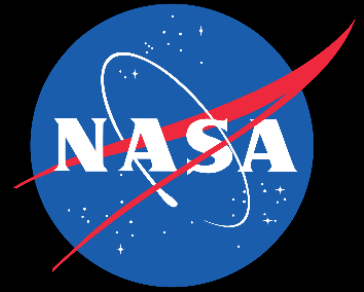


Apollo 13

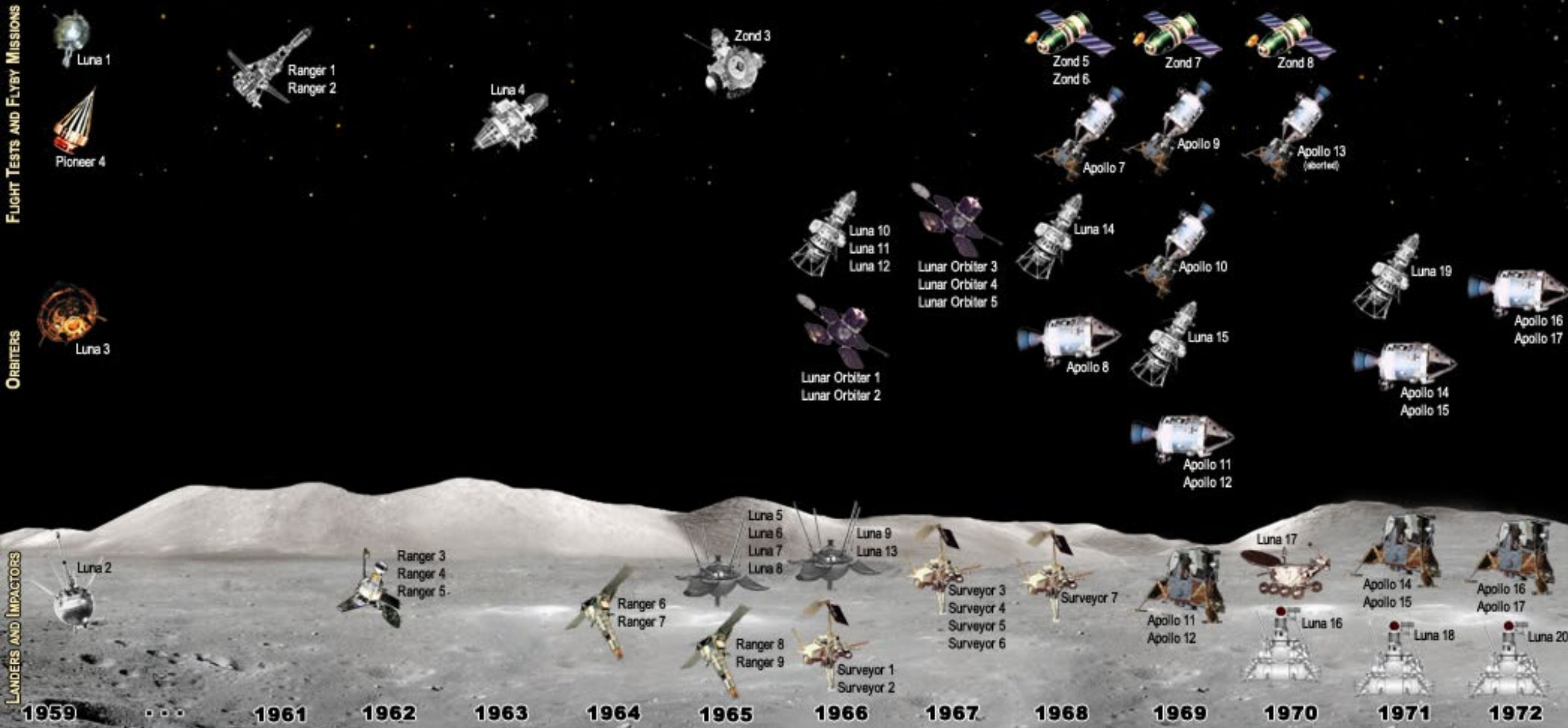


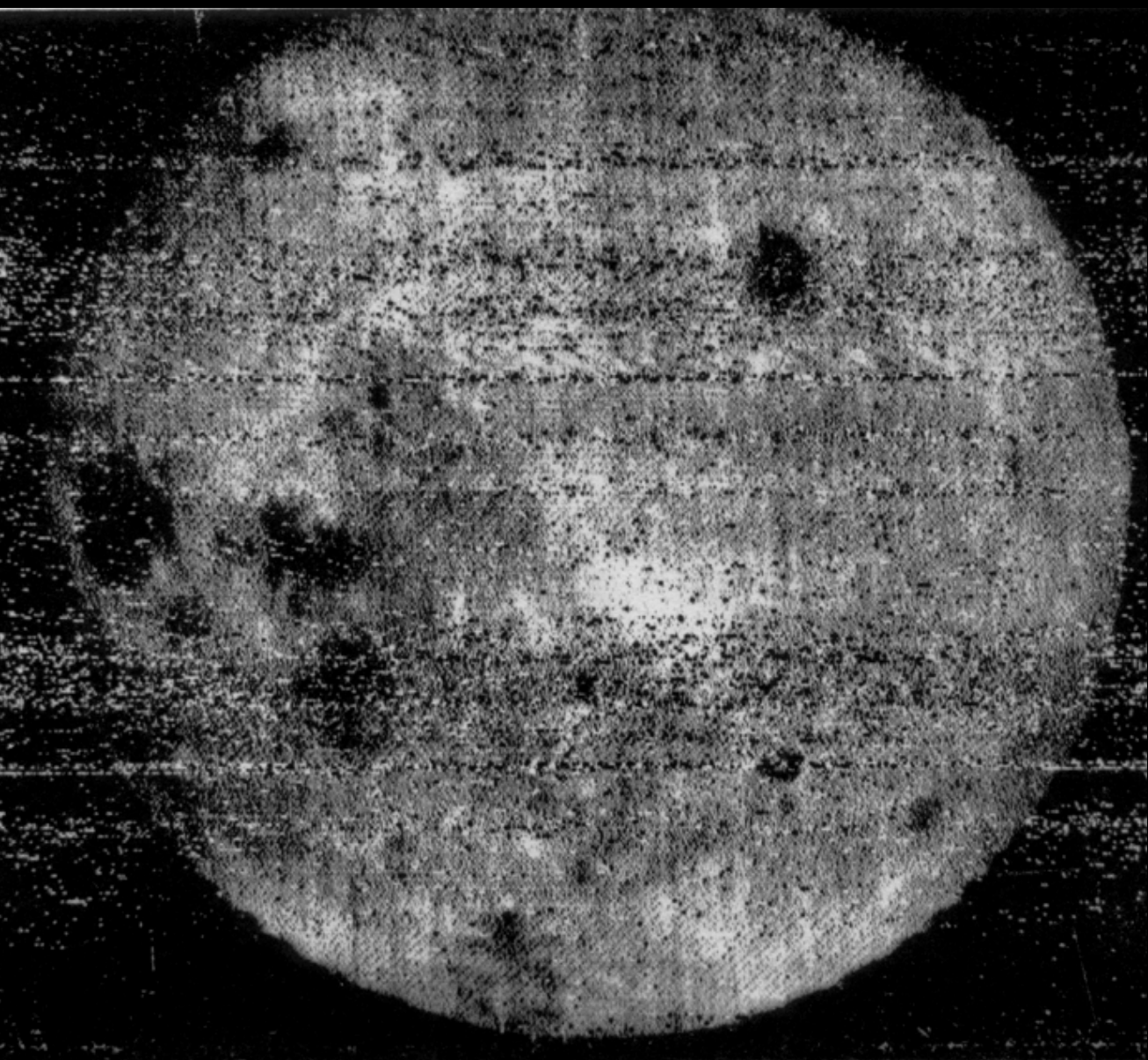
Lunar Exploration Timeline

FLIGHT TESTS AND FLYBY MISSIONS

ORBITERS

LANDERS AND IMPACTORS





Luna 3



Ranger 7

NEWS



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. 20546

TELS. WO 2-4155
WO 3-6925

FOR RELEASE: THURSDAY A.M.
April 2, 1970

RELEASE NO: 70-50K



PROJECT: APOLLO 13

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-more-

3/26/70

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April 2, 1970

RELEASE NO: 70-50

APOLLO 13 THIRD LUNAR LANDING MISSION

Apollo 13, the third U.S. manned lunar landing mission, will be launched April 11 from Kennedy Space Center, Fla., to explore a hilly upland region of the Moon and bring back rocks perhaps five billion years old.

