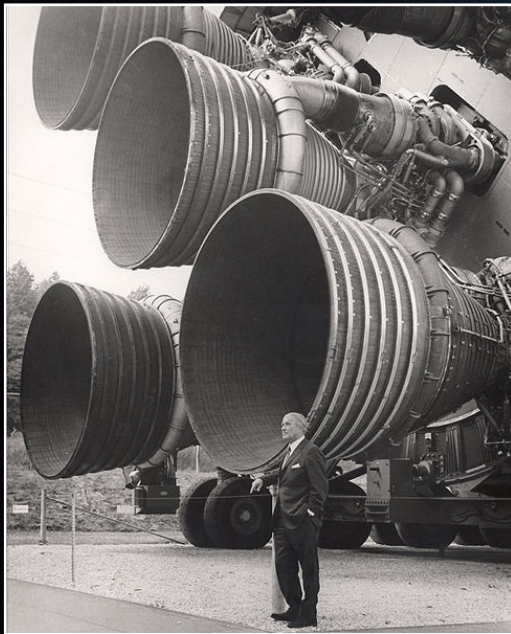
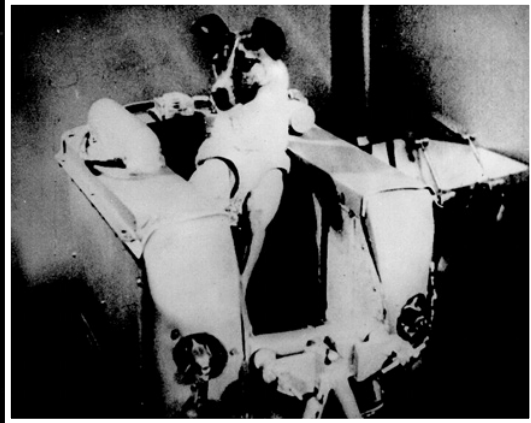


# Quarant'anni fa, la Luna



Marco Orlandi  
INAF – Osservatorio Astronomico di Bologna  
7 maggio 2009

# 1957: l'URSS inaugura la gara spaziale con gli USA



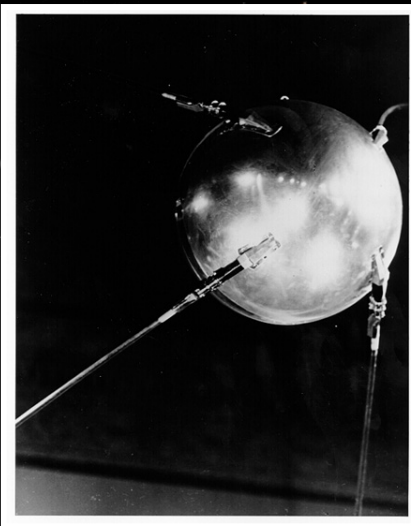
Laika



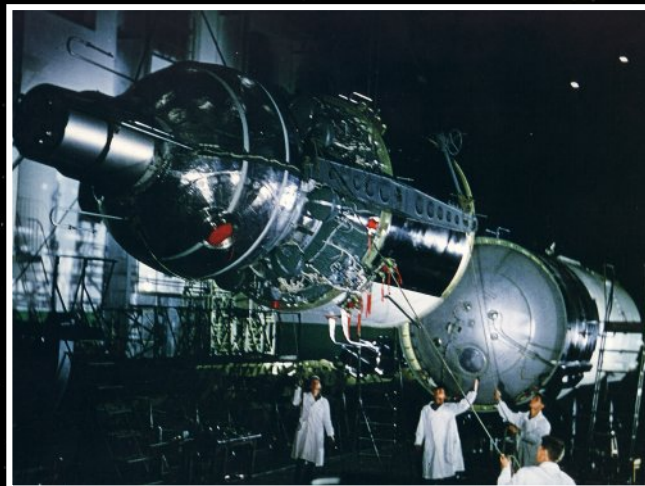
Sergei Korolev



Yuri Gagarin



Sputnik 1



Voskhod



Aleksei Leonov



# L'America risponde



**Wernher Von Braun**



**25/5/1961**  
**Congresso USA**



**Alan Shepard**  
**5/5/1961**



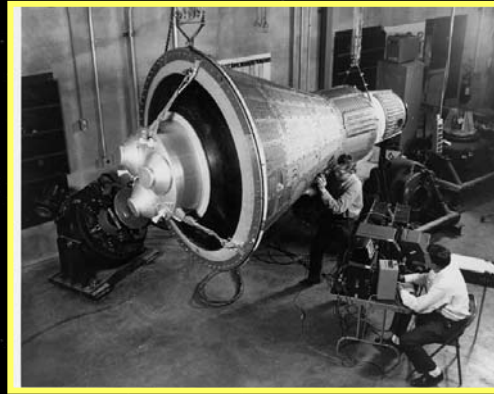
# I primi sette – aprile 1959





# Project MERCURY

5/5/1961-15/5/1963





# RIEPILOGO: LE MISSIONI DEL PROGRAMMA MERCURY

5/5/1961 **Mercury Freedom 7** Alan B. Shepard

21/7/1961 **Mercury Liberty Bell 7** Virgil I. Grissom

20/2/1962 **Mercury Friendship 7** John H. Glenn

24/5/1962 **Mercury Aurora 7** M. Scott Carpenter

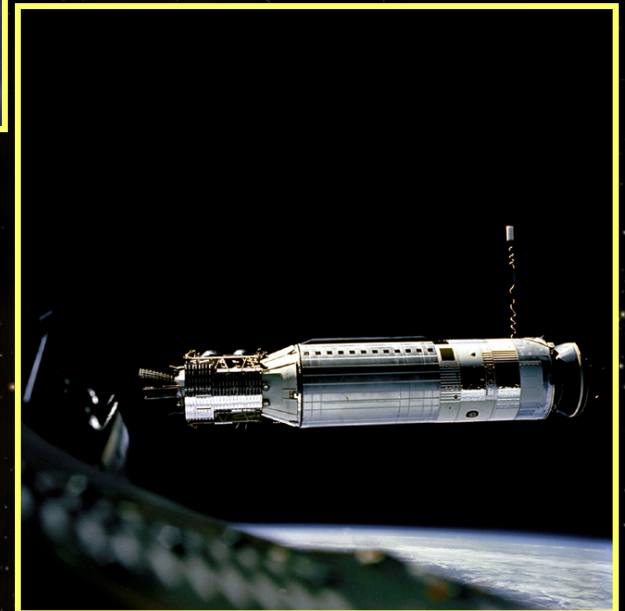
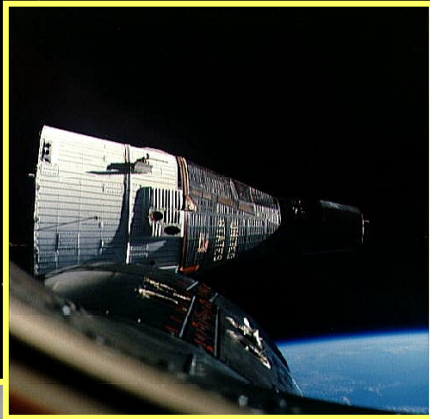
3/10/1962 **Mercury Sigma 7** Walter M. Schirra

