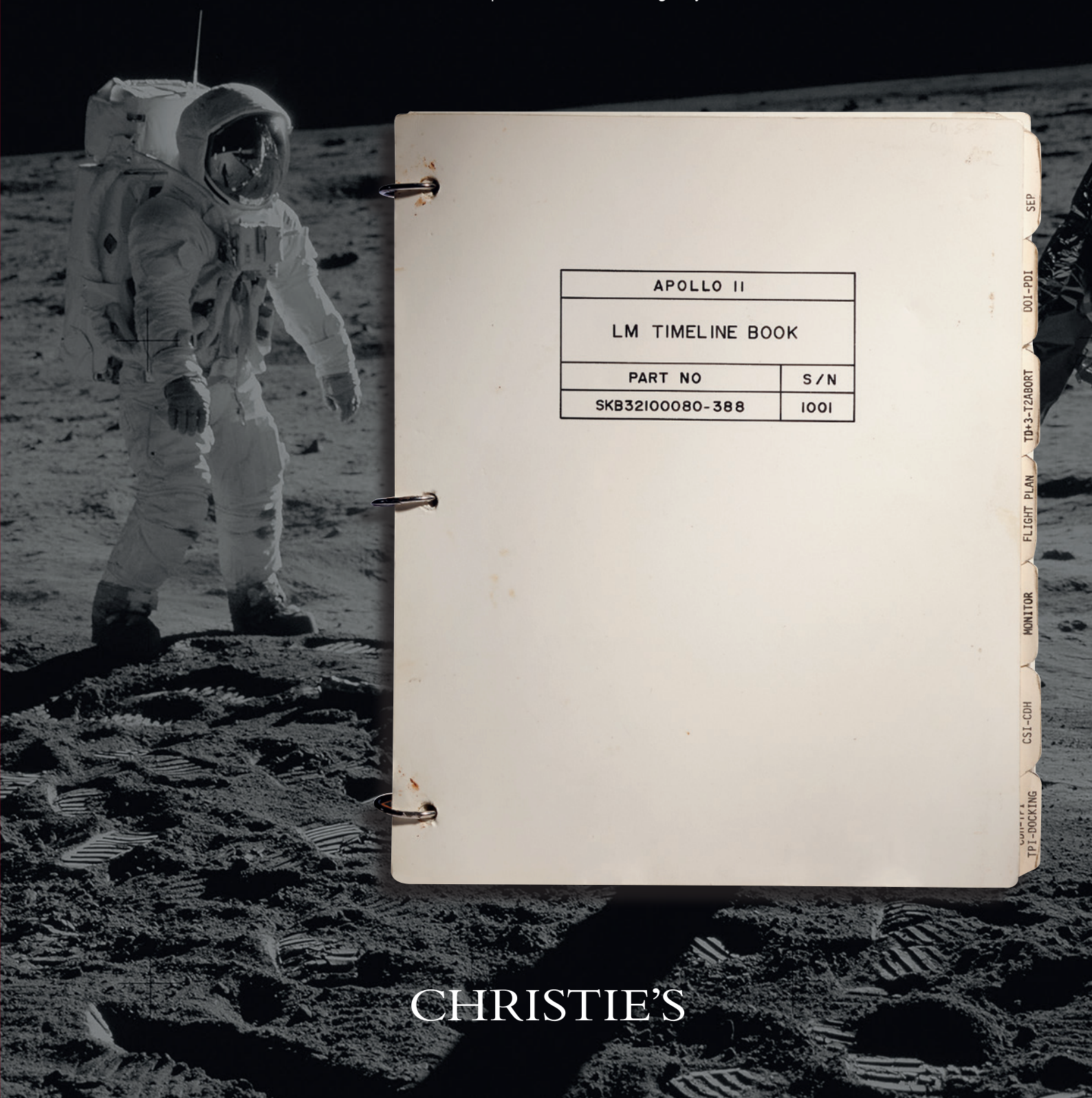
ONE GIANT LEAP: CELEBRATING SPACE EXPLORATION 50 YEARS AFTER APOLLO 11

PART ONE | New York 18 July 2019



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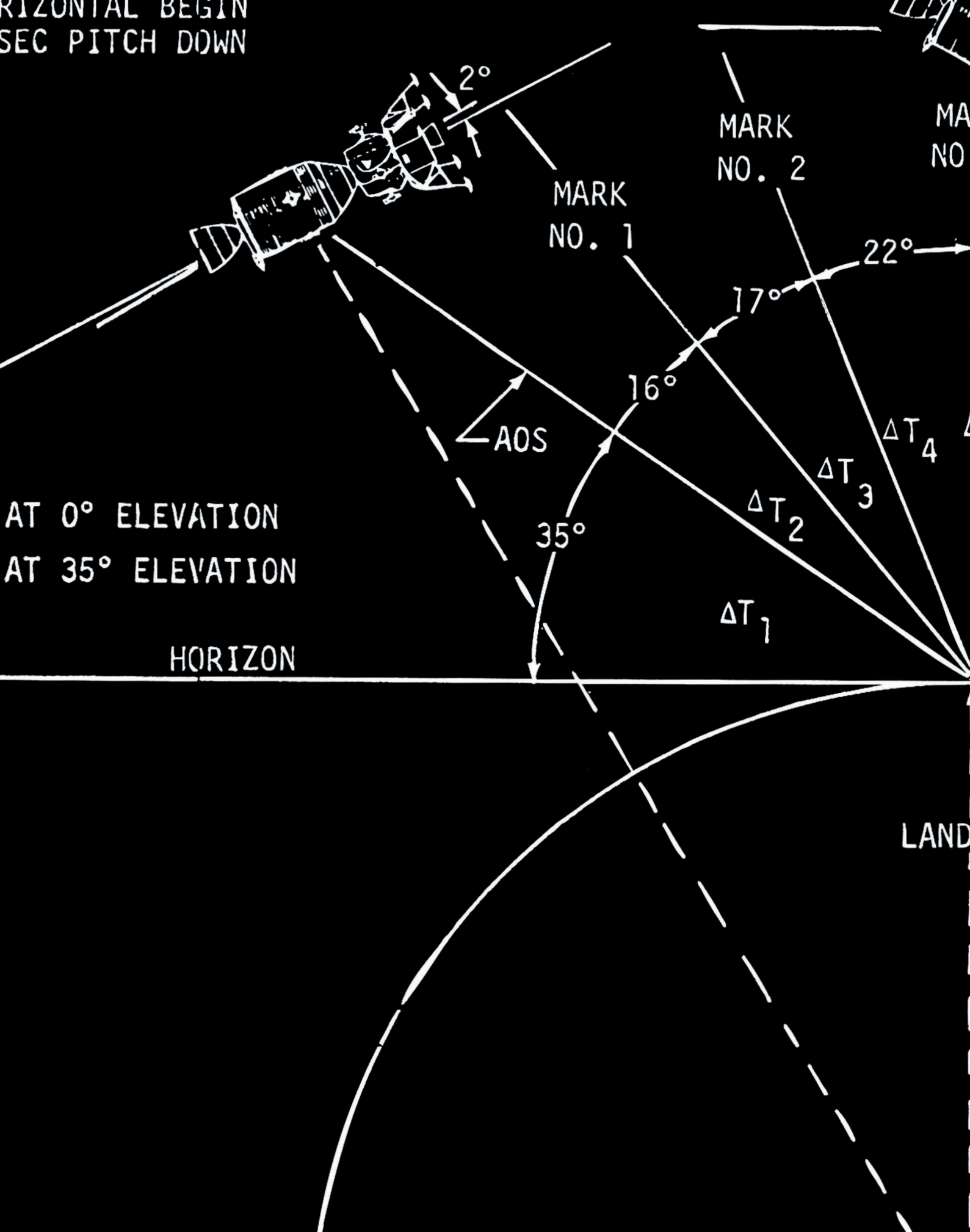
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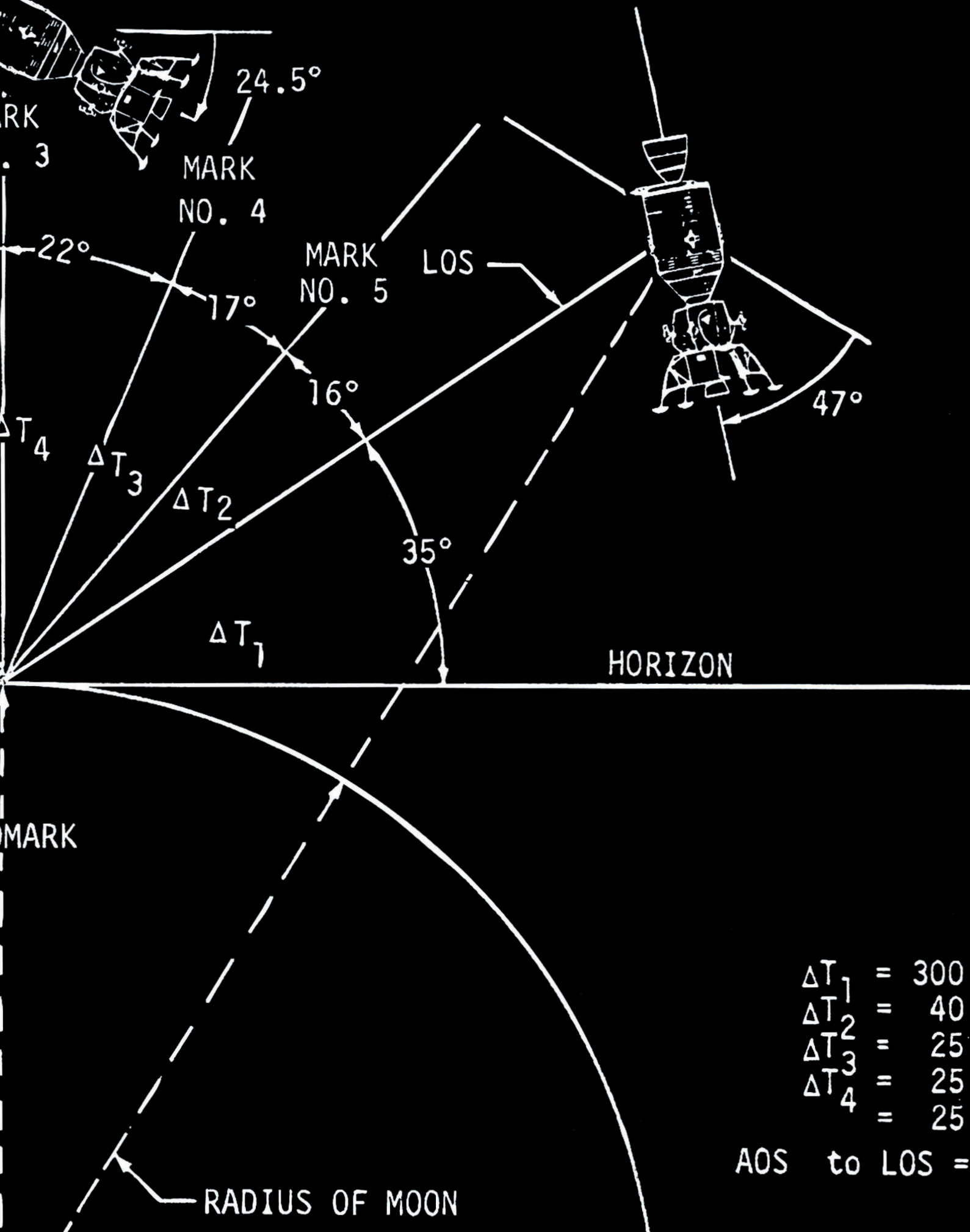
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TRANQUILLITY BA
JULY 20, 1969

One Giant Leap: Celebrating Space Exploration 50 Years after Apollo 11 Part One

18 July 2019

AUCTION

Thursday 18 July 2019 at 10.00 am (Lots 1-11)
immediately followed by Part Two (Lots 12-195)

20 Rockefeller Plaza
New York, NY 10020

VIEWING

Thursday	11 July	10.00 am - 5.00 pm
Friday	12 July	10.00 am - 5.00 pm
Saturday	13 July	10.00 am - 5.00 pm
Sunday	14 July	1.00 pm - 5.00 pm
Monday	15 July	10.00 am - 5.00 pm
Tuesday	16 July	10.00 am - 5.00 pm
Wednesday	17 July	10.00 am - 5.00 pm

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John Hays (#0822982)

FRONT COVER:
Lot 11

OPPOSITE:
Lot 9

OPPOSITE SPECIALISTS PAGE:
Lot 2

CONTENTS PAGE:
Lot 5

BACK COVER:
Lot 1

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CHRISTIE'S

29/04/2019


NASA
ARMSTRONG
APOLLO 11

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AUCTION CALENDAR

3-5 JULY 2019
BIBLIOTHÈQUE PAUL DESTRIBATS PREMIÈRE PARTIE
PARIS

9 JULY 2019
THE GOLDEN AGE OF RUSSIAN LITERATURE: A PRIVATE EUROPEAN COLLECTION
LONDON

9 JULY 2019
IMPORTANT SCIENTIFIC BOOKS FROM THE COLLECTION OF PETER AND MARGARETHE BRAUNE
LONDON

10 JULY 2019
THE HISTORY OF WESTERN SCRIPT: IMPORTANT ANTIQUITIES AND MANUSCRIPTS FROM THE SCHØYEN COLLECTION
LONDON

10 JULY 2019
VALUABLE BOOKS & MANUSCRIPTS
LONDON

11- 19 JULY 2019
THE MOON AND BEYOND: METEORITES FROM THE STIFLER COLLECTION
NEW YORK ONLINE

31 OCTOBER 2019
FINE PRINTED BOOKS & MANUSCRIPTS INCLUDING AMERICANA
NEW YORK

LUNAR CHART

SCALE 1:1,000,000

Published for
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UNITED STATES AIR FORCE
ST. LOUIS 18, MISSOURI

JULIUS CAESAR

LAC 60

Mercator Projection
Scale 1:1,000,000 at 11°00'45"

1ST EDITION SEPTEMBER 1962

NOTES

This chart was prepared with advisory assistance from Dr. Gerard P. Kuiper and his collaborators, D. W. G. Arthur and E. A. Whitaker.

CONTROL

The position of features on this chart was determined through the use of selenographic control established primarily from the measures of J. Franz and S. A. Saunder as compiled by D. W. G. Arthur and E. A. Whitaker in the Orthographic Atlas of the Moon, Edited by Dr. Gerard P. Kuiper, 1960.

VERTICAL DATUM

Vertical datum is based on an assumed spherical figure of the moon and a lunar radius of 1738 kilometers. The datum plane was subsequently adjusted to 2.6 kilometers below the surface described by the 1738 kilometer radius to minimize the extent of lunar surface of minus elevation value. Gradients of major surface undulations were established by interpolating Schrutka-Rechtenstamm computations of J. Franz's measurements of 150 moon craters. The probable error of comparative elevation values is evaluated at 1000 meters. Vertical datum, so established, is considered interim and will be refined as soon as a more accurate figure of the moon is determined.

ELEVATIONS

All elevations are shown in meters. The relative heights of crater rims and other prominences above the maria and depths of craters were determined by the shadow measuring technique as refined by the Department of Astronomy, Manchester University, under the direction of Professor Zdenek Kopal. Relative heights, thus established, have been referenced to the assumed vertical datum and have been integrated with the gradients of the surface undulations. The probable error of the localized relative heights is 100 meters. Inherent with measuring technique used, relative height determinations in general E-W direction are more accurate than in the N-S direction.

Elevations (referenced to datum)..... 2700
Relative Elevations (referenced to surrounding terrain)..... 550R
Depth of crater (rim to floor)..... (1300)

CONTOURS

All contours are approximate
Contour interval is 600 meters
Approximate contour
Depression contour

NAMES

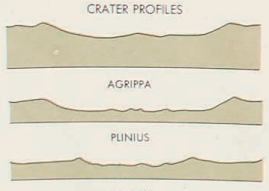
The feature names selected were adopted from the 1935 International Astronomical Union nomenclature system with minor changes introduced in the Photographic Lunar Atlas, Edited by Dr. Gerard P. Kuiper, 1960.

Craters designated by capital letters were selected from the I.A.U. list of Named Lunar Formations. Supplementary lettered formation have been added in accordance with the criterion suggested by Blagg and Müller. They are designated by lower case letters.

PORTRAYAL

The configuration of the relief features and background coloration shown on this chart were interpreted from photographs taken at Lick, Mc Donald, Mt. Wilson, Yerkes and Pic du Midi Observatories, and published in the 1960 Edition of the USAF Lunar Atlas and unpublished photographs from the Lunar and Planetary Laboratory, University of Arizona and Department of Astronomy, University of Manchester. Visual observations made with the 24 inch Lowell refracting telescope, Flagstaff, Arizona, have also been used to add and clarify details. The pictorial portrayal of relief forms was developed using an assumed light source from the West with the angle of illumination maintained equal to the angle of slope of the features portrayed. Cast shadows were eliminated to enable complete interpretation of relief forms. Surface coloration is portrayed as it appears under Zenith illumination.

CRATER PROFILES



LOCATION OF CHART AREA

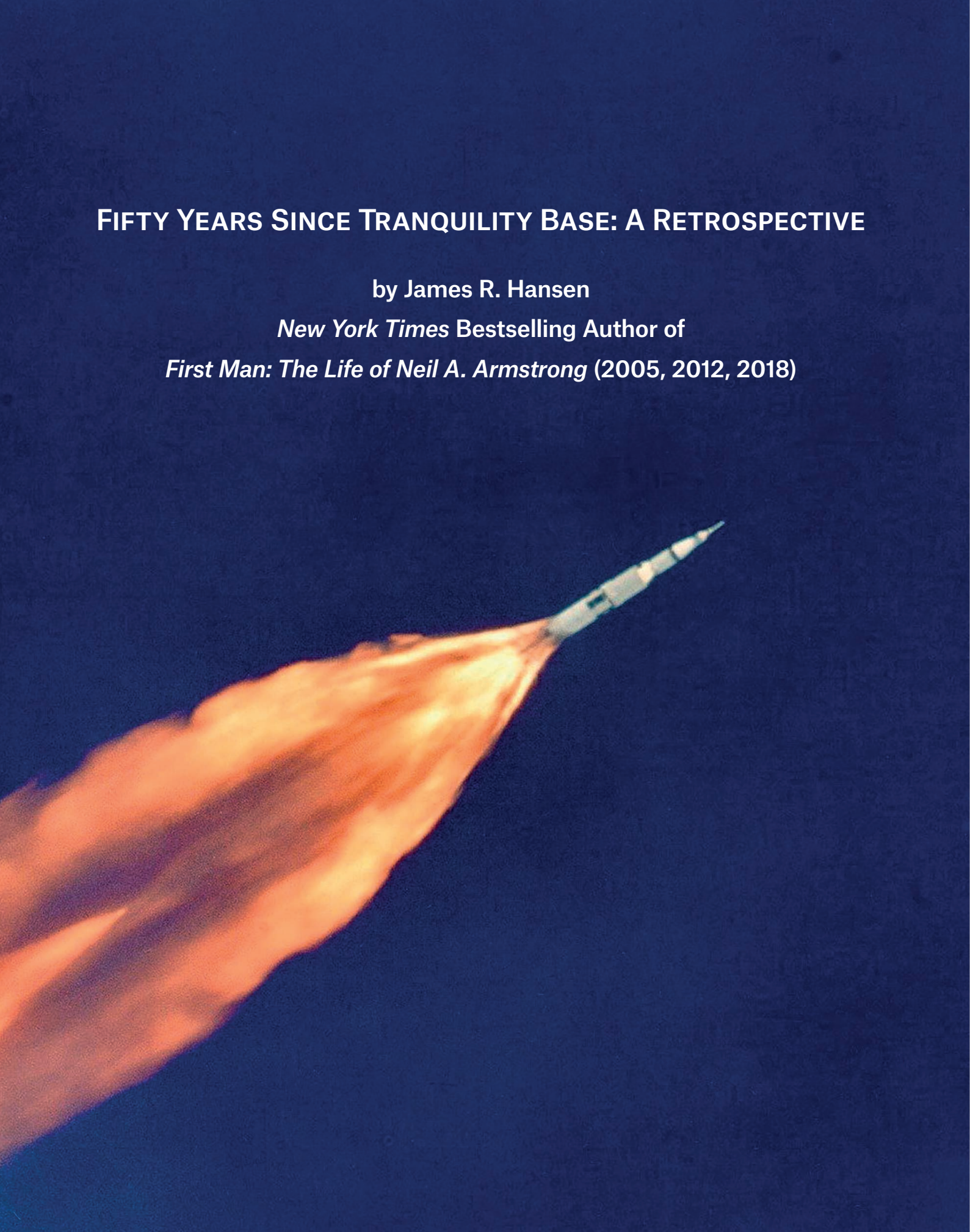
CONTENTS

Fifty Years Since Tranquility Base: A Retrospective

by James R. Hansen

New York Times Bestselling Author of

First Man: The Life of Neil A. Armstrong (2005, 2012, 2018)



Thursday morning, 25 May 1961, Washington, D.C.

President John F. Kennedy announced to a joint session of Congress: "... I believe that this nation should commit itself to achieving the goal, before this decade is out, of landing a man on the Moon and returning him safely to earth. No single space project... will be more exciting, or more impressive... or more important... and none will be so difficult or expensive." The dynamic 43-year-old president also told the American people, "It will not be one man going to the moon, it will be an entire nation. For all of us must work to put him there."

Young Jack Kennedy's lunar commitment was one of the most audacious decisions ever made by a President. NASA had been established in October 1958 in response to the Soviet Union's launch of the world's first artificial satellite, Sputnik. But when Kennedy spoke, the U.S. space program had made only one "manned" space flight, lasting fifteen minutes—the Mercury/Redstone mission of 5 May 1961—using a rocket, with astronaut Alan B. Shepard aboard. It didn't have enough power even to get into earth orbit. NASA's leaders understood, and had thoroughly advised JFK, that if the goal of the Moon landing by the end of the decade was going to be met, an unprecedented national program would have to mobilized against a dynamic complex of daunting technological challenges —and very quickly. It would need billions of dollars and an industrial partnership ultimately involving hundreds of thousands of people. The Apollo program, named after the Greek god of light, would be the largest non-military technological endeavor ever undertaken by the United States. Only the Manhattan Project to build the first atomic bomb was comparable, and that had been triggered by the dire threats of the Second World War. The Apollo program was also a matter of keen geopolitical competition, with the Americans very open about their efforts and the Soviets very closed, not even admitting they were trying.

It was a race with an uncertain outcome until nearly six years after the 22 November 1963 assassination of President Kennedy. But his deadline remained alive, even though time was closing in.

Tuesday, 15 July 1969, All Around Planet Earth

Around two thousand reporters had assembled at the Kennedy Space Center to watch the launch of Apollo 11. Eight hundred twelve came from foreign countries, 111 from Japan alone. A dozen were from the Soviet bloc. Despite political differences and international animosities, the Moon landing was proving to be a shared global event that transcended even the nastiest problems of the day. British papers used three-inch high type to herald news of the launch. A Spanish newspaper sent twenty-five contest winners on an all-expense-paid trip to Cape Kennedy. A Dutch editorialist called his country "lunar-crazy." A Czech commentator remarked, "This is the America we love, one so totally different from the America that fights in Vietnam." The popular German paper *Bild Zeitung* noted that seven of the fifty-seven Apollo supervisors were of German origin; the paper chauvinistically concluded, "12 percent of the entire Moon output is 'made in Germany.'" Even the French considered Apollo 11 "the greatest adventure in the history of humanity." *France-Soir*'s twenty-two-page supplement sold 1.5 million copies. A French journalist marveled that interest in the Moon landing was running so high "in a country whose people are so tired of politics and world affairs that they are accused of caring only about vacations and sex." Moscow Radio led its broadcast with news of the launch. *Pravda* rated the scene at Cape Kennedy front-page news, captioning a picture of the Apollo 11 crew "these three courageous men."

Wednesday, 9:32 a.m. EDT, 16 July 1969, Kennedy Space Center, Florida

The gigantic 363-foot-tall Saturn V rocket carrying Apollo 11 lifted off. Once NASA confirmed that its hardware was all working well, the spacecraft fired itself out of earth orbit and began the three-day trip through cislunar space.

Sunday, 4:18 p.m. EDT, 20 July 1969, in Lunar Orbit

Commander Neil A. Armstrong and Lunar Module Pilot Edwin E. Buzz Aldrin landed on the surface of the Moon in their lunar module (LM) "*Eagle*" while Command Module Pilot Michael Collins orbited overhead in command module "*Columbia*." The chosen landing site was a large, dark, basaltic plain formed by ancient volcanic eruptions, *Mare Tranquillitatis*: the Sea of Tranquility. Neil's first words back to Mission Control after landing was "Houston, Tranquility Base here. The *Eagle* has landed."

Sunday, 10:56 p.m. EDT, Tranquility Base, The Moon

Neil headed down the LM ladder and resolutely set foot on the surface, telling the world that it was "one small step for man—one giant leap for mankind." (Neil fully intended to say, "That's one small step for a man," but, in the rush of the moment, forgot to say, or just did not say, the "a." Or, possibly, he said it inaudibly.) Buzz soon followed him out, and the two astronauts tested their legs in the one-sixth lunar gravity and set up a series of experiments prepared by scientists across the United States.

Sunday, 11:24 p.m. EDT, Tranquility Base, The Moon

Neil and Buzz unveiled a commemorative plaque that was mounted on the ladder leg of the LM. "For those who haven't read the plaque," Neil said to the world at 04:13:52:40 mission elapsed time, "we'll read the plaque that's on the front landing gear of this LM. First, there's two hemispheres, one showing each of the two hemispheres of the Earth. Underneath it says, 'Here Men from the Planet Earth first set foot upon the Moon, July 1969 A.D. We came in peace for all mankind.'"

Sunday, 11:36 p.m. EDT, Tranquility Base, The Moon

Neil and Buzz began what turned out to be a difficult process of planting and unveiling the American flag. The act was not a territorial claim, but a reflection of national pride in an American achievement, acknowledging the years of hard work and sacrifice required by NASA, American industry, and the many thousands of the Apollo program's engineers, scientists, technicians, staff support and administrators—both men and women. Naturally, the Moon landing meant the Americans had won the Space Race, but to everyone in America and around the world it meant so much more.

Monday, 1:04 a.m. EDT, 21 July 1969, Tranquility Base, The Moon

Before reentering the LM, Neil and Buzz remembered to place a small packet of memorial items on the lunar surface. Inside were two Soviet-made medals in honor of deceased cosmonauts Yuri Gagarin, the first human to orbit the Earth, who died in a MiG-15 accident in March 1967, and Vladimir Komarov, killed a month after Gagarin at the conclusion of his Soyuz 1 flight when his spacecraft's descent parachute failed to open. Also in the packet was an Apollo 1 patch commemorating Gus Grissom, Ed White, and Roger Chaffee, the three astronauts killed in January 1967 in the Apollo fire and a small gold olive-branch pin, symbolizing the peaceful purpose of the Apollo 11 mission, a replica of the pins the astronauts were carrying on the mission for each of their wives.

There was another truly remarkable item in the packet: a half-dollar-sized silicon disk microscopically etched with statements from Richard Nixon and Lyndon B. Johnson, plus quotes from the National Aeronautics and Space Act of 1958, signed by Dwight D. Eisenhower, and from John F. Kennedy's famous promise to Congress in May 1961, along with goodwill messages from the leaders of 73 countries. NASA felt it was very important to demonstrate that the Moon landing was, indeed, a moment "for all mankind," the first time the human species had stepped onto another world. Today in 2019, on the Sea of Tranquility, that disk still rests inside in a special aluminum case—hopefully never to be disturbed.

Monday, 12:49 p.m. EDT, 24 July 1969, Middle of the Pacific Ocean, 1,440 nautical miles east of Wake Island

The Apollo 11 spacecraft, reduced now to just the command module, the other two modules discarded in space, having served their purpose—splashed down in the Pacific, concluding an historic mission that lasted 8 days, 3 hours, 18 minutes, and 35 seconds. Navy frogmen from the USS *Hornet* attached flotation collars to stabilize *Columbia*, and positioned rafts for extracting the astronauts. Within minutes Neil, Buzz, and Mike were safely on board the rescue ship, albeit wearing biological isolation suits to protect against the possibility—however remote—of transferring pathogens from the lunar surface. (Before winching them off their rafts into the recovery helicopter, the frogmen rubbed down the astronauts with a sodium hypochlorite solution and wiped down *Columbia* with Betadine to remove any remaining lunar dust. And Neil, Buzz, and Mike would have to stay in special quarantine facilities for three weeks, until 10 August 1969.) As for what Apollo 11 actually did bring back (no pathogens!), the treasure-chest was full of 48 pounds (21.7 kilograms) of rock and soil samples.

Wednesday, 13 August 1969, New York City, Chicago, Los Angeles

The Air Force Two aircraft, dispatched by President Nixon, picked up the astronauts and their families in Houston, and flew them to New York City to begin a whirlwind cross-country tour of celebration. In New York and Chicago, the astronauts rode in ticker-tape parades, with an estimated six million people lining the streets and going wild. That same evening in Los Angeles a formal state dinner at the posh Century Plaza Hotel celebrated the flight; attending the spectacular event were several members of Congress, 44 governors, the Chief Justice of the United States, ambassadors from 83 nations, and a bevy of Hollywood celebrities. President Nixon and Vice President Spiro Agnew honored each astronaut with a presentation of the Presidential Medal of Freedom.

29 September-5 November 1969: 22 foreign countries in 38 days

The Apollo 11 astronauts, their wives, and an entourage of public affairs officers and support staff went on a global 38-day tour, sharing their out-of-this-world experience with the entire planet, cultivating peaceful international relations, and meeting with leaders of many countries. Everywhere they stopped, massive crowds greeted and cheered them. Up to 150 million people saw the astronauts, and as many as 25,000 actually shook hands with them or received autographs. After it was over, Neil, Buzz, Mike, and everyone else involved felt strongly that the trip had done the nation and a troubled world a great deal of good.

Saturday, 20 July 2019: 50th Anniversary of Apollo 11

Neil is no longer with us; he died in August 2012 following heart surgery. Buzz and Mike, blessedly, are still living and active. Interestingly, all three men were born in 1930, not 50 years ago but 89. Less than five percent of people in the world today live that long. America placed a total of twelve men on the Moon in six landing missions between July 1969 and December 1972. A seventh mission, Apollo 13, in April 1970, experienced an accident 56 hours into its flight and could not land on the Moon but did make it back to earth safely. Today only four of the twelve—Buzz Aldrin (Apollo 11), Dave Scott (Apollo 15), Charlie Duke (Apollo 16), and Harrison "Jack" Schmitt (Apollo 17)—are still living, along with three Apollo command module pilots who orbited the Moon —Mike Collins (Apollo 11), Ken Mattingly (Apollo 16), and Al Worden (Apollo 15). The youngest of any of them are Jack Schmitt and Charlie Duke, 85 years young.

One of the prayers for the 50th anniversary of Apollo 11 should be this: May all the surviving Apollo astronauts live well beyond their centenaries, being here for the rest of us when we celebrate the 60th anniversary of the first Moon landing in 2029. By then, with luck and dedication, we will have once again made extraordinary journeys to the moon, preparing the path for humankind to become a true spacefaring and multi-planetary species.