The Apollo 13 lunar module will stay on the Moon more than 33 hours and the landing crew will leave the spacecraft twice to emplace scientific experiments on the lunar surface and to continue geological investigations. The Apollo 13 landing site is in the Fra Mauro uplands; the two National Aeronautics and Space Administration previous landings were in mare or "sea" areas, Apollo 11 in the Sea of Tranquility and Apollo 12 in the Ocean of Storms.

Apollo 13 crewmen are commander James A. Lovell, Jr.; command module pilot Thomas K. Mattingly III, and lunar module pilot Fred W. Haise, Jr. Lovell is a U.S. Navy captain, Mattingly a Navy lieutenant commander, and Haise a civilian.

-more-

3/26/70



REPORT OF APOLLO 13 REVIEW BOARD

COLOR ILLUSTRATIONS REPRODUCED
IN BLACK AND WHITE

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PREFACE

The Apollo 13 accident, which aborted man's third mission to explore the surface of the Moon, is a harsh reminder of the immense difficulty of this undertaking.

The total Apollo system of ground complexes, launch vehicle, and spacecraft constitutes the most ambitious and demanding engineering development ever undertaken by man. For these missions to succeed, both men and equipment must perform to near perfection. That this system has already resulted in two successful lunar surface explorations is a tribute to those men and women who conceived, designed, built, and flew it.

Perfection is not only difficult to achieve, but difficult to maintain. The imperfection in Apollo 13 constituted a near disaster, averted only by outstanding performance on the part of the crew and the ground control team which supported them.

The Apollo 13 Review Board was charged with the responsibilities of reviewing the circumstances surrounding the accident, of establishing the probable causes of the accident, of assessing the effectiveness of flight recovery actions, of reporting these findings, and of developing recommendations for corrective or other actions. The Board has made every effort to carry out its assignment in a thorough, objective, and impartial manner. In doing so, the Board made effective use of the failure analyses and corrective action studies carried out by the Manned Spacecraft Center and was very impressed with the dedication and objectivity of this effort.

The Board feels that the nature of the Apollo 13 equipment failure holds important lessons which, when applied to future missions, will contribute to the safety and effectiveness of manned space flight.

Overview

- April 11-17, 1970
- Fred W. Haise, Jr., John “Jack” L. Swigert, Jr., James A. Lovell, Jr.



Change of Crew

- Jack Swigert replaced command module pilot Ken Mattingly
 - Exposed to the German measles during training



Launch – April 11, 1970



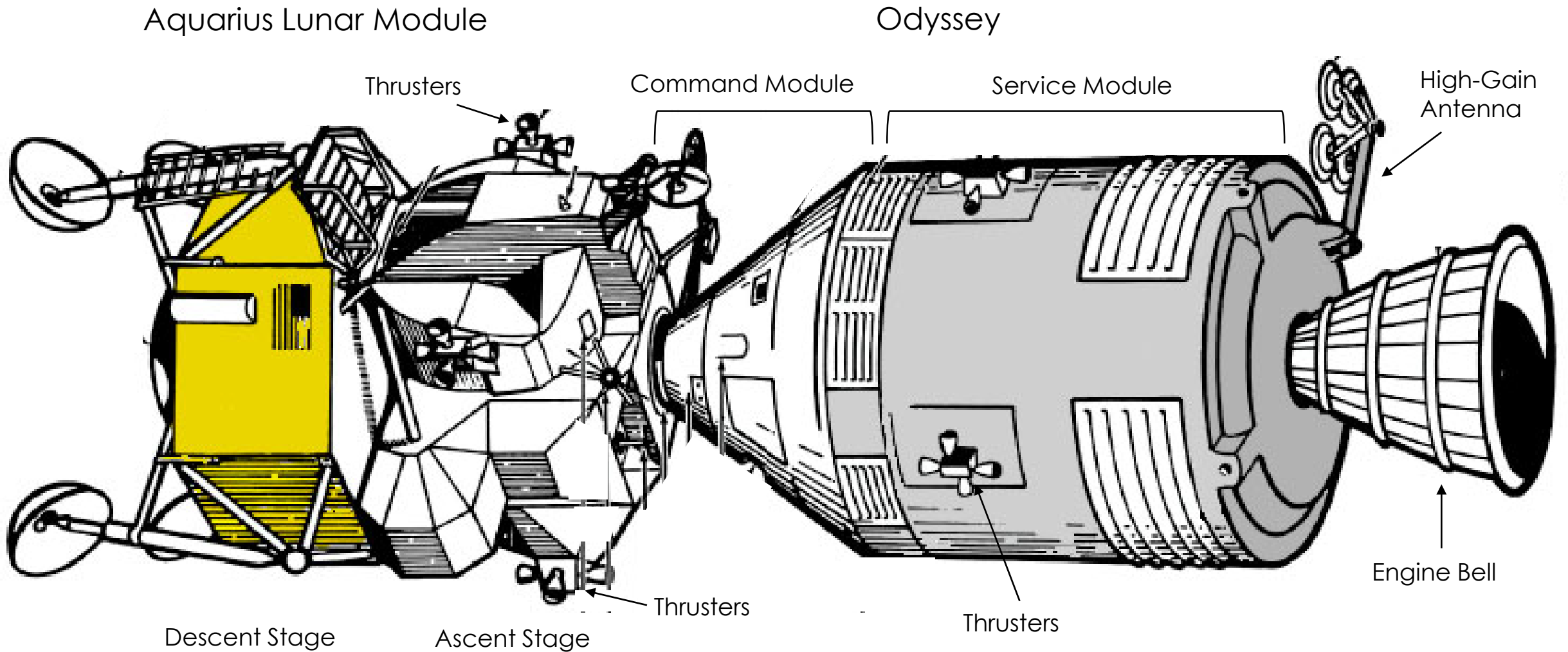


**HEIGHT = 363 FT.
APOLLO / SATURN V
SPACE VEHICLE**

**HEIGHT = 305 FT.
STATUE OF
LIBERTY**

MSFC 67 PA 117

Apollo Spacecraft





Moon on April 15, 1970

Taxes!



024:18:10 *Kerwin*: ...Today's favorite pastime across the - Uh oh; have you guys completed your income tax?



024:18:28 *Lovell*: How do I apply for an extension?



024:18:31 *Kerwin*: [Laughter.]



024:18:32 *Swigert*: Yeah, Joe. I got to - hey, listen - It ain't too funny; things kind of happened real fast down there, and I do need an extension.



024:18:43 *Kerwin*: [Laughter.]



024:18:44 *Swigert*: I didn't get mine filed. I'm really serious; would you...