15-16/5/1963 **Mercury Faith 7** L. Gordon Cooper





# Project GEMINI





# RIEPILOGO: LE MISSIONI DEL PROGRAMMA GEMINI

23/3/1965 **Gemini 3**

Virgil I. Grissom, John W. Young

3-7/6/1965 **Gemini 4**

James A. McDivitt, Edward H. White II

21-29/8/1965 **Gemini 5**

L. Gordon Cooper, Charles Conrad

4-18/12/1965 **Gemini 7**

Frank Borman, James A. Lovell

15-16/12/1965 **Gemini 6**

Walter M. Schirra, Thomas P. Stafford

16/3/1966 **Gemini 8**

Neil A. Armstrong, David R. Scott

3-6/6/1966 **Gemini 9**

Thomas P. Stafford, Eugene A. Cernan

18-21/7/1966 **Gemini 10**

John W. Young, Michael Collins

12-15/9/1966 **Gemini 11**

Charles Conrad, Richard F. Gordon

11-15/11/1966 **Gemini 12**

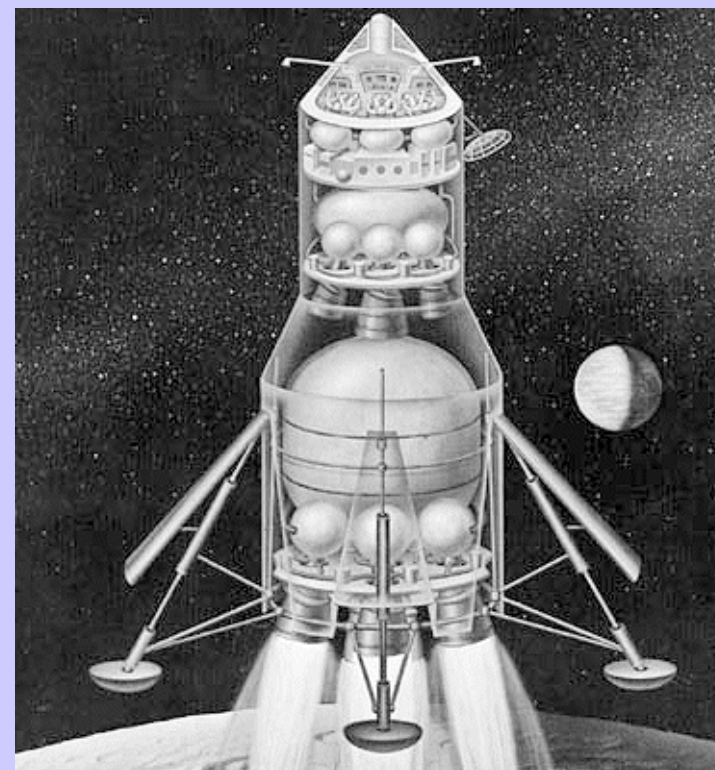
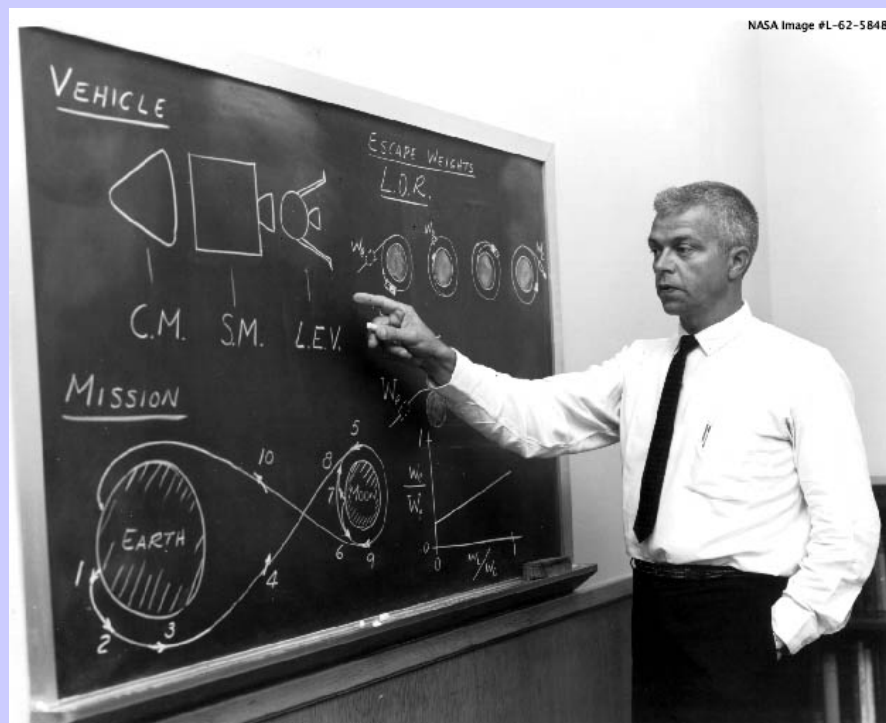
James A. Lovell, Edwin E. Aldrin





# “Vogliamo andare sulla Luna, oppure no?”

(John C. Houbolt, ingegnere, Lunar Mission Steering Group, Langley Research Center, Hampton, Virginia, in una lettera indirizzata nel 1961 a Robert C. Seamans, amministratore associato NASA)

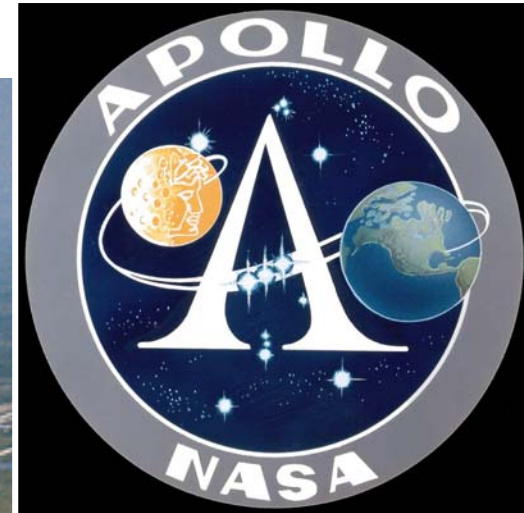


Possibili profili di missione Terra-Luna (e ritorno):

- Ascensione diretta
- EOR, Earth Orbit Rendezvous (appuntamento in orbita terrestre)
- LOR, Lunar Orbit Rendezvous (appuntamento in orbita lunare)

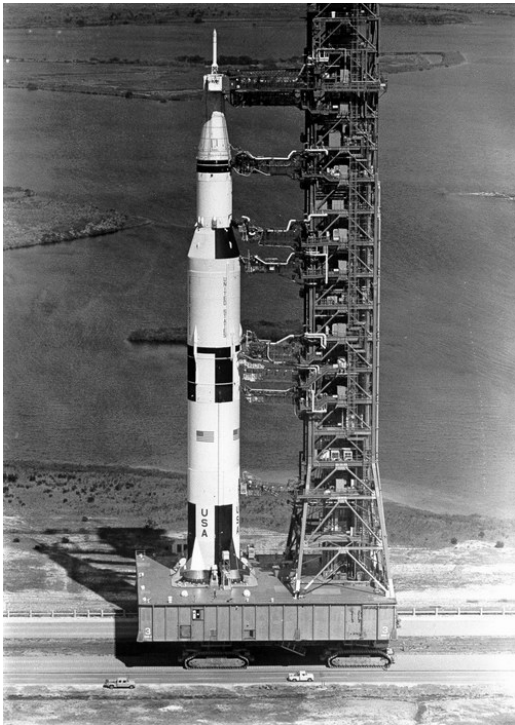
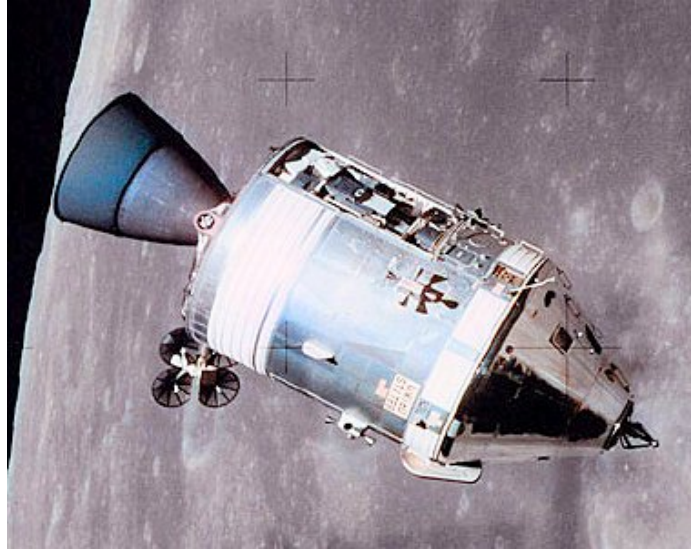