Earth itself is a spaceship, you see. Neil Armstrong explained that to the world in something he wrote right before his mission in 1969: "It's an odd kind of spacecraft, since it carries its crew on the outside instead of the inside. But it's pretty small. And it's cruising in an orbit around the Sun. It's cruising in an orbit around the center of a galaxy that's cruising in some unknown orbit, in some unknown direction and at some unspecified velocity, but with a tremendous rate of change, position, and environment. It's hard for us to get far enough away from this scene to see what's happening... From our position on the Earth it is difficult to observe where the Earth is and where it's going, or what its future course might be. Hopefully, by getting a little farther away, both in the real sense and the figurative sense, we'll be able to make some people step back and reconsider their mission in the universe, to think of themselves as a group of people who constitute the crew of a spaceship going through the universe. If you're going to run a spaceship, you've got to be pretty cautious about how you use your resources, how you use your crew, and how you treat your spacecraft."

"Hopefully the trips we will be making in the next couple of decades will open up our eyes a little. When you are looking at the Earth from the lunar distance, its atmosphere is just unobservable. The atmosphere is so thin, and such a minute part of the Earth, that it can't be sensed at all. That should impress everyone. The atmosphere of the Earth is a small and valuable resource. We're going to have to learn how to conserve it and use it wisely."

It is interesting that it took a trip to the Moon to see the fragile situation of our own planet so clearly.

The Eagle Has Landed

Property of a Single Owner

Lots 1-11

LOTS 1-10 ARE OFFERED WITHOUT RESERVE

•1
ARMSTRONG, Neil (1930-2012). Photograph signed ("Neil Armstrong"). [Kennedy Space Center, 19 June 1969.]

A SUPERB SIGNED PHOTOGRAPH OF NEIL ARMSTRONG IN SPACESUIT DURING LUNAR MODULE SIMULATOR TRAINING JUST UNDER A MONTH BEFORE APOLLO 11 LAUNCH.

A full-scale Lunar Module Flight Simulator was located in the Flight Crew Training Building at the Kennedy Space Center, Florida. Armstrong was there during parts of June 1969 and continuously from 26 June until the 16 July 1969 launch. Here he is performing a full-dress simulation in his spacesuit. Located just behind him at head level appears to be part of the *Apollo 11 LM Timeline Book* mounted with a book clamp to the Alignment Optical Telescope. Armstrong would have been working with the "Basic Edition" of the *Timeline Book* which was also dated 19 June 1969, the same date of the photograph.

Black and white photograph, 8 by 10 inches. An official NASA-released photograph with blue mimeographed caption on verso giving release date of 19 June 1969. Photo No. 69-H-986.

$4,000-6,000

2 (part)

•2
ARMSTRONG, Neil. Collection of vintage NASA press photographs, 1969.

Twenty NASA press release photographs of Commander Armstrong during Apollo 11 activities.

Includes extensive launch day and training activities, in space suits and in plain clothes. A complete list is available online or by request.

20 photographs, 8 by 10 inches, all black and white prints with blue mimeographed captions on versos. (20)

$2,500-3,500

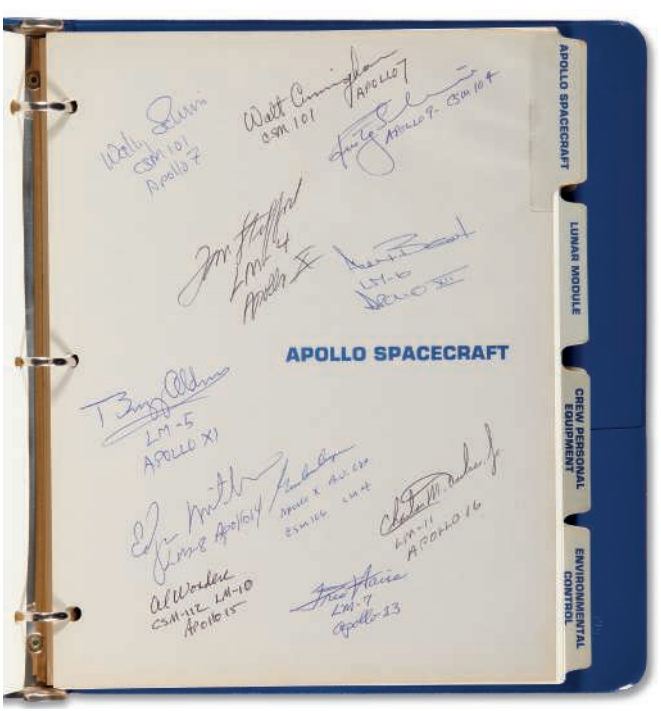
•3
LUNAR MODULE – *Apollo Spacecraft News Reference.* NASA Manned Spacecraft Center and Grumman Aircraft Engineering Corp. of Bethpage, Long Island, 1966.

A Lunar Module (LM) news media guide signed by moonwalkers, Lunar Module pilots, and additional Apollo astronauts.

The "APOLLO SPACECRAFT" tab is SIGNED and INSCRIBED with individual Apollo mission numbers by: Buzz ALDRIN, Alan BEAN, Edgar MITCHELL, Charles DUKE, Fred HAISE, Rusty SCHWEICKART, Tom STAFFORD, Walt CUNNINGHAM, Wally SCHIRRA, Al WORDEN, and Gordon COOPER. This comprises four lunar surface explorers (Aldrin, Bean, Mitchell and Duke), three astronauts who flew the Lunar Module, and four further Apollo astronauts.

10 by 11.5 inches. Approximately 200 pp. With numerous illustrations and diagrams including a large (11 by 25 inch) foldout sheet of the LM control panel identifying some one hundred switches, knobs, dials, and other instrumentation. There is a 48-page section on the LM Guidance and Control detailing lunar landing which provides details on operations performed in the *Apollo 11 LM Timeline Book*. 14 gray tinted tabbed section dividers. Original dark blue vinyl three-ring binder, the front cover with illustration of the Lunar Module and a full moon, in silver and white.

$4,000-6,000



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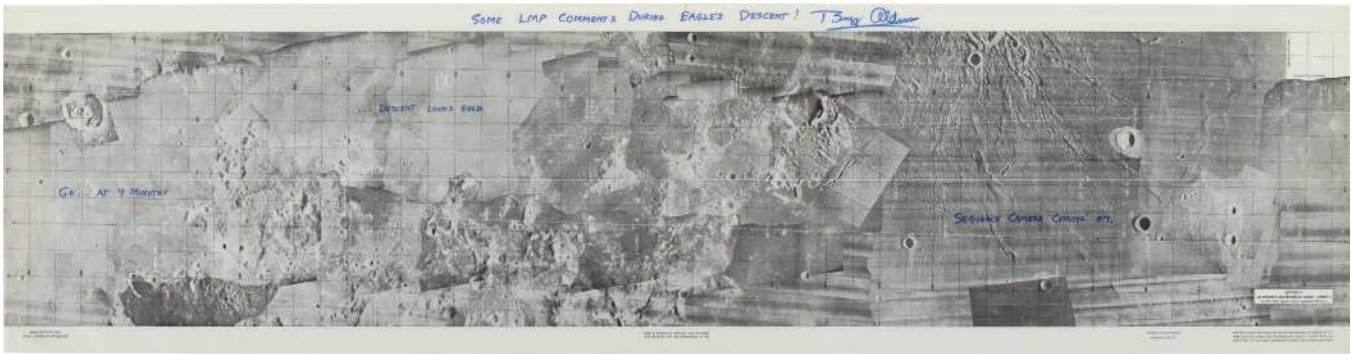


•4

LUNAR SURFACE VIEW – *LM Descent Monitoring Chart – Sheet 2, 16 July 1969 Launch Date, Landing Site No. 2, Edition 1.* Aeronautical Chart and Information Center, USAF for NASA, 1969.

A SUPERB VISUAL PRESENTATION OF THE VIEWS FROM ARMSTRONG AND ALDRIN'S LUNAR MODULE WINDOWS AS THEY PILOTED EAGLE TO LAND ON THE MOON.

A chart showing the *Eagle*'s ground track, SIGNED and INSCRIBED by Buzz ALDRIN with his communications during landing. Aldrin's flight inscription marks the points he made his original radio communications, as follows from left to right: "Go .... At 4 Minutes," "...Descent Looks Good," and "Sequence Camera Coming On." Created from Lunar Orbiter satellite photography, this chart marks the events beginning 4 minutes before *Eagle*'s Power Descent Initiation (PDI) at the far right and counts down at one minute intervals. The actual point of the PDI is labeled close to the center of the chart. At 20 second intervals, an increasing time count is labeled until T + 4 minutes after the start of PDI to the far left. During the flight period on this chart, *Eagle*'s windows were pointed down toward the Moon which allowed Armstrong and Aldrin to view these lunar features outside. Grid patterns are printed in black marking every 30 minutes of latitude and longitude. The planned LM descent path center line and viewing limits are printed in white. These events were performed and monitored while Armstrong and Aldrin were using Page 9 of the *Apollo 11 LM Timeline Book*.

Lithographed chart, 12.5 by 48 inches.

$4,000-6,000

•5

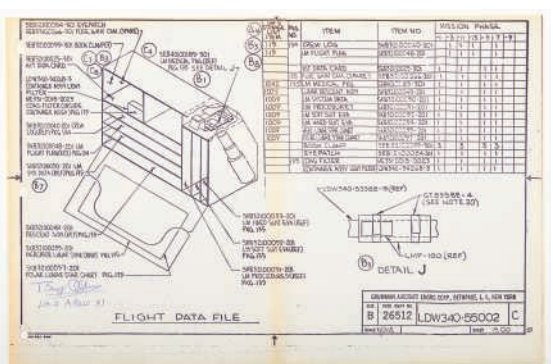
THE LANDING SITE – *Julius Caesar, Lunar Shaded Relief.* Defense Mapping Agency for NASA, September 1978.

INSCRIBED AND SIGNED BY BUZZ ALDRIN WITH AN "X" NEAR THE WORDS "TRANQUILLITY BASE, JULY 20-21, 1969, BUZZ ALDRIN."

The relatively smooth area of Mare Tranquillitatis is located in the center and right side of the chart and the heavily cratered and mountainous region of the central lunar highlands is located to the left. The landing area was officially known in NASA planning as "Landing Site 2." It was one of seven possible landing sites, all located approximately along the lunar equator facing the Earth. All landings were planned for just after sunrise at each possible site. This gave the crew maximum shadowing of lunar features for better depth perception to distinguish dangerous areas to avoid before landing. Neil Armstrong took advantage of this when the flight computer targeted his initial landing point near a crater with large boulders.

Lunar chart, 22 by 29 inches. With a lunar sphere map index and detailed legend along left edge. Scale 1:1,000,000.

$4,000-6,000



•6

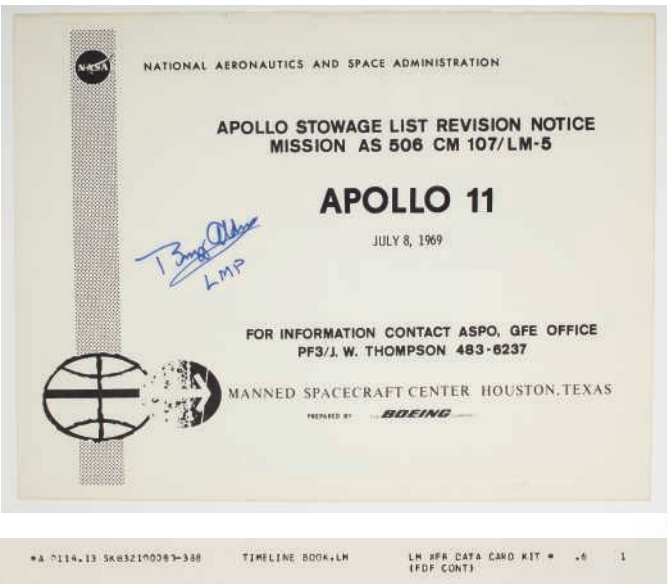
LUNAR MODULE BLUEPRINT – *Lunar Module Blueprint LDW340-55002-C. Flight Data File.* Bethpage, NY: Grumman Aircraft Engineering Corp., n.d.

EARLY PLANS FOR STOWAGE OF FLIGHT TOOLS AND MANUALS ABOARD THE LM-5 (EAGLE).

This blueprint has early planning for storage locations of critical flight manuals and crew equipment to enable the first lunar landing. The left side has a three-dimensional drawing of a storage locker for the Flight Data File (FDF). The FDF comprised NASA-written manuals on crew procedures and other reference aids as carried on all Apollo missions. The upper center has a multi-column grid with the first column heading of *"LM-5 Stowage List Item."* The second row lists the first-generation document to make the lunar landing, defined then as *"LM Flight Plan, SKB32100048-201."* By 1969, planning modifications changed this document title to the *"LM Timeline Book, SKB32100080-388."* Other manuals listed include a *Crew Log, LM Systems Data, LM Procedures, LM Hard* and *Soft Suit EVA* plus two star charts. Crew equipment listed includes an LM medical package, fuse for a 16mm camera, book clamp, eye patch, and filters for optical equipment.

10.5 by 16 inches, two folds. With key connecting the stowage list items to their locations in locker and an inset detail of the LM medical package.

$2,500-3,500



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

APOLLO STOWAGE LIST REVISION NOTICE
MISSION AS 506 CM 107/LM-5

APOLLO 11

JULY 8, 1969

Buzz Aldrin
LMP

FOR INFORMATION CONTACT ASPO, GFE OFFICE
PF3/J. W. THOMPSON 483-6237

MANNED SPACECRAFT CENTER HOUSTON, TEXAS

PREPARED BY BOEING

*A 0114.13 SK032100387-388 TIMELINE BOOK,LM LM XFR DATA CARD KIT * .6 1
(FDF CONT)

Page 10 (detail)

•7

STOWAGE LIST – *Apollo 11, Apollo Stowage List Revision Notice, Mission AS 506, CM107/LM-5.* Houston: Manned Spacecraft Center and Boeing Company, 8 July 1969.

THE APOLLO 11 STOWAGE LIST FOR FLIGHT MANUALS AND COMPONENTS, INCLUDING PLACEMENT AND USE OF THE APOLLO 11 LUNAR MODULE TIMELINE BOOK.

SIGNED and INSCRIBED: "Buzz ALDRIN, LMP" on the front cover. The movement of the *Apollo 11 LM Timeline Book* can be precisely tracked. It appears on five occasions, in the CM Launch Stowage List, the CM-LM Transfer List, the LM Lunar Launch Stowage List, the LM-CM Transfer List and the CM Entry Stowage List. On its return to Earth and at the time of *Columbia*'s splashdown, the *Timeline Book* was contained in the Data Card Kit within stowage location R3.

8 by 10.5 inches. 21 pp. Card stock covers (staples removed).

$2,500-3,500

•8

LUNAR PLAQUE – NASA test model for the Apollo 11 commemorative lunar plaque. [Manned Spacecraft Center, Technical Services Center, 1969.]

"WE CAME IN PEACE FOR ALL MANKIND." A PRODUCTION TEST MODEL BEARING EARTH'S MESSAGE LEFT ON THE MOON.

The plaque reads: "Here Men From The Planet Earth First Set Foot Upon The Moon, July 1969, A.D. We Came In Peace For All Mankind." Below this writing are the facsimile signatures and printed names of astronauts Neil A. Armstrong, Michael Collins, and Edwin E. Aldrin, Jr. At the bottom center the facsimile signature of Richard Nixon with his printed name and "President, United States of America."

The plaque eventually carried on the first lunar landing flight was made of stainless steel and placed between the third and fourth rungs on the ladder of *Eagle's* forward landing leg. The curved shaped ensured it would fit tightly against the tubular shaped landing leg and would not encumber Neil Armstrong's and Buzz Aldrin's movement up and down the ladder. Being part of the Descent Stage, it remained and is still on the Moon after the Apollo 11 crew left the lunar surface using the upper Ascent Stage. The other five lunar landing missions had similar plaques placed on their forward lander legs.

Curved aluminum plaque, measuring 7.6 by 9 inches, mounted on a custom wood display. Featuring the Western and Eastern Hemispheres of Earth and bearing engraved signatures of the Apollo 11 crew and of President Nixon.

$6,000-8,000

•9
TRANQUILITY BASE – Photograph signed and inscribed ("Tranquillity Base, July 20, 1969, Buzz Aldrin").

THE ICONIC PICTURE OF BUZZ ALDRIN BY NEIL ARMSTRONG INSCRIBED BY ALDRIN WITH ARMSTRONG'S NAME FOR THE LANDING SITE.

INSCRIBED and SIGNED by Buzz ALDRIN, "*Tranquillity Base, July 20, 1969, Buzz Aldrin.*" Buzz Aldrin was photographed by Neil Armstrong shortly after both began exploring the surface of the Moon.

Large color photograph, 16 by 20 inches.

$7,000-9,000

•10
ARMSTRONG, Neil and COLLINS, Michael. Photograph signed. Kennedy Space Center, 16 July 1969.

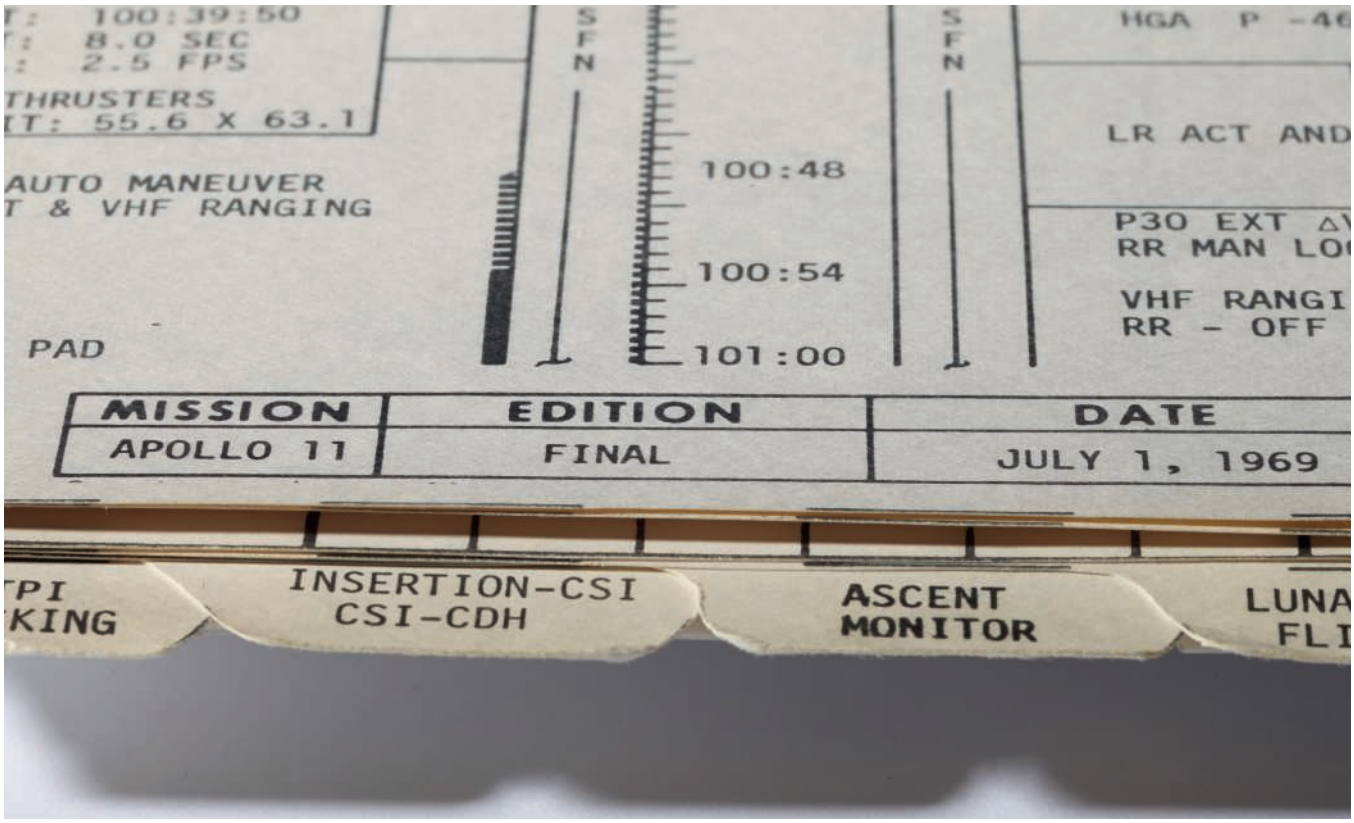
ARMSTRONG AND COLLINS ENJOY THEIR LAUNCH-DAY BREAKFAST: STEAK AND EGGS.

SIGNED by Neil ARMSTRONG and Mike COLLINS. Apollo 11 astronauts Neil Armstrong and Mike Collins enjoy breakfast prior to their launch to the Moon at the Kennedy Space Center. In addition to his traditional steak and eggs, Armstrong has toast and coffee.

Black and white photograph, 8 by 10 inches. An official NASA-released photograph with blue caption on verso reading in part: "For Release July 16, 1969, Photo No. 69-H-1123, 108-KSC-69P-609."

$3,000-5,000


TO REPOSITION
PUSH BUTTONS
FORWARD



Commander Neil Armstrong in the LM simulator at Cape Canaveral on 19 June 1969

THE BOOK WHICH GUIDED THE FIRST HUMANS TO THE SURFACE OF THE MOON

11

THE TIMELINE BOOK – *Apollo 11 LM Timeline Book*. [Houston:] Manned Spacecraft Center, Flight Planning Branch, 19 June-12 July 1969.

FLOWN ABOARD THE LUNAR MODULE *EAGLE* AND ANNOTATED BY ASTRONAUTS NEIL ARMSTRONG AND BUZZ ALDRIN IN REAL TIME, 20-21 JULY 1969, THE *TIMELINE BOOK* IS THE MOST IMPORTANT MANUAL USED TO ACCOMPLISH THE NATIONAL GOAL OF LANDING MAN ON THE MOON AND RETURNING HIM SAFELY TO EARTH.

Final edition with manuscript and typescript amendments. 10.5 by 8.5 inches. 22 leaves with 43 printed pages. Illustrated with diagrams including a full-page "CSM/LM Typical Landmark Tracking Profile" oriented from the Moon; depictions of the spacecraft oriented from the Earth, two circuit breaker boards, and several orbital grids. Printed on various stock paper, a heavier stock for 10 leaves beginning with page 6 (the first page unique to the *Timeline Book*) and lighter stock paper for the PDI Abort sequence pages. Card covers, front cover printed, covers and all pages three-hole punched and fastened with book rings. Part No. SKB32100080-388. Serial No. 1001.

$7,000,000-9,000,000

APOLLO 11	
LM TIMELINE BOOK	
PART NO	S/N
SKB32100080-388	1001

SEP
DOI-PDI
TD+3-T2ABORT
FLIGHT PLAN
MONITOR
CSI-CDH
TPI-DOCKING

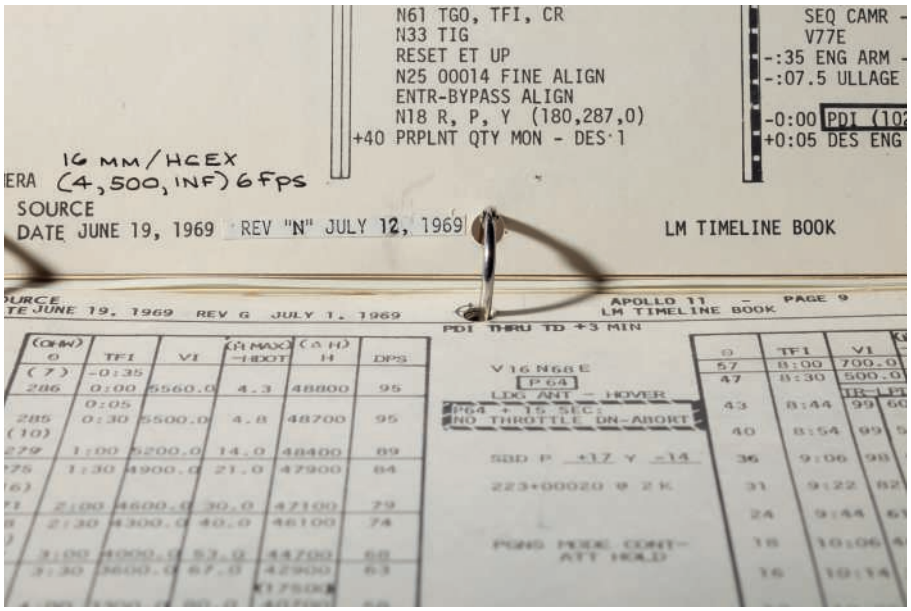
Lunar Module Pilot Buzz Aldrin demonstrating the placement of the *LM Timeline Book* during the flight

That's the Timeline Book that is laid down on the table in front of the data display keyboard; and it's on this timeline that we have all our procedures … we just turn the pages over when we go to new sequences in our timeline of procedures

—Buzz Aldrin, 18 July 1969, 5pm CDT

- This *Timeline Book* was located precisely between Commander Armstrong and Lunar Module Pilot Aldrin as they made the historic landing, amidst computer alarms flashing and with only about 20 seconds of fuel remaining.
- *Eagle*'s coordinates in the Sea of Tranquility are written by Aldrin on page ten within moments of landing, being the first writing by a human being on an extraterrestrial body.
- It narrates the entire 34-hour LM *Eagle* voyage from inspection, undocking, lunar surface descent, stay, and ascent, to the lunar orbit rendezvous with Command Module Pilot Michael Collins in *Columbia*.
- The *Timeline Book* is unique, with:
  - —numerous manuscript and typed technical updates made at Cape Canaveral as late as four days before the Apollo 11 launch
  - —faint traces of apparent lunar dust on the transfer list pages which detail the movement of lunar rock samples and equipment from LM *Eagle* to CSM *Columbia*
  - —nearly 150 completion checkmarks and other annotations made by the astronauts during the Apollo 11 mission during the flight

No more significant document of space exploration history is likely to ever be created as future manned missions will be more fully digitized and will not leave this human trace.



Edition and Revisions

Most pages are individually dated, the earliest source date being 19 June 1969–"Basic edition" (except for the landing page with a possibly erroneous hand-lettered date of 16 June). The overall "Final edition" of the book is dated 1 July 1969. Subsequent revisions are made by hand and typed over correction tape which are dated from 2 July to 12 July with alphabetic revision designations ranging from letters "C" to "N." The large majority of the used pages in the *Timeline Book* have hand-made revisions (the unused pages are the Abort sequences or blanks). There are over 20 pen-and-ink changes and nearly 20 instances of typed correction tape made by the flight planners at Cape Canaveral in concurrence with NASA MSC managers over the course of 27 days before the Apollo 11 launch.

Real-Time Annotations

There are 146 data logs, step-by-step completion checkmarks, and other annotations made in real time by Neil Armstrong and Buzz Aldrin during their mission across at least 17 of the pages.

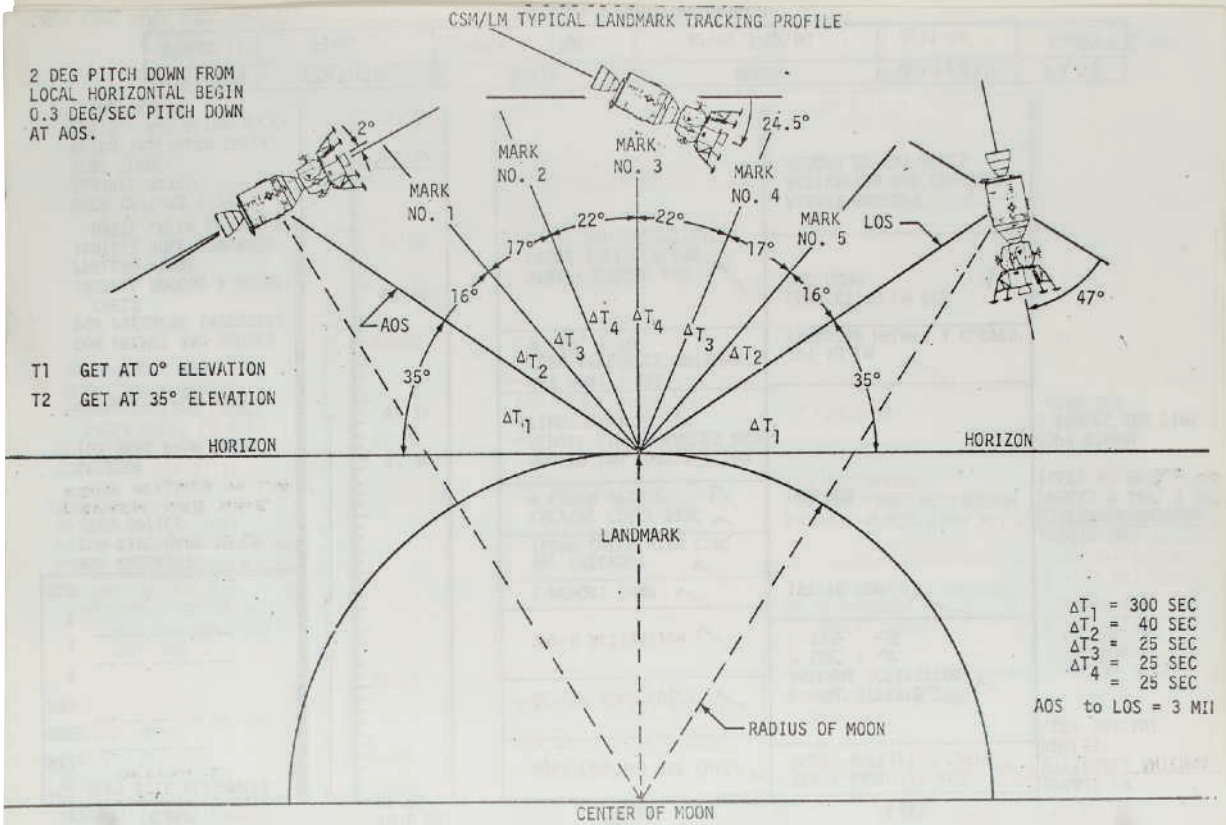
The pencil letters on the front cover read "OK EEA," signifying that the manual was okayed by Edwin Eugene Aldrin before the Apollo 11 launch. The front cover of the flown Command Service Module flight plan bears the equivalent mark made by Command Module Pilot Michael Collins. Flown flight manuals typically use Serial Number 1001, as here.

Provenance

Colonel Edwin E. "Buzz" Aldrin (b. 1930; faint pencil initials to top right corner of upper cover; full-page inscription signed "Buzz Aldrin" on the inside front cover, typed provenance letter signed on Aldrin stationery) – sold by Aldrin at a Los Angeles auction to the current owner in 2007.