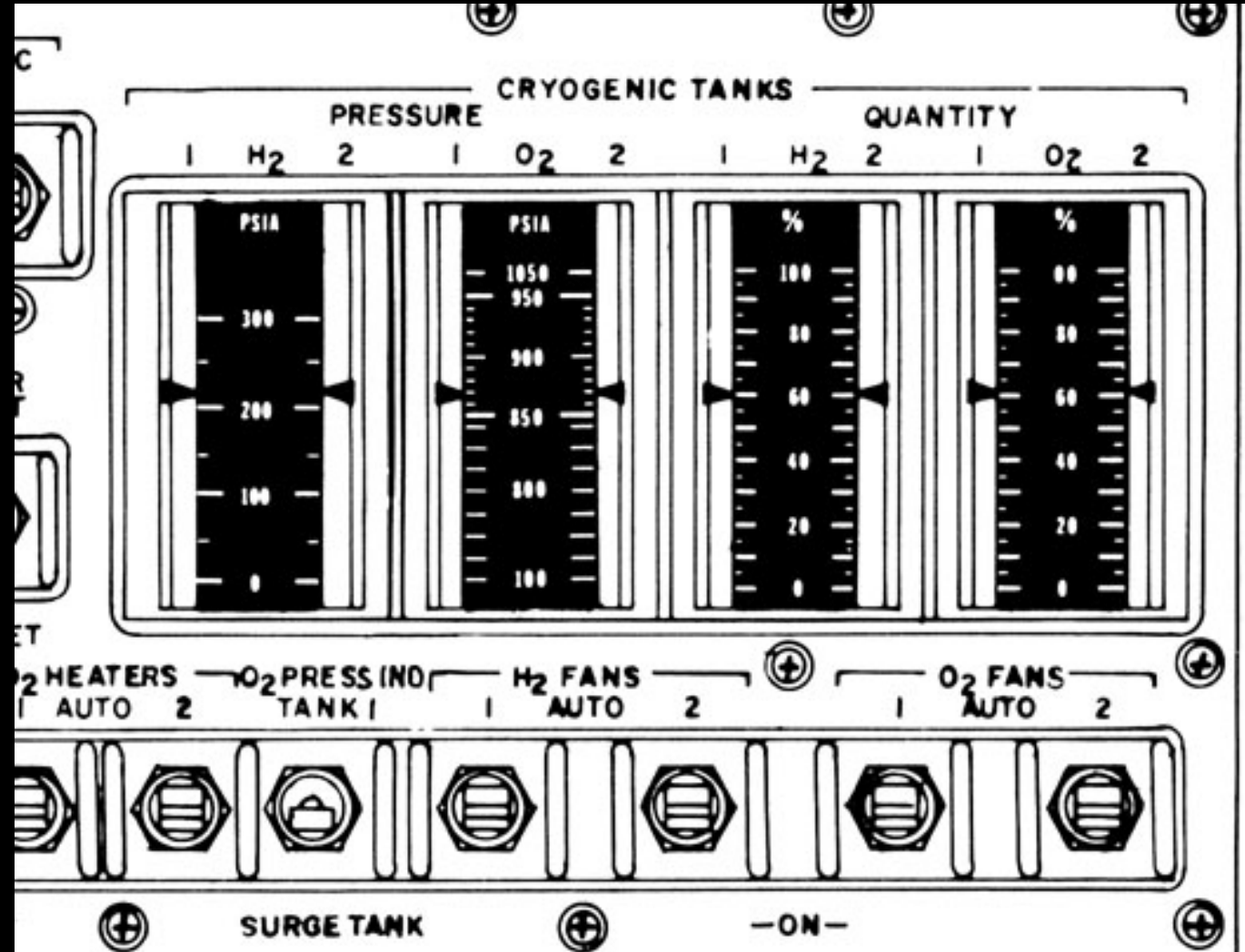


024:18:47 *Kerwin*: You're breaking up the room down here.

Onboard TV Broadcast



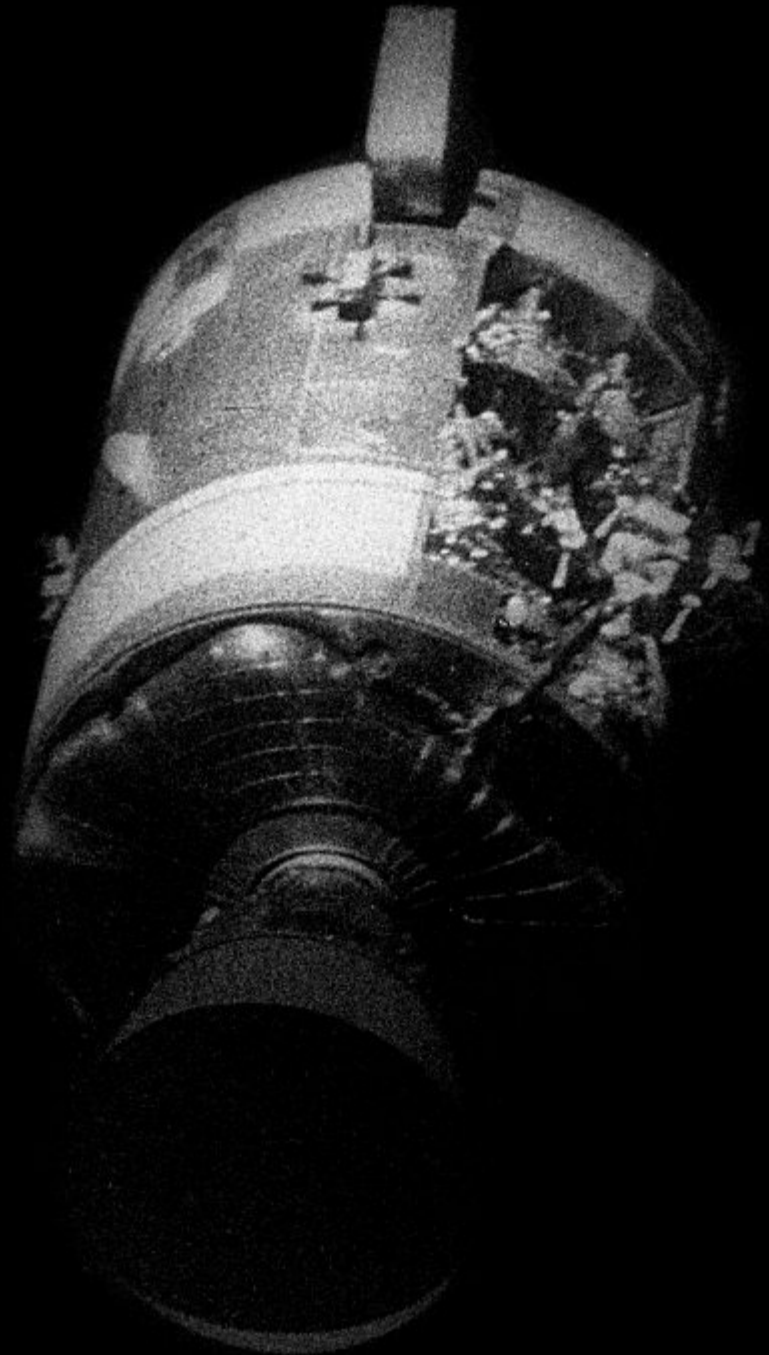
Stirring of the Cryogenic Tanks



“Houston, we’ve
had a problem.”