# Project APOLLO

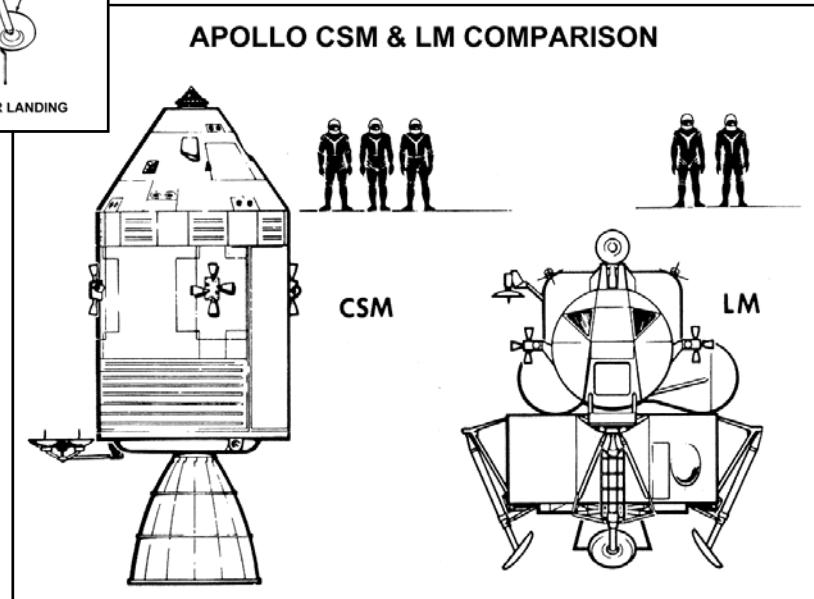
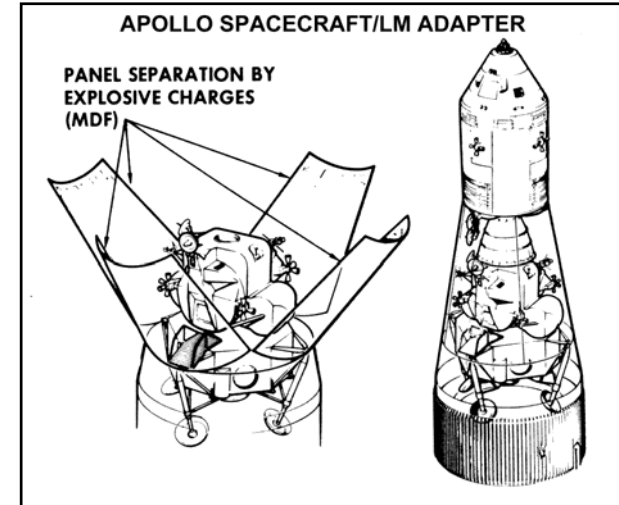
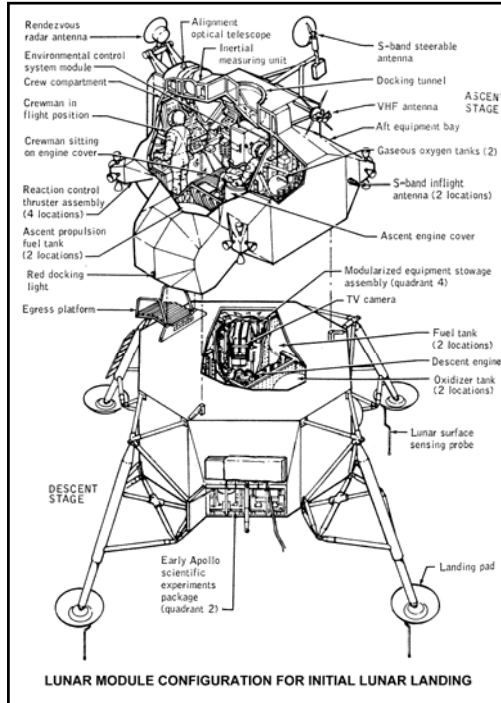
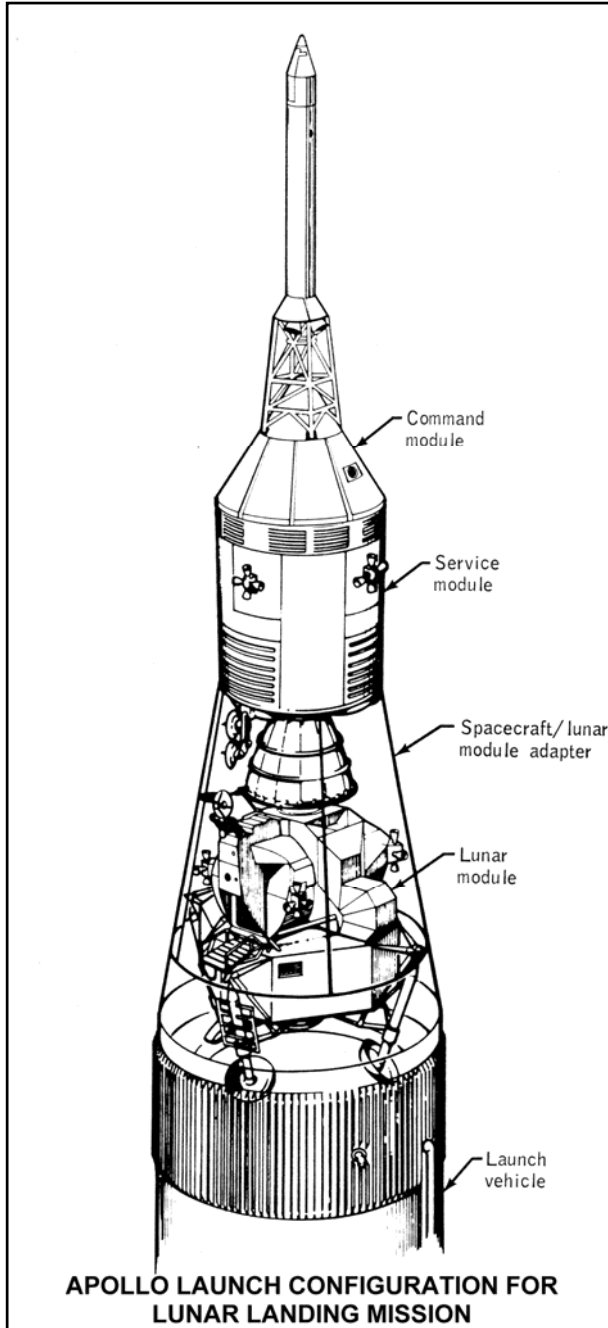




# Project APOLLO

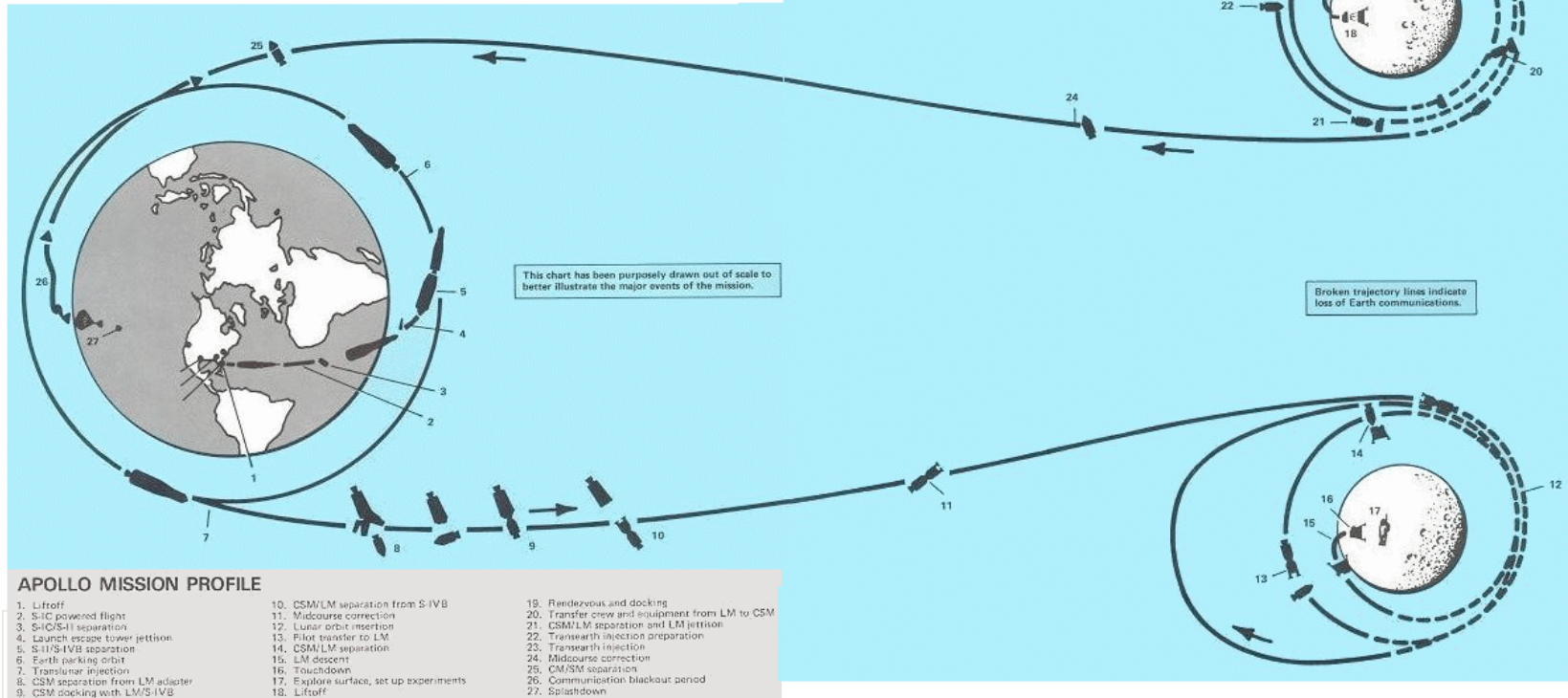
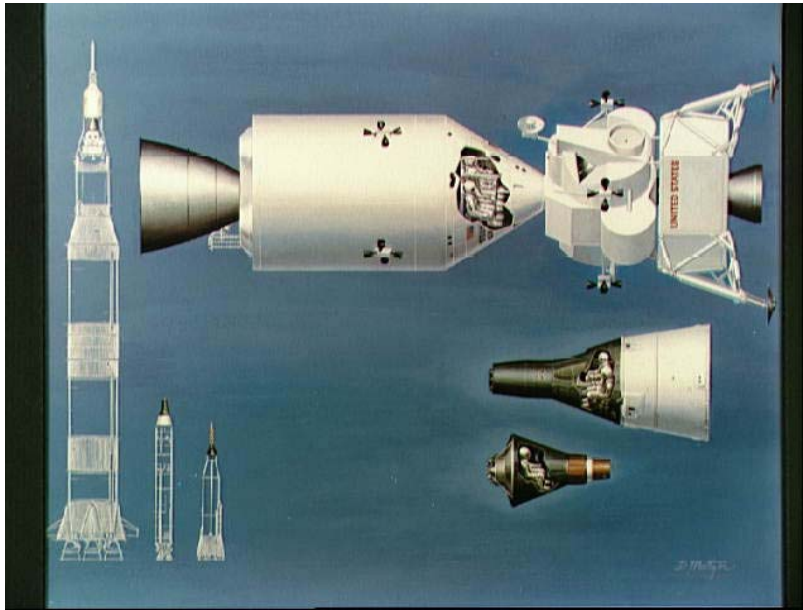


