to verify position of valves.	Apollo 9 Apollo 11 Apollo 12 Apollo 14 Apollo 15	MSC-01855

APOLLO 12

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
6	Operation of S-band high gain antenna in narrow-beam mode resulted in low signal strength on several occasions.	CSM-108	Probable failure of dual diplexer or narrow-beam comparitor component.	Phase III antenna stripline units used on Apollo 13 and subsequent spacecraft.	Apollo 12 Apollo 13 Apollo 14 Apollo 16	MSC-01855
7	Discrepancy in actual (measured) and calculated oxygen usage.	CSM-108	Leakage from 900-psi oxygen system within service module.	None. Preflight tests considered adequate.	Apollo 12	MSC-01855
8	LM crew saw strap-like material in vicinity of SM/SLA interface just prior to docking.	CSM-108	Material was similar to loose pieces shown on Apollo 10 photos.	None. Condition considered not detrimental.	Apollo 12	MSC-01855
9	Angular position of optics shaft fluctuated in zero optics mode.	CSM-108	Possible motor drive amplifier module malfunction.	None. No evidence of generic problem or design deficiency.	Apollo 12 Apollo 13	MSC-01855
10	Windows were contaminated.	CSM-108	Rain water, residue from launch escape system engine, and outgassing of silicone oils from window seals (hatch only).	For Apollo 13 and subsequent spacecraft: a. Seals added to boost protective cover to prevent rain water leakage. b. Hatch window cavity purge prior to flight. c. Insulation material removed from between inner and outer hatch windows.	Apollo 7 Apollo 8 Apollo 12	MSC-01855
11	VHF recovery antenna 2 did not deploy properly.	CSM-108	Adhesive substance probably held protective flap over ground plane radials.	Clarify installation instructions to assure removal of adhesives and proper deployment of radials.	Apollo 12	MSC-01855
12	Command module RCS oxidizer isolation valve would not remain closed during postflight operations.	CSM-108	Damaged bellows, probably resulting from pressurization of system with isolation valves closed.	Brief crews.	Apollo 7 Apollo 12	MSC-01855
13	Retention bracket for oxygen hose came loose during landing.	CSM-108	Bracket not properly bonded to panel.	Manufacturing requirements to include torque testing of bracket.	Apollo 12	MSC-01855
14	Food preparation unit leaked after hot water dispensed.	CSM-108	Two valve O-rings damaged from particle contamination.	Check valves for leakage when water temperature is 150° F.	Apollo 12 Apollo 14	MSC-01855
15	Forward heat shield mortar umbilical lanyard was severed.	CSM-108	Probably broken by drogue steel cable riser when drogue was deployed.	None. Lanyard function complete before drogue deployment.	Apollo 12	MSC-01855
16	Instrumentation discrepancies:	CSM-108				MSC-01855
	a. RCS quad D helium manifold pressure indications erroneous.		a. Probable weakening of strain gage bonding.	a. None. Measurement not necessary for flight.	Apollo 12	
	b. Suit pressure transducer indicated low.		b. Transducer internally contaminated with nickel-plating particles.	b. None. Problem considered to be isolated occurrence.	Apollo 12 Apollo 13	
	c. Potable water quantity data erratic.		c. Stain found on potentiometer resistance wafer. No evidence of moisture or urine contamination of measuring system components as on Apollo 8.	c. None. Alternate methods available for determining water quantity.	Apollo 8 Apollo 12 Apollo 13	
	d. Fuel cell 3 regulated hydrogen pressure decayed.		d. Probable leak in pressure transducer diaphragm.	d. None.	Apollo 12	

APOLLO 12

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
17	Panel 2 mission clock tuning fork display operated intermittently and clock had cracks in face glass.	CSM-108	Probable cracked solder joint associated with cordwood construction. Manufacturing process induces stress into glass.	New mission timers developed for Apollo 13 and subsequent spacecraft. Clear pressure-sensitive tape placed over glass.	Apollo 7 Apollo 11 Apollo 12 Apollo 15	MSC-01855
18	VHF communications between CSM and LM during ascent and rendezvous were unreadable.	CSM-108	Improper squelch sensitivity setting in CM. Improper use of lightweight headset in CM.	Brief crews and use communications carrier headsets during critical mission phases.	Apollo 12	MSC-01855
19	Docking hatch floodlight switch did not operate properly.	LM-6	Insufficient plunger travel.	Plunger travel increased.	Apollo 12	MSC-01855
20	Water came out of suit inlet hoses.	LM-6	Water bypassed water separator because of excessive water separator speed.	Water separator speed reduced by adding flow limitor to primary lithium hydroxide canister for Apollo 13 and subsequent spacecraft.	Apollo 12	MSC-01855
21	Cabin indication of carbon dioxide partial pressure erratic.	LM-6	Probably caused by water entering sensor.	Water separator sump tank vent line rerouted for Apollo 13 and subsequent spacecraft.	Apollo 11 Apollo 12	MSC-01855
22	Tracking light failed.	LM-6	Corona in high-voltage section of light resulting from high temperatures degrading potting compound.	Tracking light redesigned for Apollo 13 and subsequent spacecraft.	Apollo 9 Apollo 12	MSC-01855
23	MESA handle could not be released from support bracket.	LM-6	D-ring stuck in retention socket because of binding of ball detent or pulling D-ring at an angle.	D-ring eliminated, and loop clamped to end of deployment cable for Apollo 13 and subsequent spacecraft.	Apollo 12	MSC-01855
24	Hatch thermal shield torn, causing potential hazard to suit.	LM-6	PLSS snagged on shield during crewman egress.	Shield thickness increased and diameter of shield mounting holes increased.	Apollo 12	MSC-01855
25	Low-level descent propellant quantity light illuminated early.	LM-6	Low-level point sensor uncovered by propellant sloshing.	Sampling rate increased and data averaged automatically for Apollo 13 and subsequent spacecraft.	Apollo 12	MSC-01855
26	Lunar surface color television camera failed.	GFE	Image sensor was exposed to extreme light level, damaging a portion of the target.	Crew training and operational procedures changed.	Apollo 12	MSC-01855
27	16-mm camera operated intermittently during ascent.	GFE	Intermittent actuation of magazine interlock microswitch contacts.	Design of interlock switch actuation mechanism changed.	Apollo 12	MSC-01855
28	Fuel capsule for radioisotope thermoelectric generator was difficult to remove from cask assembly.	ALSEP	Binding between the contact surface of fuel capsule backplate and the latch on the cask.	Fuel capsule backplates reworked to increase clearance for Apollo 13 and subsequent missions.	Apollo 12	MSC-01855
29	Thermal shroud on passive seismic experiment would not lie flat and laminations separated.	ALSEP	Effect of 1/6-gravity greater than expected.	Laminations spot-sewed and weights added.	Apollo 12	MSC-01855
30	Cold-cathode ion gage would not remain upright.	ALSEP	Cable stiffness and effects of 1/6-gravity.	Different experiment configuration used for Apollo 13. For subsequent missions, cable wrap removed to reduce cable stiffness.	Apollo 12 Apollo 14	MSC-01855