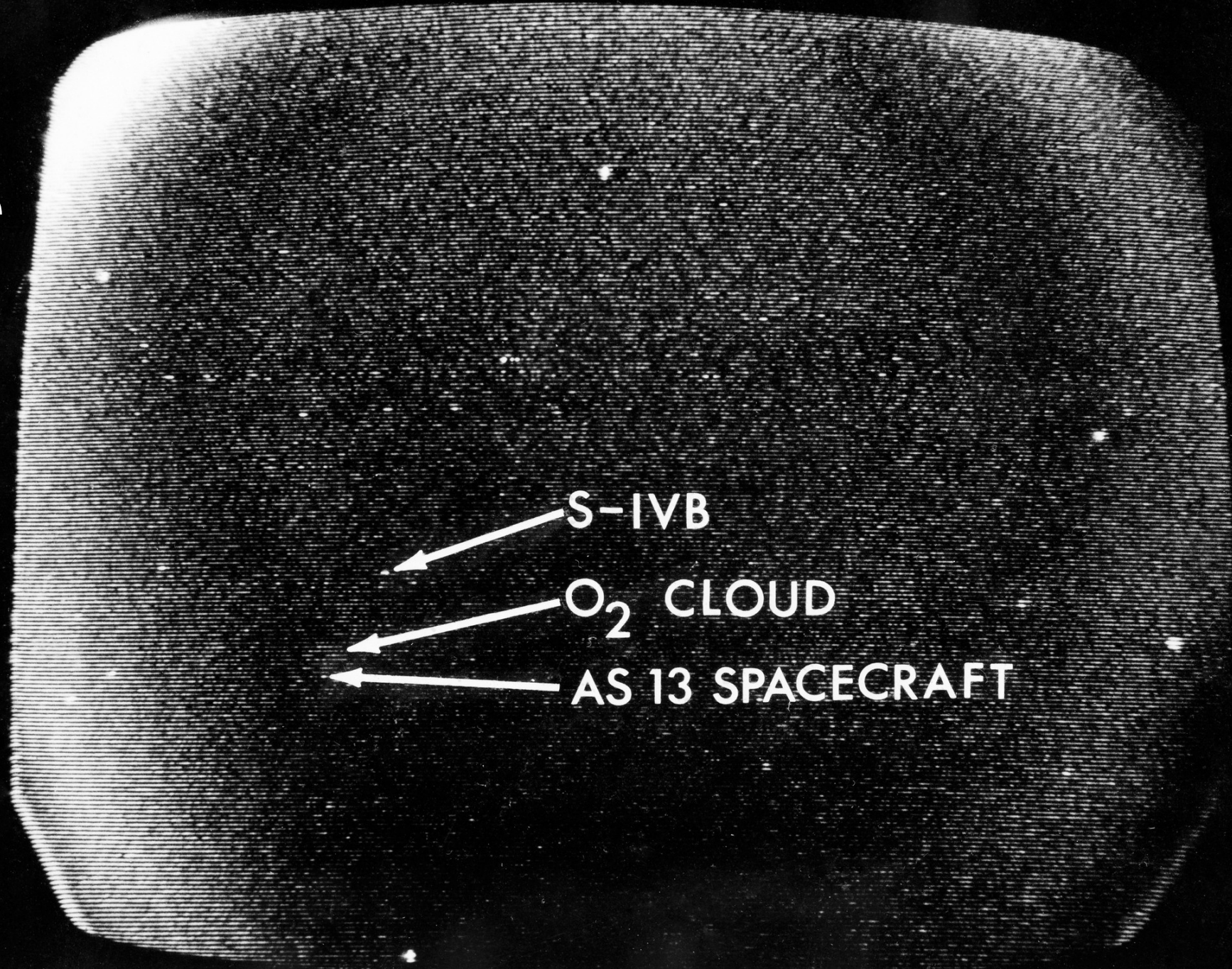
Explosion

- Micrometeoroid impact?
- Or something else...



Venting into Space

- Oxygen leaking from tank 1
 - Acts like a rocket thruster



Global Support



London



New York City



Italy

Shift Change

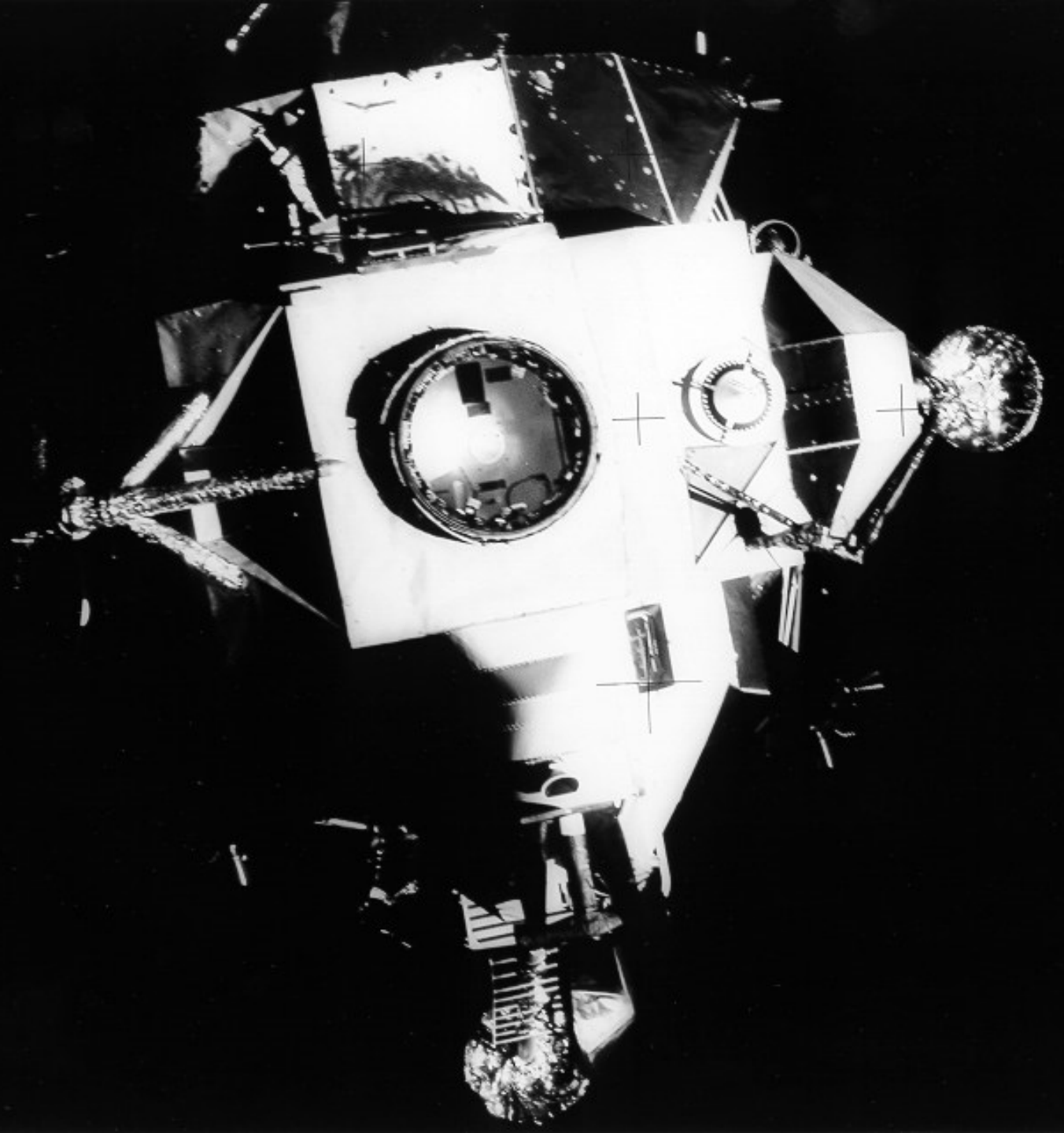


Gene Kranz's "White Team" (also "Tiger Team")