# Project APOLLO

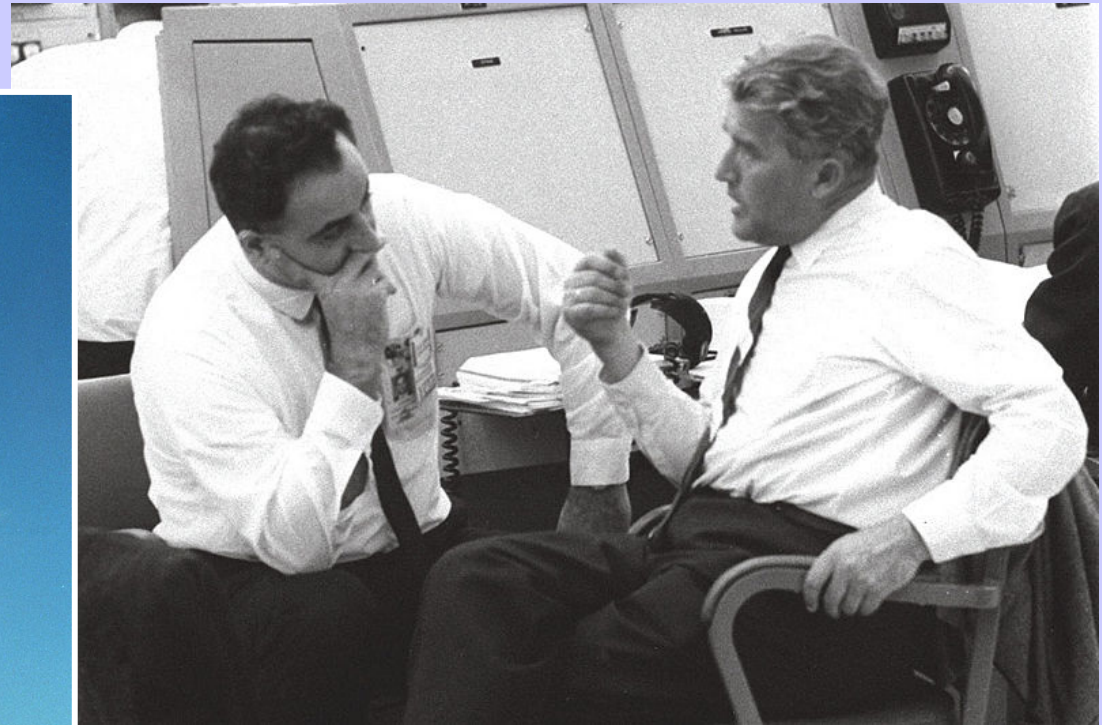
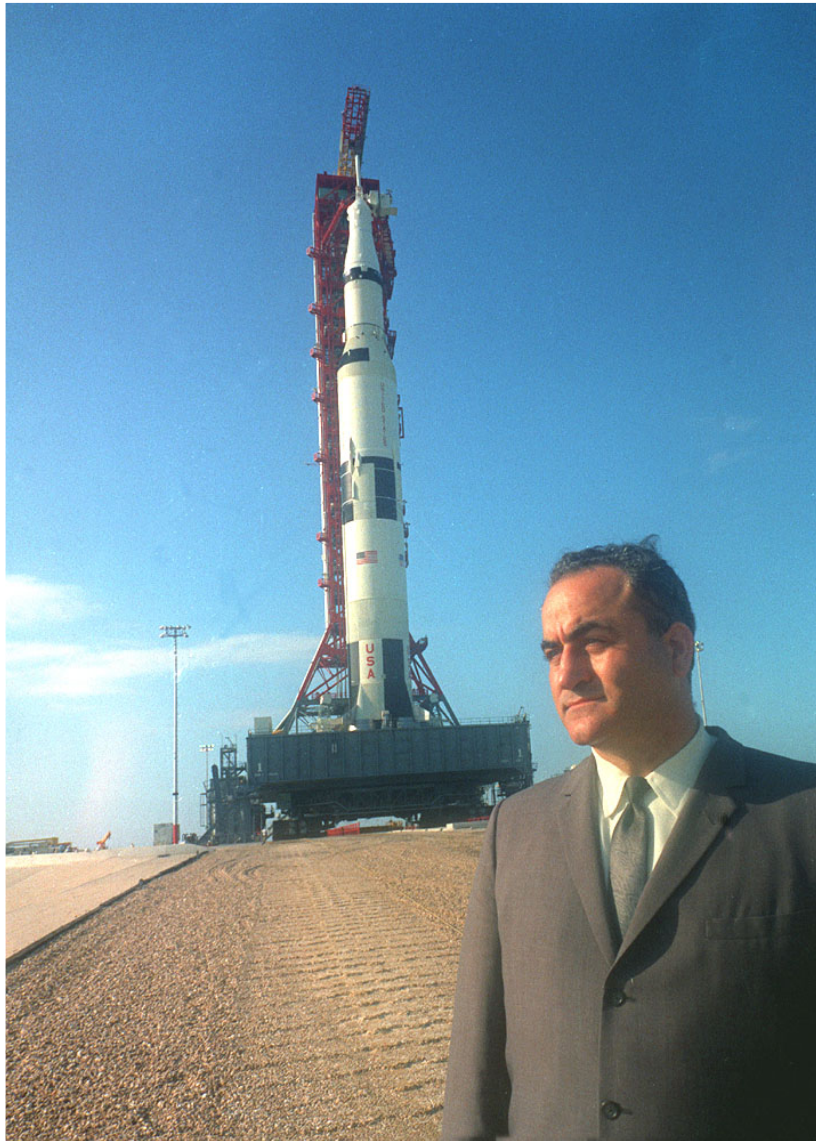




# Project APOLLO



# Project APOLLO



**Rocco Petrone**

**(1926 – 2006)**

**Wernher Von Braun**

**(1912 – 1977)**



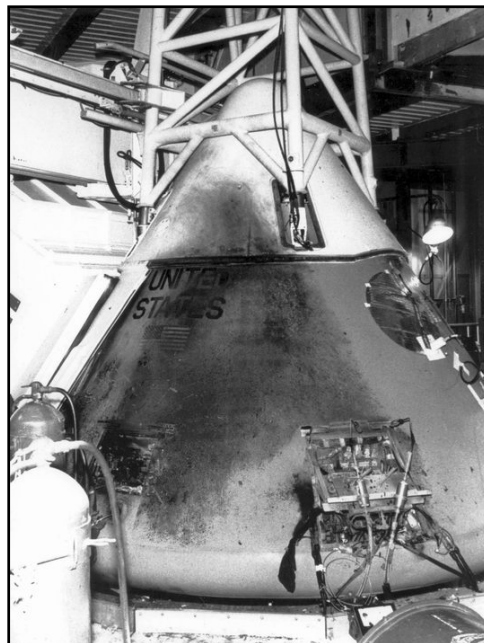
# APOLLO 1

Virgil "Gus" Grissom, Edward White, Roger Chaffee





# APOLLO 1 – 27/1/1967





# APOLLO 7

Wally Schirra – CDR

Donn Eisele - CMP

Walter Cunningham – LMP

11-22/10/1968





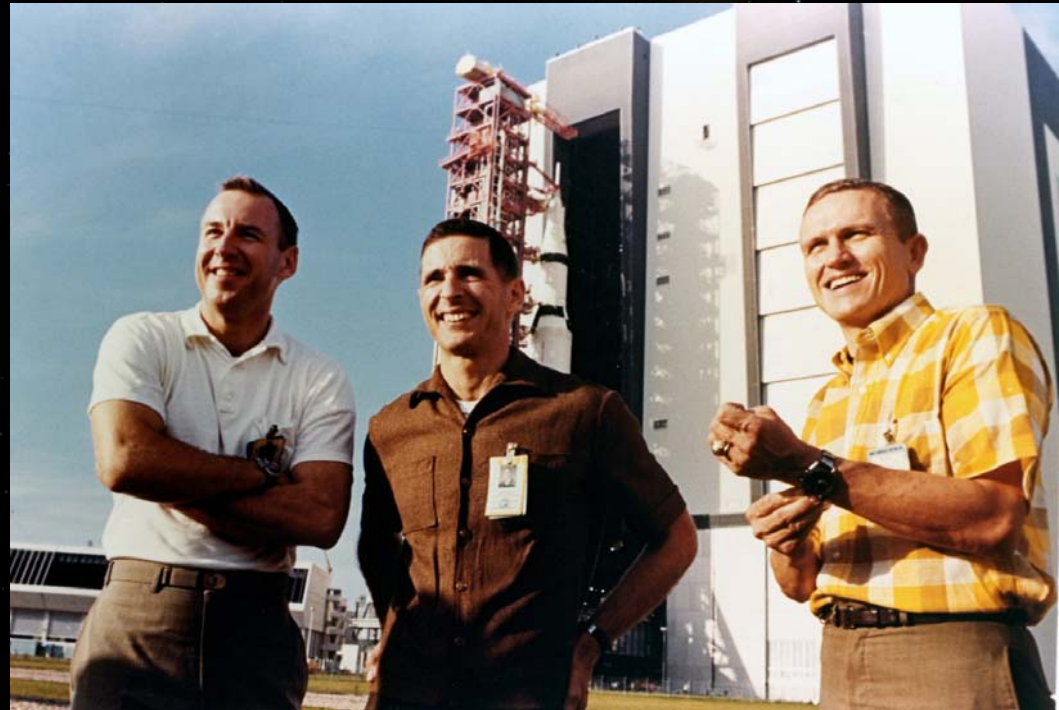
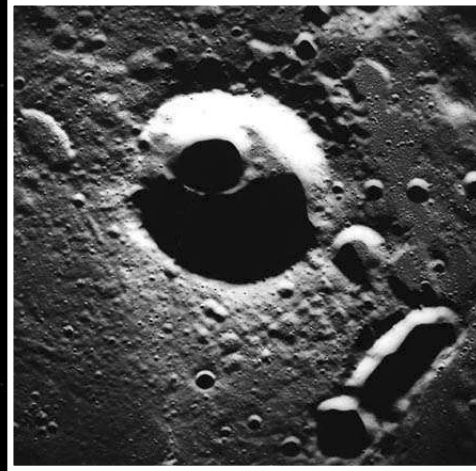
# APOLLO 8