See also the 2012 Act of Congress, Public Law 112-185, confirming astronaut ownership and transfer rights for Mercury, Gemini and Apollo program artifacts such as flight manuals: https://www.govtrack.us/congress/bills/112/hr4158/text/enr

Aldrin on his way to the Moon. The Beta cloth bag he holds is or is the same type as the one that contained the *LM Timeline Book*



3-64a

FLIGHT PLAN

CSM | LM | MCC-H

CMP

1130 EDT

98:00

MANEUVER TO TRACKING ATTITUDE 258/270
R 0 , P ~~270~~/290, Y 0
DOFF HELMET & GLOVES

SELECT OMNI C

GO INERTIAL
UNSTOW OPTICS
P22 ORBITAL NAVIGATION

98:21

98:30

MSFN

TRACK LDG SITE LANDMARK
(5 MARKS ON LDMK 130)
PITCH DOWN 0.3°/SEC AT T2
DO NOT INCORPORATE MARKS

PITCH DOWN, 0.5°/SEC
CONTINUE PITCH TO
~~STOP PITCH AND GO INERTIAL~~
AGS CAL PITCH ATT (22.5)
V64 ACQUIRE MSFN
HGA P-55 Y+2

98:50

98:56

99:00

CDR	LMP
DON HELMET & GLOVES ✓	DON HELMET & GLOVES ✓
ARS/PGA PRESSURE INTEGRITY CHECK ✓	ARS/PGA PRESSURE INTEGRITY CHECK ✓
CABIN REGULATOR CHECK ✓	CABIN REGULATOR CHECK ✓
DOFF HELMET & GLOVES ✓ COPY DAP DATA COPY GYRO TORQUE ANGLES AND FINE ALIGN IMU ✓ X ___, Y ___, Z ___	DOFF HELMET & GLOVES SELECT OMNI FWD BIO MED SWITCH - RIGHT
RATE GYRO CHECK ✓	AGS ACT & SELF TEST ✓
R 0, P ~~135/14~~ 165/22.5, Y 0 HGA P-45, Y3	V64 ACQUIRE MSFN ANT P ~~187~~ 165, Y ~~70~~ 66

UPDATE LM
DAP DATA
GYRO TORQUE ANGLES

P22 AUTO OPTICS
LMK ID 130
T1 9 8:4 0:0 2 (HOR)
T2 9 8:4 5:0 8 (35°)
9 6 NM (N) OR S)

N 89
LAT + 0 1.2 4 3
LONG/2 + 1 1.8 4 4
ALTITUDE- 0 0 1.4 6 NM

DUMP DSE

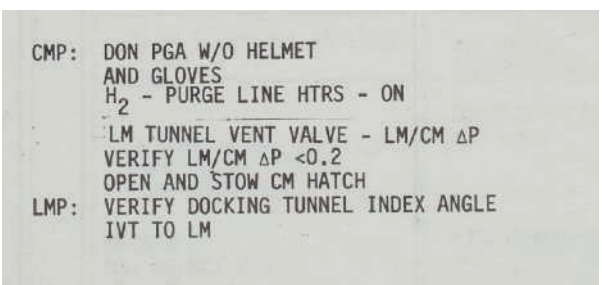
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	98:00 - 99:00	5/12	3-65

FLIGHT PLANNING BRANCH

CDH-TPI TPI-DOCKING | INSERTION-CSI CSI-CDH | ASCENT MONITOR | LUNAR SURFACE FLIGHT PLAN | PDI-TD+3MIN TD+3-T2ABORT | SEP-DOI DOI-PDI | UNDOCK TO SEP

The first seven pages in the *Timeline Book* are numbered 3-62 to 3-64, 3-64a, and 3-65 to 3-67. These pages are identical to that portion of the Apollo *11 Flight Plan* which stayed with Command Module Pilot Michael Collins in the *Columbia* during the mission. This duplication served to coordinate tasks between *Columbia* and *Eagle* just prior to and after undocking.

Page 3-65, illustrated opposite, is formatted in columns reading from left to right: "CSM / CMP" listing tasks performed in the Command Service Module (CSM) by the Command Module Pilot (CMP); a Revolution line indicator—bold solid when the crew is in lunar shadow; the Manned Space Flight Network (MSFN) line indicator—solid when the crew is in direct line-of-sight communication with the Earth; the Ground Elapsed Time (GET) tick indicator, i.e. the hours and minutes since launch; the Lunar Module (LM) column subdivided into task lists for both the Commander (CDR) and the Lunar Module Pilot (LMP); and a final column for Mission Control Center-Houston (MCC-H).



Page 3-62 (detail)

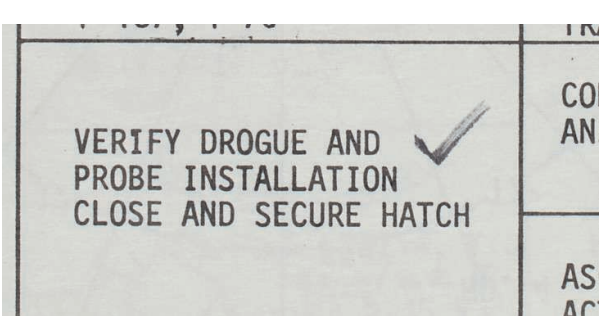
THE BEGINNING
Lunar Module Inspection and Preparation

The book begins as the crew awakens on 20 July 1969. Armstrong and Aldrin don their Liquid Cooling Garments and Collins logs a status report on the crew's sleep. At the foot of page 3-62 are the very first instructions to begin the lunar landing portion of the Apollo 11 mission: Collins dons his spacesuit (PGA = Pressure Garment Assembly) and opens and stows the Command Module Hatch. Aldrin then verifies the docking tunnel index angle and makes the all-important "IVT to LM," that is, he floats through the tunnel from *Columbia* to *Eagle* in an Intervehicular Transfer (IVT) to the Lunar Module (LM). See detail above.

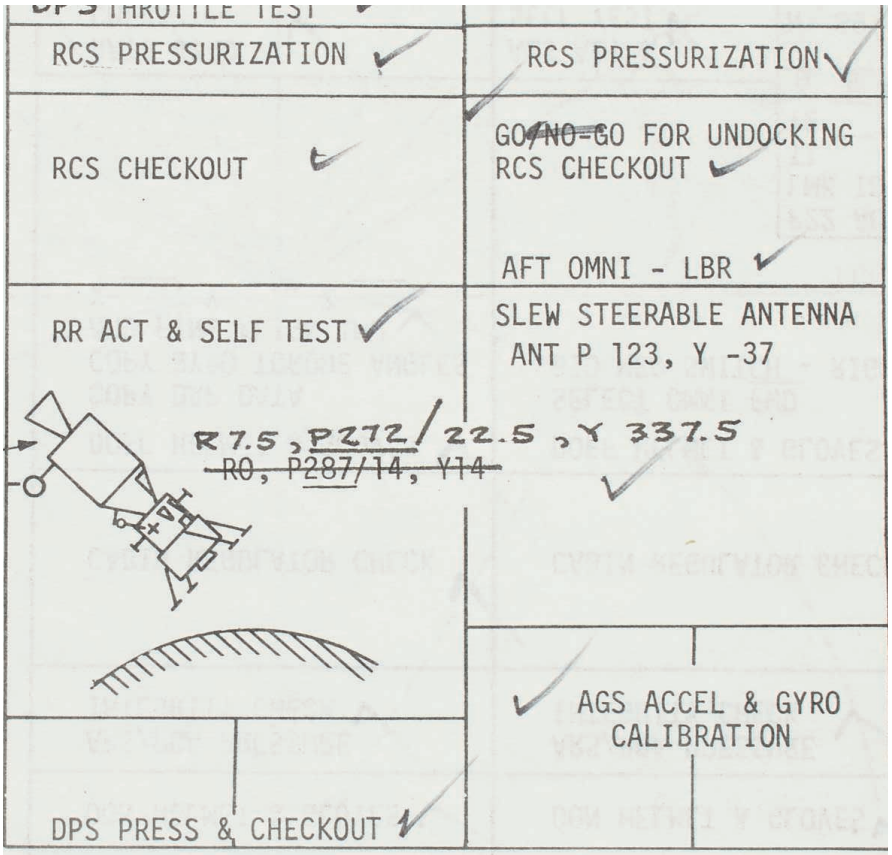
On page 3-63, Armstrong dons his spacesuit in *Columbia* while Aldrin begins work within *Eagle*. Aldrin powers it up ("LM POWER–ON"), activates the electrical power subsystem, mission timer, computer cooling system, circuit boards, and computers. At the foot of this page, Neil Armstrong enters the *Eagle* ("IVT to LM") at about 9:30am Central Time, 20 July 1969 and 96:50 GET.

For the next hour, Armstrong and Aldrin continue to configure the *Eagle* for its first and only voyage. There are 15 checkmarks made by Neil Armstrong on this page (3-64) for activities such as checking his spacesuit fan, VHF radio, clock synchronization, and adjustments for antenna. Aldrin returns to *Columbia* for about 20 minutes to don his own spacesuit and, back in the LM, completes his last step on this page which is the verification of the batteries that powered explosive devices used in the extension of the landing gear. Armstrong's last step on page 3-64 is to "Close and Secure Hatch." See detail below including checkmark made by Armstrong.

At the top of page 3-65 the first task for both astronauts is to don their gloves and helmets so that they can perform a spacesuit pressure integrity check and then a cabin regulator check. Armstrong completes the rate gyro check while Aldrin cycles the Abort Guidance Section (AGS) and acquires the *Eagle*'s independent communication line with the MSFN. The full-page illustration, page 3-64a, is a landmark tracking profile depicting five marks. The landmark was a small impact crater located on the inner wall of lunar crater 130, quite close to the actual landing site. The diagram's primary function was to assist rendezvous after the lunar landing if tracking data was lost from Earth.



Page 3-64 (detail)



Page 3-66 (detail)

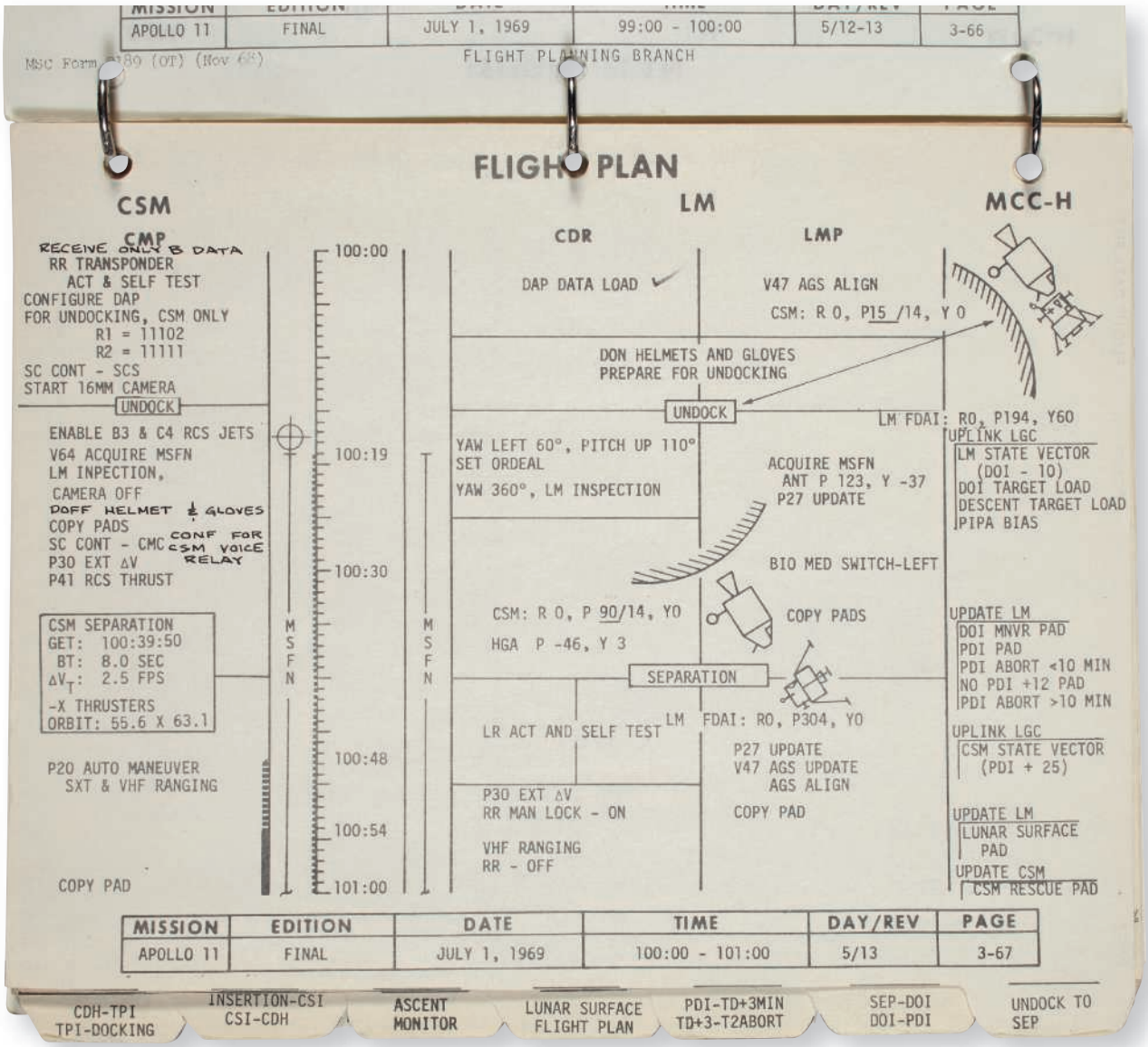
THE EAGLE HAS WINGS
Undocking to Separation

Following the steps on page 3-66, Armstrong deploys the *Eagle*'s landing gear, loads data into the Digital Auto Pilot (DAP), tests the Descent Propulsion Section (DPS) throttle, and pressurizes the Reaction Control Subsystem (RCS), the small thruster jets used for close maneuvering. At this point we have the final "GO/NO-GO FOR UNDOCKING" and Neil Armstrong has emphatically lined through the "NO-GO" leaving "GO." See detail above. Armstrong then fires the RCS jets and tests the rendezvous radar. His last action on this page is to pressurize and test the Descent Propulsion section, the big rocket engine that would lower them to the lunar surface. There are 19 checkmarks by Armstrong on this page.

The next two pages are on a single leaf and numbered page 3-67 and page 6. This leaf is tabbed "UNDOCK TO SEP," i.e. Undocking to Separation of the Lunar Module *Eagle*.

The LM *Eagle* then undocks from CSM *Columbia*. The central diagram on page 3-67 at right depicts this event. *Eagle* begins a 360° yaw so that Collins can get a good look from his vantage point in *Columbia*: the "LM Inpection" (sic). Undocking was performed about 3 minutes ahead of schedule so the crew was out of signal range during LM Inspection. As soon as they regained communication, Armstrong announced "The *Eagle* has wings."

Page 6 is the first one wholly unique to the *Timeline Book*. It backs up in time to begin five minutes before LM undocking and end with separation 25 minutes later. Aldrin has amended one of the time ticks to document that AOS (Acquisition of Signal) happened three minutes earlier than predicted in the *Timeline Book*. Aldrin also logs the then current accumulated Delta V of the *Eagle*'s X, Y, and Z axes and some other data points before zeroing out the computer. Aldrin and Armstrong then "LM Active Station Keep." The pair of astronauts in *Eagle* both take the opportunity to remove their helmets and gloves.



MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	99:00 - 100:00	5/12-13	3-66

MSC Form 2380 (OT) (Nov 68) FLIGHT PLANNING BRANCH

FLIGHT PLAN

CSM

CMP

RECEIVE ONLY S DATA
RR TRANSPONDER
ACT & SELF TEST
CONFIGURE DAP
FOR UNDOCKING, CSM ONLY
R1 = 11102
R2 = 11111
SC CONT - SCS
START 16MM CAMERA
UNDOCK
ENABLE B3 & C4 RCS JETS
V64 ACQUIRE MSFN
LM INPECTION,
CAMERA OFF
DOFF HELMET & GLOVES
COPY PADS
SC CONT - CMC CONF FOR CSM VOICE RELAY
P30 EXT ΔV
P41 RCS THRUST

CSM SEPARATION
GET: 100:39:50
BT: 8.0 SEC
ΔV_T: 2.5 FPS
-X THRUSTERS
ORBIT: 55.6 X 63.1

P20 AUTO MANEUVER
SXT & VHF RANGING

COPY PAD

MSFN

100:00
100:19
100:30
100:48
100:54
101:00

LM

CDR

DAP DATA LOAD

YAW LEFT 60°, PITCH UP 110°
SET ORDEAL
YAW 360°, LM INSPECTION

CSM: R 0, P 90/14, Y0
HGA P -46, Y 3

LR ACT AND SELF TEST

P30 EXT ΔV
RR MAN LOCK - ON

VHF RANGING
RR - OFF

LMP

V47 AGS ALIGN
CSM: R 0, P15 /14, Y 0

DON HELMETS AND GLOVES
PREPARE FOR UNDOCKING

UNDOCK

ACQUIRE MSFN
ANT P 123, Y -37
P27 UPDATE

BIO MED SWITCH-LEFT

COPY PADS

SEPARATION

LM FDAI: R0, P304, Y0

P27 UPDATE
V47 AGS UPDATE
AGS ALIGN

COPY PAD

MCC-H

LM FDAI: R0, P194, Y60
UPLINK LGC
LM STATE VECTOR
(DOI - 10)
DOI TARGET LOAD
DESCENT TARGET LOAD
PIPA BIAS

UPDATE LM
DOI MNVR PAD
PDI PAD
PDI ABORT <10 MIN
NO PDI +12 PAD
PDI ABORT >10 MIN

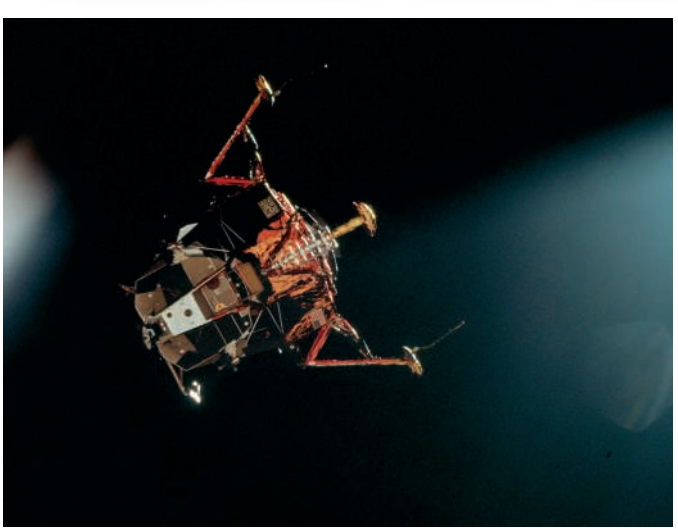
UPLINK LGC
CSM STATE VECTOR
(PDI + 25)

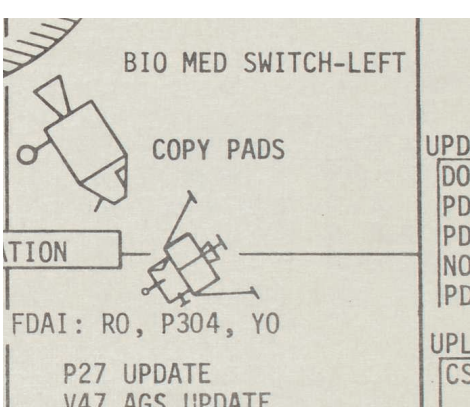
UPDATE LM
LUNAR SURFACE
PAD

UPDATE CSM
CSM RESCUE PAD

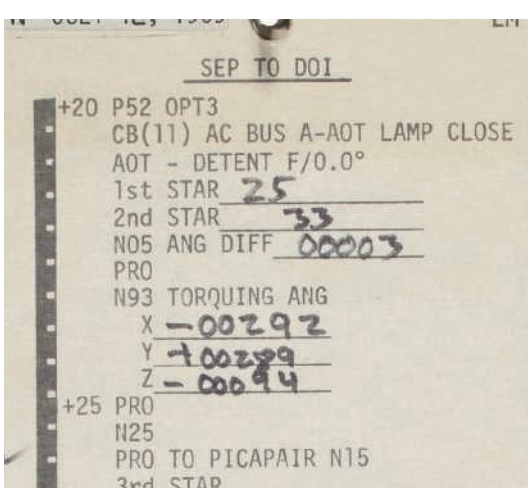
MISSION	EDITION	DATE	TIME	DAY/REV	PAGE
APOLLO 11	FINAL	JULY 1, 1969	100:00 - 101:00	5/13	3-67

CDH-TPI
TPI-DOCKING
INSERTION-CSI
CSI-CDH
ASCENT
MONITOR
LUNAR SURFACE
FLIGHT PLAN
PDI-TD+3MIN
TD+3-T2ABORT
SEP-DOI
DOI-PDI
UNDOCK TO
SEP





The LM performing the 360° yaw indicated above
photographed by Command Module Pilot Michael Collins



SEP TO DOI

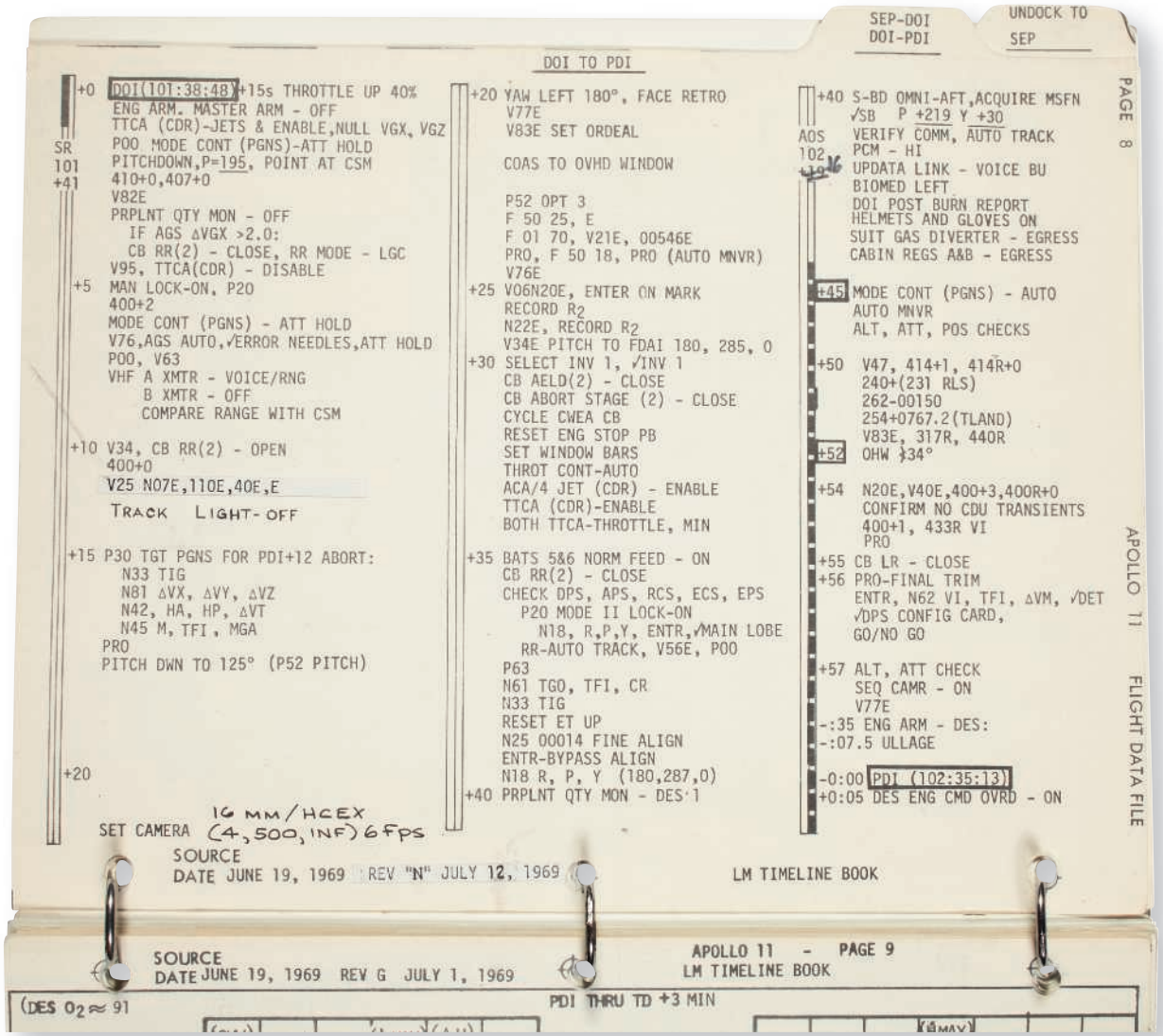
+20 P52 OPT3
CB(11) AC BUS A-AOT LAMP CLOSE
AOT - DETENT F/0.0°
1st STAR 25
2nd STAR 33
N05 ANG DIFF 00003
PRO
N93 TORQUING ANG
X −00292
Y +00289
Z −00094
+25 PRO
N25
PRO TO PICAPAIR N15
3rd STAR

Page 7 (detail)

THE LAST MAJOR STEP BEFORE LANDING
Descent Orbit Insertion

After page 6, the *LM Timeline Book*'s pages are numbered consecutively through page 23. Pages 7-8 are tabbed "SEP-DOI / DOI-PDI," meaning Separation to Descent Orbit Insertion and Descent Orbit Insertion to Powered Descent Initiation. Both of these pages are from Revision "N" dated just four days before launch.

Page 7 covers the hour between the LM's separation and the insertion into descent orbit. It begins when Commander Armstrong disables the Thrust/Translation Controller Assembly (TTCA), a.k.a. joystick, closes the circuit breaker to power the Landing Radar (LR), and checks that the ambient temperature is within an allowable range (50-70°). Armstrong and Aldrin continue with a complex list of settings and data checks. For example, Armstrong sets the landing antenna switch to descent and gets an expected alarm; he switches to auto and terminates this test with program V34E; he then opens the Landing Radar circuit breaker—following an instruction typed on correction tape and pasted in on 12 July. Around the time of Spacecraft Sunset (SS), Armstrong and Aldrin start loading program P30 which targets the Primary Guidance and Navigation Section (PGNS) to set the time of ignition for the Descent Orbit Insertion (DOI) engine burn.



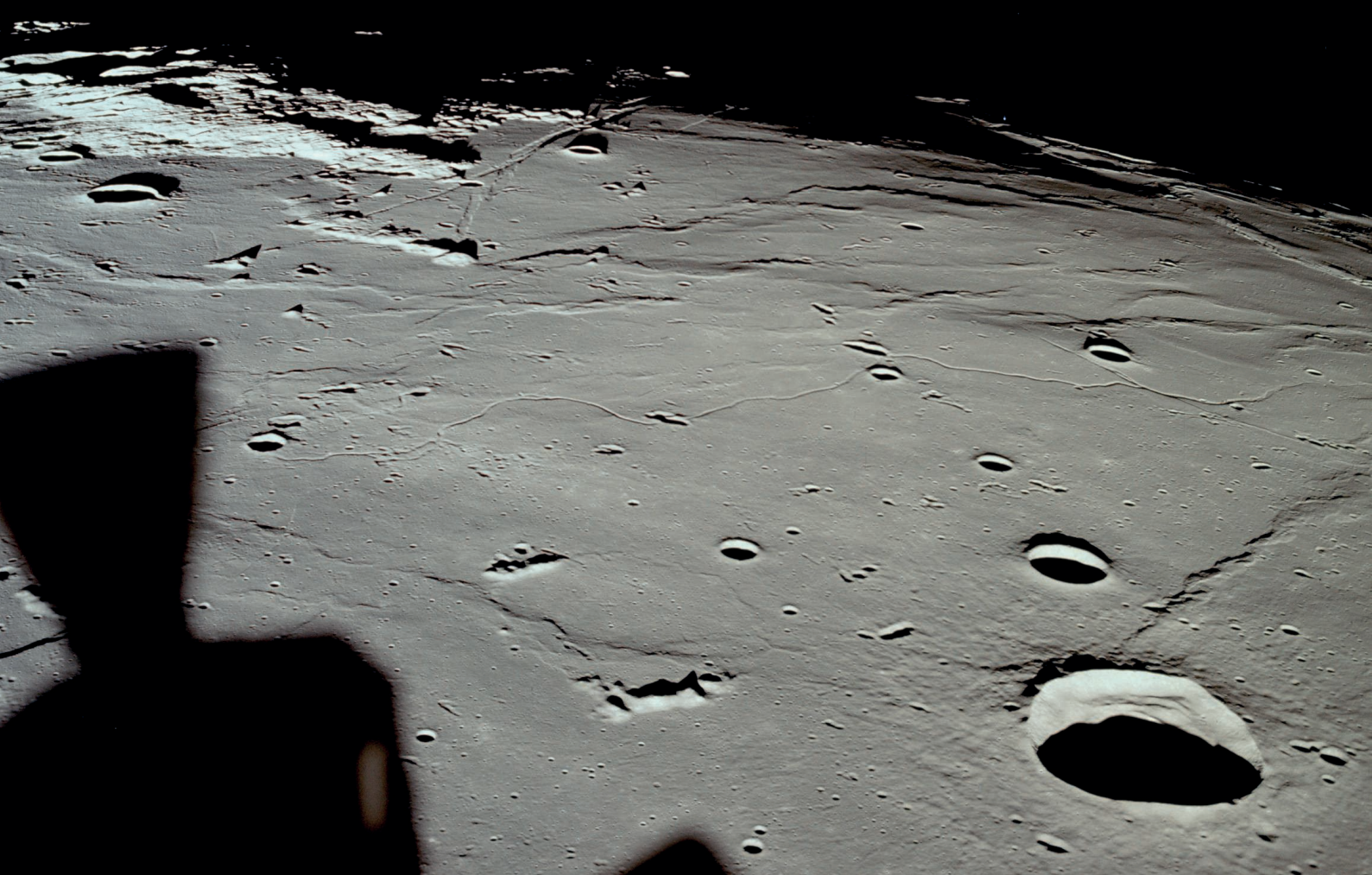
Soon after, Aldrin makes two star sightings using the Alignment Optical Telescope (AOT), see detail left. The first star he logs is Acrux, code number 25, and the second is Antares, code number 33. At the bottom of the middle column, both astronauts don their helmets and gloves again in preparation for descent. At T-minus one minute to Descent Orbit Insertion, Armstrong prepares for the burn. At T-minus 35 seconds, he places the engine arm switch to the descent position. The DOI engine burn occurs at 101:36 GET or 2:10 p.m. CDT, some two and a half minutes ahead of the schedule printed in the DOI time block on pages 7 and 8.

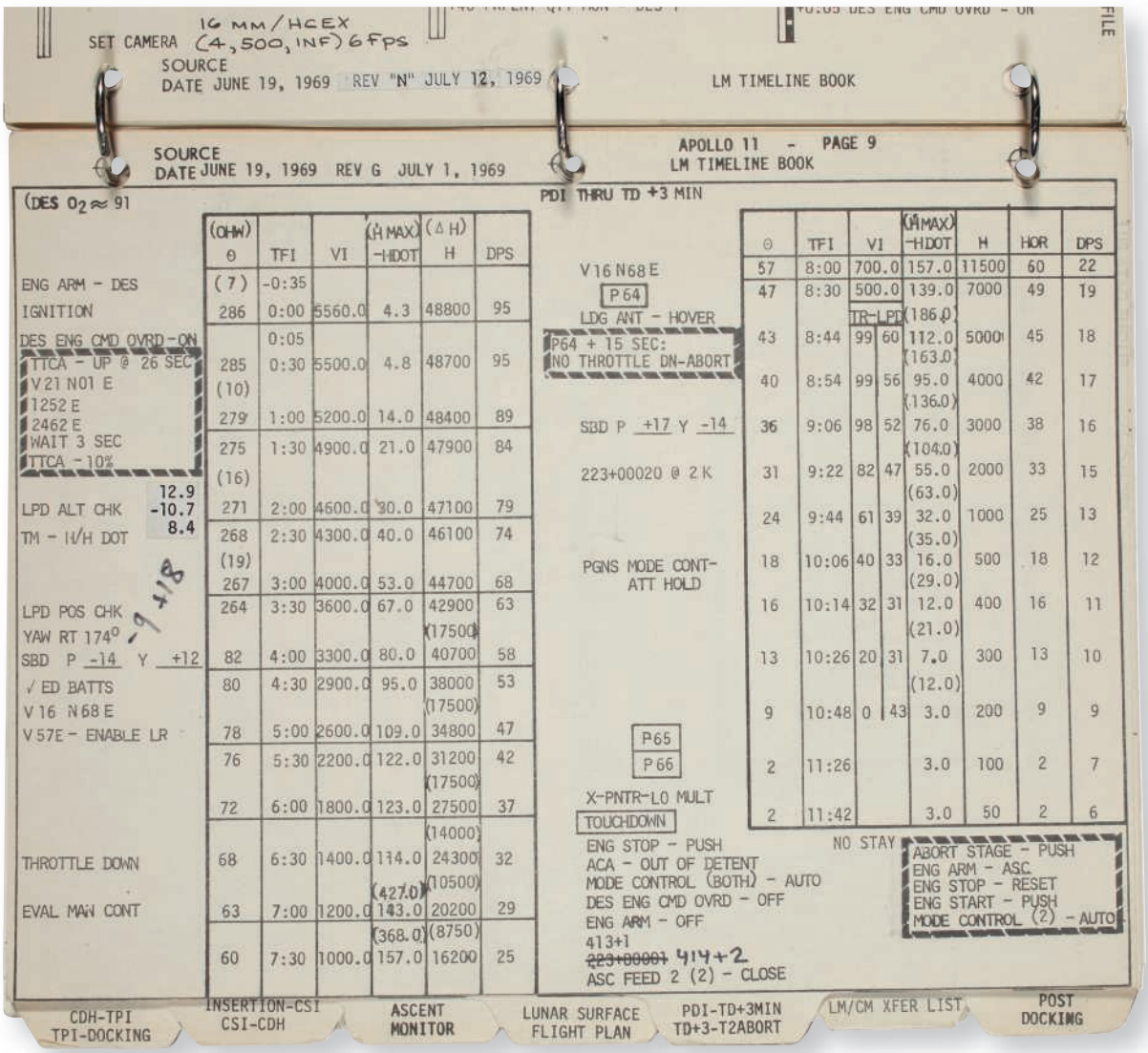
At 15 seconds into the DOI burn, the descent engine throttles up to 40% of full power. Then Armstrong sets the engine arm and master arm switches to off and places his TTCA lever to the enable jets position, giving him attitude control via the Reaction Control Subsystem (RCS) jets. He then nulls out any unwanted X-axis movement (VGX), aka residuals. The sun rises over the spacecraft at 101:41 GET.