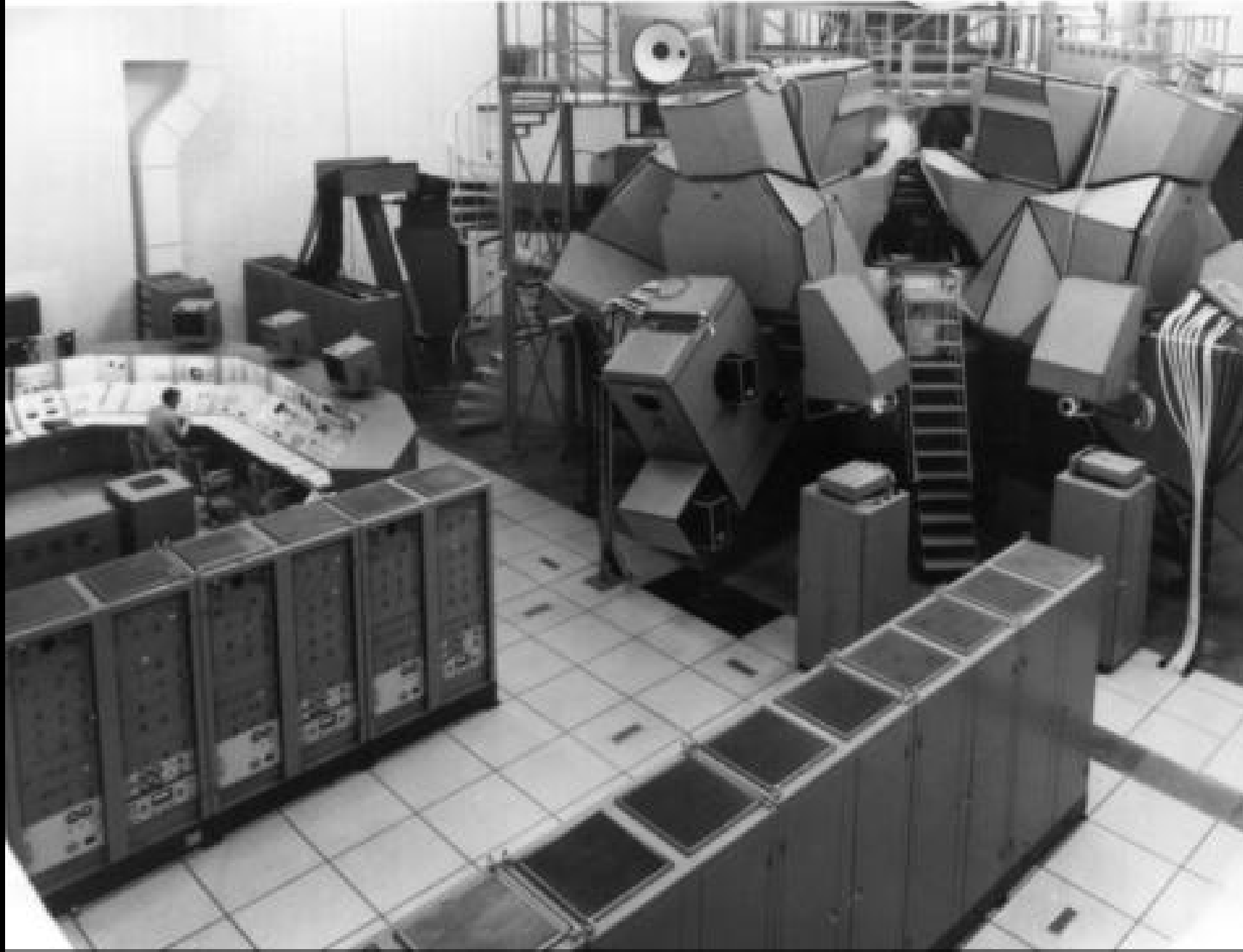


Glynn Lunney's "Black Team"