APOLLO 12

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
31	Empty collection bag tended to come loose from tool carrier.	GFE	Single spring clip on right-hand bag was not adequate for bag retention.	Double spring clip to be added for Apollo 13.	Apollo 12	MSC-01855
32	Frame counting on CM 70-mm camera did not agree with crew count.	GFE	Magazine was inadvertently opened allowing film holder to come out. This resulted in improper film transport.	Film release knob taped after magazine loading and crews briefed.	Apollo 12	MSC-01855
33	Suit pressure pulses were felt by LMP during extravehicular activity.	GFE	No evidence of system malfunction.	None.	Apollo 12	MSC-01855
34	Exposure counter on lunar surface close-up camera did not always count.	GFE	Temperature exceeded mechanical interference point of counter.	Camera handle painted white (counter is housed in handle).	Apollo 12	MSC-01855
35	Shutter, counter and film advance actions of 70-mm lunar surface camera were intermittent.	GFE	Loose handle and trigger assembly.	Thumb wheel secured by star washer and roll pin instead of spring washer and set screw.	Apollo 12	MSC-01855
36	EVA communications degraded by tone and noise.	GFE	Tone caused by interference from fan motor when microphone amplifier supply voltage was below regulator threshold of 12.5 volts. Random noise may have been caused by intermittent open in primary winding of amplifier transformer.	Brief crew and improve quality control.	Apollo 12	MSC-01855
37	Weigh bags cracked and tore when handled on lunar surface, and when used for tote bags, samples bounced out.	GFE	Material (Teflon film) was too brittle and covers were not provided.	Containers made of Teflon cloth for Apollo 13 and subsequent. Collection containers provided with means of closing for Apollo 14 and subsequent.	Apollo 12	MSC-01855

APOLLO 13

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
1	Cryogenic oxygen tank 2 lost pressure.	CSM-109	A fire which was started by electrical short-circuits in the wiring to the fan motors inside the tank led to structural failure of the tank.	The tank design was changed, a third cryogenic oxygen tank was added, an isolation valve for tank 3 was added, and an auxiliary battery was installed on Apollo 14 and subsequent spacecraft.	Apollo 13	MSC-02680 MSC-02545
2	Postlanding vent valve malfunctioned during postlanding activities (exhaust valve open - inlet valve closed).	CSM-109	Power was applied to the valves when the valve unlock handle was pulled partially out.	Caution note was added to AOH to insure that handle is moved its full travel before switching on postlanding vent fan.	Apollo 13	MSC-02680
3	Optics shaft angle fluctuated in zero optics mode.	CSM-109	Probable cause was resistance between brushes and slip rings on half-speed resolver due to vacuum and zero-g.	The only effect is system readout when optics are not in use. Shaft movement "wipes away" resistance. Crews briefed.	Apollo 12 Apollo 13	MSC-02680

APOLLO 13

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
4	Difficulty was experienced in obtaining high-gain antenna acquisition and tracking.	CSM-109	Probable short in primary winding of C-axis induction potentiometer resulting in shift of scan limit and scan limit warning functions.	Launch site tests added to ensure proper functions prior to flight. Procedure developed to determine acceptable spacecraft attitudes in the event of a similar failure on subsequent flights.	Apollo 12 Apollo 13 Apollo 14 Apollo 16	MSC-02680 MSC-03753
5	Entry monitor system 0.05g light did not illuminate at proper time.	CSM-109	Condition could not be duplicated in postflight testing. Possible procedural error or momentary failure.	None.	Apollo 13 Apollo 14	MSC-02680
6	Gas leaked from gusset-4 breech assembly in forward heat shield jettisoning system and burned hole in gusset cover plate.	CSM-109	Possible out-of tolerance parts or improper assembly.	Assembly procedures improved and thermal barrier added to breech-plenum assembly.	Apollo 13	MSC-02680
7	RCS fuel isolation valve was found open during postflight inspection.	CSM-109	Valve was miswired. Preflight functional checks did not reveal discrepancy.	Resistance checks to be performed in addition to functional checks on Apollo 14 and subsequent spacecraft.	Apollo 13	MSC-02680
8	Potable water quantity measurement fluctuated.	CSM-109	Probable erratic operation of transducer. Specific evidence of contamination or corrosion could not be found.	None required. Water quantity can be determined with acceptable accuracy by other means.	Apollo 8 Apollo 12 Apollo 13	MSC-02680
9	Suit pressure measurement was erratic.	CSM-109	Transducer probably contaminated by nickel particles.	Apollo 14 cabin pressure transducer disassembled and cleaned. Both suit and cabin transducers disassembled and cleaned for Apollo 15 and subsequent spacecraft.	Apollo 12	MSC-02680
10	Electrical circuit interrupter leaked gas when it operated prior to CM/SM separation.	CSM-109	O-ring displacement greater than normal. Not detrimental.	None required.	Apollo 13	MSC-02680
11	Supercritical helium pressure rise rate was greater than expected during CDDT.	LM-7	Probable degradation of tank insulation due to annular vacuum contamination.	Screening test was added to supplement normal testing for Apollo 14, 15 and 16 tanks. For new tanks, gasses removed from vacuum jacket periodically analyzed for contaminants during manufacturing.	Apollo 13	MSC-02680
12	The crew heard a "thumping" noise and saw snowflakes venting from quadrant 4 during trans-earth flight.	LM-7	Probable electrolyte leakage in battery 2 resulting in the battery lid being blown off.	Descent batteries, ascent batteries, new service module battery, and lunar surface drill battery were modified for Apollo 14 and subsequent missions. The design of other Apollo batteries was considered safe.	Apollo 13 Apollo 14	MSC-02680
13	Descent battery 2 malfunction light illuminated.	LM-7	False indication. Temperature switch wires possibly shorted to ground by electrolyte, or auxiliary relay possibly contaminated in electrical control assembly.	Corrective action taken to prevent electrolyte leakage (see item 12).	Apollo 13	MSC-02680

APOLLO 13

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
14	Pressure in ascent stage oxygen tank 2 increased, indicating reverse leakage from manifold into tank.	LM-7	Shutoff valve leaked, probably caused by O-ring damage during assembly or contaminated valve seat. Leak tests were inadequate.	Valves tested for both forward and reverse leakage at high and low pressures.	Apollo 13	MSC-02680
15	Left-hand window shade was cracked.	LM-7	Aclar covering was not sufficiently ductile.	Shades fabricated from improved Aclar and reinforced with Mylar before stitching.	Apollo 13	MSC-02680
16	Bumper separated from 10-mm lens of lunar module 16-mm camera.	GFE	Insufficient friction between mating surfaces.	Mating surface of bumper swaged.	Apollo 13	MSC-02680
17	Set knob came off of interval timer.	GFE	Gripping compound used to secure set screw did not provide sufficient retention force.	Knob secured with roll pin.	Apollo 13	MSC-02680
18	Nasal spray bottles were difficult to use.	GFE	Packaging did not permit satisfactory operation in flight	Packaging method changed.	Apollo 13	MSC-02680

APOLLO 14

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
1	Six attempts were required to achieve docking probe capture latch engagement during translunar docking.	CSM-110	Most probably, either foreign material interfered with the operation of the capture latch mechanism, or the translation cam jammed.	Several changes were made to prevent foreign material from getting into the probe mechanism, including a cover to be used prior to flight. Also, the translation cam assembly was modified and tests were added.	Apollo 14	MSC-04112 MSC-05101
2	High-gain antenna tracking was difficult several times during translunar coast and lunar orbit.	CSM-110	A five- to eight-degree boresight shift of wide beam was possibly caused by faulty coaxial cable connector or shock from SLA separation.	Connectors reworked and inspection procedures tightened. Thermal acceptance test performed while antenna radiating and under operating conditions.	Apollo 12 Apollo 13 Apollo 14 Apollo 16	MSC-04112
3	Urine dump nozzle was obstructed several times during mission.	CSM-110	Freezing of nozzle probably caused obstruction. Differen purge and dry procedures and colder nozzle conditions could have caused freezing.	Procedural changes.	Apollo 14	MSC-04112
4	VHF communications between CSM and LM were degraded prior to lunar lift-off and during rendezvous.	CSM-110 LM-8	System operating near range limits.	Receiver AGC measurements added to CSM and LM to study problem. Crew training expanded to include effects of weak signal strengths.	Apollo 14	MSC-04112
5	Entry monitor system 0.05g light did not illuminate at proper time.	CSM-110	Crew's view of light was obstructed by neutral density filter.	Clear glass simulator filter replaced with silvered flight unit. Filter repositioned for entry on subsequent flights.	Apollo 13 Apollo 14	MSC-04112