They configure their orbit and set parameters for descent. Ten minutes after DOI, a handwritten instruction advises them to turn their "track light off." Aldrin sets up the 16mm motion picture camera to film out his window and verifies the aperture, shutter speed, focus and frame rate, all per handwritten instructions. This camera is the only one rolling to show *Eagle*'s lunar descent.

Complicated positioning continues as they compare their data to that of *Columbia* and Mission Control and as they look out the windows. At about 45 minutes after DOI, Armstrong verified *Eagle*'s altitude, attitude and position. They also timed craters and other lunar surface features as they passed along a grid etched on Armstrong's forward window. Armstrong radioed "Our radar checks indicate 50,000 foot perilune. Our visual altitude checks steady out at about 53,000." He knew the landing radar was not that accurate above 30,000 feet, so these visual checks assured them that they were at the desired altitude. They proceed with the "final trim" at minute 56, i.e. T-minus four minutes from Powered Descent Initiation.

Armstrong at 102:38:26 GET: ***Program Alarm***
Duke, 102:38:28: ***It's looking good to us. Over.***
Armstrong, 102:38:30: ***It's a 1202***
Aldrin, 102:38:32: ***1202***
Armstrong to Aldrin, 102:38:42: ***What is it? Let's incorporate…***
Armstrong to Houston, 102:38:42: ***Give us a reading on the 1202 Program Alarm***





(OHW) θ	TFI	VI	(ḣ MAX) -HDOT	(Δ H) H	DPS
(7)	-0:35				
286	0:00	5560.0	4.3	48800	95
	0:05				
285	0:30	5500.0	4.8	48700	95
(10)					
279	1:00	5200.0	14.0	48400	89
275	1:30	4900.0	21.0	47900	84
(16)					
271	2:00	4600.0	30.0	47100	79
268	2:30	4300.0	40.0	46100	74
(19)					
267	3:00	4000.0	53.0	44700	68
264	3:30	3600.0	67.0	42900	63
				(17500)	
82	4:00	3300.0	80.0	40700	58
80	4:30	2900.0	95.0	38000	53
				(17500)	
78	5:00	2600.0	109.0	34800	47
76	5:30	2200.0	122.0	31200	42
				(17500)	
72	6:00	1800.0	123.0	27500	37
				(14000)	
68	6:30	1400.0	114.0	24300	32
			(427.0)	(10500)	
63	7:00	1200.0	143.0	20200	29
			(368.0)	(8750)	
60	7:30	1000.0	157.0	16200	25

θ	TFI	VI	(ḣ MAX) -HDOT	H	HOR	DPS
57	8:00	700.0	157.0	11500	60	22
47	8:30	500.0	139.0	7000	49	19
		TR-LPD	(186.0)			
43	8:44	99 60	112.0	5000	45	18
			(163.0)			
40	8:54	99 56	95.0	4000	42	17
			(136.0)			
36	9:06	98 52	76.0	3000	38	16
			(104.0)			
31	9:22	82 47	55.0	2000	33	15
			(63.0)			
24	9:44	61 39	32.0	1000	25	13
			(35.0)			
18	10:06	40 33	16.0	500	18	12
			(29.0)			
16	10:14	32 31	12.0	400	16	11
			(21.0)			
13	10:26	20 31	7.0	300	13	10
			(12.0)			
9	10:48	0 43	3.0	200	9	9
2	11:26		3.0	100	2	7
2	11:42		3.0	50	2	6

THE LANDING

Powered Descent Initiation

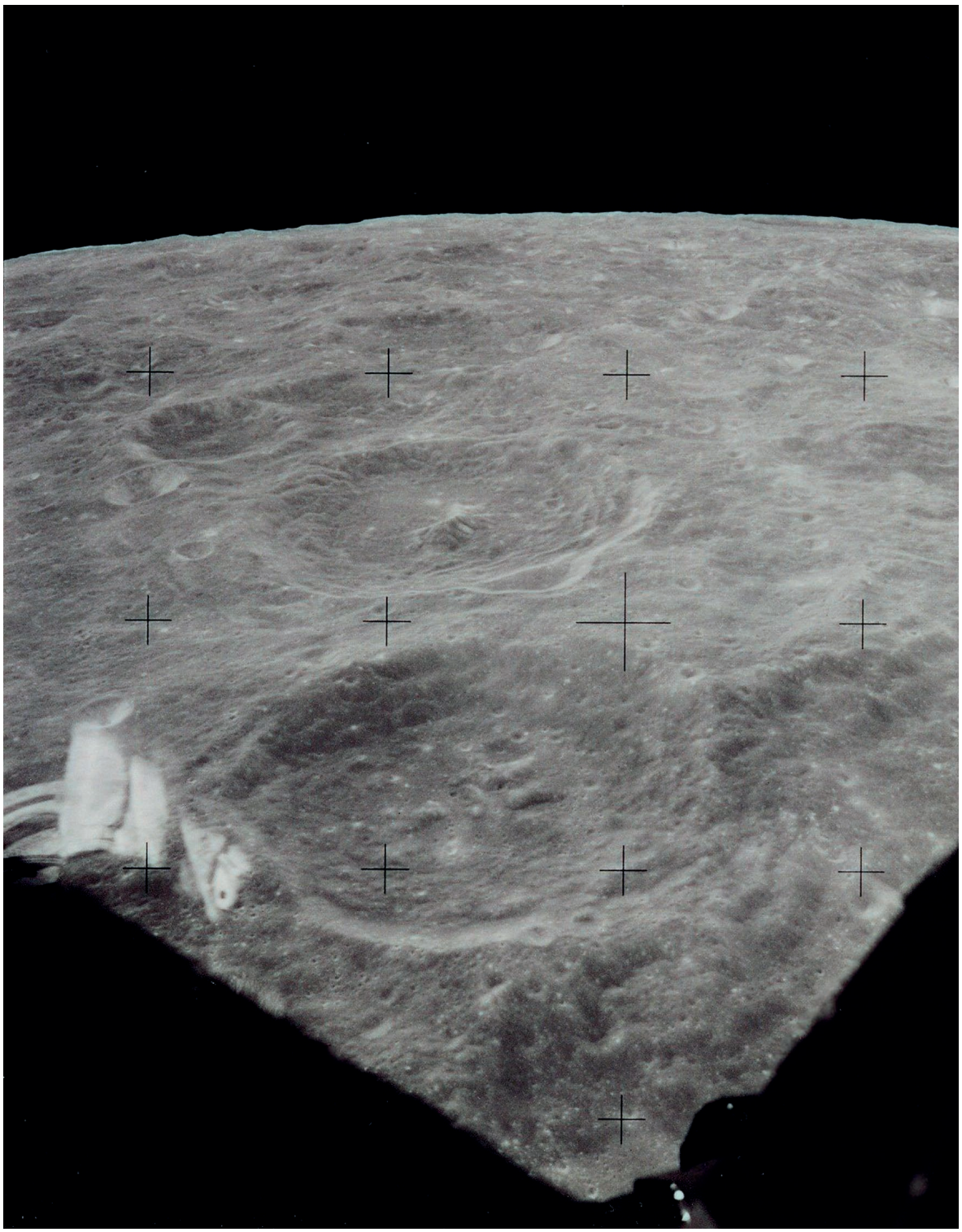
At 102:28 GET or 3:02 p.m. CDT, CapCom Charlie Duke in Houston relayed the "GO" for Powered Descent. Armstrong sets the engine arm switch to "descent" and verifies the ullage of the *Eagle*'s descent stage fuel tanks. The final task on page 8 is to set the descent engine command override to "on." They are now heading for the lunar surface in a step never before attempted by an Apollo crew or anyone else.

Armstrong and Aldrin were less than six minutes into the PDI burn (labeled on page 9 as 6:00 TFI, "Time From Ignition") when a never-supposed-to-happen computer program alarm flashed on the DSKY. They were unsure what the 1202 alarm code meant but there was great concern that it might cause a lunar landing abort. Aldrin noticed the alarm occurred when he keyed in V16 N68 to get current landing site distance, time before pitch-over, and velocity. He quit asking the onboard computer for this data and switched to relying on ground control. It took about half a minute for Houston to clear them from the first 1202 alarm. Four more alarms would follow but these were cleared more quickly.

In the midst of the alarms, at just after 102:41 GET, Armstrong called out "*P64*," indicating that the computer has just started program 64 for the approach phase. They had just gone under 7000 feet altitude and Armstrong puts the landing radar antenna switch to the hover position after P64 started pitching them forward. The lunar surface slowly came into view through the forward windows.

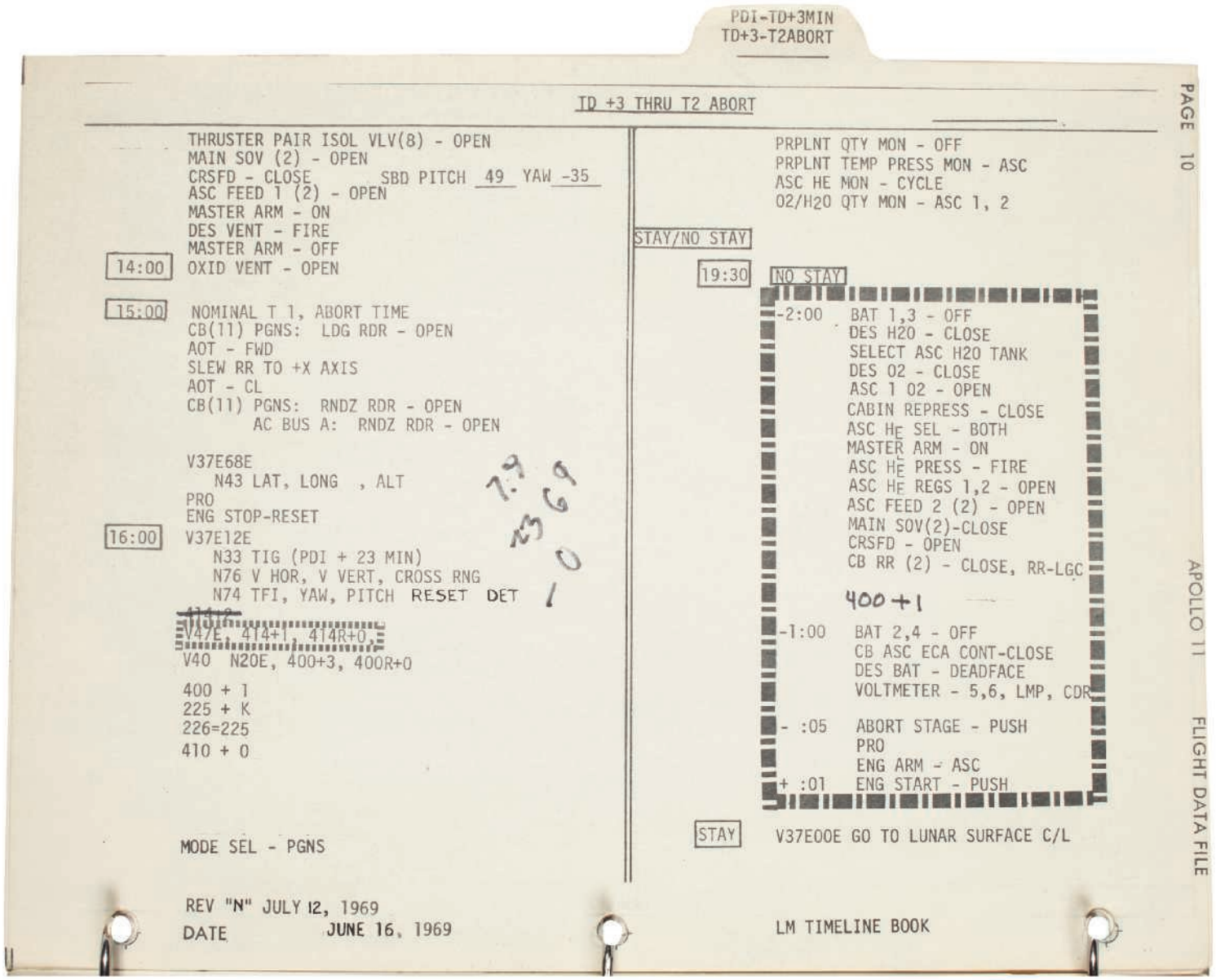
The rectangular box in the middle with angled dashes serves as a reminder warning to them that if at 15 seconds after the start of P64 they had no throttle down, then they were required to abort the lunar landing. Buzz had switched the S-band (SDB) antenna to automatic and communications remained clear. He did not slew to pitch +17 and yaw -14 angles. Engine throttle down was on time.

At about 102:42 GET, Neil radioed: "Okay, 5000 (the altitude), 100 feet per second is good (the descent rate). Altitude control is good ... Manual attitude control is good." He puts the PGNS mode control switch to attitude hold as that allows him to do a quick test of the hand controllers. At nine minutes into the PDI burn, MCC gave them a GO for landing. Aldrin acknowledged the call and said they were just below 3000 feet in altitude. Suddenly, another alarm, but different code – 1201! After a quick review, Houston gave them a GO to continue the landing.



"The auto targeting was taking us right into a football-field-sized crater, with a large number of big boulders and rocks for about one or two crater diameters around it, and it required us going in P66 and flying manually over the rock field to find a reasonably good area."

—Neil Armstrong, recounted at 102:55 GET


PDI-TD+3MIN
TD+3-T2ABORT

TD +3 THRU T2 ABORT

PAGE 10

THRUSTER PAIR ISOL VLV(8) - OPEN
MAIN SOV (2) - OPEN
CRSFD - CLOSE SBD PITCH 49 YAW -35
ASC FEED 1 (2) - OPEN
MASTER ARM - ON
DES VENT - FIRE
MASTER ARM - OFF
14:00 OXID VENT - OPEN

15:00 NOMINAL T 1, ABORT TIME
CB(11) PGNS: LDG RDR - OPEN
AOT - FWD
SLEW RR TO +X AXIS
AOT - CL
CB(11) PGNS: RNDZ RDR - OPEN
AC BUS A: RNDZ RDR - OPEN

V37E68E
N43 LAT, LONG , ALT
PRO
ENG STOP-RESET
16:00 V37E12E
N33 TIG (PDI + 23 MIN)
N76 V HOR, V VERT, CROSS RNG
N74 TFI, YAW, PITCH RESET DET
~~414+1~~
V47E, 414+1, 414R+0,
V40 N20E, 400+3, 400R+0

400 + 1
225 + K
226=225
410 + 0

MODE SEL - PGNS

REV "N" JULY 12, 1969
DATE JUNE 16, 1969

PRPLNT QTY MON - OFF
PRPLNT TEMP PRESS MON - ASC
ASC HE MON - CYCLE
O2/H2O QTY MON - ASC 1, 2

STAY/NO STAY

19:30 NO STAY

-2:00 BAT 1,3 - OFF
DES H2O - CLOSE
SELECT ASC H2O TANK
DES O2 - CLOSE
ASC 1 O2 - OPEN
CABIN REPRESS - CLOSE
ASC HE SEL - BOTH
MASTER ARM - ON
ASC HE PRESS - FIRE
ASC HE REGS 1,2 - OPEN
ASC FEED 2 (2) - OPEN
MAIN SOV(2)-CLOSE
CRSFD - OPEN
CB RR (2) - CLOSE, RR-LGC

400+1

-1:00 BAT 2,4 - OFF
CB ASC ECA CONT-CLOSE
DES BAT - DEADFACE
VOLTMETER - 5,6, LMP, CDR

- :05 ABORT STAGE - PUSH
PRO
ENG ARM - ASC
+ :01 ENG START - PUSH

STAY V37E00E GO TO LUNAR SURFACE C/L

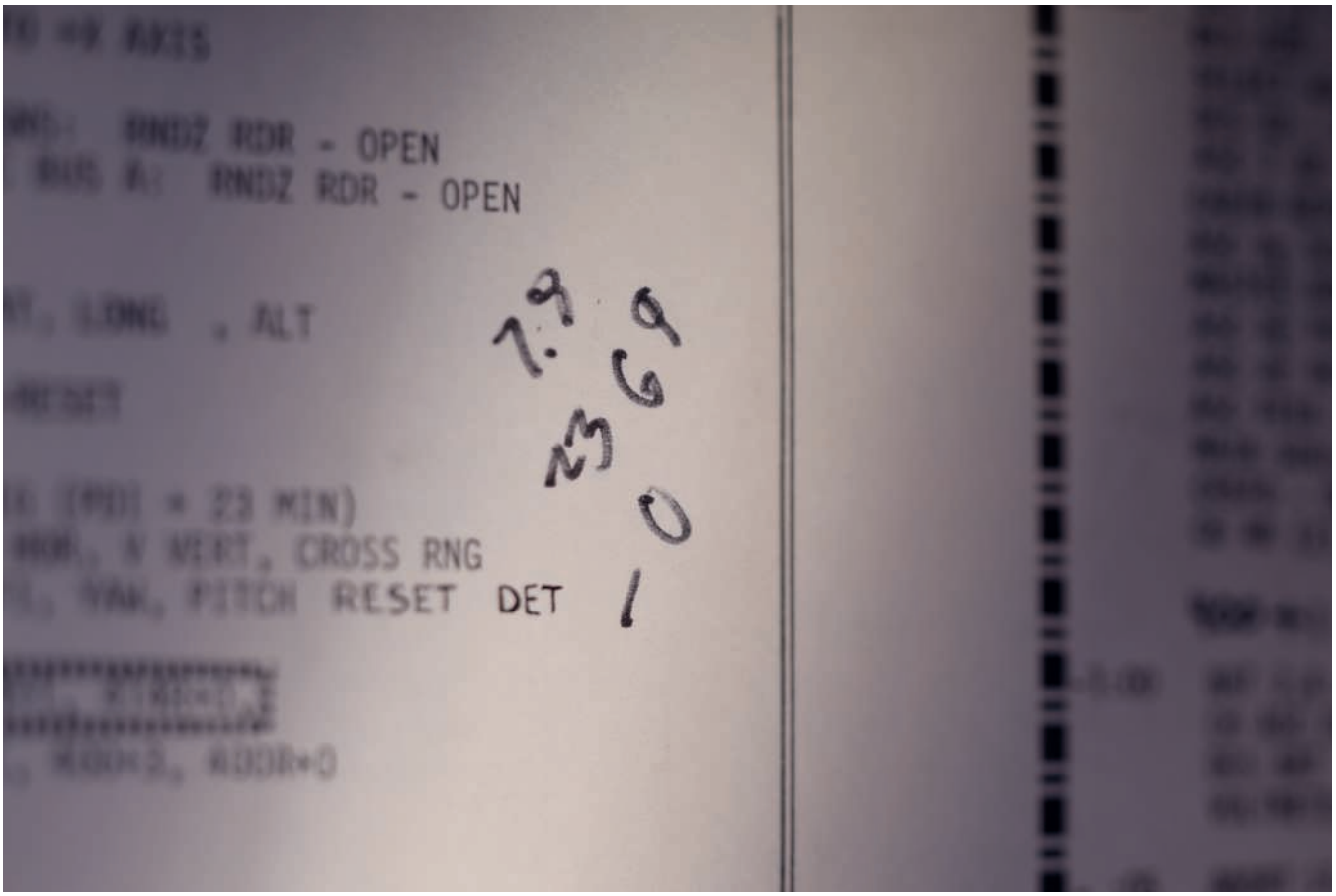
LM TIMELINE BOOK

APOLLO 11 FLIGHT DATA FILE

It was only about seven seconds after *Eagle* was cleared from the 1201 Program Alarm that Armstrong noticed West Crater coming into view and became concerned about the programmed landing point. The alarms were a significant distraction that had kept his attention inside the cockpit instead of out the window. A bit over 10 minutes into the Powered Descent, Armstrong took over control with program P66, the landing phase with Rate of Descent (ROD). This was the so-called "fly by wire"—manual control with computer assistance instead of the automated landing program P65. The previous program P64 was targeting them toward a large crater surrounded by numerous boulders. Armstrong manually flew past that crater then looked for a clear landing spot as the fuel supply rapidly depleted.

Aldrin was engaged in a long series of verbal reads to Armstrong, telling him his altitude, forward velocity, and rate of descent. The dual grids on page nine depict the ideal read-outs. Already past their planned landing time, Houston radioed that there were only 30 seconds of fuel remaining before they had to land or abort. Nine seconds later Aldrin called out: "*Contact Light*!" They made lunar TOUCHDOWN at 3:18 pm CDT on 20 July 1969. The PDI burn lasted 12 minutes and 34 seconds, some 36 seconds longer that planned, leaving very little fuel remaining in their tanks.

Reading the instructions printed on page 9, Aldrin calls out for Armstrong to push the engine stop button and put the ACA out of detent. Armstrong shifted the ACA control slightly out of its centered position which cancelled the need for the Digital Auto Pilot to fire the attitude thrusters. The "Mode Control (both) – Auto" instruction switched the PGNS and AGS systems into automatic mode. Armstrong set the descent engine override command switch to off and placed the engine arming switch to off. At this point, Aldrin keys in "413+1" which told the computer the LM had landed and for it to preserve the gyro attitude information. He radios out "413 is in" to which Charlie Duke, CapCom in Houston, quickly replies with suffused but definite joy: "We copy you down, *Eagle*."



THE FIRST HUMAN WRITING ON ANOTHER WORLD

Page 10 (detail)

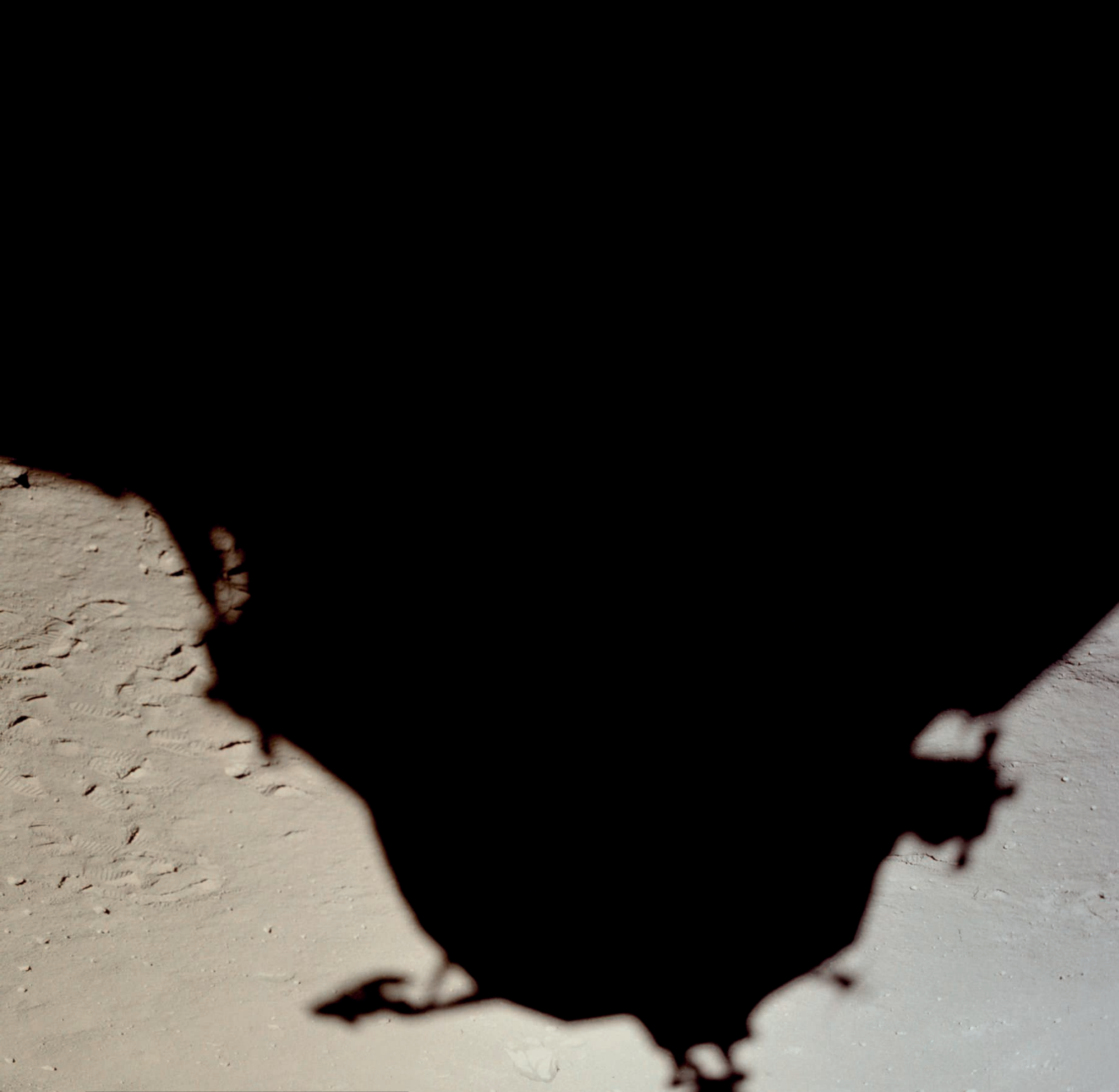
Touchdown
THE EAGLE HAS LANDED

Commander Neil Armstrong's first words from the Moon to the Earth are known to school children around the world: "Houston, Tranquility Base here, the *Eagle* has landed." Charlie Duke replied, "Roger, Tranquility. We copy you on the ground. You got a bunch of guys here about to turn blue. We're breathing again. Thanks a lot."

There may have been sighs of relief in Houston, but Armstrong and Aldrin were still busy on the Moon. To cover any possible emergency conditions such as the effects of heat from the lunar surface or other dangerous abort situations with the LM, Armstrong and Aldrin took immediate steps for a contingency lunar lift-off: a condition termed "T1." The rectangular box on the bottom right corner of page 9 lists the steps for a "NO STAY" situation. Thankfully, *Eagle*'s systems were operating fine. They were given a STAY for T1 by Houston at 102:47 GET.

It is at this triumphant point, about two minutes after landing, that Aldrin logs "Noun 43" as displayed on the DSKY just behind the *Timeline Book*. These are the landing coordinates—latitude, longitude and altitude—of the *Eagle* on the Moon, and they are the first writing by a human being on a celestial body other than Earth. Aldrin was standing on the right of the DSKY and is right-handed. The reader can see his stretch as he reached over his own bulky spacesuit to write these numbers. "In my excitement," Aldrin later explained, "I left out one decimal point and put the other after the 7 instead of before." The decimal points are immaterial—as is the fact that the computer data was a bit off (probably due to greater than anticipated bumping back at the undocking stage). Most importantly, Aldrin and Armstrong know they are the first people on the Moon, that they had safely landed in the Sea of Tranquility just north of the lunar equator, and they promptly act to record this moment in human handwriting, thereby preserving it for future generations.

The rectangular box on the right of page 10 lists steps for another NO-STAY situation, "T2". Again, they were cleared by Houston for the lunar surface stay. Pages 9 and 10 are tabbed "PDI-TD+3MIN / TD+3-T2ABORT," i.e. Powered Descent Initiation to Touchdown plus 3 minutes; and Touchdown plus 3 to the second timed abort.



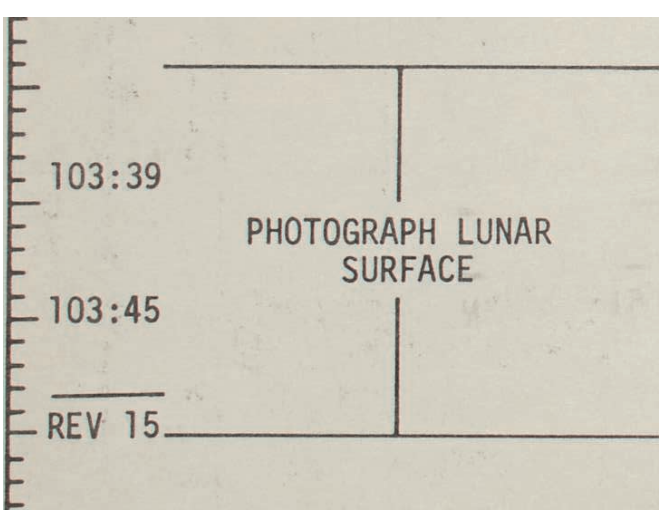
Page 11 (detail)

MEN ON THE MOON
Lunar Surface Stay

Among the first group of instructions on pages 11-12, tabbed "Lunar Surface Flight Plan," is the directive to "Close Shades." This they do *not* immediately do, being fascinated by the Moon's surface. Aldrin described the variety and changeable colors of rocks and a few minutes later Armstrong expanded on the topography: "The area out the left-hand window is a relatively level plain cratered with a fairly large number of craters of the 5 to 50 foot variety, and some ridges - small, 20, 30 feet high, I would guess, and literally thousands of little 1 and 2 foot craters around the area ... There is a hill in view, just about on the ground track ahead of us. Difficult to estimate, but might be a half a mile or a mile" (103:03 GET, 3:35 p.m. CDT).