Frank Borman – CDR  
James Lovell - CMP  
William Anders – LMP  
21-27/12/1968





# APOLLO 8





# Apollo 8... quarant'anni dopo





# APOLLO 9

James McDivitt – CDR

David Scott - CMP

Russell “Rusty” Schweickart – LMP

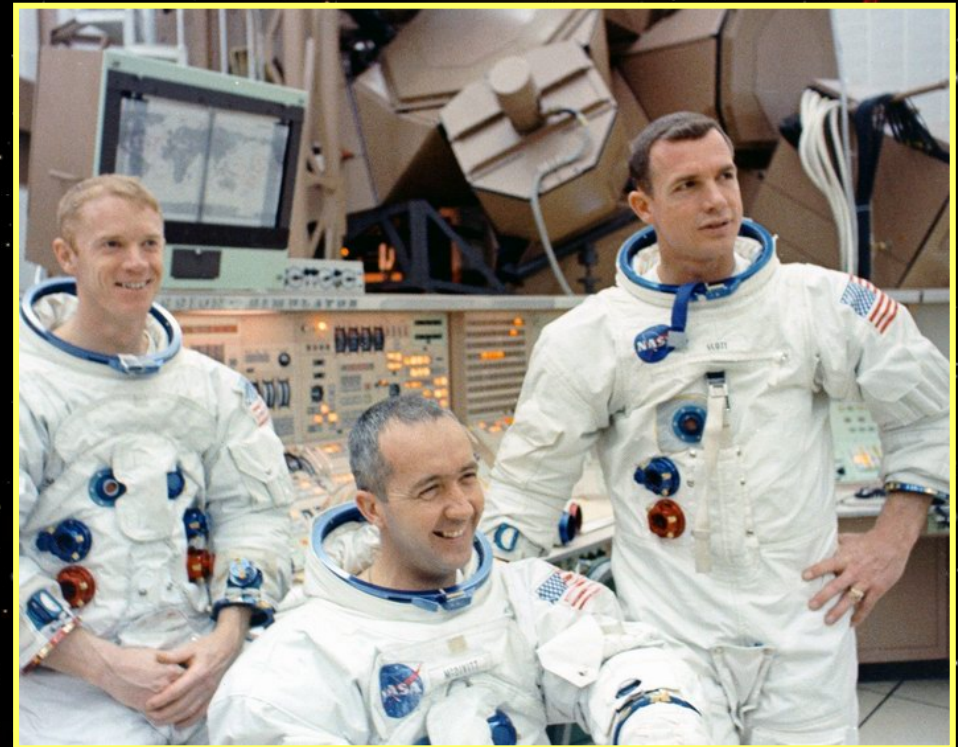
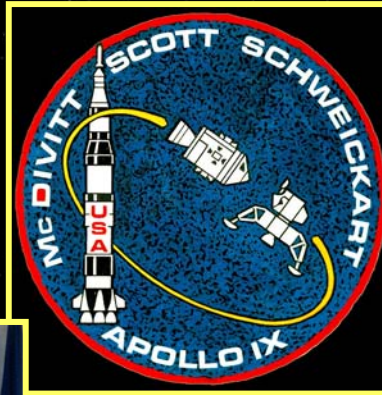
3-13/3/1969

CM

“Gumdrop”

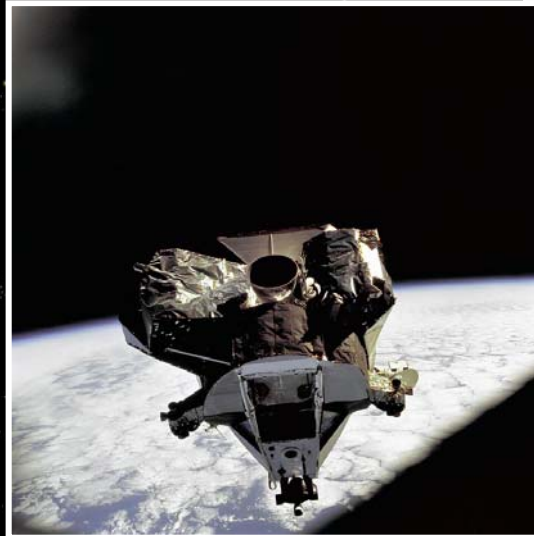
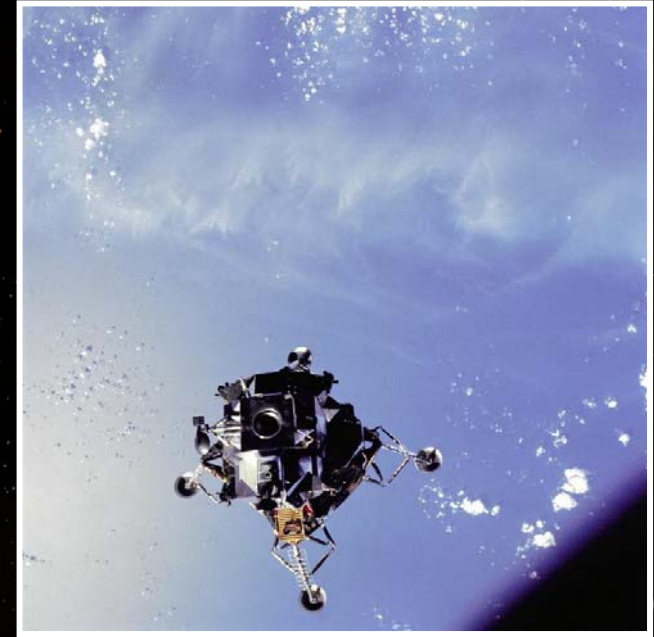
LM

“Spider”





# APOLLO 9





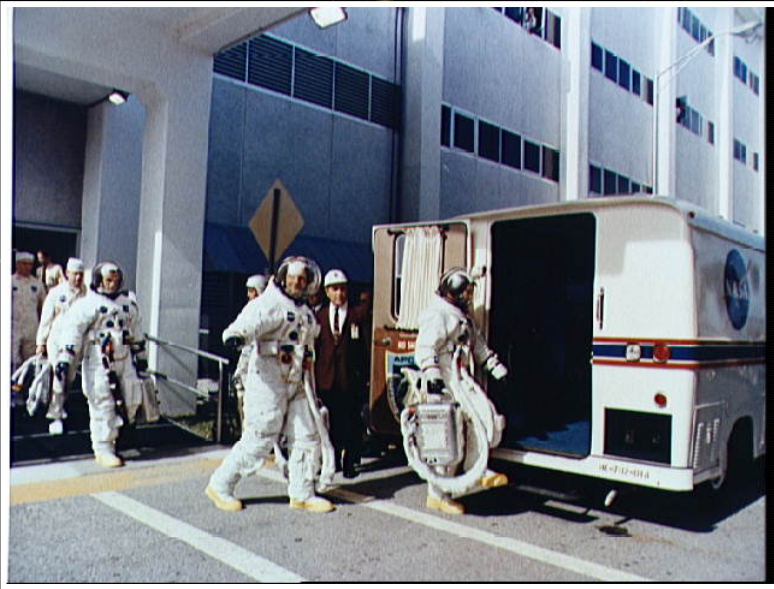
# APOLLO 10

Thomas Stafford – CDR, John Young – CMP,  
Eugene “Gene” Cernan – LMP  
18-26/5/1969

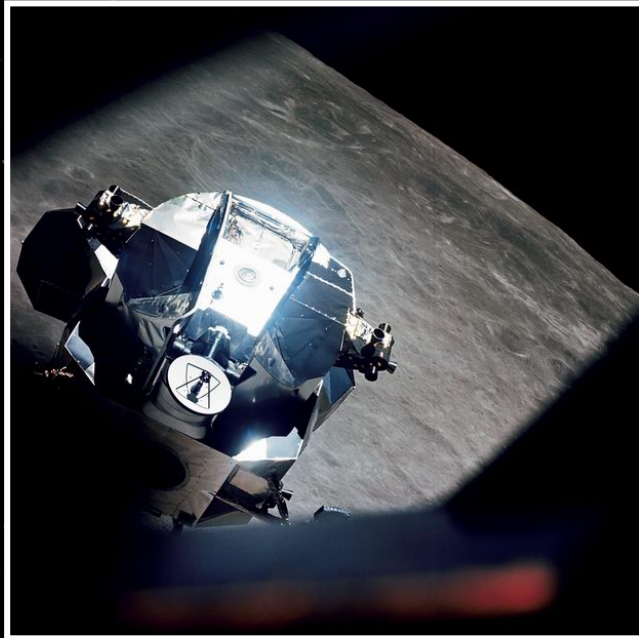




# APOLLO 10



CM "Charlie Brown"