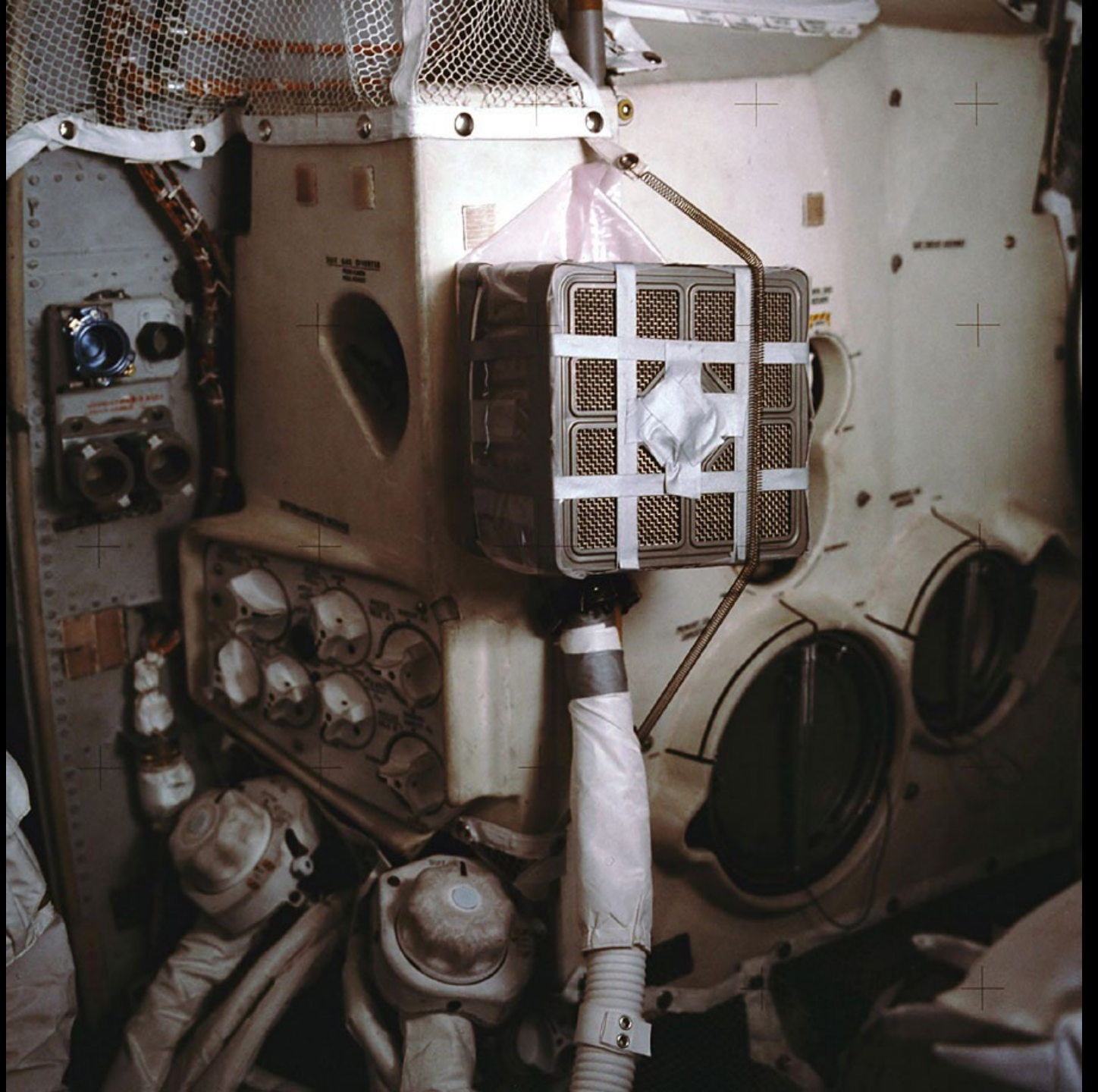
Aquarius, the Lifeboat



APOLLO MISSION SIMULATOR




Improvised Air Filter



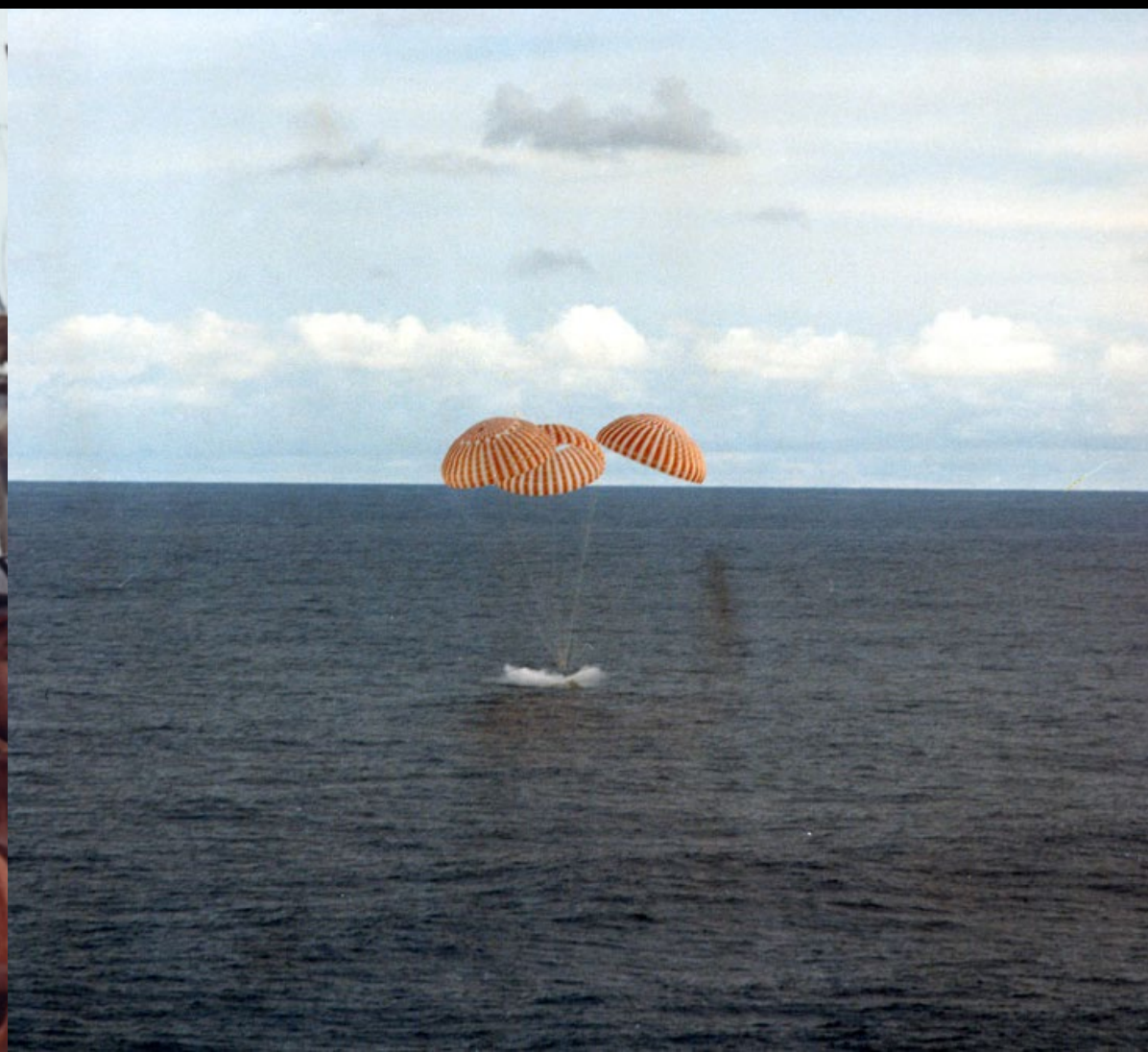
Return to Earth

Return to Earth

- 
- Service module jettison
 - Return to Odyssey
 - Farewell, Aquarius



Splashdown



Splashdown



Ticker Tape Parade



Lunar Impact of S-IVB Rocket Stage



Grumman's Mock Invoice

GRUMMAN AEROSPACE CORPORATION

* BETHPAGE, NEW YORK 11714*

ADDRESS REPLY TO:

GRUMMAN AEROSPACE CORPORATION
JOHN F. KENNEDY SPACE CENTER
KENNEDY SPACE CENTER
FLORIDA 32899

CABLE ADDRESS
GRUMAIR



17 April 1970

Mr. T. J. O'Malley
Vice President
North American Rockwell
Kennedy Space Center, Florida 32899

Subject: SERVICES RENDERED

Inspection	\$ 20.00
Towing charge @ \$1.00/mile	300,000.00
Loan of altitude vehicle \$.20/day plus .08¢ per mile	34,100.00
Battery charge	5.00
Air conditioning @ \$5.00/day	25.00
Room and board @ \$40.00 each per day	600.00
TOTAL:	<u>\$324,750.00</u>