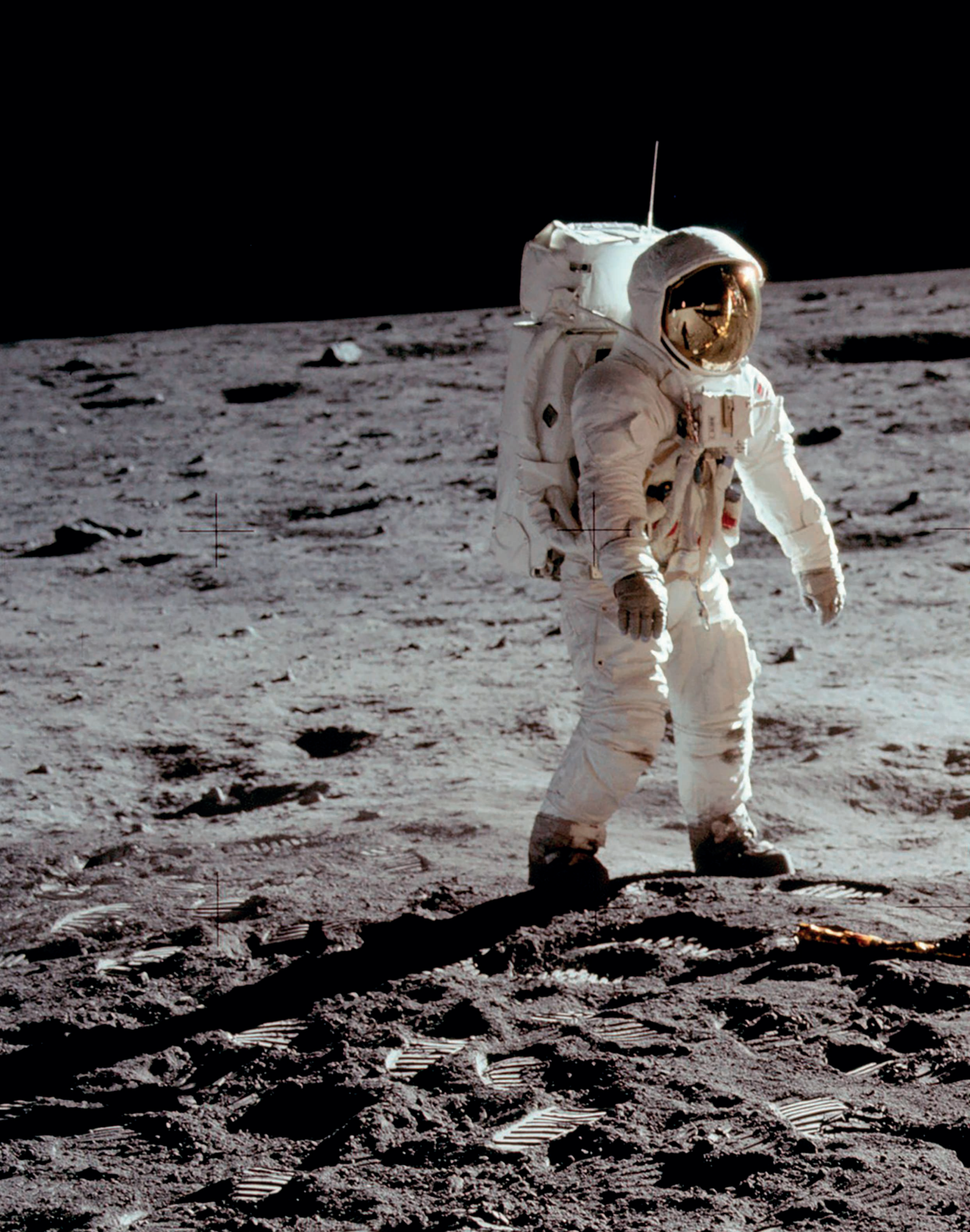
The first major task after they cleared T2 is to thoroughly test the lift-off procedures for the LM as no previous mission could have verified them. This process is called here "simulated countdown." Aldrin takes more star alignments and other verifications of their location, configures the computers, and assesses the fuel burned and remaining. He makes a handwritten note of the weight of the LM *Eagle* on landing, which was 10906 pounds (Earth weight). This writing appears just above the line "Stay / No Stay for Lunar Surface Operations," i.e. after this last check of the ascent capabilities the moonwalk is confirmed. The simulated countdown takes about two hours, but Armstrong is less busy than Aldrin at this task and takes 15 minutes to photograph the lunar surface from his window.

At 106:11 GET, 6:43p.m. CDT, Armstrong began preparing to exit *Eagle* and walk on the Moon. This is four hours earlier than planned for in the *Timeline Book* as Houston allowed the Apollo 11 crew to forego their rest period of that duration. Sleeping was the last thing on their minds after making the first manned lunar landing. The necessary spacesuit configurations were more arduous than expected in the cramped and cluttered quarters of the LM, but at 109:24 Armstrong moved down *Eagle*'s ladder on the front landing leg and became the first human to set foot on the Moon. "That's one small step for [a] man, one giant leap for mankind." Some 19 minutes later, Aldrin joined him with the words "magnificent desolation." After a little over two hours out on the lunar surface, Armstrong and Aldrin brought back sealed boxes containing lunar rocks, a sub-surface core tube sample, lunar soil, and experiment samples. A 70mm film camera magazine was shot in addition to surface close-up photography. Page 12 in the *Timeline Book* gives an overview of activities during the nearly 24 hour stay on the lunar surface. It bears four data entries written by Armstrong and seven written by Aldrin, all made while they were on the lunar surface. These entries are the calculations for ten further emergency lift-off times (TIG = Time of Ignition), each about two hours apart. Two hours is the time it took Collins in the *Columbia* to orbit the Moon and be back in range for an effective rendezvous. Additionally, Aldrin has written the weight of the LM right before ascent, 10837 pounds, being his last writing in the *LM Timeline Book* while on the Moon. They had jettisoned waste and excess equipment including their "back packs" (the EVA Portable Life Support Systems) to keep them as light and fuel-efficient as possible for the ascent.



Page 11 (detail)

Tranquility Base as viewed from Armstrong's window




Here Men from the Planet Earth first set foot upon the Moon, July 1969, A.D.
We Came in Peace for all Mankind.

T7	19	112:34:35		24	122:25:14
T8	20	114:32:43	114 30 57	25	124:23:21

ASCENT

PITCH	OHW	TFI	VI	H DOT	H
		-0:05			
		0:00	15.0	0	0
		0:10	50.0	55.0	300
308	39	0:30	200.0	90.0	1800
305	37	1:00	400.0	125.0	5000
302	35	1:30	700.0	150.0	9200
299	33	2:00	1000.0	170.0	14000
296	31	2:30	1400.0	185.0	19300
292	29	3:00	1700.0	190.0	24900
289	27	3:30	2100.0	190.0	30600
285	24	4:00	2400.0	185.0	36300
281	22	4:30	2900.0	175.0	41600
277	19	5:00	3300.0	155.0	46700
273	16	5:30	3700.0	135.0	51000
269	13	6:00	4200.0	110.0	54800
265	10	6:30	4700.0	80.0	57500
260	7	7:00	5300.0	50.0	59500
		7:14	5540.0	32.0	60150

ABORT STAGE-PUSH
PRO
ENG ARM-ASC
ENG START-PUSH
N63, YAW
PITCH
BAL CPL-OFF

SBD P 134 Y -32
CHANGE 16mm. FRAME RATE TO 6 fps.

N76E VH Vv ΔR
V16 N77 E

N85 E, 500R
TM-R, R DOT

200 FPS MAIN SOV(2)-OPEN
ASC FEED2(2) - CLOSE
50 FPS ENG ARM - OFF
0 FPS ABORT STAGE-RESET
ENG STOP RESET
MODE CONT (2)-ATT HOLD
BAL CPL-ON
END APS CARD
ATT TRANSL - 2 JETS
ΔVX NULL, KEY REL
VI, HDOT, H
PRO ΔV'S
V82E, 315R, 403R, 313R
PRO PRO
P00, RR-AUTO TRACK
CRSFD-CLOSE

MANUAL ASCENT

CONFIGURATION-NOMINAL EXCEPT
MODE CONT-ATT HOLD
PROFILE-NOMINAL EXCEPT
4-STEP FOR DIRECT MODE.
BAL CPL-OFF AFTER PITCH
8-BALL 4-STEP:
:20 PITCH DN TO 300°
3:15 285
5:15 270
7:00 255

OHW 4-STEP
:15 PITCH DN TO 37
1:14 32
3:26 25
5:24 11

ASC QTY LITE-MAIN SOV(2)-OPEN
ASC FEED2(2) - CLOSE
BURN TO PROP DEPLETION

MONITOR

PGNS	AGS
06 63 VI, H, H	500 VGX
16 77 TGO, VY	367 H
16 85 VGX, VGY, VGZ	433 VI

APOLLO 11 FLIGHT DATA FILE

PAGE 13

CDH-TPI TPI-DOCKING | INSERTION-CSI CSI-CDH | ASCENT MONITOR | 5 < PDI1 ≤ 10 | RELATIVE TRAJ 0 < PDI1 ≤ 5 | LM/CM XFER LIST | POST DOCKING

Apollo 10 photograph, "U.S.1" and "Wagon Road" rilles visible. Image courtesy of NARA

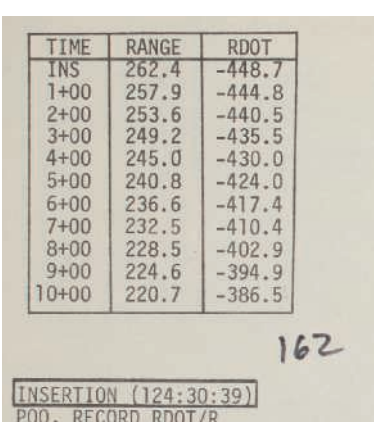
"GOING RIGHT DOWN U.S. 1..."
Ascent from the Lunar Surface

Just one minute earlier than the planned time of 124:22 GET, Armstrong pushes the abort stage button while Aldrin enters proceed ("PRO") on the DSKY. Armstrong then places the engine arm switch to ascent and pushes the engine start button. See upper left of page 13. They began pitch over right on time about 13 seconds after lift-off. In stark contrast to their launch five days earlier, this one had exactly zero people watching from the ground.

The lunar ascent was of course just as unique to Apollo 11 as the lunar landing, being impossible to test-run on Earth. The detailed central grid defines and measures the planned profile of the ascent. The values reading from left to right: Pitch, Overhead Window (OHW—this window had a reticle for visual confirmation of pitch), Time From Ignition (TFI), Inertial Velocity (VI), rate of change in Altitude (H DOT), and current Altitude (H). *Eagle* functioned perfectly, an incredible testimony to the software engineers and mathematicians of Earth who programmed this automatic ascent and to the rocket engineers who designed and built the ascent stage engine. If it had not fired and operated properly on this its first trial, Armstrong and Aldrin would have been stranded on the Moon.

Aldrin commented twice that it was a "very quiet ride" and at about three minutes after ignition, Armstrong radioed "We're going right down U.S. 1." Tom Stafford and Gene Cernan on Apollo 10 had photographed the area around the landing site and captured a distinctive pair of east-west rilles (Rimae Hypatia). At some point in the intervening weeks, the astronauts nicknamed these rilles "Wagon Road" for the northerly and "U.S. 1" for the southerly.

Remarkably, this critical page has probably the most last-minute corrections from Cape Canaveral of any of them. There are 11 lines of typed correction tape, and in two instances the typed corrections themselves are corrected in manuscript. Their calculations came down to the wire but worked perfectly. The right-side of the page lists steps for a contingency manual ascent. The printed tab "Ascent Monitor" is misprinted upside-down on page 14 (which is otherwise blank).

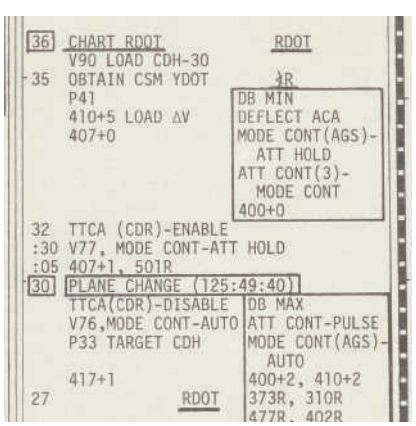


TIME	RANGE	RDOT
INS	262.4	-448.7
1+00	257.9	-444.8
2+00	253.6	-440.5
3+00	249.2	-435.5
4+00	245.0	-430.0
5+00	240.8	-424.0
6+00	236.6	-417.4
7+00	232.5	-410.4
8+00	228.5	-402.9
9+00	224.6	-394.9
10+00	220.7	-386.5

162

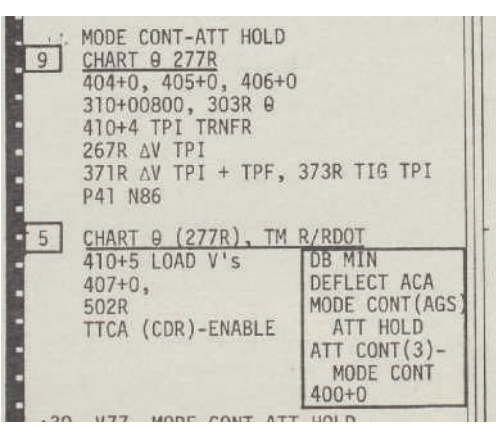
INSERTION (124:30:39)

Page 15 (detail)



36 CHART RDOT RDOT
V90 LOAD CDH-30
35 OBTAIN CSM YDOT ½R
P41
410+5 LOAD ΔV DB MIN
407+0 DEFLECT ACA
MODE CONT(AGS)-
ATT HOLD
ATT CONT(3)-
MODE CONT
400+0
32 TTCA (CDR)-ENABLE
:30 V77, MODE CONT-ATT HOLD
:05 407+1, 501R
30 PLANE CHANGE (125:49:40)
TTCA(CDR)-DISABLE DB MAX
V76,MODE CONT-AUTO ATT CONT-PULSE
P33 TARGET CDH MODE CONT(AGS)-
AUTO
417+1 400+2, 410+2
27 RDOT 373R, 310R
477R, 402R

Page 16 (detail)



MODE CONT-ATT HOLD
9 CHART θ 277R
404+0, 405+0, 406+0
310+00800, 303R θ
410+4 TPI TRNFR
267R ΔV TPI
371R ΔV TPI + TPF, 373R TIG TPI
P41 N86

5 CHART θ (277R), TM R/RDOT
410+5 LOAD V's DB MIN
407+0, DEFLECT ACA
502R MODE CONT(AGS)
TTCA (CDR)-ENABLE ATT HOLD
ATT CONT(3)-
MODE CONT
400+0

Page 17 (detail)

TPI THRU DOCKING

0 TPI (126:58:27)
NULL RESIDUALS
TTCA (CDR)-DISABLE
P35
V76, MODE CONT-AUTO
M=0, V93
404+0,405+0,406+0
400+2
V82E

DB MAX
ATT CONT-PULSE
MODE CONT(AGS)-
AUTO
400+2

5

LOS 127 +06
OMNI-AFT
S BD 90, 0 SLEW
PCM-LO

9 CHART θ (277R)

DB MIN
DEFLECT ACA
MODE CONT(AGS)-
ATT HOLD
ATT CONT(3)-
MODE CONT
400+0

10

12 PRO-FINAL COMP

13 CHART θ (277R), TM R/RDOT
P41
TTCA (CDR)-ENABLE
V77, MODE CONT-ATT HOLD
:05 407+1, 472R
-0 +.4 +.9
15 MCC1
N81
V76, MODE CONT-AUTO
TTCA (CDR)-DISABLE
P35
M=0, V93
404+0, 405+0, 406+0

DB MAX
ATT CONT(3)-
PULSE
MODE CONT(AGS)-
AUTO

20

20

SR 127 +2

24 CHART θ (277R)

25

DB MIN
MODE CONT(AGS)-
ATT HOLD
ATT CONT (3)-
MODE CONT

27 PRO-FINAL COMP

28 CHART θ (277R), TM R/RDOT
P41
TTCA (CDR)-ENABLE
V77, MODE CONT-ATT HOLD
:05 407+1, 472R
30 MCC2
N81 +.1 +1.2 +.5

P00
V48,11002 (22002)
P47
V63
404+0, 405+0, 406+0
BAL CPL - ON

DB MAX
ATT CONT(3)-
PULSE

35

40

40

BRAKING:
30 FPS - 6000 FT
20 FPS - 3000 FT
10 FPS - 1500 FT
5 FPS - 600 FT

45

50

AOS 127 +53

55

DB MIN
ATT CONT (3) - PULSE
OMNI-AFT
~~VERIFY COMM, AUTO TRACK~~
~~PCM HB~~
BIOMED LEFT
DOCKING
COAS SW-FWD
EXT LTG-DOCK
SHFT/TRUN-+50
V41N72 (+00000,+32000)
PITCH DOWN 90°
YAW LEFT 120°
CONTACT
THRUST +X UNTIL CAPTURE
TTCA (CDR) - DISABLE
MODE CONT (BOTH)-OFF

60

POST - DOCKING

CONFIGURE RCNS And ACS

CATCHING A RIDE HOME
Lunar Orbital Rendezvous

At 124:32 GET, Armstrong radioed that "the *Eagle* is back in orbit, having left Tranquility Base and leaving behind a replica from our Apollo 11 patch and the olive branch." CapCom replied, "We copy. The whole world is proud of you." The initial lunar orbit was about 47 nautical miles at the high point and 9.5 nautical miles at the low point. The grid at the upper left of page 15 shows the time in minutes from Lunar Orbit Insertion, their Range from *Columbia*, and the Range delta over time (RDOT). Aldrin handwrote the antenna angle pitch value "162" just below this grid.

Armstrong and Aldrin realign the navigational equipment using program P52 to prepare *Eagle* for the CSI (Concentric Sequence Initiation) maneuver. Essentially, they must prepare to circularize their orbit to be concentric with the orbit of the CSM *Columbia*, a process detailed on page 15 covering a period of 50 minutes. Armstrong uses the small RCS thruster engines to speed up the LM when at the high point of the orbit and the momentum carried them into a circular orbit about 13 nautical miles below *Columbia*.

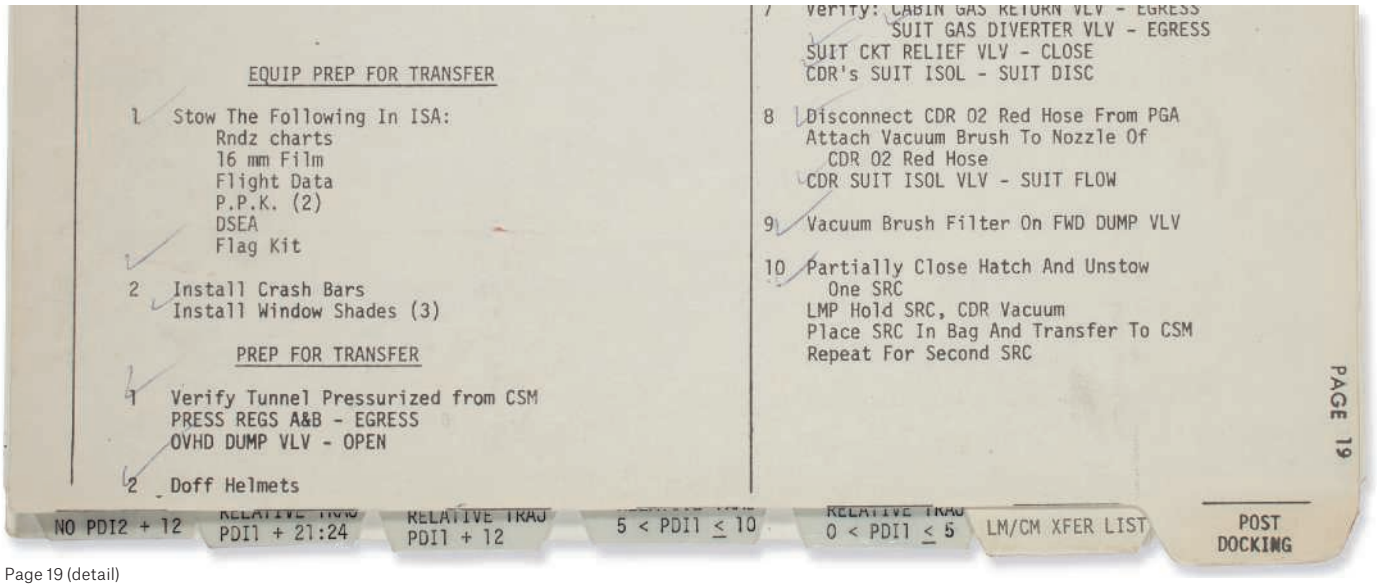
After completing the CSI burn, the crew nulls the residuals and soon starts program P33 for the next engine burn, CDH (Constant Delta Height) which will take them to the same altitude as *Columbia*. TPI (Terminal Phase Initiation) is next which both slows *Eagle* down and puts it on an intercept path with *Columbia*.

TPI was *Eagle*'s last big engine burn but Armstrong still must perform two mid-course corrections (MCC1 and MCC2) based on Aldrin's calculations. Next to each of these calculations on page 18, Aldrin has handwritten the values for N81, the planned X, Y and Z directional velocity changes for each burn. Before the first he has crossed out some numbers and written the correct ones above. Aldrin's doctoral thesis work at MIT was on manned orbital rendezvous, and specifically line-of-sight guidance techniques as he is using here.

Armstrong then slowed *Eagle* dramatically—see braking chart at upper right of page 18—and was station-keeping on the *Columbia* by 127:52 GET or 5:24 p.m. CDT on Monday, 21 July 1969. *Eagle* stayed in place about 13 minutes, then almost immediately after they regained communications with Houston (AOS=acquisition of signal), they dock with *Columbia*. Armstrong's only other docking experience had been rough, the so-called "wild ride" of Gemini VIII when a malfunctioning thruster sent him and Dave Scott into a calamitous spin. This happened out of radio contact with Houston. Had Armstrong not recovered the craft and survived, the mystery from having little or no telemetry data would have meant a major delay to the Gemini program and possibly a delay or even a cancellation of Apollo.

The entire series of events on pages 15 through 18 took some 3.5 hours to accomplish over nearly two full lunar orbits. Pages 15-16 are tabbed "Insertion-CSI / CSI-CDH" and pages 16-17 are "CDH-TPI / TPI-Docking."

Eagle approaching *Columbia*, photographed by Collins



EQUIP PREP FOR TRANSFER

1 Stow The Following In ISA:
Rndz charts
16 mm Film
Flight Data
P.P.K. (2)
DSEA
Flag Kit

2 Install Crash Bars
Install Window Shades (3)

PREP FOR TRANSFER

1 Verify Tunnel Pressurized from CSM
PRESS REGS A&B - EGRESS
OVHD DUMP VLV - OPEN

2 Doff Helmets

7 Verify: CABIN GAS RETURN VLV - EGRESS
SUIT GAS DIVERTER VLV - EGRESS
SUIT CKT RELIEF VLV - CLOSE
CDR's SUIT ISOL - SUIT DISC

8 Disconnect CDR O2 Red Hose From PGA
Attach Vacuum Brush To Nozzle Of
CDR O2 Red Hose
CDR SUIT ISOL VLV - SUIT FLOW

9 Vacuum Brush Filter On FWD DUMP VLV

10 Partially Close Hatch And Unstow
One SRC
LMP Hold SRC, CDR Vacuum
Place SRC In Bag And Transfer To CSM
Repeat For Second SRC

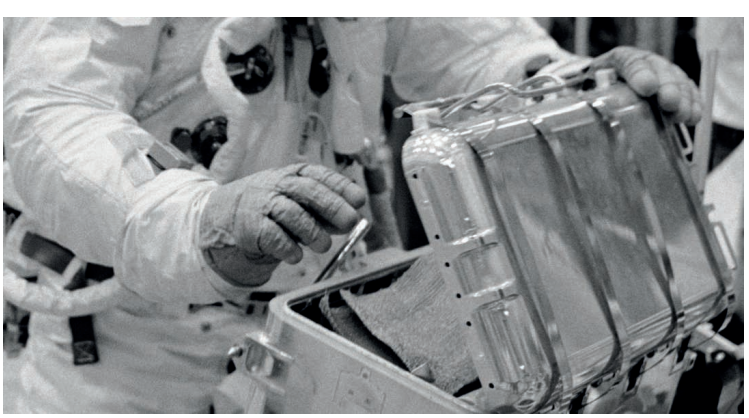
PAGE 19

NO PDI2 + 12 | PDI1 + 21:24 | RELATIVE TRAJ PDI1 + 12 | 5 < PDI1 ≤ 10 | 0 < PDI1 ≤ 5 | LM/CM XFER LIST | POST DOCKING

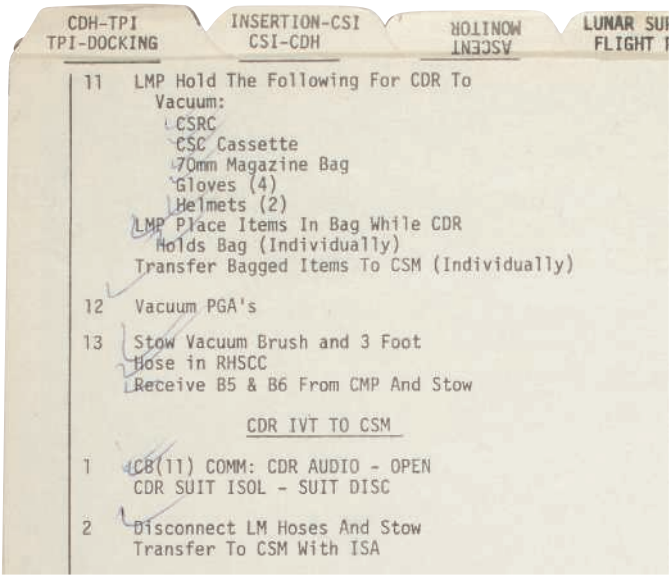
Page 19 (detail)

It is interesting to note the slight smudges along the outer edges of pages 19, 20, 21, 22, and parts of 23. During the lunar dust cleaning process, Neil and my hands were in direct contact with lunar dust on the closed sample return containers during completion of tasks in Step 10. Neil vacuumed the boxes which we called Sample Return Containers (SRC). I then needed to check off that step number 10 by holding the Timeline Book then flipping over to Page 20.

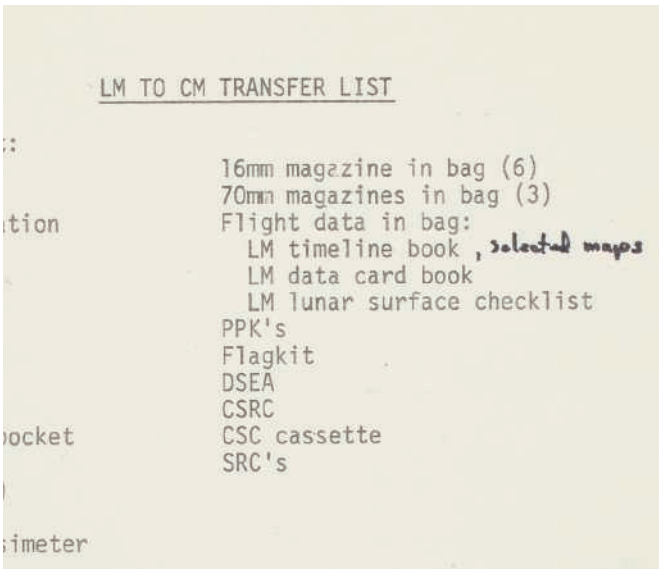
—Buzz Aldrin



Aldrin in training for moving lunar material (detail)



Page 20 (detail)



Page 23 (detail)

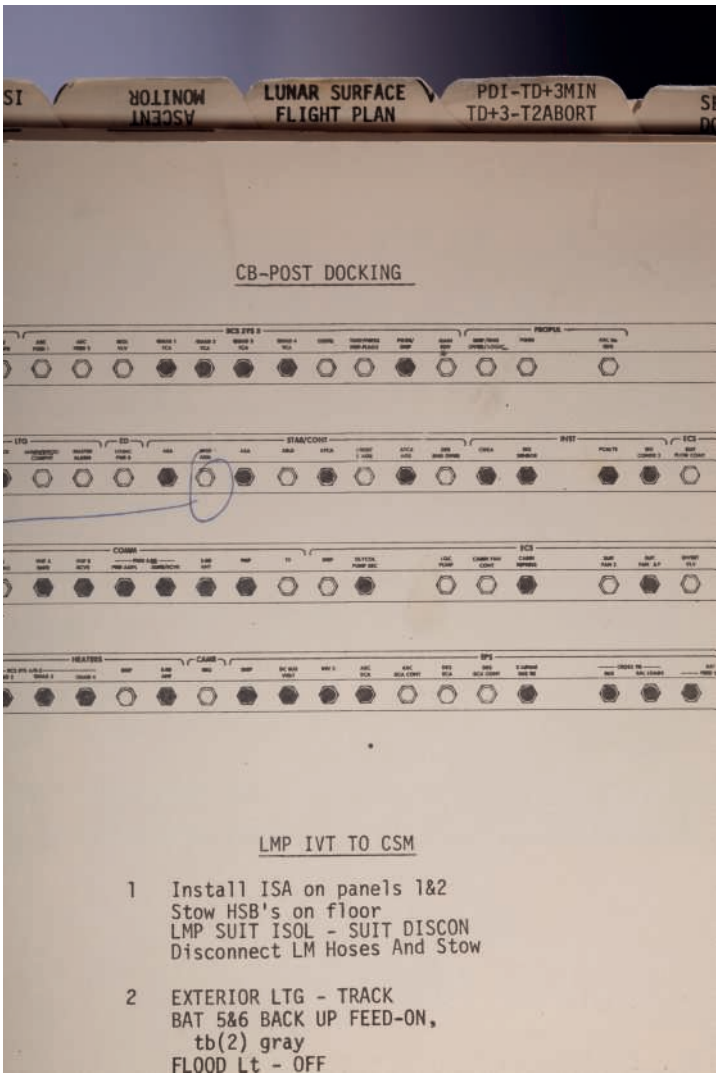
MOVING THE MOON ROCKS
Lunar Module to Command Module Transfer

Page 19 of the *LM Timeline Book* begins the steps needed to first secure the LM and then prepare it for jettison. Pages 19-20 are tabbed "Post Docking." Armstrong and Aldrin prepare their equipment for transfer, including stowage of the Flight Data manuals in the Interim Stowage Assembly (ISA) and installation of crash bars and window shades. They then prepare to make the transfer, verifying the pressure of the transfer tunnel, doffing helmets and gloves, and opening the hatch they had closed about 30 hours earlier.

These two pages are extensively notated by Aldrin with 45 completion checkmarks. Before Armstrong and Aldrin's spacesuits, the lunar surface film magazines, the first lunar Contingency Sample (the Moon rocks stored in Armstrong's spacesuit leg pocket), the two large Sample Return Containers (SRCs), and the helmets and gloves were transferred, they vacuum everything to remove residual lunar dust. Armstrong and Aldrin follow the step-by-step instructions for handling of the paramount SRC's: unstow, hold, vacuum, bag, transfer, repeat. These two Sample Return Containers held together about 48 pounds of lunar rock which would be distributed to scientists around the Earth. Gathering these samples was a crucial purpose of the Apollo program.

Next, Armstrong and Aldrin take turns vacuuming each other's spacesuits. Aldrin radioed to Houston at about this point, "it doesn't appear as though the red hose is going to be much of a competitor to the leading vacuum cleaner brands" (128:40 GET). Lunar dust is notoriously sticky and remains a significant challenge for unmanned lunar surface experiments to this day. Grains of lunar dust are tiny and barbed, not having the effects of wind or water erosion to wear them smooth. This jagged quality, and the effects of static electricity, make lunar dust extremely frustrating to clean. Aldrin and Armstrong struggle with it for about 40 minutes and then Armstrong leaves *Eagle* to rejoin Collins in *Columbia* ("CDR IVT to CSM," i.e. the Commander makes an Intervehicular Transfer to the Command Service Module).