APOLLO 14

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
6	Main bus A remained energized when main bus-tie switches were placed in the "off" position at 800 feet.	CSM-110	Motor-driven switch did not operate because motor stalled as a result of contamination of commutator.	Switch response time checked for Apollo 15 and subsequent spacecraft, and bad switches replaced if necessary.	Apollo 14	MSC-04112 MSC-05242
7	Main bus B - battery C circuit breaker contact was intermittent.	CSM-110	Contacts did not make because of glass particles on contact surface.	None required.	Apollo 14	MSC-04112 MSC-05814
8	Food preparation unit leaked momentarily after hot water was dispensed.	CSM-110	Stroke time of valve assembly was slow because of dimensional interference between the cylinder and piston at higher temperatures.	Hot water explusion tests conducted on Apollo 15 and subsequent spacecraft.	Apollo 12 Apollo 14	MSC-04112 MSC-04751
9	Rapid repressurization system required recharging in addition to normal rechargings.	CSM-110	Fill valve was closed before system was fully charged. Leakage rate was not excessive.	Crews briefed on recharging techniques for other-than-normal rechargings.	Apollo 14	MSC-04112
10	Ascent battery 5 voltage decreased.	LM-8	Possible short between plates of battery cell, short from cell to case, or external battery load.	Stricter inspection and improved procedures used for plug installation and assembly of cell plates. Test added at launch site to measure parasitic loads prior to battery installation.	Apollo 12 Apollo 14	MSC-04112 MSC-05257
11	Abort command was set in computer although abort switch had not been depressed.	LM-8	Probable metallic contamination within abort switch module.	All switches of this type replaced with switches screened by X-ray and vibration. Circuit modified to eliminate single-point failures. Primary guidance computer software modified.	Apollo 14	MSC-04112
12	S-band steerable antenna operation was intermittent.	LM-8	Undetermined.	Incidental amplitude modulation of uplink signal minimized for Apollo 15 and subsequent missions.	Apollo 11 Apollo 14 Apollo 15	MSC-00171 MSC-04112 MSC-07505
13	Landing radar system switched scales and initial slant range indication was high.	LM-8	Switching to low-scale range was caused by turning on radar too soon. Initial slant range reading was caused by side lobe lock-on.	Wiring modification made to enable holding system in high-scale while in antenna position 1. Low-scale switching enabled in position 2. Position 2 automatically selected at high gate.	Apollo 14	MSC-04112
14	Abort guidance system failed during rendezvous braking phase.	LM-8	Failure could have been caused by any of 27 components in the +4-volt logic power supply, the sequencer, or the interconnections between the two modules.	Design, manufacturing, testing and installation methods considered adequate. No corrective action required.	Apollo 14	MSC-04112
15	Glass cracked on data entry and display assembly.	LM-8	Possible internal stress in glass, improper mounting, or glass was inadvertently hit.	Clear plastic tape applied to glass similar to mission timer windows.	Apollo 14	MSC-04112
16	Lunar topographic camera malfunctioned.	GFE	Transistor in shutter control circuit was shorted, causing continuous shutter operation and tearing sprocket holes in shutter curtain.	None. Screening and tests considered adequate.	Apollo 14	MSC-04112

APOLLO 14

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
17	Lunar Module Pilot's right glove pulled to the left and down during the second EVA.	GFE	Glove wrist-control cable system design inherently allows glove to take various neutral positions.	None.	Apollo 14	MSC-04112
18	Intervalometer double-cycling occurred 13 times out of 283 exposures.	GFE	Intervalometer responded to random pulses from motor current.	None. Condition does not degrade photography.	Apollo 14	MSC-04112
19	Communications with Commander were intermittent.	GFE	Condition was corrected when constant wear garment electrical adapter was replaced with spare unit. No abnormalities found postflight.	None.	Apollo 14	MSC-04112
20	Active seismic experiment thumper misfired five times.	ALSEP	Selector switch dial may not have been held in position by detent, and firing switch may have been contaminated by dust.	Detent mechanism redesigned and dust protection added.	Apollo 14	MSC-04112
21	Transmission of operate-select command to suprathermal ion detector resulted in noisy data from three experiments.	ALSEP	Probable arcing or corona within suprathermal ion detector equipment prior to dust cover removal.	Operation prior to dust cover removal limited to minimum "on" time for Apollo 15 (last mission for experiment).	Apollo 14	MSC-04112
22	Lunar portable magnetometer cable was difficult to rewind.	ALSEP	No provision for locking reel during rewind. Gripping reel and crank was difficult with gloved hand.	Ratchet and pawl locking device, and better grip for reel and crank added for Apollo 16 (not carried on Apollo 15).	Apollo 14	MSC-04112
23	Central station 12-hour timer pulses did not occur after initial activation.	ALSEP	Mechanical section of timer did not drive switches. Loss of timer has no adverse effect on experiments.	Solid-state timer used for Apollo 15 and subsequent missions.	Apollo 12 Apollo 14	MSC-04112
24	Y-axis leveling of passive seismic experiment was intermittent.	ALSEP	Probable intermittent operation of a component in the motor control circuit.	None.	Apollo 14	MSC-04112
25	Long-period vertical seismometer of passive seismic experiment was unstable when operated with the feedback filter in.	ALSEP	Unknown.	None. Satisfactory data obtained by operating experiment in filter-out mode.	Apollo 14	MSC-04112
26	Active seismic experiment geophone 3 data showed intermittent spikes to off-scale high during high-bit-rate listening mode.	ALSEP	Probable open in positive-going diode-wired transistor in the logarithmic compressor for geophone 3.	None.	Apollo 14	MSC-04112 MSC-07638
27	Suprathermal ion detector data was intermittently erroneous.	ALSEP	Probable intermittent component or wire connection resulting in an intermittent failure of the start reset pulse for the positive log A/D converter control logic.	None. Apollo 15 is last mission for experiment.	Apollo 14	MSC-04112
28	Charged particle lunar environment experiment analyzer B data lost.	ALSEP	Probable short to ground in the analyzer B power supply filter, the analyzer, or the interconnections between the two.	None. Experiment was not carried after Apollo 14.	Apollo 14	MSC-04112