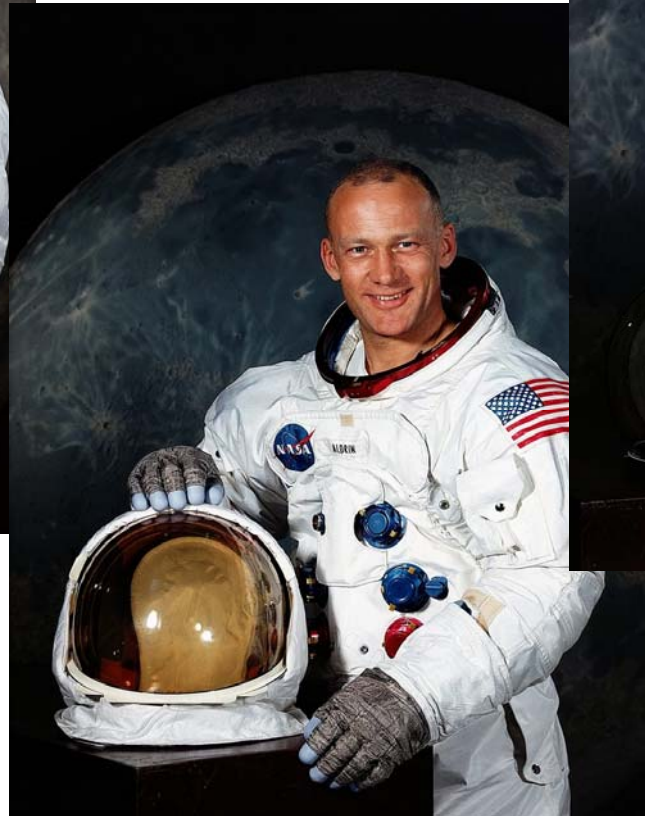


LM "Snoopy"





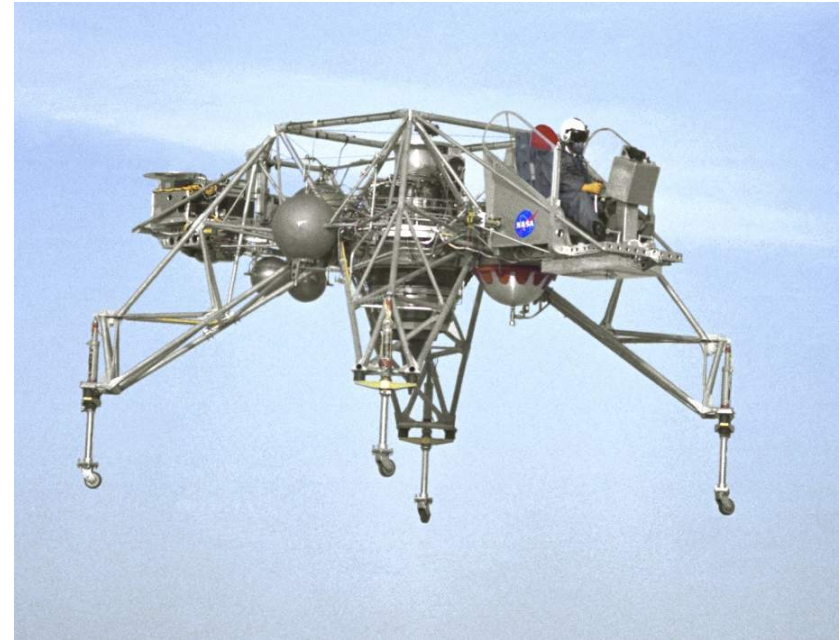
# APOLLO 11: prossima fermata, la Luna



Neil Armstrong, Edwin "Buzz" Aldrin, Michael Collins



# APOLLO 11: addestramento per la Luna



LLRV  
Lunar  
Landing  
Research  
Vehicle



# APOLLO 11: addestramento per la Luna



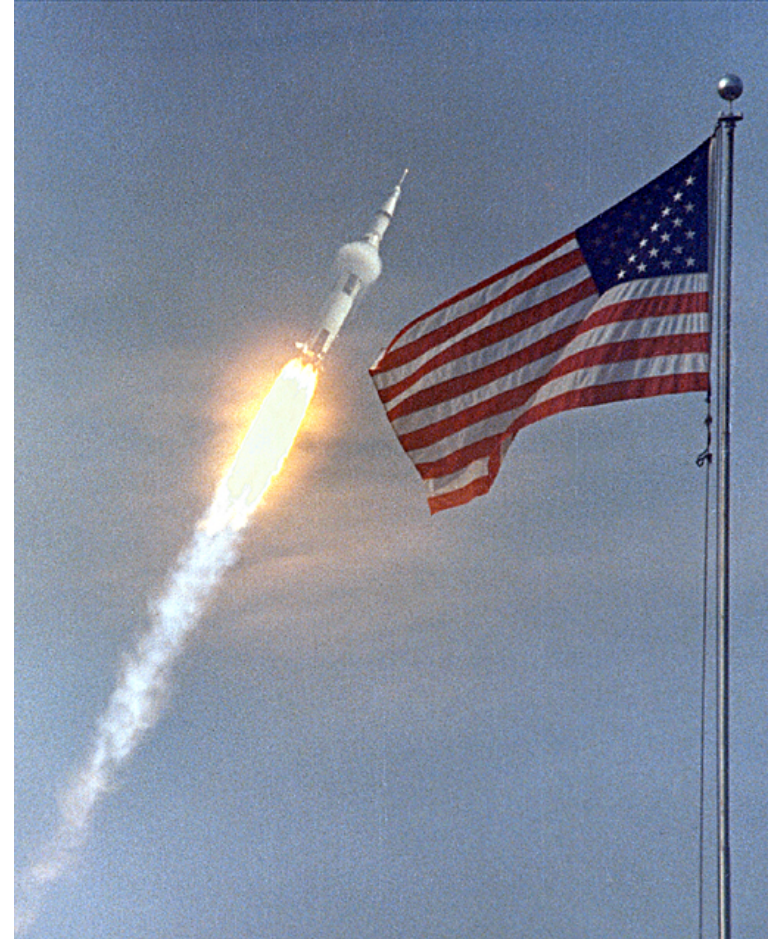


# APOLLO 11: 16 luglio 1969





# APOLLO 11: 16 luglio 1969



CM "Columbia"  
LM "Eagle"



20 luglio 1969

*“Houston, Tranquillity Base here.*

*The Eagle has landed”*



*“Ha toccato!”*

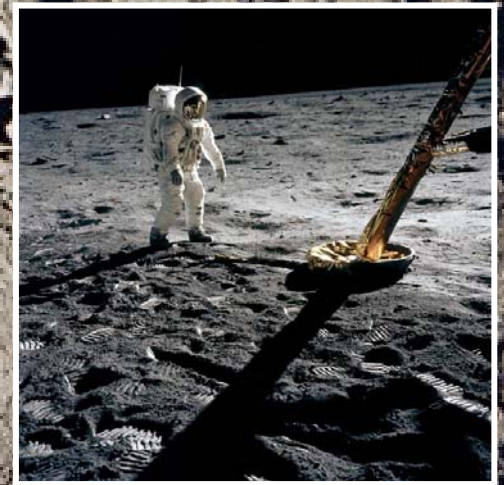
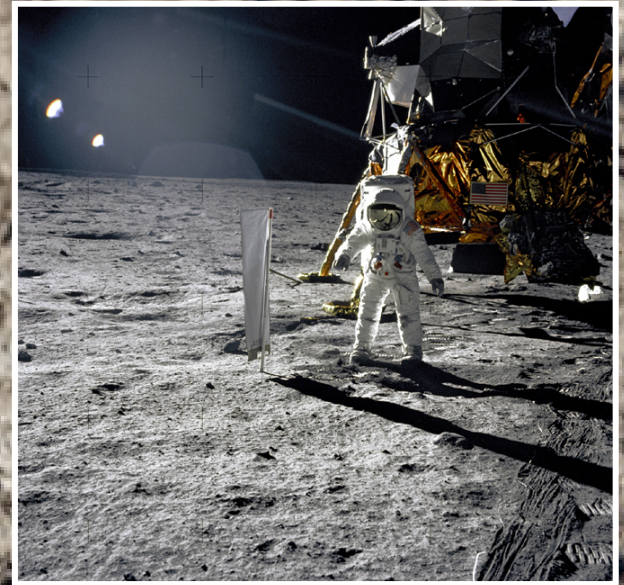
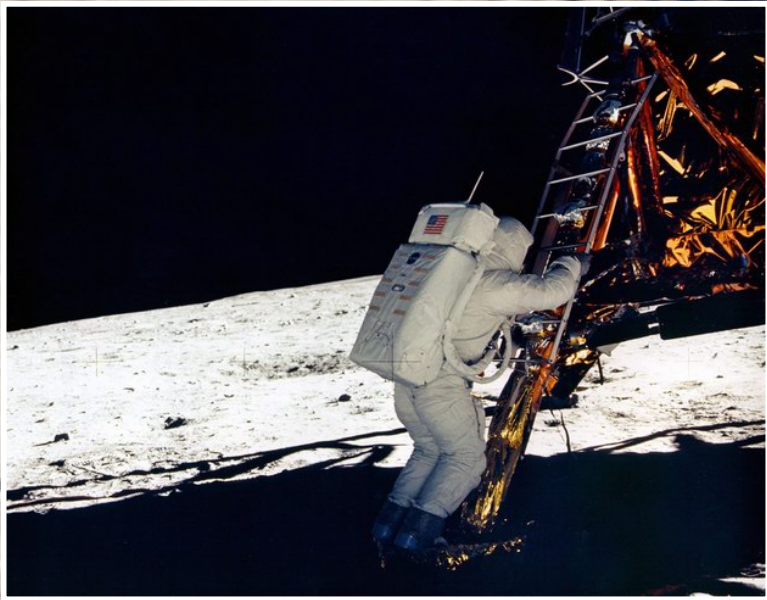
Allunaggio: 20/7/1969 ore 22.17