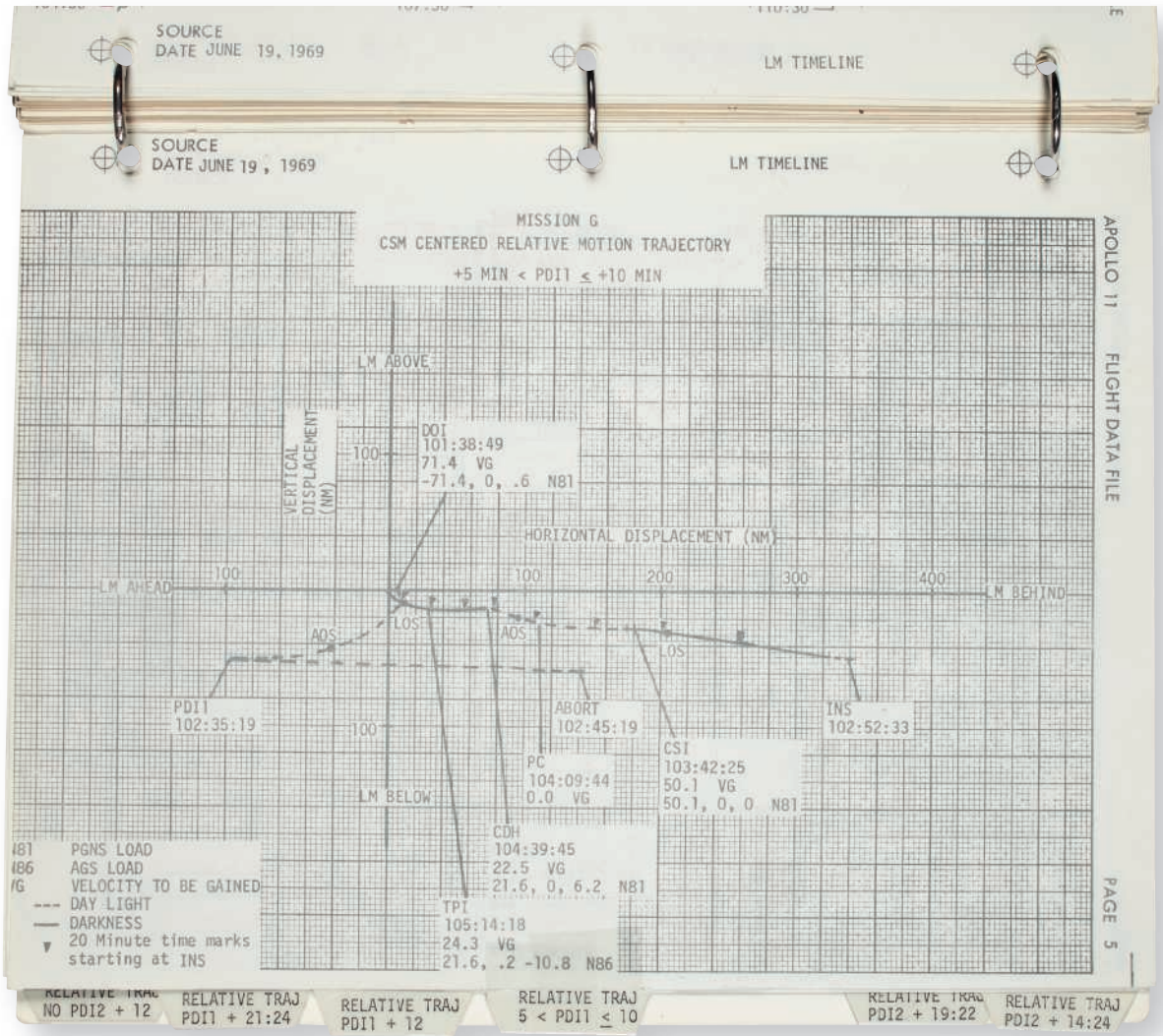
As Aldrin was the first to enter the LM *Eagle*, so he is the last to leave it. He spends about 20 minutes configuring *Eagle* and its computers for jettison. His final action on the LM is to configure the two circuit breaker boards to align with the charts on pages 21 and 22. Page 23 is tabbed "LM/CM Transfer List": the final check that everything NASA intended to be retained from *Eagle* was retained. The *LM Timeline Book* itself is one of only 25 line items on this list. It is the first item listed in the category "Flight data in bag." The others are a handwritten addition of "selected maps," the *LM Data Card Book*, and the *LM Lunar Surface Checklist. The Data Card Book* was a series of grids in which data was recorded for input to the LM flight computers (which had less than 40,000 words of memory). It was sold at auction in 2003 and is now in a private collection. The other Checklist was the detailed version of what is covered in the *Timeline Book* on pages 11-12. It measured 8.5 by 5 inches and many if not most of its individual pages have been sold one-by-one over the past twenty years. At least one flown Apollo 11 map has appeared at auction, but we trace none that were annotated during the mission. The *Timeline Book* is the only flown narrative book still intact from the voyage of the *Eagle*.



Page 22 (detail)

This breaker was of critical importance. We had to arm the Ascent Engine to be able to leave the Moon. Any problems while engaging this breaker might have stranded Neil and me on the Moon. Luckily, a pen I used to make many of the notes in this Timeline Book worked to push the breaker closed, thus sending power to arm the engine. We kept the cap of that pen inserted into the breaker to ensure the breaker would remain closed.

—Buzz Aldrin



WHAT MIGHT HAVE BEEN

Page 21 is an illustration of control panel 11 showing the desired setting for circuit breakers after the LM-CSM docking. Aldrin has circled one of the breakers, labeled "ENG ARM," in the blue pen he had been using throughout the Post-Docking stage. Aldrin made this circle around the Ascent Engine Arming breaker —and drew a long line to emphasize it—as a reminder to himself to tell post-flight debriefing crews about a problem. Aldrin broke off the knob on this breaker with his spacesuit backpack sometime before or after the moonwalk. LM egress and ingress were considerably more difficult than anticipated due to the presence of extra items in the LM, whereas in training only the items needed for that specific exercise were placed in the simulator. Loss of this knob could have stranded the *Eagle* and its crew on the Moon. Incredibly, they managed to use a pen to jam the circuit breaker closed—very possibly the self-same black felt-tip pen which was used to make the first writing on the Moon, or at least many of the notes in the *Timeline Book*. The cap of the pen remained inserted in the breaker throughout lunar surface ascent. This incident is also partially described in the official Apollo 11 Mission Report (16.2.11, see lot 80) and circuit breaker guards were installed on Apollo 12 and subsequent vehicles.

This damaged circuit breaker was by no means the only anomaly during the flight of the *Eagle*. There were the computer alarms during descent, patchy communication lines with Houston, the descent trajectory into a rocky crater, and gimbal lock prior to docking, just after the rendezvous. Both the flight crew and ground crew handled it all with grace and decisiveness. The remaining pages of the *Timeline Book* demonstrate that they prepared for every contingency to the best of their ability. Following page 23, the LM/CM Transfer List, there is one blank page and then 17 pages of "Rendezvous Timelines and Relative Motion Trajectories," starting again with page 1. These are Powered Descent Initiation abort scenarios at different time points prior to or during the lunar landing. These are arranged to have a single-page timeline and a single-page orbital grid, viewable as one spread. An example of the orbital grid is shown above. These leaves are on lightweight paper like that used in the *CM Flight Plan*. The paper is so lightweight that it was decided to reinforce the tabs with scotch tape lest they tear during an emergency. Thankfully, the scotch tape was only precautionary and these pages were not used in flight. The *Apollo 11 LM Timeline Book* ends with a single blank page and blank lower cover on card stock paper.

The *Apollo 11 LM Timeline Book* was not completed a year, a month, or even a week before it flew into outer space on 16 July 1969. If the final form were finished earlier, Armstrong and Aldrin could have trained with consistent procedures over and over to become highly proficient before their flight to the Moon. The *Timeline Book* was rather in continuous flux, incorporating corrections, modifications, and layouts up to the last few days. This put incredible pressure on the crew but as it turned out it was nothing that they, with the constant support and directives of Houston, could not execute on the first and only flight of the Lunar Module *Eagle*.

While heading home to Earth on *Columbia*, during the crew's final mission broadcast to the world, Armstrong said: "The responsibility for this flight lies first with history and with the giants of science who have preceded this effort; next with the American people, who have through their will, indicated their desire; next, to four administrations, and their Congresses, for implementing that will; and then, to the agency and industry teams that built our spacecraft, the Saturn, the *Columbia*, the *Eagle*, and the little EMU, the space suit and backpack that was our small spacecraft out on the lunar surface. We would like to give a special thanks to all those Americans who built the spacecraft, who did the construction, design, the tests, and put their hearts and all their abilities into those crafts. To those people, tonight, we give a special thank you, and to all the other people that are listening and watching tonight, God bless you. Good night from Apollo 11" (177:41 GET).

Documentation

Included in the lot with the *Apollo 11 LM Timeline Book* is the following documentation:
1. Typed provenance letter signed by Buzz Aldrin dated 2 November 2007, one page.
2. Typed statement, undated, four pages and signed by Buzz Aldrin on the fourth page. This statement provides additional details as to the use of this Book including which pen marks were made by Aldrin and which by Neil Armstrong and Aldrin's excitement when logging the landing coordinates. Quotations from Buzz Aldrin in this catalogue not otherwise attributed are from this statement.
3. A research archive comprising copies of NASA documents, many printed on Aldrin's personal stationery (as are the above), captioned photographs, and a copy of the Congressional Act regarding astronaut ownership of Apollo program artifacts.
4. An additional series of Apollo 11 photographs and film stills, some vintage but mostly recent printings. Supplemental images used in this lot description are reproduced from this series except as noted.

The transcript of the Apollo 11 air-to-ground voice transmission and other data are publicly available on NASA's website and were essential to the cataloguing of this lot.

Condition

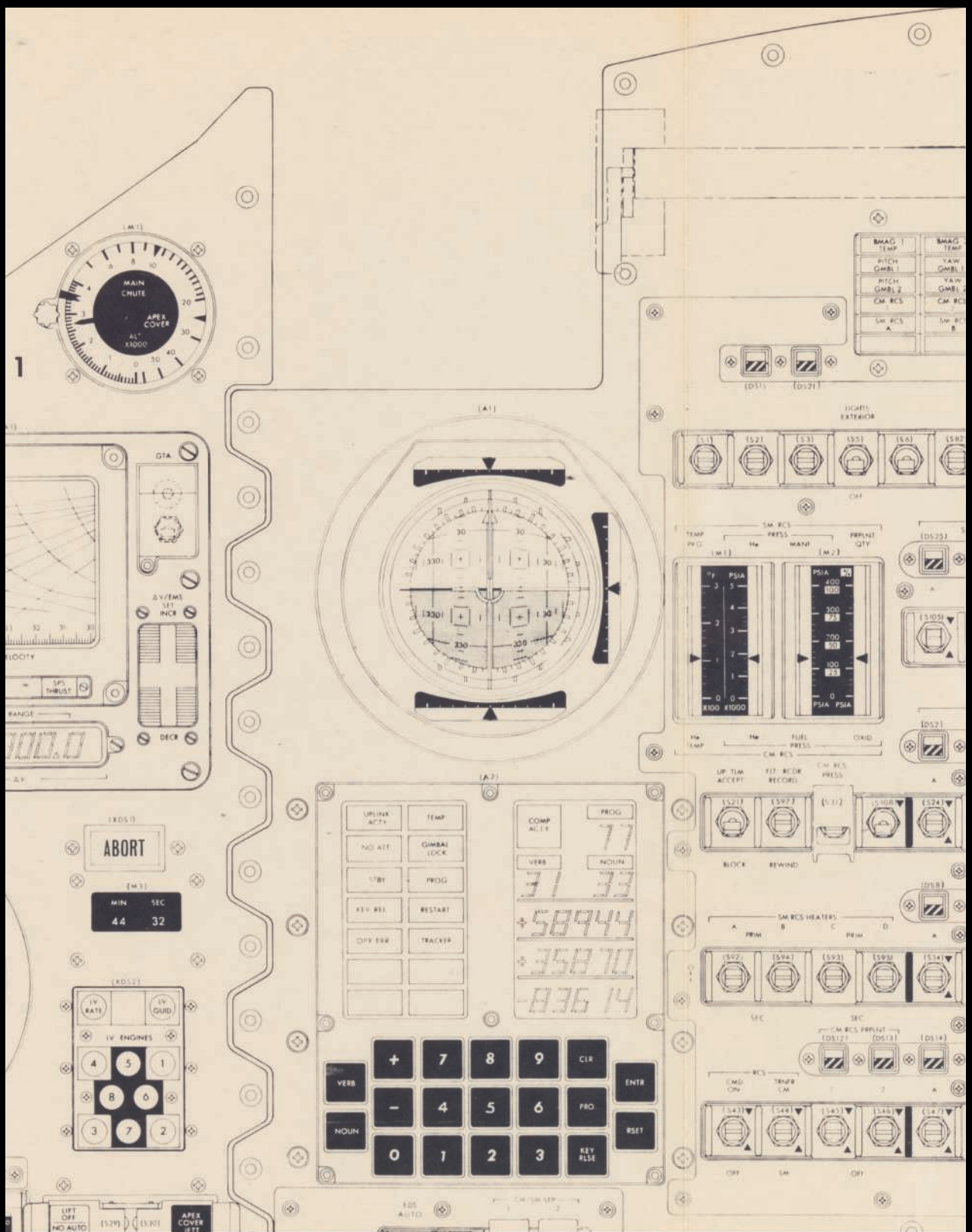
The card covers show a couple of tiny rust stains near top and bottom punch-holes, there are a few instances of faint offsetting, faint smudges on the transfer list pages indicating lunar dust residue, the scotch tape on the "PDI ABORTS" tabs has partially leached causing some tiny spots of adhesiveness to facing pages, pages 13-15 have a small stain which Aldrin later surmised was a drip of coffee occurring during post-flight review of the LM voyage by the Apollo 11 crew and other teams, few other very minor stains including to back cover. Housed in a custom clamshell box. Excellent condition.


NY 50

From our position on the Earth it is difficult to observe where the Earth is and where it's going, or what its future course might be. Hopefully, by getting a little farther away, both in the real sense and the figurative sense, we'll be able to make some people step back and reconsider their mission in the universe, to think of themselves as a group of people who constitute the crew of a spaceship going through the universe. If you're going to run a spaceship, you've got to be pretty cautious about how you use your resources, how you use your crew, and how you treat your spacecraft.

–Neil Armstrong, 1969

RUNNING ON THE MOON
A CONVERSATION WITH MARGARET HAMILTON
Leader of the Inflight Software Team for the Apollo Program



Margaret Hamilton next to code print outs, 1969. Courtesy MIT Museum

The whole world was watching when Neil Armstrong made "one small step for a man, one giant leap for mankind" on 20 July 1969. Getting to the Moon and back took an army of people working behind the scenes for a project that was on the frontier of technology. The 1960s were the infancy of software engineering, and the Apollo space program was a key incubator of the field. The space program provided the funding and attracted the brainpower to fill the United States with pioneers of what is now a multibillion-dollar industry.

Christie's spoke to one of these pioneers, Margaret Hamilton, who led the in flight software team for the Apollo program including Apollo 11. Her work for NASA not only took us to our nearest celestial neighbor—it changed the world of computing. She received the Presidential Medal of Freedom for this work in 2016.

The in-flight software ran on the Apollo Guidance Computer (AGC), which had been specially developed by the MIT Instrumentation Laboratory. Two AGCs were installed, each weighing about 70 pounds: one on the Command Module and one on the Lunar Module. They used core rope memory, a type of read-only memory that was made from wires woven through magnetic cores. This was also known as LOL, or "Little Old Lady" memory after the women who physically wove the wires together. The AGC user interface was called the DSKY (Display and Keyboard, pronounced "disky") and the whole was part of a system called PGNCS (Primary Guidance, Navigation, and Control Section). The Lunar Module was also equipped with an Abort Guidance Section (AGS) which provided backup and support to PGNCS.

In 1965, Hamilton was working for the SAGE Project at Lincoln Labs, where she had been writing software to search for Russian aircraft and preparing to begin a PhD program in mathematics at Brandeis University. But when she heard that MIT was hiring people to work on the Moon mission, it was an opportunity she could not pass up.

Detail from the Command Module control panel blueprint including DSKY (lot 46)

And so that's when I said, we're doing engineering too! They thought it was funny, a joke. It was amusing because whoever heard of this term 'software engineering,' right?

Everything was new and there were many breakthroughs. "On Apollo, we realized that what we were doing was different than just coding," says Hamilton. "As time went on, we learned more and more about putting together code for a whole system with many pieces: software to software, software to hardware, and software to human-ware—the astronauts." Software development was far from an established profession in the 1960s. "When I began it was not a field, it was just something you learned from person to person—good stuff and not-so-good stuff that was handed down," she recalls. "Even the word was unknown. When Apollo first started, the person who was in charge asked his wife, 'What is software? Is it soft clothing?"

It was Hamilton herself who coined the term "software engineering," part of an effort to get hardware people to take her team's work as seriously as they took other kinds of engineering. "We'd run the software with simulations of the astronauts, simulations of the hardware, and often both. And I began to realize, what we're doing is at least as sophisticated—we're doing engineering as much as anybody is here."

"And so that's when I said, we're doing engineering too! They thought it was funny, a joke. It was amusing because whoever heard of this term 'software engineering,' right? It was all in good fun. But I still meant it. One day somebody who was a hardware guru came into a meeting and we were all joking. And this hardware guru said: 'She does have a point. She's trying to make it formal and it should be made formal.' They stopped laughing after that."

What was the hardest part of her job?

"Our greatest challenge was that our software had to be man-rated, meaning the astronauts' lives were at stake. There was a never-ending focus on making everything as perfect as possible. Anything to do with the prevention of errors was a top priority both during development and during real time." Hamilton and her team had to come up with out-of-the-box ideas to create software that was both extremely reliable and extremely flexible—able to cope with anything that might happen in space.

The reliability of the whole system working together—not only software, but also its interface with the hardware and the peopleware—had long been a preoccupation of Hamilton. Her experience working on Apollo 8 really drove this home:

"I used to take my daughter to work on nights and weekends, because I wanted her to be with me as much as possible. Lauren would play astronaut [in the simulator]. She did that for a while, just playing around, and all of a sudden everything crashed. And I went over and said, 'What did you do?' And I realized that she had chosen program one [P01] by mistake—that's a prelaunch program. She was trying to lift off when she was already going to the Moon on her simulation. So, I thought, what if the astronauts did that? What if they were on the way, and they chose that—and they wiped out all the navigation data?"

"I took it to the powers that be at MIT and NASA, and I said, 'I'm really worried about this—it could happen.' Their response was that, No, it's not going to happen because the astronauts are trained so well that they're not going to make any mistakes. I responded, typically: 'but what if they do?' They weren't going to change it. I said, can I at least put in a program note so it's part of the specs that you shouldn't do it? Okay. I put the program note in there. They thought it was a riot, but then it actually happened during the real flight!"

Five days into the Apollo 8 flight, astronaut Jim Lovell made exactly the same mistake as young Lauren Hamilton and selected P01, erasing the flight's navigational data. Due to the official program note, the problem was quickly identified and Houston uploaded the data necessary to complete the mission.

Our greatest challenge was that our software had to be man-rated, meaning the astronauts' lives were at stake. There was a never-ending focus on making everything as perfect as possible. Anything to do with the prevention of errors was a top priority both during development and during real time.

Every mission built upon the knowledge gained from prior missions, learning from mistakes and coming up with new solutions. Apollo 11 was the very first mission in which the asynchronous software environment worked in conjunction with Priority Displays, allowing the software to interrupt the astronauts in case of a problem. The lack of communication from software to astronaut had been a major concern for Hamilton. Again, she encountered skepticism. Before Hamilton intervened, the DSKY was not even powered up at all times during spaceflight (in fact most of the time it was off). Hamilton pressed, "I said, Well, why can't we leave it on? And they said, Well, we've never done that before..."

Indeed, Hamilton told us that "the Priority Display's man-in-the-loop solution had never been done before. It was the first time the software was able to communicate directly with the astronauts. This made it possible for the software to warn the astronauts and to interrupt their normal mission displays, letting them know there was an emergency, and what kind of emergency it was, by displaying one of a possible set of 'never supposed to happen' alarms."

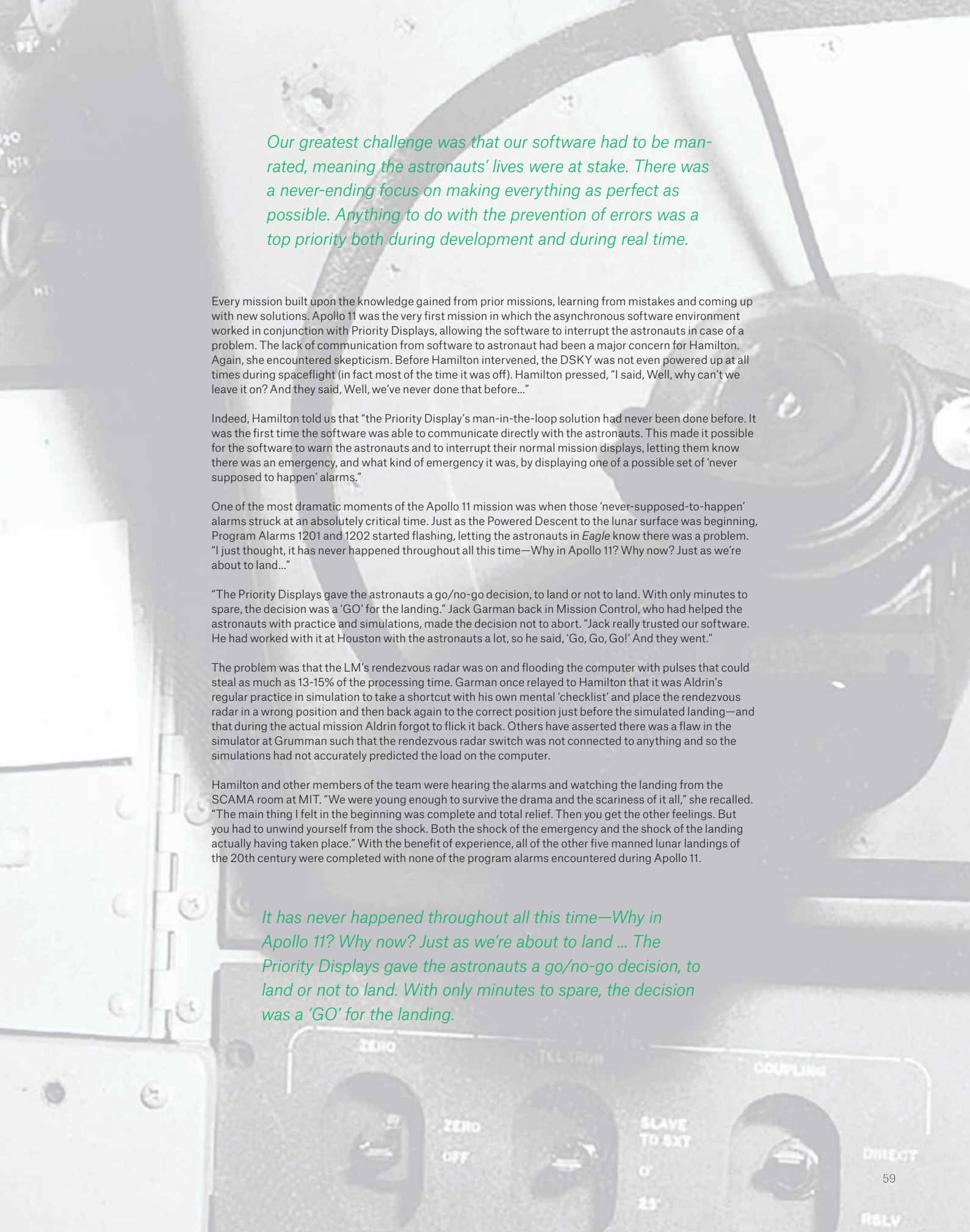
One of the most dramatic moments of the Apollo 11 mission was when those 'never-supposed-to-happen' alarms struck at an absolutely critical time. Just as the Powered Descent to the lunar surface was beginning, Program Alarms 1201 and 1202 started flashing, letting the astronauts in *Eagle* know there was a problem. "I just thought, it has never happened throughout all this time—Why in Apollo 11? Why now? Just as we're about to land..."

"The Priority Displays gave the astronauts a go/no-go decision, to land or not to land. With only minutes to spare, the decision was a 'GO' for the landing." Jack Garman back in Mission Control, who had helped the astronauts with practice and simulations, made the decision not to abort. "Jack really trusted our software. He had worked with it at Houston with the astronauts a lot, so he said, 'Go, Go, Go!' And they went."

The problem was that the LM's rendezvous radar was on and flooding the computer with pulses that could steal as much as 13-15% of the processing time. Garman once relayed to Hamilton that it was Aldrin's regular practice in simulation to take a shortcut with his own mental 'checklist' and place the rendezvous radar in a wrong position and then back again to the correct position just before the simulated landing—and that during the actual mission Aldrin forgot to flick it back. Others have asserted there was a flaw in the simulator at Grumman such that the rendezvous radar switch was not connected to anything and so the simulations had not accurately predicted the load on the computer.

Hamilton and other members of the team were hearing the alarms and watching the landing from the SCAMA room at MIT. "We were young enough to survive the drama and the scariness of it all," she recalled. "The main thing I felt in the beginning was complete and total relief. Then you get the other feelings. But you had to unwind yourself from the shock. Both the shock of the emergency and the shock of the landing actually having taken place." With the benefit of experience, all of the other five manned lunar landings of the 20th century were completed with none of the program alarms encountered during Apollo 11.

It has never happened throughout all this time—Why in Apollo 11? Why now? Just as we're about to land ... The Priority Displays gave the astronauts a go/no-go decision, to land or not to land. With only minutes to spare, the decision was a 'GO' for the landing.

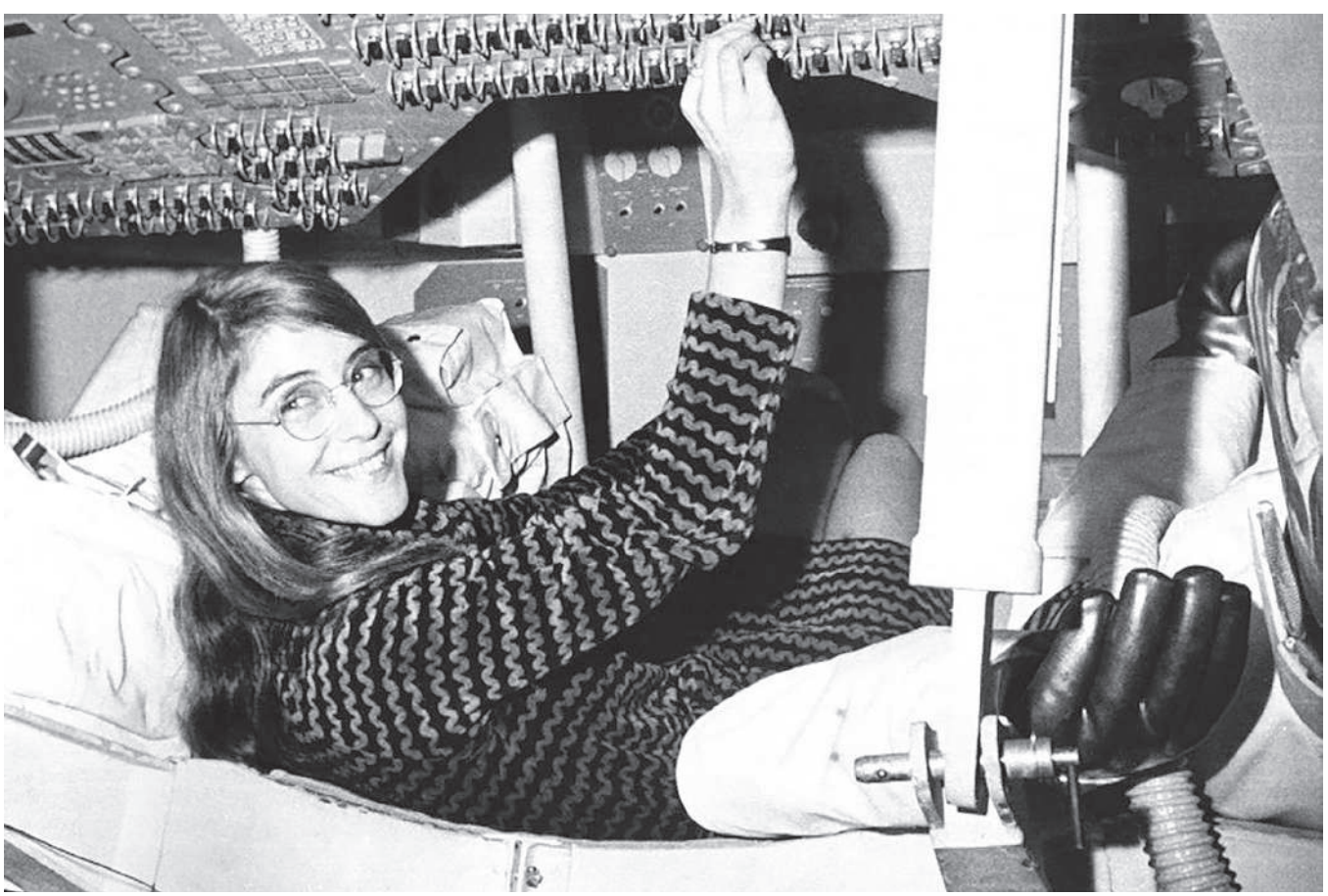


It was the most thrilling thing. Our computers and our software worked, the landing took place, the astronauts were walking on the Moon and our code was running on the Moon!

"I don't really remember if I was more excited about the landing itself, or that the software worked just the way it should have—but it was a combination of excitement," Hamilton shared. "It was the most thrilling thing. Our computers and our software worked, the landing took place, the astronauts were walking on the Moon and our code was running on the Moon!"

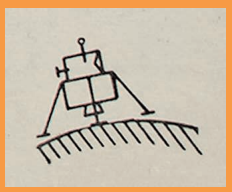
Everything on Apollo was a group effort for a greater cause. "One thing is coming up with it, building it, then really making it happen. We were involved as an integrated team, all working together: the hardware was involved, the astronauts were involved, mission control—and of course the software. It became like a system-wide solution."

We asked Hamilton what she feels is the legacy of the Apollo program. She replied, "I think first that the software was ultra-reliable: that we could detect errors in real time, in a real mission with real astronauts and recover from them or help the astronaut recover from them. We learned how to do man-in-the-loop. And I think the hardware was more reliable than anything that's been built—probably still. How to build reliable systems: that is definitely a legacy." She sat back in her chair. "Another [legacy] is that we went to the Moon..." She smiled. "—And back!"