APOLLO 15

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
1	Service module reaction control system propellant isolation valves closed.	CSM-112	Latching magnets may have been partially degaussed during preflight tests by application of reverse voltage to coils.	Magnetic latching force tests performed prior to flight for Apollo 16 and subsequent spacecraft.	Apollo 9 Apollo 11 Apollo 12 Apollo 14 Apollo 15	MSC-05161
2	Water panel chlorine injection port leaked.	CSM-112	Insufficient septum compression. Septum retention insert was loosened when cap was removed.	Shim added under insert shoulder and installation torque increased for Apollo 16 and subsequent spacecraft.	Apollo 15	MSC-05161
3	Service propulsion system thrust light illuminated when no engine firing command was present.	CSM-112	Loose strand of wire within delta-V thrust switch probably caused a short to ground	New screening procedures used for critical switches on Apollo 16 and subsequent spacecraft.	Apollo 15	MSC-05161
4	Integral lighting circuit breaker opened.	CSM-112	Input filter capacitor in lower-equipment-bay mission timer was shorted.	Fuses added to units for Apollo 16 and 17 spacecraft.	Apollo 15	MSC-05161
5	Battery relay bus voltage reading was low (13.66 volts versus 32 volts).	CSM-112	Instrumentation problem. Exact cause not determined.	None. Isolated case and other measurements available.	Apollo 15	MSC-05161
6	Mass spectrometer boom did not fully retract on five of twelve occasions.	CSM-112	Cable probably jammed in boom housing during retraction.	The following changes were made for Apollo 16: 1. The mechanism was modified. 2. A proximity switch was added to indicate retraction to within 1-foot of full retraction. 3. A thermal-vacuum test was added.	Apollo 15 Apollo 16	MSC-05161
7	Potable water tank failed to refill.	CSM-112	Check valve between fuel cell and waste tank dump leg leaked. A small piece of wire was found between polymer umbrella and seating surface.	None. Isolated case. If problem recurs, potable water tank will fill when waste water tank is full.	Apollo 15	MSC-05161
8	Panel 2 mission timer stopped.	CSM-112	Probable intermittent component which healed itself.	None. Time can be obtained from other timer or Mission Control Center.	Apollo 11 Apollo 12 Apollo 15	MSC-05161
9	One main parachute collapsed at 6000 feet altitude.	CSM-112	Raw fuel expelled during depletion firing became ignited and damaged the parachute riser and suspension lines.	Propellant load biased to provide slight excess of oxidizer. Propellant depletion firing eliminated. Suspension line connector link material changed.	Apollo 4 Apollo 15 Apollo 16	MSC-05161 MSC-05805
10	Data recorder tape deteriorated.	CSM-112	Scratched recorder heads damaged tape.	Removable head covers provided to prevent handling damage during installation.	Apollo 15	MSC-05161
11	Seconds digit of digital event timer became obscured.	CSM-112	Elongation of idler gear bearing points allowed shaft to tilt and caused gear to scrape paint from number wheel.	Units inspected visually for signs of wear and paint flakes.	Apollo 10 Apollo 15 Apollo 16	MSC-05161
12	Crew restraint harness came apart on center and right couches.	CSM-112	Plug-and-cap assemblies that attach restraint harnesses to couch seat came apart.	Thread locking sealant used to prevent unscrewing of plug and cap.	Apollo 15	MSC-05161

APOLLO 15

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
13	Loose object was striking blades of cabin fan.	CSM-112	A 1/4-inch washer was found in the ducting after the flight. The washer could have drifted in and out of the fan outlet during flight.	None. No detrimental effects.	Apollo 8 Apollo 15 Apollo 16	MSC-05161
14	Visability through scanning telescope was not adequate to identify constellations.	CSM-112	Condensation was probably present on the eyepiece window and on prisms in the removable eyepiece.	Heater was added to removable eyepiece.	Apollo 15	MSC-05161
15	Roll axis did not align properly when gyro display alignment pushbutton was pressed.	CSM-112	Possible contamination between slip-rings and thumb wheel resolvers in attitude set control panel, or contamination of either of two "golden-g" relays in gyro display coupler.	Attitude set control panel resolvers wiped clean by rotating them, or replaced if necessary. Gyro display coupler and electronic display assembly replaced on Apollo 16 as a result of reevaluation of all devices used in stabilization and control system.	Apollo 15	MSC-05161
16	Circuit breaker supplying main bus A power to battery charger could not be opened manually during postflight testing.	CSM-112	Corrosion on indicator stem prevented operation. Corrosion could have been caused by sea water, urine or sweat.	None.	Apollo 15	MSC-05161
17	Toggle-arm pivot pin for side-A shutoff valve of main oxygen regulator was sheared.	CSM-112	Improper shimming allowed pivot pin to come out of one side of cam holder. Pin failed in single shear and bending.	New inspection criteria developed to assure proper assembly of valves.	Apollo 15	MSC-05161
18	Crew optical alignment sight fell off stowage mount during landing.	CSM-112	Locking pin did not engage because the ramp which moves the pin into the locking position was gouged.	New fit checks used to assure proper operation of latching mechanism. AOH and crew checklists changed to include verification of latching pin engagement.	Apollo 15	MSC-05161
19	Water/glycol pump differential pressure fluctuated after cabin depressurizations for standup EVA and second EVA.	LM-10	Condensation on water/glycol sensing lines froze and sublimed at cabin depressurization. This froze the fluid in the lines, causing the indications.	None. System operation not affected.	Apollo 15	MSC-05161
20	Water separator speed decreased during cabin depressurization for standup EVA.	LM-10	Condensation on outside of line between water separator pitot tube and water management system froze and sublimed at cabin depressurization. This froze the water in the line, causing the separator to slow down because of excessive water.	None. System not damaged from freezing, and other separator can be used.	Apollo 15	MSC-05161
21	Water gun/bacteria filter quick disconnect broke.	LM-10	Improper stowage caused excessive force to be applied to quick disconnect by bending hose.	Plastic parts replaced by steel inserts in all applications of quick disconnect in lunar module and command module.	Apollo 15	MSC-05161
22	Interruption of S-band steerable antenna tracking prior to powered descent.	LM-10	Unexplained.	No additional corrective action taken (see Apollo 14).	Apollo 11 Apollo 12 Apollo 14 Apollo 15	MSC-05161 MSC-07505
23	Descent engine control assembly circuit breaker was open when checked after lunar module separation.	LM-10	Breaker was probably left open by crew.	None.	Apollo 15	MSC-05161

APOLLO 15

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
24	Abort guidance system warnings and master alarms occurred after insertion into lunar orbit and prior to lunar module deorbit.	LM-10	Probably caused by EMI from test mode fail buffer momentarily turning on test mode fail driver. This could have latched the master alarm and abort guidance sytem warning light on.	Low side of input to buffer grounded to suppress noise feedback.	Apollo 15	MSC-05161
25	No line-of-sight rate data on Commander's crosspointers during rendezvous braking.	LM-10	The most probable cause was an open in the rendezvous radar signal return line.	None. All-up thermal/ vacuum test of each spacecraft would be required to detect this type of defect.	Apollo 15	MSC-05161
26	Range/range-rate meter window broke prior to crew ingress.	LM-10	Surface flaw in glass probable existed which was deeper than threshold depth of glass operating stress.	Glass doubler added. Other spacecraft glass applications reviewed and appropriate corrective measures taken where required.	Apollo 15	MSC-05161
27	Panoramic camera velocity/altitude sensor did not provide proper control for camera.	SIM	Problem related to optical signal-to-noise ratio.	Optical signal enhanced by increasing lens aperature and deleting infrared filter. Optical noise reduced. Manual override of velocity/ altitude sensor provided.	Apollo 15	MSC-05161
28	Laser altimeter altitude data became intermittent after revolution 24 and no altitude data were obtained after revolution 38.	SIM	The intermittent condition was caused by a decrease in laser output power. The fault was not determined.	Automatic power compensation circuit added to maintain power output at adequate level. Relay which was source of EMI was removed from remaining flight altimeters.	Apollo 15 Apollo 16	MSC-05161 MSC-07230
29	Mapping camera extension and retraction times were longer than normal and camera would not retract after 15th (last) extension.	SIM	Undetermined.	Dry film lubricant on lead screw replaced with wet film silicone grease and oil mixture. Number of extend/retract operations reduced.	Apollo 15 Apollo 16 Apollo 17	MSC-05161 JSC-07954
30	Gamma ray spectrometer experienced gain shift and temporary spectrum zero reference shift.	SIM	Gain shift caused by aging of photomultiplier tube in gamma ray detector assembly due to high cosmic ray flux rates. Zero shift probably caused by open or short within pulse height analyzer.	Apollo 16 spectrometer aged prior to flight at expected flux rates. No corrective action taken for zero reference shift.	Apollo 15	MSC-05161
31	Lunar surface drilling problems:	ALSEP				
	a. Penetration to full depth with bore stems not achieved.		a. Reduced depth of flutes at joints caused binding of stems.	a. Bore stem joints redesigned to allow continuous flutes.	Apollo 15	MSC-05161
	b. Releasing bore stems from drill adapter was difficult.		b. Lunar soil did not hold bore stem stationary and core stem wrench did not fit bore stems properly.	b. Wrench provided that fits both core stems and bore stems. Bore stem/ drill adapter eliminated.	Apollo 15	MSC-05161
	c. Bore stem damaged near first joint.		c. Up-and-down movement of drill separated first joint.	c. Bore stem joints redesigned.	Apollo 15	MSC-05161
	d. Core stem difficult to remove from drilled hole.		d. Friction from compacted material in flutes.	d. Mechanical extraction device provided.	Apollo 15	MSC-05161
	e. Core stem sections difficult to separate.		e. Holding vise was mounted backward on LRV pallet. Installation drawing in error.	e. Installation drawing corrected.	Apollo 15	MSC-05161