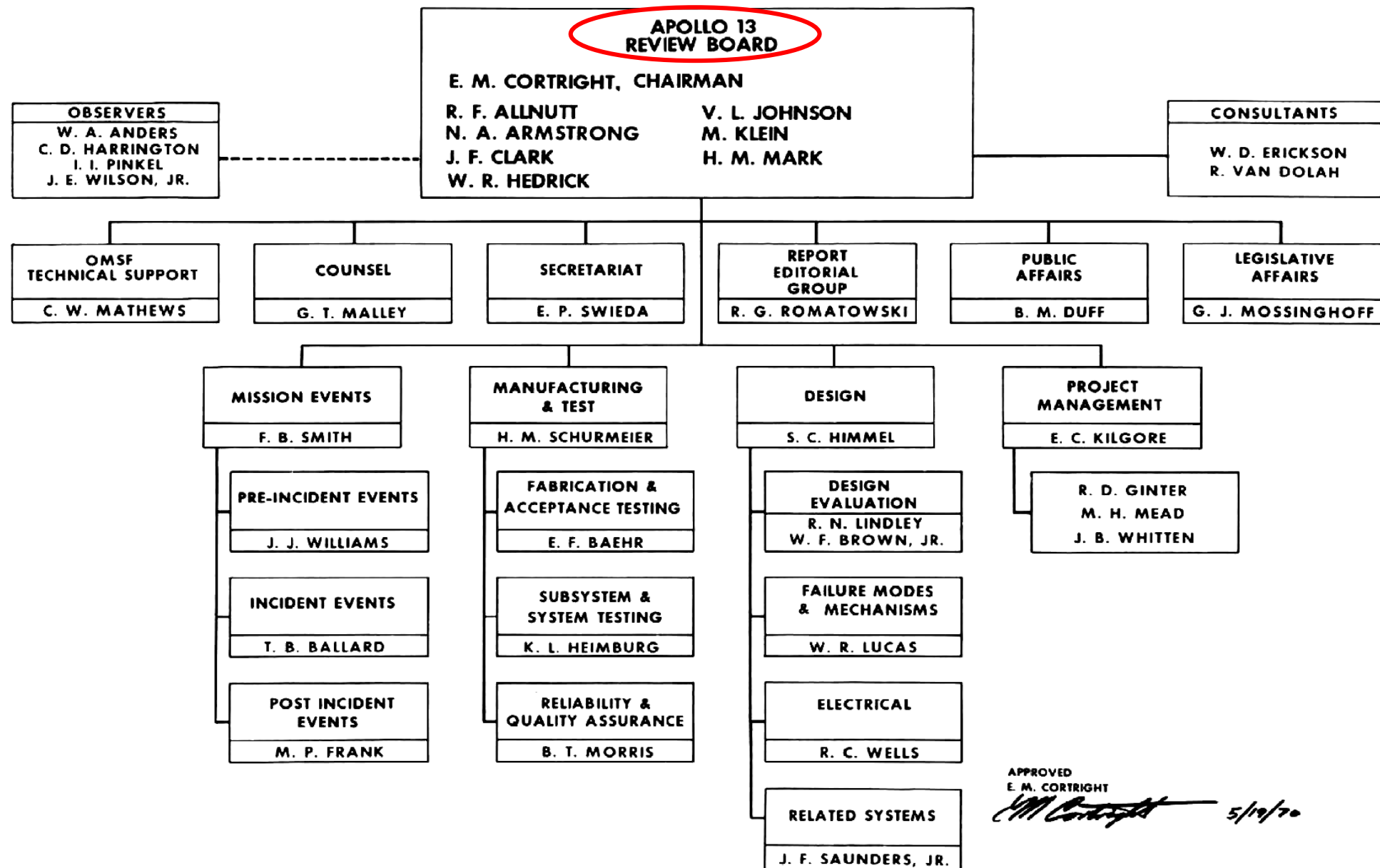
Very truly yours,

GRUMMAN AEROSPACE CORPORATION

George M. Skurla
Vice President

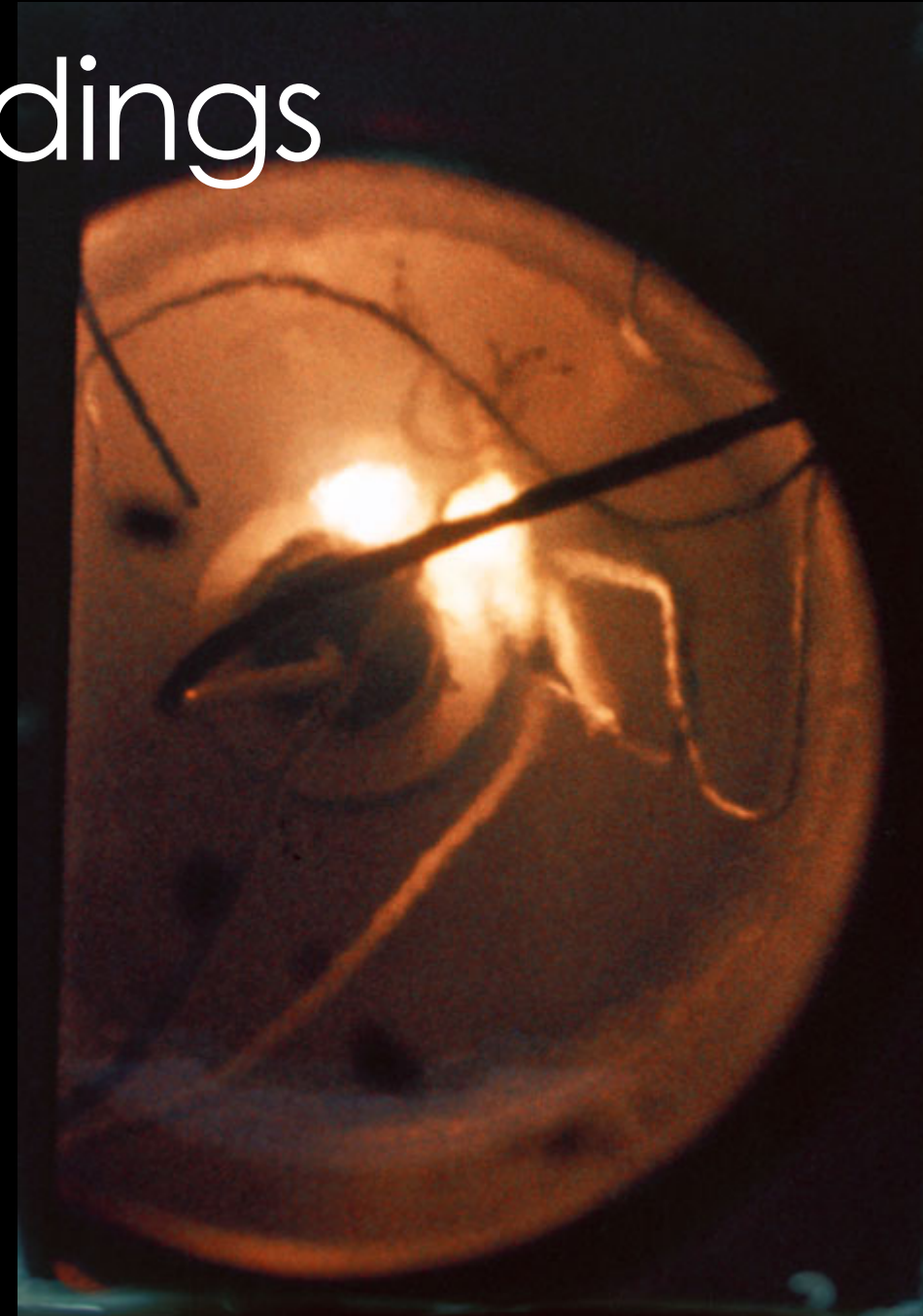
P.S. 2% contractor discount if paid within 30 days.

NASAWATCH



Oxygen Tank No. 2 Findings

- Previously installed in Apollo 10's SM, removed for modification, damaged in process
- Tank installed in Apollo 13's SM & tested
 - Didn't empty properly
 - Remaining oxygen was "boiled off" using electrical heater w/in tank
 - Tank's internal heating elements severely damaged
- Spark → Fire → Explosion



“Successful Failure”

Apollo 13 Mirror

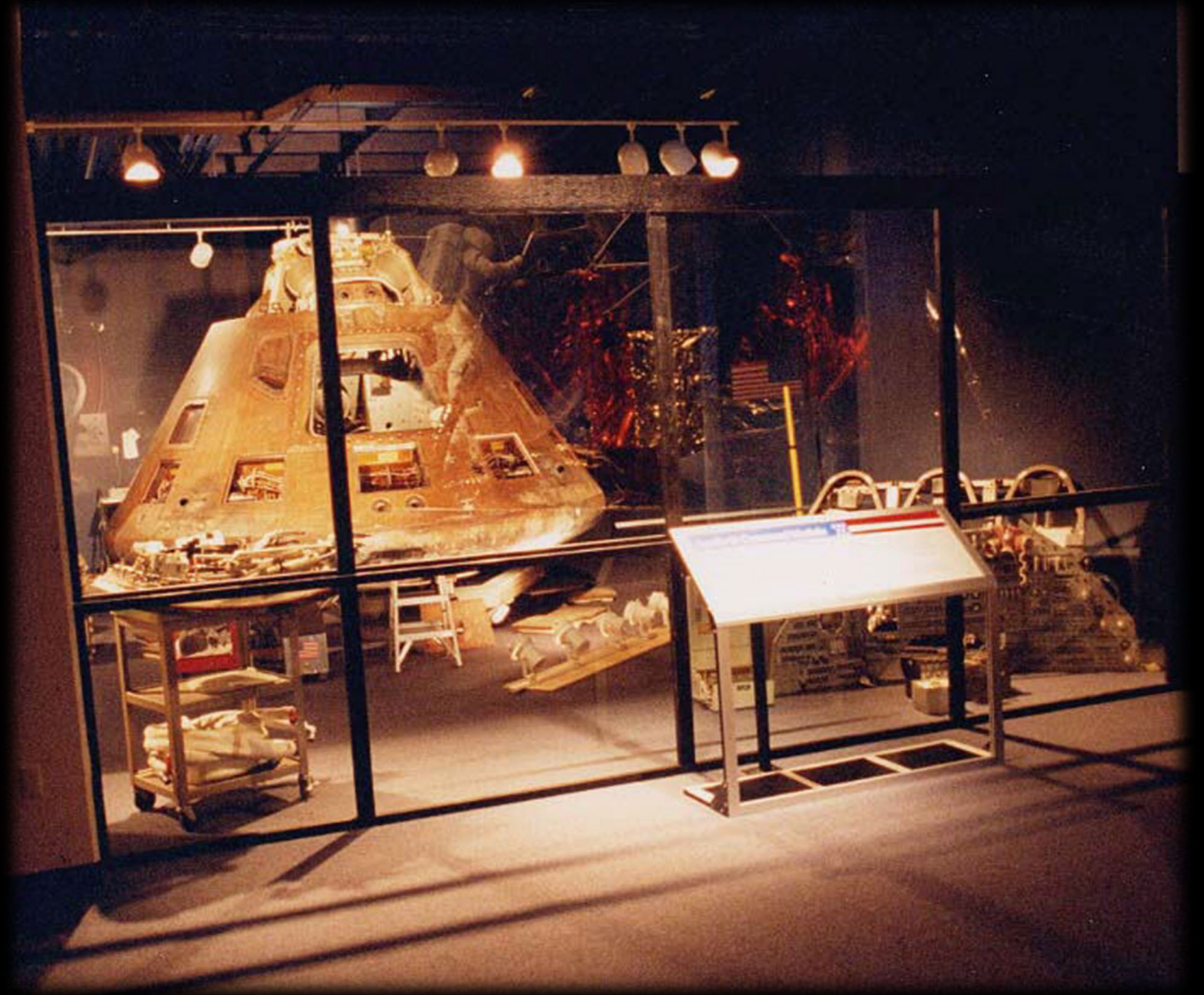


THIS MIRROR FLOWN ON AQUARIUS, LM-7, TO THE
MOON APRIL 11-17, 1970. RETURNED BY A GREATFUL
APOLLO 13 CREW TO "REFLECT THE IMAGE" OF THE
PEOPLE IN MISSION CONTROL WHO GOT US BACK!