Margaret Hamilton in Apollo Command Module Simulator. Courtesy MIT Museum

ACRONYM & ABBREVIATION GLOSSARY



ACA	Attitude Control Assembly (hand contoller)	LONG	Longitude
AGC	Apollo Guidance Computer	LOPC	Lunar Orbit Plane Change
AGS	Abort Guidance Section	LOS	Loss of Signal
ALIGN	Alignment	LPD	Landing Point Designator
ALT	Altitude or Altimeter	LR	Landing Radar
ANT	Antenna	M	Mark (timing or point placement)
AOS	Acquisitions Of Signal	MA	Master Alarm
AOT	Alignment Optical Telescope	MAG	Magazine (photgraphic film)
APS	Ascent Propulsion Section	MCC	Mission Control Center
ARM	Armed or Arming	MCC	MidCourse Correction
ASC	Ascent	MCC-H	Mission Control Center Houston
ATCA	Attitude & Translation Control Assembly	MSC	Manned Spacecraft Center (Houston)
ATT	Attitude	MSFN	Manned Space Flight Network
CAL	Calibration	N	Noun
CALC	Calculate	NAV	Navigation
CAPCOM	Spacecraft Communicator	ORDEAL	Orbital Rate Display Earth and Lunar
CB	Circuit Breaker	PDI	Powered Descent Initiation
CDH	Constant Delta Height	PGA	Pressure Garment Assembly (spacesuit)
CDR	Commander	PGNCS	Primary Guidance, Naviagation, and Control Section
CL	Close	PGNS	Primary Guidance and Navigation Section
CLSD	Closed	PLSS	Portable Life Support System (spacesuit “backpack”)
CM	Command Module	PPK	Personal Preference Kit
CMC	Command Module Computer	PRO	Proceed
CMP	Command Module Pilot	PROP	Propellant
COMM	Communications	PROP	Propulsion
CSM	Comman Service Module	Range Rate	Change in range per unit of time
DOI	Descent Orbit Insertion	RCS	Reaction Control Subsystem
DPS	Descent Propulsion Section	R-DOT	Rate of approach - time (t) derivative of range
DSKY	Display Keyboard	REV	Revolution (orbit around earth or moon)
ECS	Environmental Control System	RLS	Radius of Landing Site
ED	Explosive Device	RLS	Reference Landing Site
E-DUMP	Erasable Memory (computer, downloaded to MSFN)	RNG	Range
EVA	Extravehicular Activity	ROD	Rate of Descent
G&C	Guidance and Control	RR	Rendezvous Radar
G&N	Guidance and Navigation	S/C	Spacecraft
GDC	Gyro Display Coupler	SEP	Separation
GET	Ground Elapsed Time	SEQ	Sequence
GNCS	Guidance, Navigation and Control Subsystem	SM	Service Module
H	Height (altitude)	SR	Sun Rise
H-DOT	Descent/Ascent rate - time derivative of height (H)	SRC	Sample Return Container (lunar rock box)
IGN	Ignition	SS	Sun Set
IMU	Inertial Measurment Unit	SYNCH	Synchronization
IVT	Intervehicular Transfer	SYS	System
KSC	Kennedy Space Center	TCA	Thrust Chamber Assembly
LAT	Latitude	THROT	Throttle
LCG	Liquid Cooled Garment	TIG	Time of Ignition
LDG	Landing	TPI	Terminal Phase Initiation
LGC	LM Guidance Computer	V	Verb
LM	Lunar Module	XMTR	Transmitter
LMP	Lunar Module Pilot	XPNDR	Transponder
LOI	Lunar Orbit Insertion	X-PNTR	Cross-pointer

CONDITIONS OF SALE • BUYING AT CHRISTIE'S

CONDITIONS OF SALE

These Conditions of Sale and the Important Notices and Explanation of Cataloguing Practice set out the terms on which we offer the **lots** listed in this catalogue for sale. By registering to bid and/or by bidding at auction you agree to these terms, so you should read them carefully before doing so. You will find a glossary at the end explaining the meaning of the words and expressions coloured in **bold**.

Unless we own a **lot** in whole or in part (Δ symbol), Christie's acts as agent for the seller.

A BEFORE THE SALE

1 DESCRIPTION OF LOTS

(a) Certain words used in the catalogue description have special meanings. You can find details of these on the page headed "Important Notices and Explanation of Cataloguing Practice" which forms part of these terms. You can find a key to the Symbols found next to certain catalogue entries under the section of the catalogue called "Symbols Used in this Catalogue".

(b) Our description of any **lot** in the catalogue, any **condition** report and any other statement made by us (whether orally or in writing) about any **lot**, including about its nature or **condition**, artist, period, materials, approximate dimensions, or **provenance** are our opinion and not to be relied upon as a statement of fact. We do not carry out in-depth research of the sort carried out by professional historians and scholars. All dimensions and weights are approximate only.

2 OUR RESPONSIBILITY FOR OUR DESCRIPTION OF LOTS

We do not provide any guarantee in relation to the nature of a **lot** apart from our **authenticity warranty** contained in paragraph E2 and to the extent provided in paragraph I below.

3 CONDITION

(a) The **condition** of **lots** sold in our auctions can vary widely due to factors such as age, previous damage, restoration, repair and wear and tear. Their nature means that they will rarely be in perfect **condition**. **Lots** are sold "as is," in the **condition** they are in at the time of the sale, without any representation or warranty or assumption of liability of any kind as to **condition** by Christie's or by the seller.

(b) Any reference to **condition** in a catalogue entry or in a **condition** report will not amount to a full description of condition, and images may not show a **lot** clearly. Colours and shades may look different in print or on screen to how they look on physical inspection. **Condition** reports may be available to help you evaluate the **condition** of a **lot**. **Condition** reports are provided free of charge as a convenience to our buyers and are for guidance only. They offer our opinion but they may not refer to all faults, inherent defects, restoration, alteration or adaptation because our staff are not professional restorers or conservators. For that reason **condition** reports are not an alternative to examining a **lot** in person or seeking your own professional advice. It is your responsibility to ensure that you have requested, received and considered any **condition** report.

4 VIEWING LOTS PRE-AUCTION

(a) If you are planning to bid on a **lot**, you should inspect it personally or through a knowledgeable representative before you make a bid to make sure that you accept the description and its **condition**. We recommend you get your own advice from a restorer or other professional adviser.

(b) Pre-auction viewings are open to the public free of charge. Our specialists may be available to answer questions at pre-auction viewings or by appointment.

5 ESTIMATES

Estimates are based on the **condition**, rarity, quality and **provenance** of the **lots** and on prices recently paid at auction for similar property. **Estimates** can change. Neither you, nor anyone else, may rely on any **estimates** as a prediction or guarantee of the actual selling price of a **lot** or its value for any other purpose. **Estimates** do not include the **buyer's premium** or any applicable taxes.

6 WITHDRAWAL

Christie's may, at its option, withdraw any **lot** from auction at any time prior to or during the sale of the **lot**. Christie's has no liability to you for any decision to withdraw.

7 JEWELLERY

(a) Coloured gemstones (such as rubies, sapphires and emeralds) may have been treated to improve their look, through methods such as heating and oiling. These methods are accepted by the international jewellery trade but may make the gemstone less strong and/or require special care over time.

(b) All types of gemstones may have been improved by some method. You may request a gemmological report for any item which does not have a report if the request is made to us at least three weeks before the date of the auction and you pay the fee for the report.

(c) We do not obtain a gemmological report for every gemstone sold in our auctions. Where we do get gemmological reports from internationally accepted gemmological laboratories, such reports will be described in the catalogue. Reports from American gemmological laboratories will describe any improvement or treatment to the gemstone. Reports from European gemmological laboratories will describe any improvement or treatment only if we request that they do so, but will confirm when no improvement or treatment has been made. Because of differences in approach and technology, laboratories may not agree whether a particular gemstone has been treated, the amount of treatment, or whether treatment is permanent. The gemmological laboratories will only report on the improvements or treatments known to the laboratories at the date of the report.

(d) For jewellery sales, **estimates** are based on the information in any gemmological report. If no report is available, assume that the gemstones may have been treated or enhanced.

8 WATCHES & CLOCKS

(a) Almost all clocks and watches are repaired in their lifetime and may include parts which are not original. We do not give a **warranty** that any individual component part of any watch is **authentic**. Watchbands described as "associated" are not part of the original watch and may not be **authentic**. Clocks may be sold without pendulums, weights or keys.

(b) As collectors' watches often have very fine and complex mechanisms, you are responsible for any general service, change of battery, or further repair work that may be necessary. We do not give a **warranty** that any watch is in good working order. Certificates are not available unless described in the catalogue.

(c) Most wristwatches have been opened to find out the type and quality of movement. For that reason, wristwatches with water resistant cases may not be waterproof and we recommend you have them checked by a competent watchmaker before use. Important information about the sale, transport and shipping of watches and watchbands can be found in paragraph H2(f).

B REGISTERING TO BID

1 NEW BIDDERS

(a) If this is your first time bidding at Christie's or you are a returning bidder who has not bought anything from any of our salerooms within the last two years you must register at least 48 hours before an auction begins to give us enough time to process and approve your registration. We may, at our option, decline to permit you to register as a bidder. You will be asked for the following:

(i) for individuals: Photo identification (driver's licence, national identity card, or passport) and, if not shown on the ID document, proof of your current address (for example, a current utility bill or bank statement);

(ii) for corporate clients: Your Certificate of Incorporation or equivalent document(s) showing your name and registered address together with documentary proof of directors and beneficial owners; and

(iii) for trusts, partnerships, offshore companies and other business structures, please contact us in advance to discuss our requirements.

(b) We may also ask you to give us a financial reference and/or a deposit as a condition of allowing you to bid. For help, please contact our Credit Department at **+1 212-636-2490**.

2 RETURNING BIDDERS

As described in paragraph B(1) above, we may at our option ask you for current identification, a financial reference, or a deposit as a condition of allowing you to bid. If you have not bought anything from any of our salerooms within the last two years or if you want to spend more than on previous occasions, please contact our Credit Department at **+1 212-636-2490**.

3 IF YOU FAIL TO PROVIDE THE RIGHT DOCUMENTS

If in our opinion you do not satisfy our bidder identification and registration procedures including, but not limited to completing any anti-money laundering and/or anti-terrorism financing checks we may require to our satisfaction, we may refuse to register you to bid, and if you make a successful bid, we may cancel the contract for sale between you and the seller.

4 BIDDING ON BEHALF OF ANOTHER PERSON

If you are bidding on behalf of another person, that person will need to complete the registration requirements above before you can bid, and supply a signed letter authorising you to bid for him/her. A bidder accepts personal liability to pay the **purchase price** and all other sums due unless it has been agreed in writing with Christie's, before commencement of the auction, that the bidder is acting as an agent on behalf of a named third party acceptable to Christie's and that Christie's will only seek payment from the named third party.

5 BIDDING IN PERSON

If you wish to bid in the saleroom you must register for a numbered bidding paddle at least 30 minutes before the auction. You may register online at **www.christies.com** or in person. For help, please contact the Credit Department on +1 212-636-2490.

6 BIDDING SERVICES

The bidding services described below are a free service offered as a convenience to our clients and Christie's is not responsible for any error (human or otherwise), omission, or breakdown in providing these services.

(a) **Phone Bids**

Your request for this service must be made no later than 24 hours prior to the auction. We will accept bids by telephone for **lots** only if our staff are available to take the bids. If you need to bid in a language other than in English, you must arrange this well before the auction. We may record telephone bids. By bidding on the telephone, you are agreeing to us recording your conversations. You also agree that your telephone bids are governed by these Conditions of Sale.

(b) **Internet Bids on Christie's LIVE™**

For certain auctions we will accept bids over the Internet. For more information, please visit **https://www.christies.com/buying-services/buying-guide/register-and-bid/** As well as these Conditions of Sale, internet bids are governed by the Christie's LIVE™ Terms of Use which are available on is **https://www.christies.com/LiveBidding/OnlineTermsOfUse.**

(c) **Written Bids**

You can find a Written Bid Form at the back of our catalogues, at any Christie's office, or by choosing the sale and viewing the **lots** online at **www.christies.com**. We must receive your completed Written Bid Form at least 24 hours before the auction. Bids must be placed in the currency of the saleroom. The **auctioneer** will take reasonable steps to carry out written bids at the lowest possible price, taking into account the **reserve**. If you make a written bid on a **lot** which does not have a **reserve** and there is no higher bid than yours, we will bid on your behalf at around 50% of the **low estimate** or, if lower, the amount of your bid. If we receive written bids on a **lot** for identical amounts, and at the auction these are the highest bids on the **lot**, we will sell the **lot** to the bidder whose written bid we received first.

C CONDUCTING THE SALE

1 WHO CAN ENTER THE AUCTION

We may, at our option, refuse admission to our premises or decline to permit participation in any auction or to reject any bid.

2 RESERVES

Unless otherwise indicated, all **lots** are subject to a **reserve**. We identify **lots** that are offered without **reserve** with the symbol • next to the **lot number**. The **reserve** cannot be more than the **lot's low estimate**.

3 AUCTIONEER'S DISCRETION

The **auctioneer** can at his or her sole option:

(a) refuse any bid;

(b) move the bidding backwards or forwards in any way he or she may decide, or change the order of the **lots**;

(c) withdraw any **lot**;

(d) divide any **lot** or combine any two or more **lots**;

(e) reopen or continue the bidding even after the hammer has fallen; and

(f) in the case of error or dispute related to bidding and whether during or after the auction, continue the bidding, determine the successful bidder, cancel the sale of the **lot**, or reoffer and resell any **lot**. If you believe that the **auctioneer** has accepted the successful bid in error, you must provide a written notice detailing your claim within 3 business days of the date of the auction. The **auctioneer** will consider such claim in good faith. If the **auctioneer**, in the exercise of his or her discretion under this paragraph, decides after the auction is complete, to cancel the sale of a **lot**, or reoffer and resell a **lot**, he or she will notify the successful bidder no later than by the end of the 7th calendar day following the date of the auction. The **auctioneer's** decision in exercise of this discretion is final. This paragraph does not in any way prejudice Christie's ability to cancel the sale of a **lot** under any other applicable provision of these Conditions of Sale, including the rights of cancellation set forth in sections B(3), E(2)(i), F(4), and J(1).

4 BIDDING

The **auctioneer** accepts bids from:

(a) bidders in the saleroom;

(b) telephone bidders;

(c) internet bidders through 'Christie's LIVE™ (as shown above in paragraph B6); and

(d) written bids (also known as absentee bids or commission bids) left with us by a bidder before the auction.

5 BIDDING ON BEHALF OF THE SELLER

The **auctioneer** may, at his or her sole option, bid on behalf of the seller up to but not including the amount of the **reserve** either by making consecutive bids or by making bids in response to other bidders. The **auctioneer** will not identify these as bids made on behalf of the seller and will not make any bid on behalf of the seller at or above the **reserve**. If **lots** are offered without **reserve**, the **auctioneer** will generally decide to open the bidding at 50% of the **low estimate** for the **lot**. If no bid is made at that level, the **auctioneer** may decide to go backwards at his or her sole option until a bid is made, and then continue up from that amount. In the event that there are no bids on a **lot**, the **auctioneer** may deem such **lot** unsold.

6 BID INCREMENTS

Bidding generally starts below the **low estimate** and increases in steps (bid increments). The **auctioneer** will decide at his or her sole option where the bidding should start and the bid increments. The usual bid increments are shown for guidance only on the Written Bid Form at the back of this catalogue.

7 CURRENCY CONVERTER

The saleroom video screens (and Christies LIVE™) may show bids in some other major currencies as well as US dollars. Any conversion is for guidance only and we cannot be bound by any rate of exchange used. Christie's is not responsible for any error (human or otherwise), omission or breakdown in providing these services.

8 SUCCESSFUL BIDS

Unless the **auctioneer** decides to use his or her discretion as set out in paragraph C3 above, when the **auctioneer's** hammer strikes, we have accepted the last bid. This means a contract for sale has been formed between the seller and the successful bidder. We will issue an invoice only to the registered bidder who made the successful bid. While we send out invoices by mail and/or email after the auction, we do not accept responsibility for telling you whether or not your bid was successful. If you have bid by written bid, you should contact us by telephone or in person as soon as possible after the auction to get details of the outcome of your bid to avoid having to pay unnecessary storage charges.

9 LOCAL BIDDING LAWS

You agree that when bidding in any of our sales that you will strictly comply with all local laws and regulations in force at the time of the sale for the relevant sale site.

D THE BUYER'S PREMIUM AND TAXES

1 THE BUYER'S PREMIUM

In addition to the **hammer price**, the successful bidder agrees to pay us a **buyer's premium** on the **hammer price** of each **lot** sold. On all **lots** we charge 25% of the **hammer price** up to and including US$300,000, 20% on that part of the **hammer price** over US$300,000 and up to and including US$4,000,000, and 13.5% of that part of the **hammer price** above US$4,000,000.

2 TAXES

The successful bidder is responsible for any applicable taxes including any sales or use tax or equivalent tax wherever such taxes may arise on the **hammer price,** the **buyer's premium,** and/or any other charges related to the **lot**.

For **lots** Christie's ships to or within the United States, a sales or use tax may be due on the **hammer price**, **buyer's premium**, and/or any other charges related to the **lot**, regardless of the nationality or citizenship of the successful bidder. Christie's will collect sales tax where legally required. The applicable sales tax rate will be determined based upon the state, county, or locale to which the **lot** will be shipped. Christie's shall collect New York sales tax at a rate of 8.875% for any **lot** collected from Christie's in New York.

In accordance with New York law, if Christie's arranges the shipment of a **lot** out of New York State, New York sales tax does not apply, although sales tax or other applicable taxes for other states may apply. If you hire a shipper (other than a common carrier authorized by Christie's), to collect the **lot** from a Christie's New York location, Christie's must collect New York sales tax on the **lot** at a rate of 8.875% regardless of the ultimate destination of the **lot**.

If Christie's delivers the **lot** to, or the **lot** is collected by, any framer, restorer or other similar service provider in New York that you have hired, New York law considers the **lot** delivered to the successful bidder in New York and New York sales tax must be imposed regardless of the ultimate destination of the **lot**. In this circumstance, New York sales tax will apply to the **lot** even if Christie's or a common carrier (authorized by Christie's that you hire) subsequently delivers the **lot** outside New York.

Successful bidders claiming an exemption from sales tax must provide appropriate documentation to Christie's prior to the release of the **lot** or within 90 days after the sale, whichever is earlier. For shipments to those states for which Christie's is not required to collect sales tax, a successful bidder may have a use or similar tax obligation. *It is the successful bidder's responsibility to pay all taxes due*. Christie's recommends you consult your own independent tax advisor with any questions.

E WARRANTIES

1 SELLER'S WARRANTIES

For each **lot**, the seller gives a **warranty** that the seller:

(a) is the owner of the **lot** or a joint owner of the **lot** acting with the permission of the other co-owners or, if the seller is not the owner or a joint owner of the **lot**, has the permission of the owner to sell the **lot**, or the right to do so in law; and

(b) has the right to transfer ownership of the **lot** to the buyer without any restrictions or claims by anyone else.

If either of the above **warranties** are incorrect, the seller shall not have to pay more than the **purchase price** (as defined in paragraph F1(a) below) paid by you to us. The seller will not be responsible to you for any reason for loss of profits or business, expected savings, loss of opportunity or interest, costs, damages, **other damages** or expenses. The seller gives no **warranty** in relation to any **lot** other than as set out above and, as far as the seller is allowed by law, all **warranties** from the seller to you, and all other obligations upon the seller which may be added to this agreement by law, are excluded.

2 OUR AUTHENTICITY WARRANTY

We warrant, subject to the terms below, that the **lots** in our sales are **authentic** (our "**authenticity warranty**"). If, within 5 years of the date of the auction, you give notice to us that your **lot** is not **authentic**, subject to the terms below, we will refund the **purchase price** paid by you. The meaning of **authentic** can be found in the glossary at the end of these Conditions of Sale. The terms of the **authenticity warranty** are as follows:

(a) It will be honored for claims notified within a period of 5 years from the date of the auction. After such time, we will not be obligated to honor the **authenticity warranty**.

(b) It is given only for information shown in **UPPERCASE type** in the first line of the **catalogue description** (the "**Heading**"). It does not apply to any information other than in the **Heading** even if shown in **UPPERCASE type**.

(c) The **authenticity warranty** does not apply to any **Heading** or part of a **Heading** which is **qualified**. **Qualified** means limited by a clarification in a **lot's catalogue description** or by the use in a Heading of one of the terms listed in the section titled **Qualified Headings** on the page of the catalogue headed "Important Notices and Explanation of Cataloguing Practice". For example, use of the term "ATTRIBUTED TO…" in a **Heading** means that the **lot** is in Christie's opinion probably a work by the named artist but no **warranty** is provided that the **lot** is the work of the named artist. Please read the full list of **Qualified Headings** and a **lot's** full **catalogue description** before bidding.

(d) The **authenticity warranty** applies to the **Heading** as amended by any **Saleroom Notice**.

(e) The **authenticity warranty** does not apply where scholarship has developed since the auction leading to a change in generally accepted opinion. Further, it does not apply if the **Heading** either matched the generally accepted opinion of experts at the date of the auction or drew attention to any conflict of opinion.

(f) The **authenticity warranty** does not apply if the **lot** can only be shown not to be **authentic** by a scientific process which, on the date we published the catalogue, was not available or generally accepted for use, or which was unreasonably expensive or impractical, or which was likely to have damaged the **lot**.

(g) The benefit of the **authenticity warranty** is only available to the original buyer shown on the invoice for the **lot** issued at the time of the sale and only if on the date of the notice of claim, the original buyer is the full owner of the **lot** and the **lot** is free from any claim, interest or restriction by anyone else. The benefit of this **authenticity warranty** may not be transferred to anyone else.

(h) In order to claim under the **authenticity warranty** you must:

(i) give us written notice of your claim within 5 years of the date of the auction. We may require full details and supporting evidence of any such claim;

(ii) at Christie's option, we may require you to provide the written opinions of two recognised experts in the field of the **lot** mutually agreed by you and us in advance confirming that the **lot** is not **authentic**. If we have any doubts, we reserve the right to obtain additional opinions at our expense; and

(iii) return the **lot** at your expense to the saleroom from which you bought it in the **condition** it was in at the time of sale.

(i) Your only right under this **authenticity warranty** is to cancel the sale and receive a refund of the **purchase price** paid by you to us. We will not, under any circumstances, be required to pay you more than the **purchase price** nor will we be liable for any loss of profits or business, loss of opportunity or value, expected savings or interest, costs, damages, **other damages** or expenses.

(j) **Books**. Where the **lot** is a book, we give an **additional warranty** for 21 days from the date of the auction that any **lot** is defective in text or illustration, we will refund your **purchase price**, subject to the following terms:

(a) This additional **warranty** does not apply to:

(i) the absence of blanks, half titles, tissue guards or advertisements, damage in respect of bindings, stains, spotting, marginal tears or other defects not affecting completeness of the text or illustration;

(ii) drawings, autographs, letters or manuscripts, signed photographs, music, atlases, maps or periodicals;

(iii) books not identified by title;

(iv) **lots** sold without a printed **estimate**;

(v) books which are described in the catalogue as sold not subject to return; or

(vi) defects stated in any **condition** report or announced at the time of sale.

(b) To make a claim under this paragraph you must give written details of the defect and return the **lot** to the sale room at which you bought it in the same **condition** as at the time of sale, within 21 days of the date of the sale.

(k) **South East Asian Modern and Contemporary Art and Chinese Calligraphy and Painting.** In these categories, the **authenticity warranty** does not apply because current scholarship does not permit the making of definitive statements. Christie's does, however, agree to cancel a sale in either of these two categories of art where it has been proven the **lot** is a forgery. Christie's will refund to the original buyer the **purchase price** in accordance with the terms of Christie's Authenticity Warranty, provided that the original buyer notifies us with full supporting evidence documenting the forgery claim within twelve (12) months of the date of the auction. Such evidence must be satisfactory to us that the property is a forgery in accordance with paragraph E2(h)(ii) above and the property must be returned to us in accordance with E2h(iii) above. Paragraphs E2(b), (c), (d), (e), (f) and (g) and (i) also apply to a claim under these categories.

3 YOUR WARRANTIES

(a) You warrant that the funds used for settlement are not connected with any criminal activity, including tax evasion, and you are neither under investigation, nor have you been charged with or convicted of money laundering, terrorist activities or other crimes.

(b) where you are bidding on behalf of another person, you warrant that:

(i) you have conducted appropriate customer due diligence on the ultimate buyer(s) of the **lot**(s) in accordance with all applicable anti-money laundering and sanctions laws, consent to us relying on this due diligence, and you will retain for a period of not less than 5 years the documentation evidencing the due diligence. You will make such documentation promptly available for immediate inspection by an independent third-party auditor upon our written request to do so;

(ii) the arrangements between you and the ultimate buyer(s) in relation to the **lot** or otherwise do not, in whole or in part, facilitate tax crimes;

(iii) you do not know, and have no reason to suspect, that the funds used for settlement are connected with, the proceeds of any criminal activity, including tax evasion, or that the ultimate buyer(s) are under investigation, or have been charged with or convicted of money laundering, terrorist activities or other crimes.

F PAYMENT

1 HOW TO PAY

(a) Immediately following the auction, you must pay the **purchase price** being:

(i) the **hammer price**; and

(ii) the **buyer's premium**; and

(iii) any applicable duties, goods, sales, use, compensating or service tax, or VAT.

Payment is due no later than by the end of the 7th calendar day following the date of the auction (the "**due date**").

(b) We will only accept payment from the registered bidder. Once issued, we cannot change the buyer's name on an invoice or re-issue the invoice in a different name. You must pay immediately even if you want to export the **lot** and you need an export licence.

(c) You must pay for **lots** bought at Christie's in the United States in the currency stated on the invoice in one of the following ways:

(i) Wire transfer
JP Morgan Chase Bank, N.A.,
270 Park Avenue, New York, NY 10017;
ABA# 021000021; FBO: Christie's Inc.;
Account # 957-107978,
for international transfers, SWIFT: CHASUS33.

(ii) Credit Card.
We accept Visa, MasterCard, American Express and China Union Pay. Credit card payments at the New York premises will only be accepted for New York sales. Christie's will not accept credit card payments for purchases in any other sale site.

To make a 'cardholder not present' (CNP) payment, you must complete a CNP authorisation form which you can get from our Post-Sale Services. You must send a completed CNP authorisation form by fax to +1 212 636 4939 or you can mail to the address below. Details of the conditions and restrictions applicable to credit card payments are available from our Post-Sale Services, whose details are set out in paragraph (d) below.

(iii) Cash
We accept cash payments (including money orders and traveller's checks) subject to a maximum global aggregate of US$7,500 per buyer per year at our Post-Sale Services only

(iv) Bank Checks
You must make these payable to Christie's Inc. and there may be conditions.

(v) Checks
You must make checks payable to Christie's Inc. and they must be drawn from US dollar accounts from a US bank.

(d) You must quote the sale number, your invoice number and client number when making a payment. All payments sent by post must be sent to:
Christie's Inc. Post-Sale Services,
20 Rockefeller Center, New York, NY 10020.

(e) For more information please contact our Post-Sale Services by phone at +1 212 636 2650 or fax at +1 212 636 4939 or email PostSaleUS@christies.com.

2 TRANSFERRING OWNERSHIP TO YOU

You will not own the **lot** and ownership of the **lot** will not pass to you until we have received full and clear payment of the **purchase price**, even in circumstances where we have released the **lot** to you.

3 TRANSFERRING RISK TO YOU

The risk in and responsibility for the **lot** will transfer to you from whichever is the earlier of the following:

(a) When you collect the **lot**; or

(b) At the end of the 30th day following the date of the auction or, if earlier, the date the **lot** is taken into care by a third party warehouse as set out on the page headed 'Storage and Collection', unless we have agreed otherwise with you.

4 WHAT HAPPENS IF YOU DO NOT PAY

(a) If you fail to pay us the **purchase price** in full by the **due date**, we will be entitled to do one or more of the following (as well as enforce our rights under paragraph F5 and any other rights or remedies we have by law):

(i) we can charge interest from the **due date** at a rate of up to 1.34% per month on the unpaid amount due;

(ii) we can cancel the sale of the **lot**. If we do this, we may sell the **lot** again, publically or privately on such terms we shall think necessary or appropriate, in which case you must pay us any shortfall between the **purchase price** and the proceeds from the resale. You must also pay all costs, expenses, losses, damages and legal fees we have to pay or may suffer and any shortfall in the seller's commission on the resale;

(iii) we can pay the seller an amount up to the net proceeds payable in respect of the amount bid by your default in which case you acknowledge and understand that Christie's will have all of the rights of the seller to pursue you for such amounts;

(iv) we can hold you legally responsible for the **purchase price** and may begin legal proceedings to recover it together with other losses, interest, legal fees and costs as far as we are allowed by law;

(v) we can take what you owe us from any amounts which we or any company in the **Christie's Group** may owe you (including any deposit or other part-payment which you have paid to us);

(vi) we can, at our option, reveal your identity and contact details to the seller;

(vii) we can reject at any future auction any bids made by or on behalf of the buyer or to obtain a deposit from the buyer before accepting any bids;

(viii) we can exercise all the rights and remedies of a person holding security over any property in our possession owned by you, whether by way of pledge, security interest or in any other way as permitted by the law of the place where such property is located. You will be deemed to have granted such security to us and we may retain such property as collateral security for your obligations to us; and

(ix) we can take any other action we see necessary or appropriate.

(b) If you owe money to us or to another **Christie's Group** company, we can use any amount you do pay, including any deposit or other part-payment you have made to us, or which we owe you, to pay off any amount you owe to us or another **Christie's Group** company for any transaction.

5 KEEPING YOUR PROPERTY

If you owe money to us or to another **Christie's Group** company, as well as the rights set out in F4 above, we can use or deal with any of your property we hold or which is held by another **Christie's Group** company in any way we are allowed to by law. We will only release your property to you after you pay us or the relevant **Christie's Group** company in full for what you owe. However, if we choose, we can also sell your property in any way we think appropriate. We will use the proceeds of the sale against any amounts you owe us and we will pay any amount left from that sale to you.

If there is a shortfall, you must pay us any difference between the amount we have received from the sale and the amount you owe us.

G COLLECTION AND STORAGE

(a) You must collect purchased **lots** within seven days from the auction **(but note that lots will not be released to you until you have made full and clear payment of all amounts due to us)**.

(b) Information on collecting **lots** is set out on the storage and collection page and on an information sheet which you can get from the bidder registration staff or Christie's Post-Sale Services Department on +1 212 636 2650.

(c) If you do not collect any **lot** within thirty days following the auction we may, at our option
  (i) charge you storage costs at the rates set out at www.christies.com/storage.
  (ii) move the **lot** to another Christie's location or an affiliate or third party warehouse and charge you transport costs and administration fees for doing so and you will be subject to the third party storage warehouse's standard terms and to pay for their standard fees and costs.
  (iii) sell the **lot** in any commercially reasonable way we think appropriate.

(d) The Storage conditions which can be found at www.christies.com/storage will apply.

(e) In accordance with New York law, if you have paid for the **lot** in full but you do not collect the **lot** within 180 calendar days of payment, we may charge you New York sales tax for the **lot**.

(f) Nothing in this paragraph is intended to limit our rights under paragraph F4.

H TRANSPORT AND SHIPPING

1 SHIPPING

We will enclose a transport and shipping form with each invoice sent to you. You must make all transport and shipping arrangements. However, we can arrange to pack, transport, and ship your property if you ask us to and pay the costs of doing so. We recommend that you ask us for an estimate, especially for any large items or items of high value that need professional packing. We may also suggest other handlers, packers, transporters, or experts if you ask us to do so. For more information, please contact Christie's Post-Sale Services at +1 212 636 2650. See the information set out at **www.christies.com/shipping** or contact us at PostSaleUS@christie.com. We will take reasonable care when we are handling, packing, transporting, and shipping a. However, if we recommend another company for any of these purposes, we are not responsible for their acts, failure to act, or neglect.

2 EXPORT AND IMPORT

Any **lot** sold at auction may be affected by laws on exports from the country in which it is sold and the import restrictions of other countries. Many countries require a declaration of export for property leaving the country and/or an import declaration on entry of property into the country. Local laws may prevent you from importing a **lot** or may prevent you selling a **lot** in the country you import it into.

(a) You alone are responsible for getting advice about and meeting the requirements of any laws or regulations which apply to exporting or importing any **lot** prior to bidding. If you are refused a licence or there is a delay in getting one, you must still pay us in full for the **lot**. We may be able to help you apply for the appropriate licences if you ask us to and pay our fee for doing so. However, we cannot guarantee that you will get one. For more information, please contact Christie's Art Transport Department at +1 212 636 2480. See the information set out at **www.christies.com/shipping** or contact us at ArtTransportNY@christies.com.

(b) **Endangered and protected species**
Lots made of or including (regardless of the percentage) endangered and other protected species of wildlife are marked with the symbol ~ in the catalogue. This material includes, among other things, ivory, tortoiseshell, crocodile skin, rhinoceros horn, whalebone certain species of coral, and Brazilian rosewood. You should check the relevant customs laws and regulations before bidding on any **lot** containing wildlife material if you plan to import the **lot** into another country. Several countries refuse to allow you to import property containing these materials, and some other countries require a licence from the relevant regulatory agencies in the countries of exportation as well as importation. In some cases, the **lot** can only be shipped with an independent scientific confirmation of species and/or age, and you will need to obtain these at your own cost.