APOLLO 15

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
32	Central station rear curtain retainer removal lanyard broke.	ALSEP	Force required to remove pins was greater than expected.	Lanyard material changed from 50-pound test to 180-pound test.	Apollo 15	MSC-05161
33	Universal handling tool did not lock in place in suprathermal ion detector fitting.	ALSEP	Fitting in awkward position for inserting and locking tool.	None. Last mission for experiment.	Apollo 15	MSC-05161
34	Ground-commanded television could not be elevated as unit approached limits of travel.	GFE	Elastomer clutch facing material degraded under operating conditions.	Clutch design changed and clutch torque increased.	Apollo 15	MSC-05161
35	Lunar communications relay unit downlink signal lost after lunar module ascent.	GFE	Current capacity of 7.5-ampere LRV circuit breaker was degraded because of elevated temperatures.	A 10-ampere circuit breaker was substituted for the 7.5-ampere circuit breaker. A manual switch was added to allow overriding of the LRV circuit breaker after the final EVA. The lunar communications relay unit was modified so that the internal 7.5-ampere circuit breaker is bypassed when operating in the external power mode.	Apollo 15	MSC-05161
36	Lunar surface 16-mm camera magazine jammed.	GFE	Tape on camera caused mismating of magazines and camera. Excessive manual advancement of film depleted film loops.	Crew training improved. Tape flagged for removal.	Apollo 15	MSC-05161
37	Lunar surface 70-mm camera stopped at end of second EVA.	GFE	Two set screws in drive pinion were slipping on motor shaft.	Flats ground on motor shaft. Locking compound used on set screws.	Apollo 15	MSC-05161
38	Water was difficult to obtain from insuit drinking device.	GFE	Devices were not properly positioned within the suits.	Additional crew training given in making position adjustments.	Apollo 15 Apollo 16	MSC-05161
39	Oxygen purge system antenna broke.	GFE	Inadvertent flexure and contact.	Protective cover provided to protect antenna while stowed and during unsuiting. Antenna not deployed until after egress.	Apollo 15 Apollo 16	MSC-05161
40	Retractable tethers failed.	GFE	Spring expanded and jammed after no-load release. Knots untied allowing cord to retract into housing.	Knots changed and crew training improved.	Apollo 15 Apollo 16	MSC-05161
41	Deployment saddle was difficult to release from vehicle.	LRV	Vehicle was tilted, causing stress preloading of vehicle/saddle interface.	Crew training improved.	Apollo 15	MSC-05161
42	Battery 2 volt/ammeter was inoperative.	LRV	Unknown.	None.	Apollo 15	MSC-05161
43	Front steering system was inoperative upon vehicle activation and during first EVA.	LRV	Possible motor/gear train assembly binding.	Flight unit replaced by spare unit and hand-controller-commanded tests run for Apollo 16.	Apollo 15 Apollo 16	MSC-05161 MSC-07230 MSC-07683

APOLLO 15

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
44	Seat belt problems:	LRV				
	a. Belt hooks slipped through handholds when not in use.		a. Belts not sufficiently stiff.	a. Stiffer belts provided.	Apollo 15	MSC-05161
	b. Belts snagged on GSE connector when displaced from proper stowage locations.		b. Belts not sufficiently stiff.	b. Stiffer belts provided.	Apollo 15	MSC-05161
	c. Belts not long enough to secure hooks to outboard handholds easily.		c. Conformance of suits to seated position was not as close as expected.	c. Overcenter tightening mechanism provided.	Apollo 15	MSC-05161

APOLLO 16

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
1	Water/glycol temperature control circuit failed in the automatic mode.	CSM-113	Crack in output silicon-controlled rectifier used in temperature controller caused rectifier to self-gate on and remain on, resulting in secondary failure of feedback capacitor.	All remaining controllers tested for forward breakdown voltage, although test is not conclusive. If problem reoccurs, manual control is satisfactory.	Apollo 11 Apollo 16	MSC-07230 MSC-07598
2	SPS oxidizer tank pressure measurement shifted upward.	CSM-113	Pressure transducer reference cavity leaked.	Transducers replaced after altitude chamber testing vacuum checked prior to installation. Redundant devices added for critical measurements on Apollo 17 and subsequent spacecraft.	Apollo 16	MSC-07230
3	Computer issued gimbal lock indication when no gimbal lock condition existed.	CSM-113	Probably caused by voltage transient from contact bounce of thrust vector enable relay	Filter added across primary of transformer in digital-to-analog converter portion of coupling data unit.	Apollo 16	MSC-07230
4	Inertial subsystem warnings and coupling data unit fail indications occurred during trans-earth flight.	CSM-113	Conductive contaminant in diode located in fail detect circuit of coupling data unit probably caused false indications.	None. No hazard to crew if defect reoccurs in this and other applications of diode in guidance system.	Apollo 16	MSC-07230 MSC-07571
5	Heat leak into hydrogen tank 3 was abnormally high early in mission.	CSM-113	Ambient air probably leaked into insulation vacuum annulus during boost.	None. Preflight procedures and inspection of tanks considered adequate.	Apollo 12 Apollo 16	MSC-07230
6	Spacecraft did not respond to uplink real-time commands twice.	CSM-113	Undetermined.	None. If condition occurs again, normal operation can be restored by cycling up-telemetry command reset switch.	Apollo 9 Apollo 16	MSC-07230
7	Chlorine ampule leaked during one of the daily water system chlorinations.	CSM-113	Teflon bladder was probably pinched between base plate and sidewall of ampule.	Ampules checked for bladder adhesion to sidewall. Entrapped air removed to reduce bladder expansion.	Apollo 16	MSC-07230
8	Mass spectrometer would not fully retract and finally stalled two-thirds out.	CSM-113	Initial stalls were probably caused by jamming of cable in boom housing. Final stall was probably caused by inoperative motor due to previous stalling with motor on.	None. Failure cause not applicable to Apollo 17 and subsequent spacecraft.	Apollo 15 Apollo 16	MSC-07230