Armstrong posa piede sulla Luna: 21/7/1969  
ore 04.56

Aldrin posa piede sulla Luna: 21/7/1969 ore  
05.15

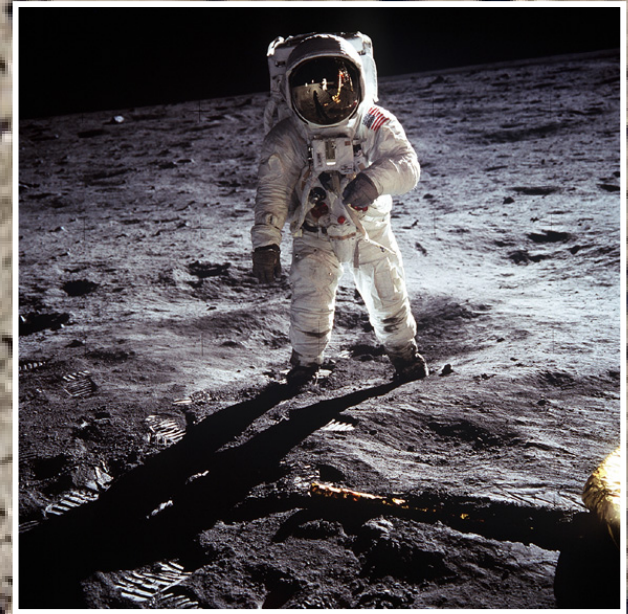
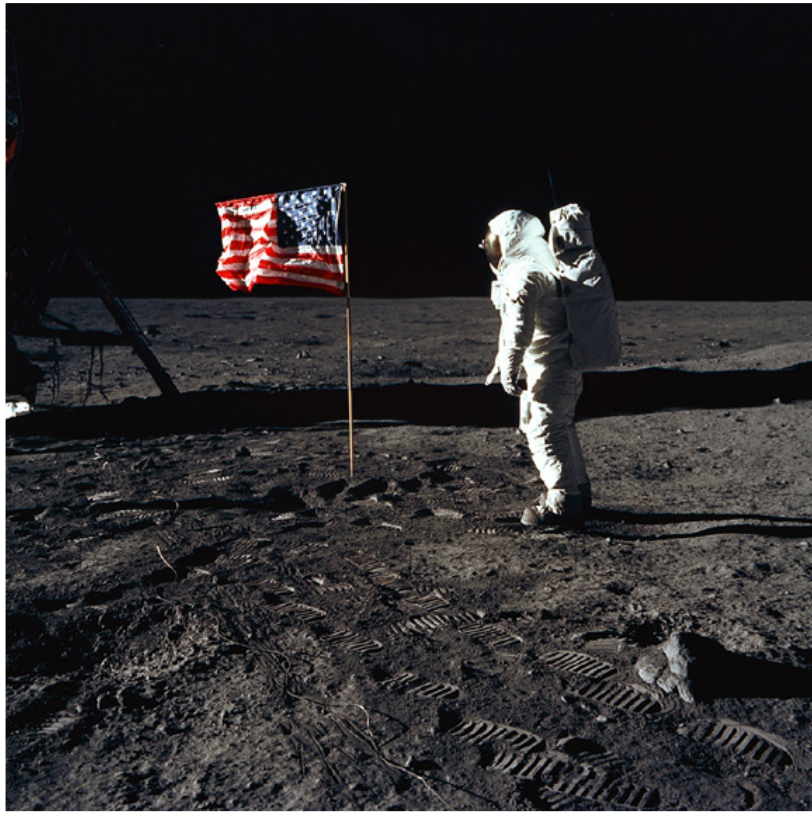


# *Walking on the Moon*





# Walking on the Moon



“... one small step for a man,  
one giant leap for mankind”



24 luglio 1969





# APOLLO 11: missione compiuta



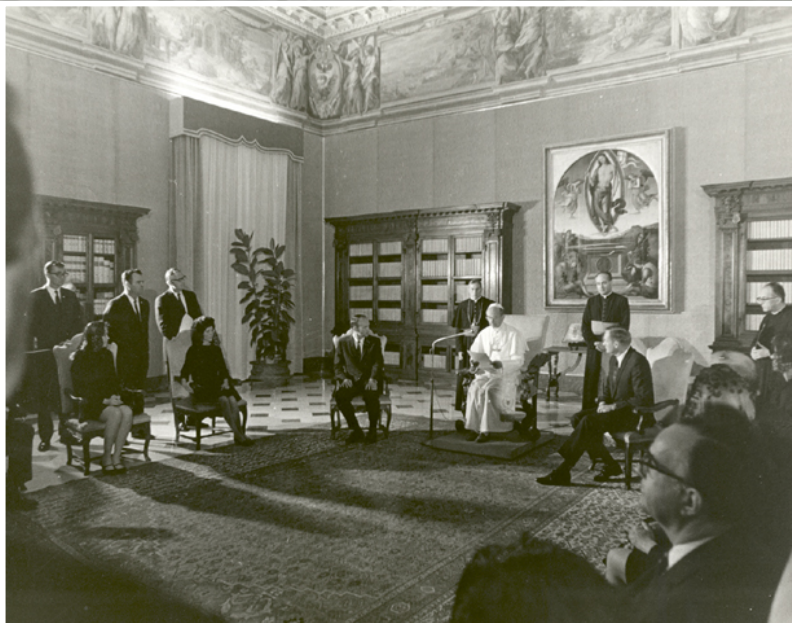
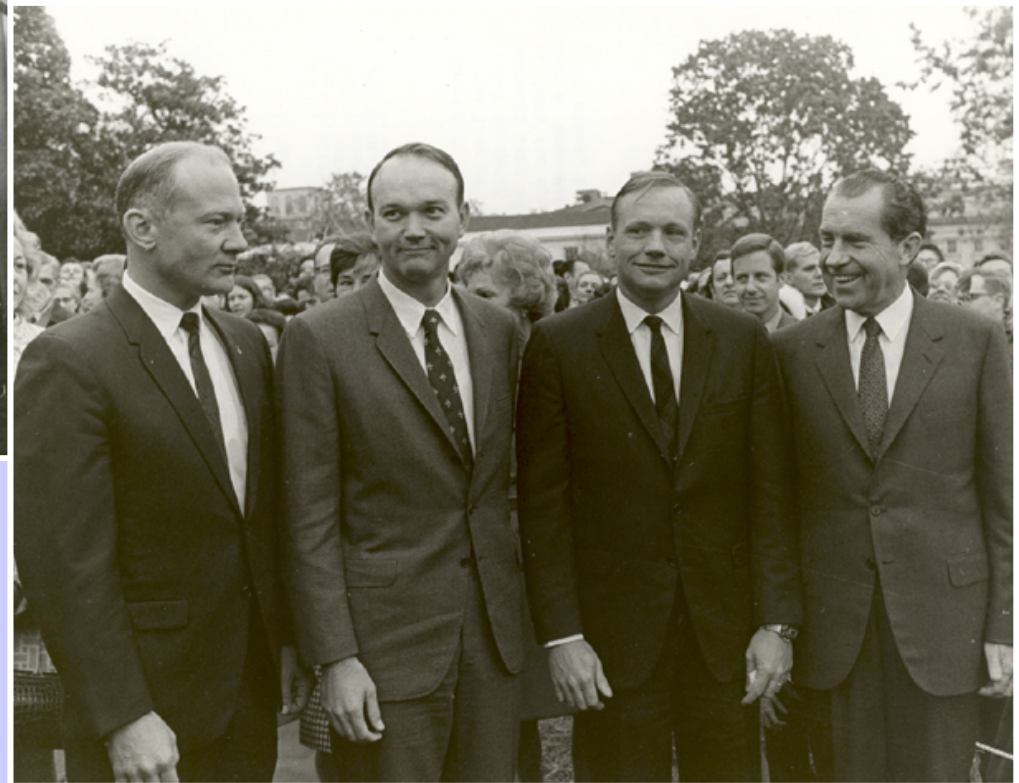