(c) **Lots containing Ivory or materials resembling ivory**
If a **lot** contains elephant ivory, or any other wildlife material that could be confused with elephant ivory (for example, mammoth ivory, walrus ivory, helmeted hornbill ivory) you may be prevented from exporting the **lot** from the US or shipping it between US States without first confirming its species by way of a rigorous scientific test acceptable to the applicable Fish and Wildlife authorities. You will buy that **lot** at your own risk and be responsible for any scientific test or other reports required for export from the USA or between US States at your own cost. We will not be obliged to cancel your purchase and refund the **purchase price** if your **lot** may not be exported, imported or shipped between US States, or it is seized for any reason by a government authority. It is your responsibility to determine and satisfy the requirements of any applicable laws or regulations relating to interstate shipping, export or import of property containing such protected or regulated material.

(d) **Lots of Iranian origin**
Some countries prohibit or restrict the purchase, the export and/or import of Iranian-origin "works of conventional craftsmanship" (works that are not by a recognized artist and/or that have a function, (for example: carpets, bowls, ewers, tiles, ornamental boxes). For example, the USA prohibits the import and export of this type of property without a license issued by the US Department of the Treasury, Office of Foreign Assets Control. Other countries, such as Canada, only permit the import of this property in certain circumstances. As a convenience to buyers, Christie's indicates under the title of a **lot** if the **lot** originates from Iran (Persia). It is your responsibility to ensure you do not bid on or import a **lot** in contravention of the sanctions or trade embargoes that apply to you.

(f) **Gold**
Gold of less than 18ct does not qualify in all countries as 'gold' and may be refused import into those countries as 'gold'.

(g) **Watches**
Many of the watches offered for sale in this catalogue are pictured with straps made of endangered or protected animal materials such as alligator or crocodile. These **lots** are marked with the symbol Ψ in the catalogue. These endangered species straps are shown for display purposes only and are not for sale. Christie's will remove and retain the strap prior to shipment from the sale site. At some sale sites, Christie's may, at its discretion, make the displayed endangered species strap available to the buyer of the **lot** free of charge if collected in person from the sale site within 1 year of the date of the auction. Please check with the department for details on a particular **lot**.

For all symbols and other markings referred to in paragraph H2, please note that **lots** are marked as a convenience to you, but we do not accept liability for errors or for failing to mark **lots**.

I OUR LIABILITY TO YOU

(a) We give no **warranty** in relation to any statement made, or information given, by us or our representatives or employees, about any **lot** other than as set out in the **authenticity warranty** and, as far as we are allowed by law, all **warranties** and other terms which may be added to this agreement by law are excluded. The seller's **warranties** contained in paragraph E1 are their own and we do not have any liability to you in relation to those **warranties**.

(b) (i) We are not responsible to you for any reason (whether for breaking this agreement or any other matter relating to your purchase of, or bid for, any **lot**) other than in the event of fraud or fraudulent misrepresentation by us or other than as expressly set out in these conditions of sale; or
  (ii) give any representation, warranty or guarantee or assume any liability of any kind in respect of any **lot** with regard to merchantability, fitness for a particular purpose, description, size, quality, condition, attribution, authenticity, rarity, importance, medium, provenance, exhibition history, literature, or historical relevance. Except as required by local law, any warranty of any kind is excluded by this paragraph.

(c) In particular, please be aware that our written and telephone bidding services, Christie's LIVE™, **condition** reports, currency converter and saleroom video screens are free services and we are not responsible to you for any error (human or otherwise), omission or breakdown in these services.

(d) We have no responsibility to any person other than a buyer in connection with the purchase of any **lot**.

(e) If, in spite of the terms in paragraphs I(a) to (d) or E2(i) above, we are found to be liable to you for any reason, we shall not have to pay more than the **purchase price** paid by you to us. We will not be responsible to you for any reason for loss of profits or business, loss of opportunity or value, expected savings or interest, costs, damages, or expenses.

J OTHER TERMS

1 OUR ABILITY TO CANCEL

In addition to the other rights of cancellation contained in this agreement, we can cancel a sale of a **lot** if : (i) any of your warranties in paragraph E3 are not correct; (ii) we reasonably believe that completing the transaction is, or may be, unlawful; or (iii) we reasonably believe that the sale places us or the seller under any liability to anyone else or may damage our reputation.

2 RECORDINGS

We may videotape and record proceedings at any auction. We will keep any personal information confidential, except to the extent disclosure is required by law. However, we may, through this process, use or share these recordings with another **Christie's Group** company and marketing partners to analyse our customers and to help us to tailor our services for buyers. If you do not want to be videotaped, you may make arrangements to make a telephone or written bid or bid on Christie's LIVE™ instead. Unless we agree otherwise in writing, you may not videotape or record proceedings at any auction.

3 COPYRIGHT

We own the copyright in all images, illustrations and written material produced by or for us relating to a **lot** (including the contents of our catalogues unless otherwise noted in the catalogue). You cannot use them without our prior written permission. We do not offer any guarantee that you will gain any copyright or other reproduction rights to the **lot**.

4 ENFORCING THIS AGREEMENT

If a court finds that any part of this agreement is not valid or is illegal or impossible to enforce, that part of the agreement will be treated as being deleted and the rest of this agreement will not be affected.

5 TRANSFERRING YOUR RIGHTS AND RESPONSIBILITIES

You may not grant a security over or transfer your rights or responsibilities under these terms on the contract of sale with the buyer unless we have given our written permission. This agreement will be binding on your successors or estate and anyone who takes over your rights and responsibilities.

6 TRANSLATIONS

If we have provided a translation of this agreement, we will use this original version in deciding any issues or disputes which arise under this agreement.

7 PERSONAL INFORMATION

We will hold and process your personal information and may pass it to another **Christie's Group** company for use as described in, and in line with, our privacy notice at **www.christies.com/about-us/contact/privacy.**

8 WAIVER

No failure or delay to exercise any right or remedy provided under these Conditions of Sale shall constitute a waiver of that or any other right or remedy, nor shall it prevent or restrict the further exercise of that or any other right or remedy. No single or partial exercise of such right or remedy shall prevent or restrict the further exercise of that or any other right or remedy.

9 LAW AND DISPUTES

This agreement, and any non-contractual obligations arising out of or in connection with this agreement, or any other rights you may have relating to the purchase of a **lot** will be governed by the laws of New York. Before we or you start any court proceedings (except in the limited circumstances where the dispute, controversy or claim is related to proceedings brought by someone else and this dispute could be joined to those proceedings), we agree we will each try to settle the dispute by mediation submitted to JAMS, or its successor, for mediation in New York. If the Dispute is not settled by mediation within 60 days from the date when mediation is initiated, then the Dispute shall be submitted to JAMS, or its successor, for final and binding arbitration in accordance with its Comprehensive Arbitration Rules and Procedures or, if the Dispute involves a non-U.S. party, the JAMS International Arbitration Rules. The seat of the arbitration shall be New York and the arbitration shall be conducted by one arbitrator, who shall be appointed within 30 days after the initiation of the arbitration. The language used in the arbitral proceedings shall be English. The arbitrator shall order the production of documents only upon a showing that such documents are relevant and material to the outcome of the Dispute. The arbitration shall be confidential, except to the extent necessary to enforce a judgment or where disclosure is required by law. The arbitration award shall be final and binding on all parties involved. Judgment upon the award may be entered by any court having jurisdiction thereof or having jurisdiction over the relevant party or its assets. This arbitration and any proceedings conducted hereunder shall be governed by Title 9 (Arbitration) of the United States Code and by the United Nations Convention on the Recognition and Enforcement of Foreign Arbitral Awards of June 10, 1958.

10 REPORTING ON WWW.CHRISTIES.COM

Details of all **lots** sold by us, including **catalogue descriptions** and prices, may be reported on **www.christies.com**. Sales totals are **hammer price** plus **buyer's premium** and do not reflect costs, financing fees, or application of buyer's or seller's credits. We regret that we cannot agree to requests to remove these details from **www.christies.com**.

K GLOSSARY

auctioneer: the individual **auctioneer** and/or Christie's.

authentic: authentic : a genuine example, rather than a copy or forgery of:
  (i) the work of a particular artist, author or manufacturer, if the **lot** is described in the **Heading** as the work of that artist, author or manufacturer;
  (ii) a work created within a particular period or culture, if the **lot** is described in the **Heading** as a work created during that period or culture;
  (iii) a work for a particular origin source if the **lot** is described in the Heading as being of that origin or source; or
  (iv) in the case of gems, a work which is made of a particular material, if the **lot** is described in the **Heading** as being made of that material.

authenticity warranty: the guarantee we give in this agreement that a **lot** is **authentic** as set out in paragraph E2 of this agreement.

buyer's premium: the charge the buyer pays us along with the **hammer price**.

catalogue description: the description of a **lot** in the catalogue for the auction, as amended by any saleroom notice.

Christie's Group: Christie's International Plc, its subsidiaries and other companies within its corporate group.

condition: the physical condition of a **lot**.

due date: has the meaning given to it paragraph F1(a).

estimate: the price range included in the catalogue or any saleroom notice within which we believe a **lot** may sell. **Low estimate** means the lower figure in the range and **high estimate** means the higher figure. The **mid estimate** is the midpoint between the two.

hammer price: the amount of the highest bid the **auctioneer** accepts for the sale of a **lot**.

Heading: has the meaning given to it in paragraph E2.

lot: an item to be offered at auction (or two or more items to be offered at auction as a group).

other damages: any special, consequential, incidental or indirect damages of any kind or any damages which fall within the meaning of 'special', 'incidental' or 'consequential' under local law.

purchase price: has the meaning given to it in paragraph F1(a).

provenance: the ownership history of a **lot**.

qualified: has the meaning given to it in paragraph E2 and **Qualified Headings** means the paragraph headed **Qualified Headings** on the page of the catalogue headed 'Important Notices and Explanation of Cataloguing Practice'.

reserve: the confidential amount below which we will not sell a **lot**.

saleroom notice: a written notice posted next to the **lot** in the saleroom and on **www.christies.com**, which is also read to prospective telephone bidders and notified to clients who have left commission bids, or an announcement made by the **auctioneer** either at the beginning of the sale, or before a particular **lot** is auctioned.

UPPER CASE type: means having all capital letters.

warranty: a statement or representation in which the person making it guarantees that the facts set out in it are correct.

SYMBOLS USED IN THIS CATALOGUE

The meaning of words coloured in **bold** in this section can be found at the end of the section of the catalogue headed 'Conditions of Sale'

°

Christie's has a direct financial interest in the **lot**. See Important Notices and Explanation of Cataloguing Practice.

Δ

Owned by Christie's or another **Christie's Group** company in whole or part. See Important Notices and Explanation of Cataloguing Practice.

♦

Christie's has a direct financial interest in the **lot** and has funded all or part of our interest with the help of someone else. See Important Notices and Explanation of Cataloguing Practice.

¤

Bidding by interested parties

•

Lot offered without **reserve** which will be sold to the highest bidder regardless of the pre-sale estimate in the catalogue.

~

Lot incorporates material from endangered species which could result in export restrictions. See Paragraph H2(b) of the Conditions of Sale.

■

See Storage and Collection pages in the catalogue.

Ψ

Lot incorporates material from endangered species that is not for sale and shown for display purposes only. See Paragraph H2(g) of the Conditions of Sale.

Please note that **lots** are marked as a convenience to you and we shall not be liable for any errors in, or failure to, mark a **lot**.

29/03/19

IMPORTANT NOTICES AND EXPLANATION OF CATALOGUING PRACTICE

IMPORTANT NOTICES

Δ Property Owned in part or in full by Christie's

From time to time, Christie's may offer a lot which it owns in whole or in part. Such property is identified in the catalogue with the symbol Δ next to its lot number. Where Christie's has an ownership or financial interest in every lot in the catalogue, Christie's will not designate each lot with a symbol, but will state its interest in the front of the catalogue.

° Minimum Price Guarantees

On occasion, Christie's has a direct financial interest in the outcome of the sale of certain lots consigned for sale. This will usually be where it has guaranteed to the Seller that whatever the outcome of the auction, the Seller will receive a minimum sale price for the work. This is known as a minimum price guarantee. Where Christie's holds such financial interest we identify such lots with the symbol ° next to the lot number.

° ♦ Third Party Guarantees/Irrevocable bids

Where Christie's has provided a Minimum Price Guarantee it is at risk of making a loss if the lot fails to sell. Christie's sometimes chooses to share that risk with a third party who agrees prior to the auction to place an irrevocable written bid on the lot. If there are no other higher bids, the third party commits to buy the lot at the level of their irrevocable written bid. In doing so, the third party takes on all or part of the risk of the lot not being sold. Lots which are subject to a third party guarantee arrangement are identified in the catalogue with the symbol ° ♦.

In most cases, Christie's compensates the third party in exchange for accepting this risk. Where the third party is the successful bidder, the third party's remuneration is based on a fixed financing fee. If the third party is not the successful bidder, the remuneration may either be based on a fixed fee or is an amount calculated against the hammer price. The third party may continue to bid for the lot above the irrevocable written bid. Where the third party is the successful bidder, Christie's will report the purchase price net of the fixed financing fee.

Third party guarantors are required by us to disclose to anyone they are advising their financial interest in any lots they are guaranteeing. However, for the avoidance of any doubt, if you are advised by or bidding through an agent on a lot identified as being subject to a third party guarantee, you should always ask your agent to confirm whether or not he or she has a financial interest in relation to the lot

¤ Bidding by interested parties

When a party with a direct or indirect interest in the lot who may have knowledge of the lot's reserve or other material information may be bidding on the lot, we will mark the lot with this symbol ¤. This interest can include beneficiaries of an estate that consigned the lot or a joint owner of a lot. Any interested party that successfully bids on a lot must comply with Christie's Conditions of Sale, including paying the lot's full Buyer's Premium plus applicable taxes.

Post-catalogue notifications

In certain instances, after the catalogue has been published, Christie's may enter into an arrangement or become aware of bidding that would have required a catalogue symbol. In those instances, a pre-sale or pre-lot announcement will be made.

Other Arrangements

Christie's may enter into other arrangements not involving bids. These include arrangements where Christie's has given the Seller an Advance on the proceeds of sale of the lot or where Christie's has shared the risk of a guarantee with a partner without the partner being required to place an irrevocable written bid or otherwise participating in the bidding on the lot. Because such arrangements are unrelated to the bidding process they are not marked with a symbol in the catalogue.

FOR PICTURES, DRAWINGS, PRINTS AND MINIATURES

Terms used in this catalogue have the meanings ascribed to them below. Please note that all statements in this catalogue as to authorship are made subject to the provisions of the Conditions of Sale and **authenticity warranty**. Buyers are advised to inspect the property themselves. Written **condition** reports are usually available on request.

QUALIFIED HEADINGS

In Christie's opinion a work by the artist.
★"Attributed to …"
In Christie's qualified opinion probably a work by the artist in whole or in part.
★"Studio of …"/ "Workshop of …"
In Christie's qualified opinion a work executed in the studio or workshop of the artist, possibly under his supervision.
★"Circle of …"
In Christie's qualified opinion a work of the period of the artist and showing his influence.
★"Follower of …"
In Christie's qualified opinion a work executed in the artist's style but not necessarily by a pupil.
★"Manner of …"
In Christie's qualified opinion a work executed in the artist's style but of a later date.
★"After …"
In Christie's qualified opinion a copy (of any date) of a work of the artist.
"Signed …"/"Dated …"/
"Inscribed …"
In Christie's qualified opinion the work has been signed/dated/inscribed by the artist.
"With signature …"/ "With date …"/
"With inscription …"
In Christie's qualified opinion the signature/ date/inscription appears to be by a hand other than that of the artist.

The date given for Old Master, Modern and Contemporary Prints is the date (or approximate date when prefixed with 'circa') on which the matrix was worked and not necessarily the date when the impression was printed or published.

★This term and its definition in this Explanation of Cataloguing Practice are a qualified statement as to authorship. While the use of this term is based upon careful study and represents the opinion of specialists, Christie's and the seller assume no risk, liability and responsibility for the **authenticity** of authorship of any **lot** in this catalogue described by this term, and the **Authenticity Warranty** shall not be available with respect to **lots** described using this term.

POST 1950 FURNITURE

All items of post-1950 furniture included in this sale are items either not originally supplied for use in a private home or now offered solely as works of art. These items may not comply with the provisions of the Furniture and Furnishings (Fire) (Safety) Regulations 1988 (as amended in 1989 and 1993, the "Regulations"). Accordingly, these items should not be used as furniture in your home in their current condition. If you do intend to use such items for this purpose, you must first ensure that they are reupholstered, restuffed and/or recovered (as appropriate) in order that they comply with the provisions of the Regulations.These will vary by department.

29/03/19

STORAGE AND COLLECTION

PAYMENT OF ANY CHARGES DUE

Specified **lots** (sold and unsold) marked with a filled square (■) not collected from Christie's by 5.00pm on the day of the sale will, at our option, be removed to Christie's Fine Art Storage Services (CFASS in Red Hook, Brooklyn). Christie's will inform you if the **lot** has been sent offsite.

If the **lot** is transferred to Christie's Fine Art Storage Services, it will be available for collection after the third business day following the sale.

Please contact Christie's Post-Sale Service 24 hours in advance to book a collection time at Christie's Fine Art Services. All collections from Christie's Fine Art Services will be by pre-booked appointment only.

Please be advised that after 50 days from the auction date property may be moved at Christie's discretion. Please contact Post-Sale Services to confirm the location of your property prior to collection.

Tel: +1 212 636 2650
Email: PostSaleUS@christies.com

Operation hours for both Christie's Rockefeller and Christie's Fine Art Storage are from 9:30 am to 5:00 pm, Monday – Friday.

COLLECTION AND CONTACT DETAILS

Lots will only be released on payment of all charges due and on production of a Collection Form from Christie's. Charges may be paid in advance or at the time of collection. We may charge fees for storage if your **lot** is not collected within thirty days from the sale. Please see paragraph G of the Conditions of Sale for further detail.

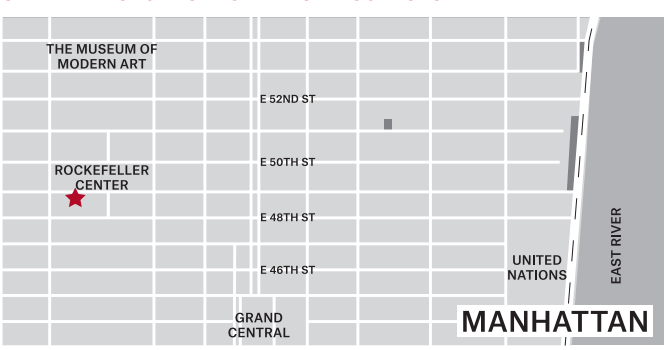
Tel: +1 212 636 2650
Email: PostSaleUS@christies.com

SHIPPING AND DELIVERY

Christie's Post-Sale Service can organize domestic deliveries or international freight. Please contact them on +1 212 636 2650 or PostSaleUS@christies.com.

Long-term storage solutions are also available per client request. CFASS is a separate subsidiary of Christie's and clients enjoy complete confidentiality. Please contact CFASS New York for details and rates: +1 212 636 2070 or storage@cfass.com

STREET MAP OF CHRISTIE'S NEW YORK LOCATIONS



Christie's Rockefeller Center
20 Rockefeller Plaza, New York 10020
Tel: +1 212 636 2000
nycollections@christies.com
Main Entrance on 49th Street
Receiving/Shipping Entrance on 48th Street
Hours: 9.30 AM - 5.00 PM
Monday-Friday except Public Holidays

Christie's Fine Art Storage Services (CFASS)
62-100 Imlay Street, Brooklyn, NY 11231
Tel: +1 212 974 4500
nycollections@christies.com
Main Entrance on Corner of Imlay and Bowne St
Hours: 9.30 AM - 5.00 PM
Monday-Friday except Public Holidays

13/08/18

WRITTEN BIDS FORM
CHRISTIE'S NEW YORK

ONE GIANT LEAP: CELEBRATING SPACE EXPLORATION 50 YEARS AFTER APOLLO 11 - PART ONE

THURSDAY 18 JULY 2019
AT 10.00 AM

20 Rockefeller Plaza
NewYork, NY 10020

CODE NAME: BASE
SALE NUMBER: 17119

(Dealers billing name and address must agree with tax exemption certificate. Invoices cannot be changed after they have been printed.)

BID ONLINE FOR THIS SALE AT CHRISTIES.COM

BIDDING INCREMENTS

Bidding generally starts below the **low estimate** and increases in steps (bid increments) of up to 10 per cent. The auctioneer will decide where the bidding should start and the bid increments. Written bids that do not conform to the increments set below may be lowered to the next bidding-interval.

US$100 to US$2,000	by US$100s
US$2,000 to US$3,000	by US$200s
US$3,000 to US$5,000	by US$200, 500, 800

(e.g. US$4,200, 4,500, 4,800)

US$5,000 to US$10,000	by US$500s
US$10,000 to US$20,000	by US$1,000s
US$20,000 to US$30,000	by US$2,000s
US$30,000 to US$50,000	by US$2,000, 5,000, 8,000

(e.g. US$32,000, 35,000, 38,000)

US$50,000 to US$100,000	by US$5,000s
US$100,000 to US$200,000	by US$10,000s
Above US$200,000	at auctioneer's discretion

The auctioneer may vary the increments during the course of the auction at his or her own discretion.

1. I request Christie's to bid on the stated **lots** up to the maximum bid I have indicated for each **lot**.
2. I understand that if my bid is successful the amount payable will be the sum of the **hammer price** and the **buyer's premium** (together with any applicable state or local sales or use taxes chargeable on the **hammer price** and **buyer's premium**) in accordance with the Conditions of Sale—Buyer's Agreement). The **buyer's premium** rate shall be an amount equal to 25% of the **hammer price** of each **lot** up to and including US$300,000, 20% on any amount over US$300,000 up to and including US$4,000,000 and 13.5% of the amount above US$4,000,000.
3. I agree to be bound by the Conditions of Sale printed in the catalogue.
4. I understand that if Christie's receive written bids on a **lot** for identical amounts and at the auction these are the highest bids on the **lot**, Christie's will sell the **lot** to the bidder whose written bid it received and accepted first.
5. Written bids submitted on "no reserve" **lots** will, in the absence of a higher bid, be executed at approximately 50% of the **low estimate** or at the amount of the bid if it is less than 50% of the **low estimate**.

I understand that Christie's written bid service is a free service provided for clients and that, while Christie's will be as careful as it reasonably can be, Christie's will not be liable for any problems with this service or loss or damage arising from circumstances beyond Christie's reasonable control.

AUCTION RESULTS: CHRISTIES.COM

08/01/19

Written bids must be received at least 24 hours before the auction begins. Christie's will confirm all bids received by fax by return fax. If you have not received confirmation within one business day, please contact the Bid Department. Tel: +1 212 636 2437 on-line www.christies.com

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◯ Please tick if you prefer not to receive information about our upcoming sales by e-mail

I HAVE READ AND UNDERSTOOD THIS WRITTEN BID FORM AND THE CONDITIONS OF SALE — BUYER'S AGREEMENT

Signature

If you have not previously bid or consigned with Christie's, please attach copies of the following documents. Individuals: government-issued photo identification (such as a photo driving licence, national identity card, or passport) and, if not shown on the ID document, proof of current address, for example a utility bill or bank statement. Corporate clients: a certificate of incorporation. Other business structures such as trusts, offshore companies or partnerships: please contact the Credit Department at +1 212 636 2490 for advice on the information you should supply. If you are registering to bid on behalf of someone who has not previously bid or consigned with Christie's, please attach identification documents for yourself as well as the party on whose behalf you are bidding, together with a signed letter of authorisation from that party. New clients, clients who have not made a purchase from any Christie's office within the last two years, and those wishing to spend more than on previous occasions will be asked to supply a bank reference.

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Lot number (in numerical order)	Maximum Bid US$ (excluding buyer's premium)	Lot number (in numerical order)	Maximum Bid US$ (excluding buyer's premium)

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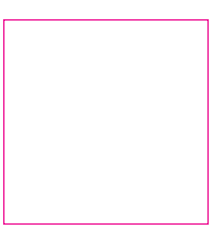

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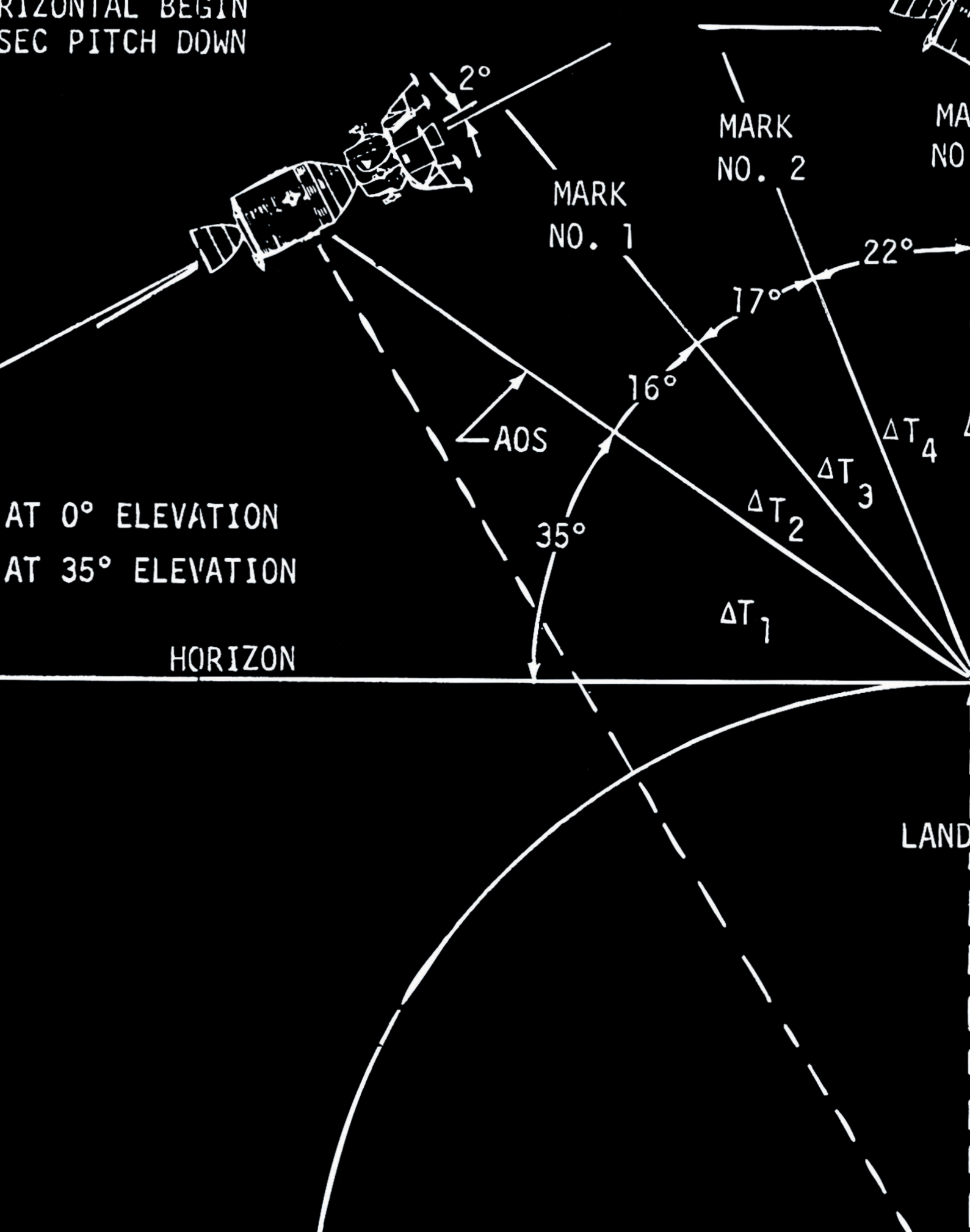
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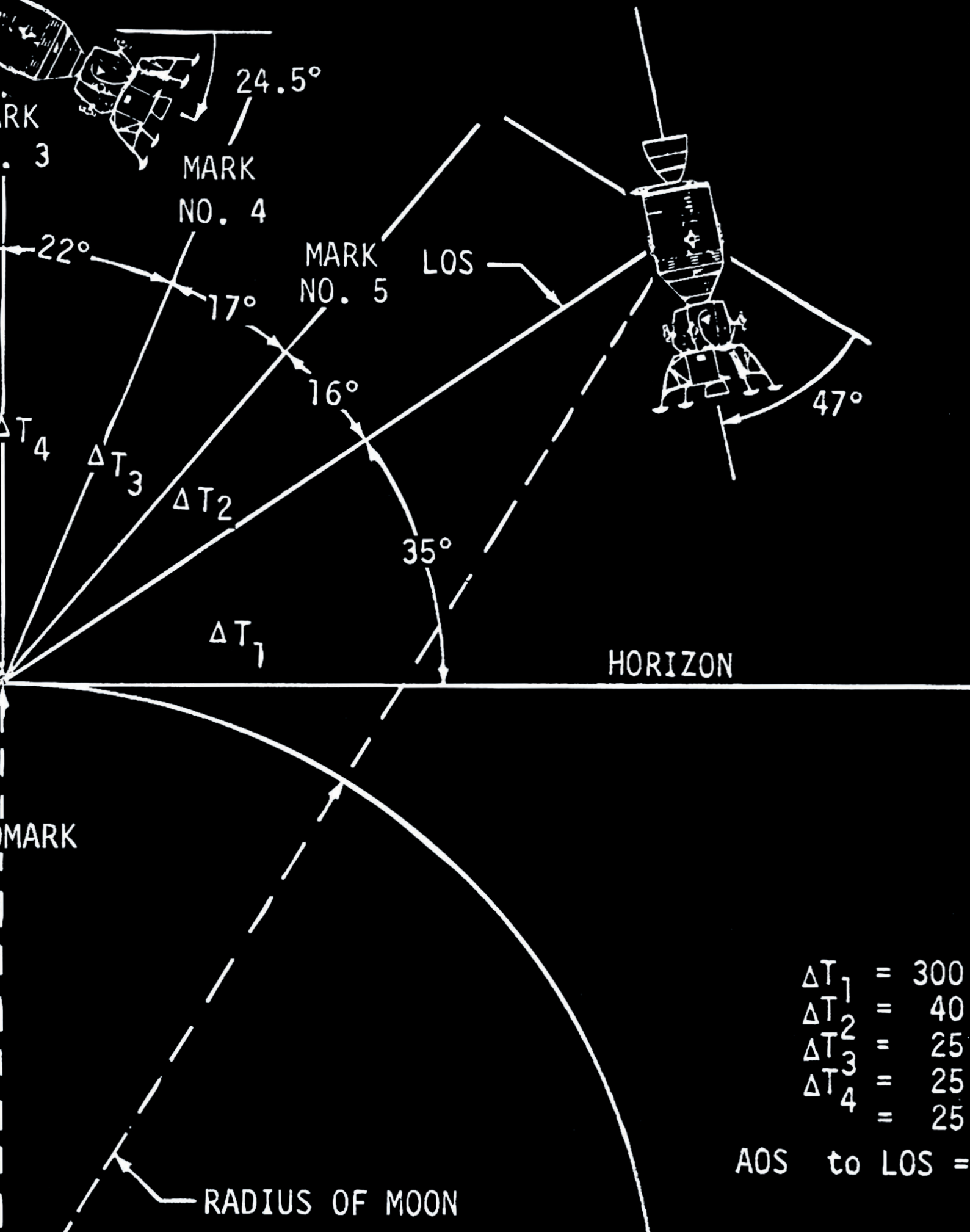
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