APOLLO 16

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
9	Gamma ray spectrometer boom would not fully retract.	CSM-113	Cable probably jammed in boom housing during retraction.	None. Failure cause not applicable to Apollo 17 and subsequent spacecraft.	Apollo 15 Apollo 16	MSC-07230
10	Oscillations of service propulsion engine gimbal yaw actuator occurred when secondary servo loop was selected.	CSM-113	Open in rate feedback loop of secondary yaw servo system. Open was possibly caused by cable flexing.	Routing of cable harness to actuator assembly changed to provide strain relief and prevent flexing.	Apollo 16	MSC-07230
11	Cabin fans made a loud "moaning" sound.	CSM-113	An object probably got into the fan and was later freed.	None.	Apollo 8 Apollo 15 Apollo 16	MSC-07230
12	Suit pressure transducer reading was higher than normal during transearth EVA.	CSM-113	Lunar dust particle was found in transducer. It may have caught in air gap of variable reluctance element.	Five-micron filter added in suit pressure sense line for Apollo 17 and subsequent spacecraft.	Apollo 16	MSC-07230
13	Digital event timer indicated erroneous time.	CSM-113	Bearing points in magnesium motor plates became elongated by wear, permitting idler gear to rub against number wheel. Paint particles from number wheel interfered with proper counting.	Units visually inspected for Apollo 17. Skylab units to be modified if cases require opening for other rework.	Apollo 10 Apollo 15 Apollo 16	MSC-07230
14	Scanning telescope shaft axis drove erratically.	CSM-113	Broken socket spring in telescope harness connector.	Apollo 17 harness inspected for broken springs. New harnesses to be manufactured for Skylab spacecraft.	Apollo 16	MSC-07230 MSC-07573
15	Two lithium hydroxide canisters stuck in side B when being removed.	CSM-113	Canister expansion from moisture buildup was greater than normal during solo flight because suit control valves were positioned to full flow. Also, the side-B fit was tighter than that of side A.	Removal force specification changed. Flight procedures changed to insure that suit control valves are positioned to cabin flow for solo operations.	Apollo 16	MSC-07230
16	High-gain antenna could not be acquired for approximately 1 1/2 hours while spacecraft was in passive thermal control and crew was asleep.	CSM-113	Undetermined. Possible logic circuit malfunction.	None. If problem was in electronics box, it has a low probability of recurring. Also, secondary unit can be selected.	Apollo 12 Apollo 13 Apollo 14 Apollo 16	MSC-07230
17	Extending and locking Y-Y strut in preparation for entry was difficult.	CSM-113	Insufficient clearance.	None. AOH has inflight procedure for strut adjustment.	Apollo 16	MSC-07230
18	One of recovered main parachutes had numerous small holes in canopy.	CSM-113	RCS yaw engines were fired at 350 feet altitude to vent trapped propellants and pressure. Holes were caused by oxidizer expelled from plus yaw engines.	Command module landed with RCS pressurized and propellant isolation valves closed.	Apollo 4 Apollo 15 Apollo 16	MSC-07230 MSC-07641
19	Water/glycol found on command module floor during postflight operations.	CSM-113	Fiber under two O-ring seals in suit heat exchanger bypass valve.	Bypass valve, B-nut connections, and cabin floor inspected for leak prior to launch.	Apollo 16	MSC-07230

APOLLO 16

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
20	Scrubber tank of decontamination unit failed during postflight deactivation of reaction control system.	GSE	Rapid overpressurization of tank occurred because of insufficient quantity of neutralizer for the quantity of oxidizer.	Decontamination procedure changed. Control of procedure and paperwork formalized. Deactivation/Decontamination Manager appointed.	Apollo 16	MSC-07230
21	Two reaction control system regulator inlet filter screens were deformed.	CSM-113	Filter element end caps were bulged by helium pressure surge during system activation.	None required.	Apollo 16	MSC-07230 MSC-07640
22	Thermal coating peeled away from ascent stage thermal shield panels.	LM-11	Coating was not compatible with the thermal conditions experienced.	Coating was removed from Apollo 17 spacecraft because adequate thermal protection was provided by tank insulation.	Apollo 16	MSC-07230
23	Four thermal shields were torn loose from ascent stage aft equipment rack.	LM-11	Probably caused by insufficient venting of thermal blanket during earth launch, and ascent engine exhaust entering cavity behind thermal shields during ascent from lunar surface.	Thermal shield configuration changed. Additional venting of thermal blankets provided.	Apollo 16	MSC-07230
24	S-band steerable antenna would not move in yaw axis.	LM-11	Stow latch mechanism did not release antenna. Exact cause unknown.	Exposed solder fillet removed from stow latch mechanism. Inspection and checkout procedures improved. Wiring added to provide redundant paths through safe/arm switch to solder melting elements.	Apollo 16	MSC-07230
25	Reaction control system A helium regulator leaked.	LM-11	Most probably caused by contamination introduced during component replacement and, subsequently, swept into regulator outlet by backflow.	No components replaced downstream of Apollo 17 regulators. Changes made to launch site testing to eliminate regulator backflow.	Apollo 16	MSC-07230
26	Cabin gas return valve apparently failed to open in "automatic" position.	LM-11	Probably caused by contamination on inlet screen or on flapper valve.	Test added to preflight checkout of Apollo 17 spacecraft.	Apollo 16	MSC-07230
27	Control of ascent stage attitude lost after jettison.	LM-11	The most likely cause was an open circuit breaker which provides 28 volts to the primary preamplifiers. It either did not make contact or was inadvertently left open.	None required.	Apollo 16	MSC-07230
28	Abort guidance system out-of-plane error was larger than expected.	LM-11	The most likely cause was contamination or an air bubble in the fluid between the gyro float and case.	Abort sensor assembly installed in Apollo 17 spacecraft checked for contamination and air bubbles.	Apollo 16	MSC-07230
29	Indicated ascent engine chamber pressure showed two temporary rises aboye normal.	LM-11	Indications caused by characteristics of pressure transducer.	None required.	Apollo 16	MSC-07230
30	Command module television camera monitor lost horizontal synchronization twice.	GFE	Caused by either an intermittent condition in precision voltage regulator circuit assembly in low-voltage power supply, or shift in stable range of horizontal potentiometer setting.	Low-voltage power supply voltage regulators replaced on remaining flight units. Warm optimum setting marks applied to TV monitor case.	Apollo 16	MSC-07230 MSC-07489