JAMES LOVELL JOHN SWIGERT FRED HAISE

Apollo 13 Command Module

- Name: “Odyssey”
- Location:
 - Kansas Cosmosphere and Space Center
 - Hutchinson, KS



More Info



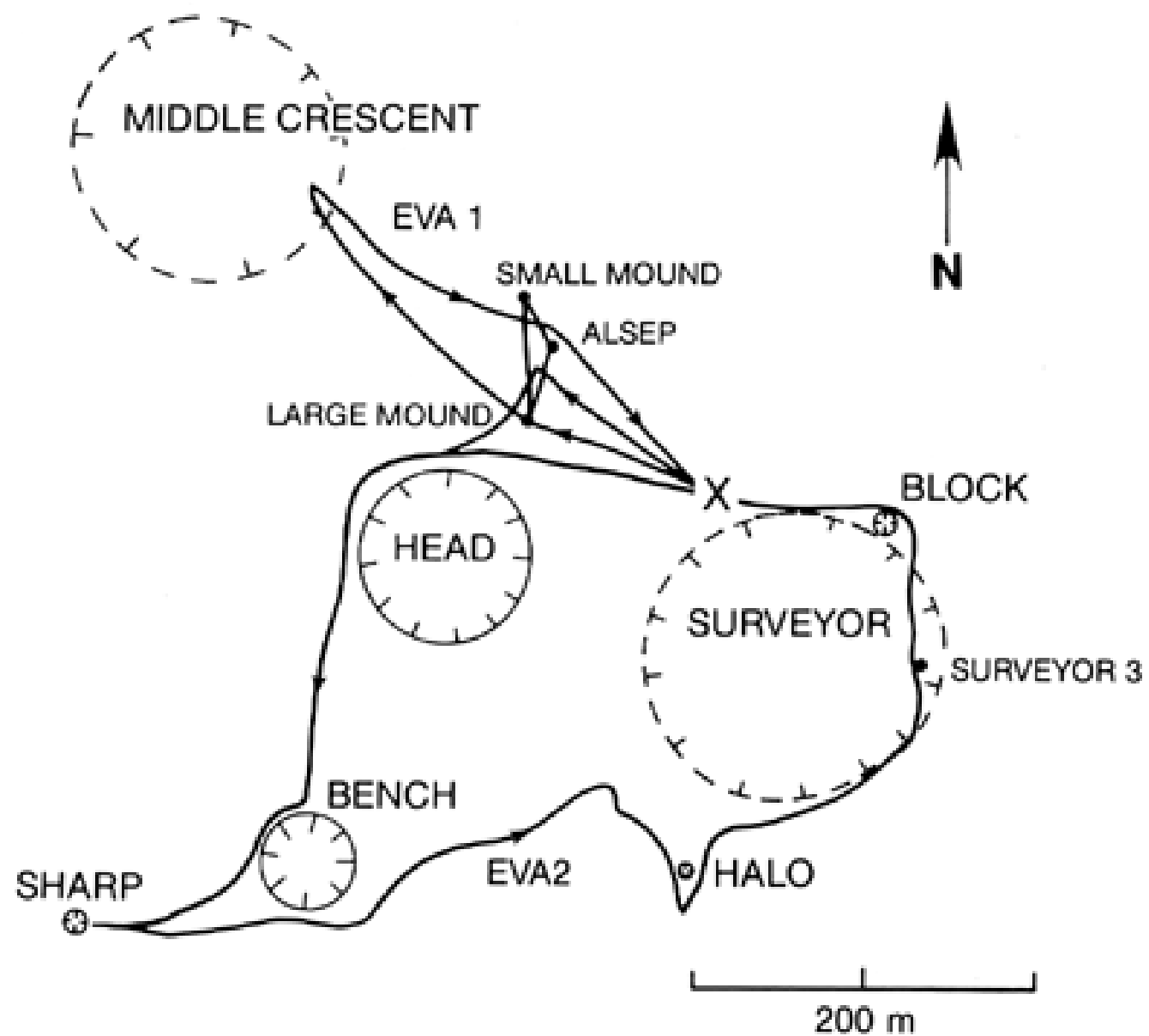
Apollo Landing Sites



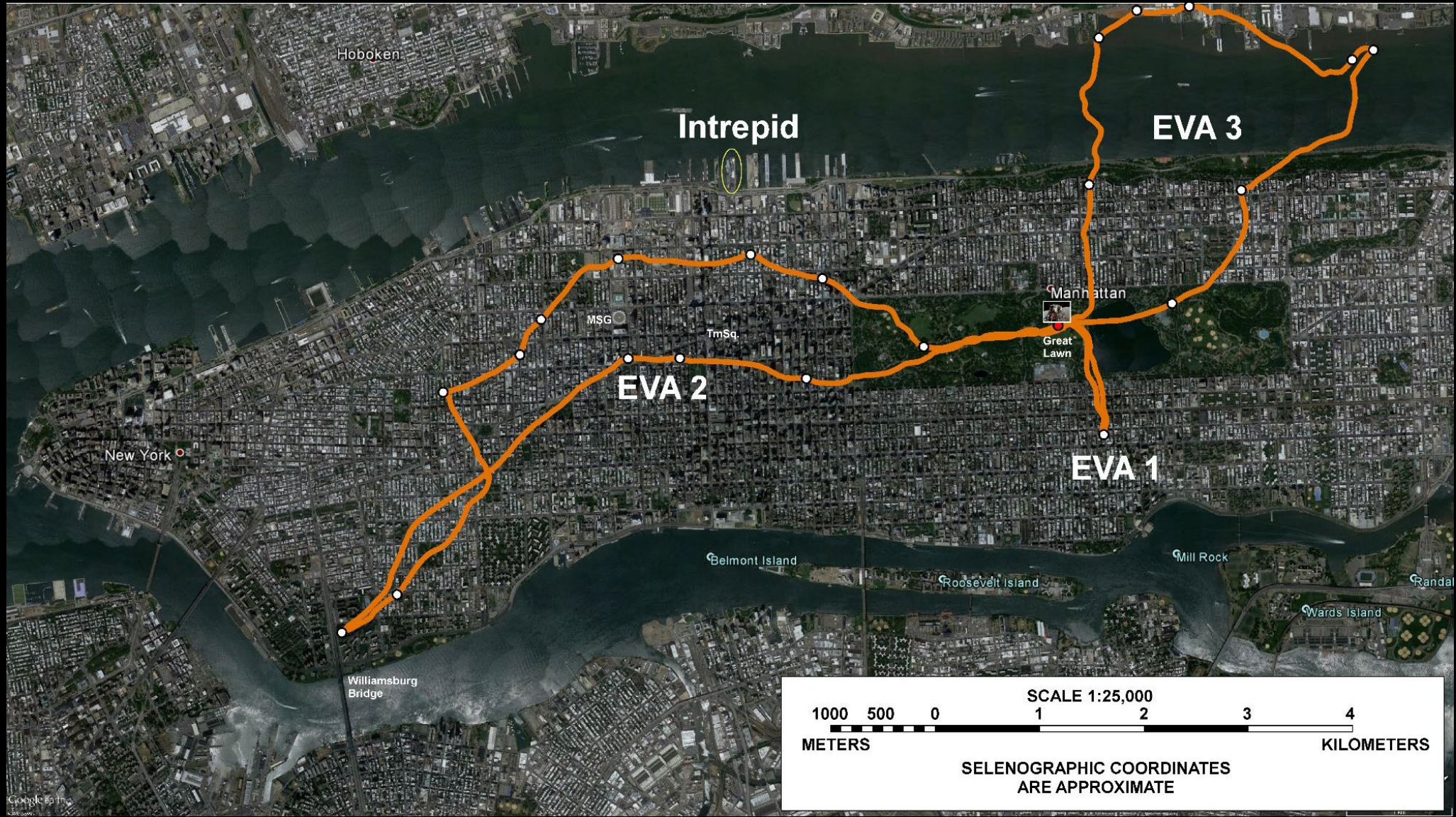
Apollo 11 Traverses



APOLLO 12



Apollo 17 Traverses



JFK's Speech

- The Decision to Go to the Moon
 - May 25, 1961
- We Choose to Go to the Moon
 - September 12, 1962



Additional Resources

- Apollo Images:
 - <https://images.nasa.gov/>
- Apollo Videos:
 - <https://svs.gsfc.nasa.gov/Gallery/apollo.html>
- Apollo 13 General:
 - <http://apolloinrealtime.org/>
 - <https://history.nasa.gov/afj/ap13fj/index.html>
 - <https://nssdc.gsfc.nasa.gov/planetary/lunar/apollo13info.html>
 - https://www.lpi.usra.edu/lunar/missions/apollo/apollo_13/overview