APOLLO 16

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
31	Oxygen purge system antenna broke.	GFE	Antenna inadvertently left unstowed during ingress, and probably struck ascent engine cover.	Spare antenna stowed on lunar rover for Apollo 17.	Apollo 15 Apollo 16	MSC-07230
32	Experimental gas/water separator was cracked and leaked.	GFE	Unit was made for demonstration purposes and material was highly susceptible to cracking.	None. Device not flown on subsequent missions.	Apollo 16	MSC-07230
33	Wrist disconnects were hard to rotate after exposure to lunar surface environment.	GFE	Lunar dust got between sliding surfaces.	Rubber dust covers added for Apollo 17.	Apollo 16	MSC-07230
34	Headset microphone boom tip was loose.	GFE	Insufficient adhesive applied when tip was installed on acoustical tube.	Pull test added to assure adequate attachment.	Apollo 16	MSC-07230
35	Headset earphone operation was intermittent.	GFE	Electrical adapter 21-pin connector was probably not seated securely.	None.	Apollo 16	MSC-07230
36	Retractable tether would not fully retract.	GFE	Thread sealant on spool shaft increased friction.	Units tested for friction buildup prior to flight.	Apollo 15 Apollo 16	MSC-07230
37	Pressure indicated by cuff gage was low during transearth EVA.	GFE	Contaminant may have temporarily caused resistance in mechanism movement, or gage may have been misread.	None required.	Apollo 16	MSC-07230
38	Extravehicular mobility unit maintenance kit expanded.	GFE	Wet-wipe packets expanded in cabin environment.	Some variation in expansion can be expected. Apollo 17 crew briefed.	Apollo 16	MSC-07230
39	Pressure garment assembly purge valve pin came out on three occasions.	GFE	Pin was probably pulled out by red apple on lanyard snagging on lunar rover lap belt.	Purge valve assembly modified by eliminating barrel actuator spring and shortening lanyard.	Apollo 16	MSC-07230
40	Tool carrier fell off portable life support system during EVA preparations.	GFE	Snap buckle release pin was inadvertently pulled.	Pin pull force increased from 5 lb to between 10 and 20 lb.	Apollo 16	MSC-07230
41	Lunar Module Pilot's watch crystal came out during lunar surface activity.	GFE	Warpage of crystal from thermal cycling caused it to pop out.	None. Watch not critical to mission success or crew safety.	Apollo 16	MSC-07230
42	Cable broke on heat flow experiment.	ALSEP	Ribbon cable became entangled with crewman's feet and was pulled loose at central station connector.	Connector was modified to provide strain relief and greater pull strength for Apollo 17.	Apollo 16	MSC-07230
43	One of four stakes on active seismic experiment mortar package pallet did not deploy.	ALSEP	Release pin was bent and jammed.	None. Experiment not scheduled for subsequent mission.	Apollo 16	MSC-07230
44	Telemetry indication of active seismic experiment mortar box roll angle was off-scale high.	ALSEP	Sensor circuit failure. Other data indicated that alignment was satisfactory.	None. Experiment not scheduled for subsequent mission.	Apollo 16	MSC-07230
45	Cosmic ray detector panel shade did not fully deploy and lanyard broke.	Lunar surface experiment	Insufficient clearance between stationary blockplate and movable target plate because of projecting screws.	None. Experiment not scheduled for subsequent mission.	Apollo 16	MSC-07230

APOLLO 16

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
46	Vertical staff of gnomon separated from leg assembly.	Lunar surface experiment	The most probable cause was breaking of the inner gimbal pivot pins.	Pivot pins for the Apollo 17 gnomon were given additional tempering and a thin film of oil was applied to protect against corrosion.	Apollo 16	MSC-07230
47	Bag dispenser assemblies repeatedly fell off brackets on 70-mm cameras.	Lunar surface experiment	Method of latching dispenser adapter to camera was inadequate.	Adapter redesigned.	Apollo 16	MSC-07230
48	Documented sample bag dispenser support bracket came apart.	Lunar surface experiment	Screws came loose.	Apollo 17 dispensers inspected to assure proper staking of screws.	Apollo 16	MSC-07230
49	Sample collection bag came loose from portable life support system tool carrier several times.	Lunar surface experiment	Method of attachment was inadequate.	Bag hooks redesigned.	Apollo 16	MSC-07230
50	Lunar surface far ultraviolet camera azimuth adjustment became difficult.	Lunar surface experiment	Grease in azimuth ring bearing became stiff.	No corrective action was taken since this experiment was not scheduled for another flight.	Apollo 16	MSC-07230
51	Velcro patch came off padded sample bags.	Lunar surface experiment	Improper bond material used for Velcro hook patch.	No corrective aciton taken since this equipment was not scheduled for another flight.	Apollo 16	MSC-07230
52	Loop came off lanyard for penetrometer stowage, release pin.	Lunar surface experiment	Lanyard loop was probably not properly crimped to cable.	Cable size changed from 3/64 inch to 1/16 inch and pull tested.	Apollo 16	MSC-07230
53	Active seismic experiment pitch sensor indicated off-scale high after launching third grenade.	ALSEP	Based on ground tests, mortar assembly is pitched up above normal 45° elevation or pitch sensor has failed. Most likely cause is failure in pitch sensor circuit.	No corrective action taken as the experiment was not scheduled for another mission.	Apollo 16	MSC-07230
54	Mapping camera extend/ retract times were abnormally long.	SIM	Unknown. (See Apollo 17 item 23.)	Openings in gear box sealed with pressure-sensitive tape. Excess lubricant removed from drive screw. Cover over rear transfer gears redesigned.	Apollo 15 Apollo 16 Apollo 17	MSC-05161 MSC-07230 JSC-07954
55	Mapping camera stellar glare shield failed to retract.	SIM	Undetermined. Possible cause was misalignment of drive rack and pinion gear when assembly was fully extended.	Drive rack aligned for proper pinion gear engagement.	Apollo 16 Apollo 17	MSC-07230 JSC-07954
56	Laser altimeter output degraded.	SIM	Most probable cause of Apollo 15 and Apollo 16 failures was contamination of optical surfaces within laser module by lubricant from Q-switch bearings.	Apollo 17 laser module modified to incorporate Q-switch bearings with oil-impregnated ball retainers. High purity quartz used in flashlamps.	Apollo 15 Apollo 16	MSC-05161 MSC-07230
57	Panoramic camera automatic exposure control indicated low light levels.	SIM	Problem could have resulted from contamination on light sensor optics, or a failure in the sensor or its associated circuitry. Problem existed preflight but was not detected.	No changes were made to hardware because there was no previous history of the types of failures that could have caused the problem. Sensor output voltage limits were added to preflight test procedure.	Apollo 16	MSC-07230

APOLLO 16

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
58	Laser altimeter photomultiplier tube voltage was erratic.	SIM	Some anomalous voltages probably cuased by sunlight reflections. An intermittent condition could have been caused by cyclic thermal environment of lunar orbit.	No corrective action taken because qualification test results and acceptance tests were considered adequate.	Apollo 16	MSC-07230
59	Nine frames of mapping camera metric photographs overexposed.	SIM	Noise voltage on power supplied to shift register or generated by some intermittent condition in camera must have switched one or more stages in register on or off.	No corrective action was taken because qualification test results and acceptance tests were considered adequate.	Apollo 16	MSC-07230
60	Mapping camera film was contaminated.	SIM	Most likely cause was residue from manufacturing or contaminants introduced from some outside source.	More thorough cleaning and inspection procedures implemented.	Apollo 16	MSC-07230
61	Electrical system meter anomalies: a. Battery 2 voltmeter indicated off-scale low. b. Battery 2 ampere-hour meter indicated off-scale low. c. Battery 1 and 2 temperature meters indicated off-scale low.	LRV	Undetermined. Intermittent conditions must have existed in several multiple-wire splices.	No corrective action taken because cause of intermittent conditions could not be determined.	Apollo 16	MSC-07230 MSC-07684
62	Rear steering inoperative.	LRV	Open circuit may have occurred in hand controller potentiometer, or between potentiometer wiper and summing diode.	No corrective action taken. Problem could not be further isolated and existing design and testing were considered adequate.	Apollo 15 Apollo 16	MSC-05161 MSC-07230 MSC-07683
63	Navigation system computed parameters did not update.	LRV	Circuit breaker and switch configuration was probably incorrect.	No corrective action required.	Apollo 16	MSC-07230
64	Scale debonded from pitch attitude sensor.	LRV	The most probable cause was a flaw in the bonding.	No corrective action required.	Apollo 16	MSC-07230

APOLLO 17

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
1	Spurious master alarms occurred without accompanying caution and warning lights.	CSM-114	Intermittent ground in panel 2. Circuitry is current limited so no hazard resulted.	None required.	Apollo 17	JSC-07904
2	Mission timer was 15 seconds slow at about 2 hours after lift-off.	CSM-114	Not determined.	None - vehicle has redundant timers.	Apollo 17	JSC-07904
3	Retract limit switch on lunar sounder HF antenna boom 1 did not actuate.	CSM-114	Abnormal friction on the limit switch cam follower arm, defective limit switch actuating mechanism spring, misalignment of the antenna tape element slot, or a malfunction in the limit switch assembly.	None - device not to be flown on future missions.	Apollo 17	JSC-07904

APOLLO 17

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
4	Lunar sounder high frequency antenna boom 2 deployment was slower than expected.	CSM-114	Not determined. Increased and varying loads in a thermal/vacuum environment are a peculiarity experienced in mechanisms several times on Apollo.	None - device not to be flown on future missions.	Apollo 17	JSC-07904 MSC-05161 MSC-07230
5	Entry monitor system accelerometer null bias shifted.	CSM-114	Contamination in accelerometer or open or short circuit in the accelerometer control circuits.	None required.	Apollo 17	JSC-07904
6	Chlorine ampule leaked.	CSM-114	Bladder was not completely compressed in the ampule bore. When injector was then mated with the water port, back pressure ballooned and tore the bladder.	Skylab and Apollo-Soyuz crews trained to properly compress the bladder before mating injector to water port.	Apollo 16	JSC-07904
7	Mapping camera plume shield door failed to close.	CSM-114	Not determined. Increased and varying loads in a thermal/vacuum environment are a peculiarity experienced in mechanisms several times on Apollo.	None - device not to be flown on future missions.	Apollo 17	JSC-07904 JSC-05161 MSC-07230
8	Hydrogen tanks 1 and 2 pressure operating deadband decreased in automatic heater mode.	CSM-114	Probably contamination in the hydrogen tank pressure sensing switch stops reduced the switch's shaft travel that reduced the upper and lower deadband pressure spread.	None required. Problems of this nature can be handled by manual control of tank fans and heater cycles.	Apollo 17	JSC-07904
9	Erroneous measurements transmitted by telemetry.	CSM-114	A failure occurred somewhere in the last four stages of programmer counter A. If the failure had not become intermittent, automatic counter switchover would not have occurred and the affected measurements would have been permanently lost.	A mating connector for the PCM package GSE connector will be carried in the Skylab and the ASTP spacecraft. The connector will have an internal jumper that grounds the proper pin so that the crew can switch to the desired programmer counter A or B.	Apollo 17	JSC-07904 JSC-07985
10	Water/glycol temperature control valve failed to maintain the evaporator temperature.	CSM-114	Sticking occurs in valve gear train after driving hard against full closed stop position. Pitch circles of two gear pairs in the valve gear train are sometimes not tangent. Causes contacting teeth to slide rather than roll. Also some gear trains have dry lubricant scraped off the gear teeth in the area of contact, causing high sliding friction.	None - manual valve operation is satisfactory as shown during Apollo 16.	Apollo 17	JSC-07904 MSC-07230
11	Battery 4 voltage reading was lower than that of battery 3.	LM-12	Battery 4 voltage reading was not a true reading. The voltage measurement signal conditioner has an input resistive divider network. A resistive increase of 1 percent in this network would account for the lower voltage of battery 4. Another possibility of this type exists in the zero-adjust network.	None - this circuitry will not be flown on any planned future mission.	Apollo 17	JSC-07904

APOLLO 17

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
12	Oxygen demand regulator leaked.	LM-12	Could have been caused by contamination of regulator A; a 2.5-micron particle between the regulator (ball) poppet and the seat. Also possible, but not likely, the crew could have inadvertently bumped the regulator handle.	None - this equipment is not to be used on future spacecraft.	Apollo 17	JSC-07904
13	No extravehicular activity warning tone in Command Module Pilot's communications carrier.	GFE	Warning tone loss and left earphone loss were caused by two wire leads broken 1/4-inch below their exit point from the potting of the flex relief attached to the lower end of the communications carrier splice block.	Crew training and procedures revised to reflect a harness configuration that prevents twisting of the wire harness.	Apollo 17	JSC-07904
14	Lunar surface gravimeter beam cannot be stabilized in the null position.	ALSEP	Mathematical design error resulted in the sensor mass weight being about 2 percent lighter than the proper nominal weight for 1/6g operation.	The beam has been balanced and centered by partial caging of the mass weight assembly. Further analysis of data channels is in progress to determine if free mode oscillations and gravity waves are being detected with this configuration.	Apollo 17	JSC-07904
15	Surface electrical properties receiver temperature higher than predicted.	Lunar surface experiment	A dust film covering 10 percent of the optical solar reflector (mirror) on top of the receiver could result in the indicated degradation of thermal control. Also, the thermal Kapton bag top cover flaps could not be tightly closed to keep out dust and sunlight.	None - this experiment is not scheduled for a future mission, however, similar bonding configurations will require stringent quality control.	Apollo 17	JSC-07904
16	Lunar ejecta and meteorite experiment temperature high.	ALSEP	Error in calculating thermal control configuration capability for Apollo 17 site.	Instrument is operating properly but is commanded off each lunar day until its temperature cools down again. Temperature of operation is being increased in controlled increments each lunar day until allowable maximum is reached.	Apollo 17	JSC-07904
17	Cask dome removal was difficult.	ALSEP	Removal tool pins were not locked into the recess in the dome.	The dome was easily wedged off the cask with the hammer. No further investigation was performed since the cask is not scheduled to be flown on future missions.	Apollo 17	JSC-07904
18	Background noise in the lunar atmospheric composition experiment data.	ALSEP	Cause is not known.	The condition is stable and has caused no loss of data. No further ground tests are planned since this experiment will not be flown on future missions.	Apollo 17	JSC-07904

APOLLO 17

Anomaly No.	Anomaly Statement	Vehicle/ Equipment	Cause	Corrective Action	Missions	References
19	Panoramic camera velocity/altitude sensor operated erratically.	SIM	Analysis indicates that the erratic operation may have resulted from a downward shift in the scaling of the sensor output signal. This would most likely be caused by a failure within the sensor head circuitry.	The override capability was used for the remainder of the mission. This locks out the sensor and substitutes preset voltages which corresponds to orbital travel rates for 55 and 60 mile altitudes. This was the last mission for the panoramic camera and no further investigation is necessary.	Apollo 17	JSC-07904
20	Mapping camera exposure pulse absent at low light levels.	SIM	The light sensor circuitry experienced a threshold shift. This shift could have been the result of a photodiode failure or a change in the performance of the amplifier, the one-shot multivibrator or the circuitry between these two elements.	The film was properly exposed showing that nothing was reducing the light being transmitted to the film. The only loss was the telemetry indication that confirms that the light had been transmitted. Since this was the last mission for this camera, no further analysis is necessary.	Apollo 17	JSC-07904 MSC-05161 MSC-07230
21	Panoramic camera gimbal drive failed during final pass.	SIM	Most likely, the gimbal drive motor failed since the motor brushes are limited life items. Another possibility is failure of the electrical circuitry that provides power to the motor.	No corrective action was taken since this was the last mission for this camera.	Apollo 17	JSC-07904
22	Ultraviolet spectrometer temperature measurement failures.	SIM	Probably a component failure or a short in the circuit wiring in the reference voltage or the minus 15 volt supply.	These were housekeeping measurements and were independent of scientific data circuitry. Since this was the only mission for this instrument, no corrective action was taken.	Apollo 17	JSC-07904
23	Mapping camera deploy/ retract times were excessive.	SIM	The behavior was quite similar to that during the Apollo 15 and 16 missions. Other anomalies in the scientific instrument module bay suggest a common unknown factor. In all cases, some degree of sliding between metal surfaces was required. The friction between those surfaces may have been significantly increased by the effects of a hard vacuum in space that is unobtainable in ground testing.	Since this was the last mission for this instrument, no corrective action was taken. However the general problem is being studied for future missions at Lewis Research Center.	Apollo 17	MSC-05161 MSC-07230 JSC-07904 JSC-07954