# APOLLO 11: il trionfo





# APOLLO 11: la missione infinita...





# APOLLO 12

Charles "Pete" Conrad – CDR

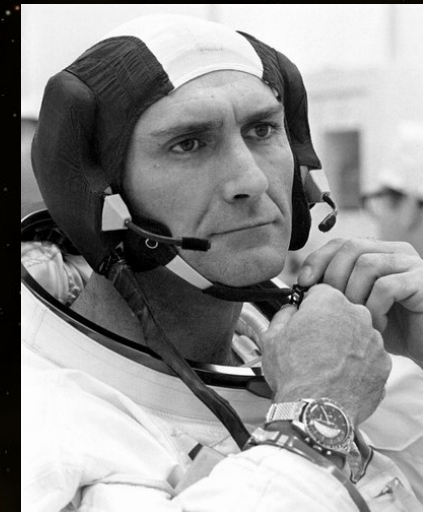
Richard F. "Dick" Gordon - CMP

Alan L. Bean – LMP

14-24/11/1969

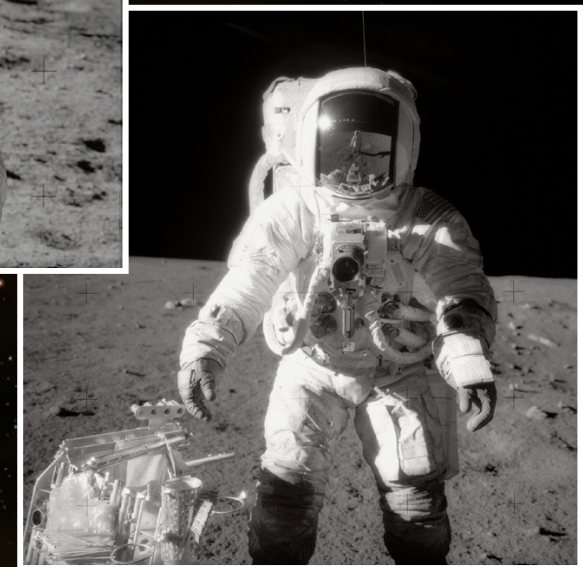
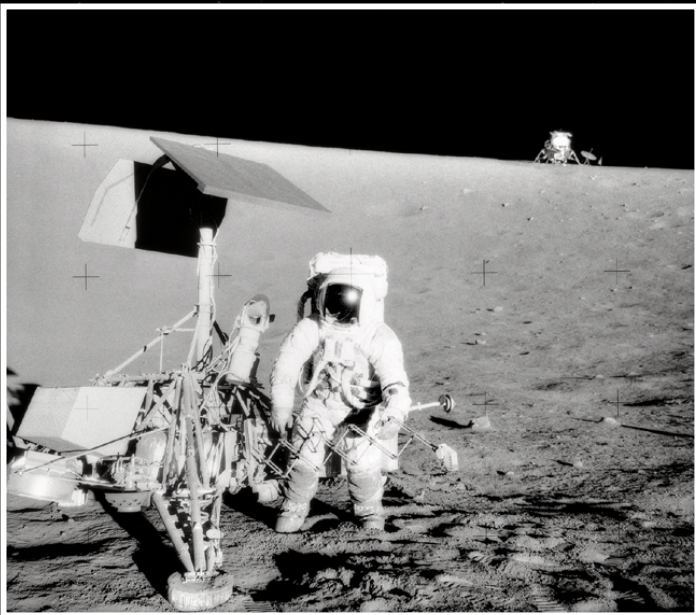
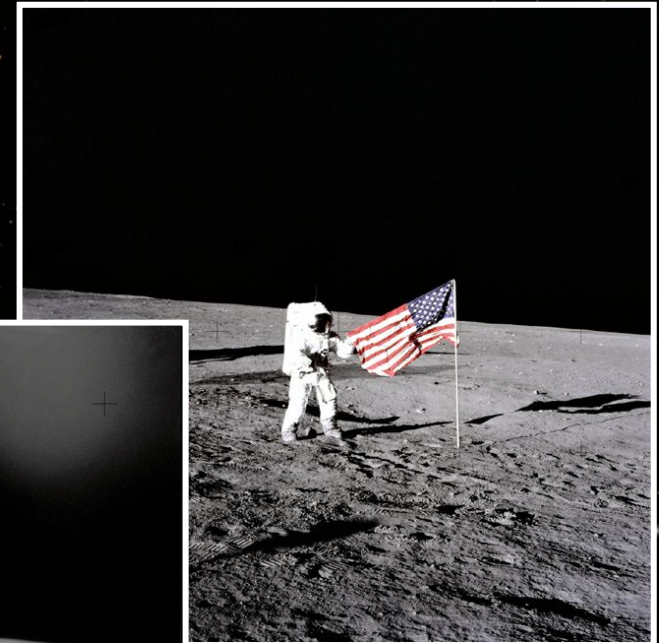
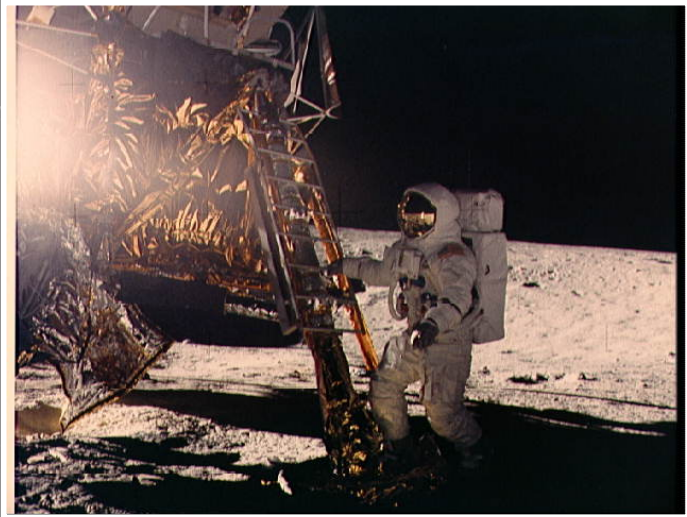
CM "Yankee Clipper"

LM "Intrepid"





# APOLLO 12 – Luna, Oceano delle Tempeste, 19/11/1969



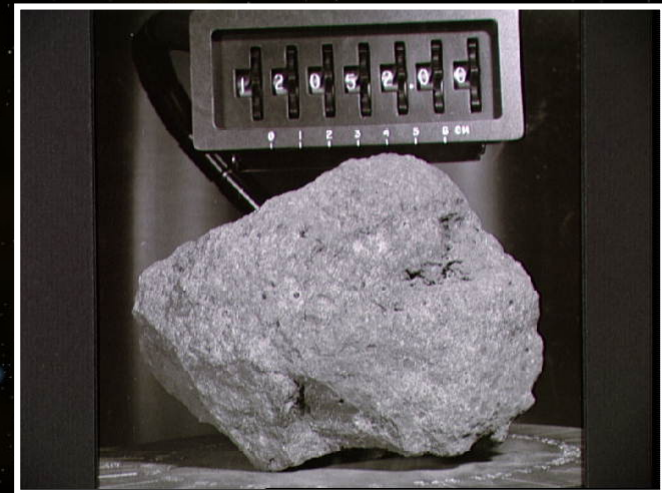


APOLLO 12, Oceano Pacifico, 24/11/1969





# APOLLO 12





# APOLLO 13

James Lovell – CDR

John “Jack” Swigert - CMP

Fred Haise – LMP

11-17/4/1970

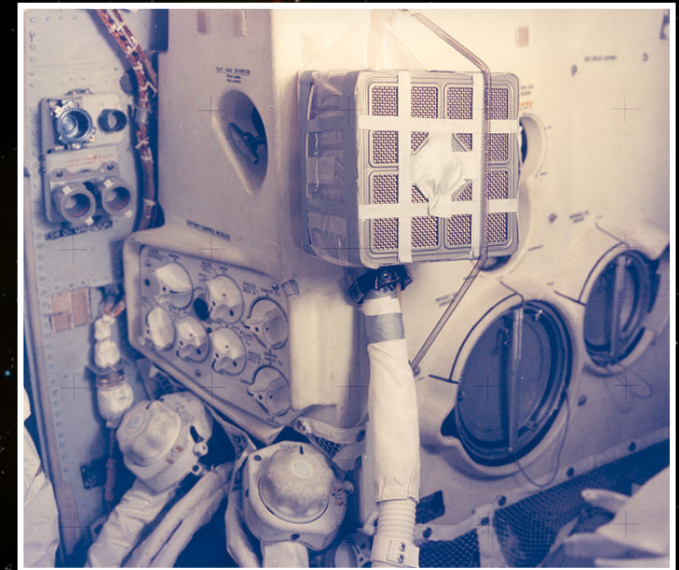
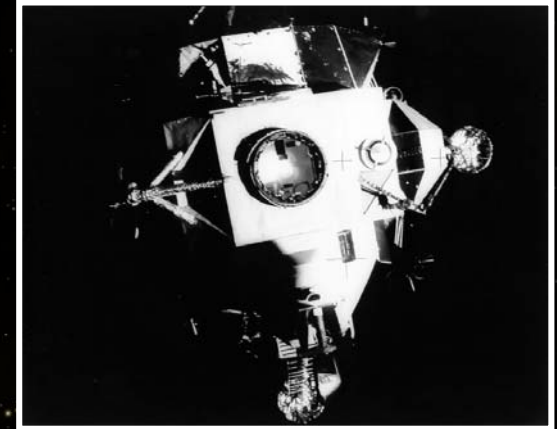
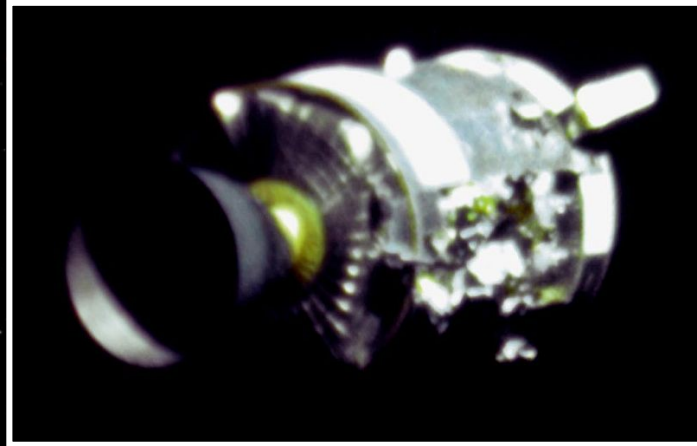
CM “Odyssey”

LM “Aquarius”





# APOLLO 13: "Houston, abbiamo un problema"





# APOLLO 13 – 17/4/1970





# Dalla realtà al cinema: “Apollo 13” di Ron Howard, 1995





# APOLLO 14

Alan B. Shepard – CDR

Stuart A. Roosa - CMP

Edgar D. Mitchell – LMP

31/1-9/2/1971

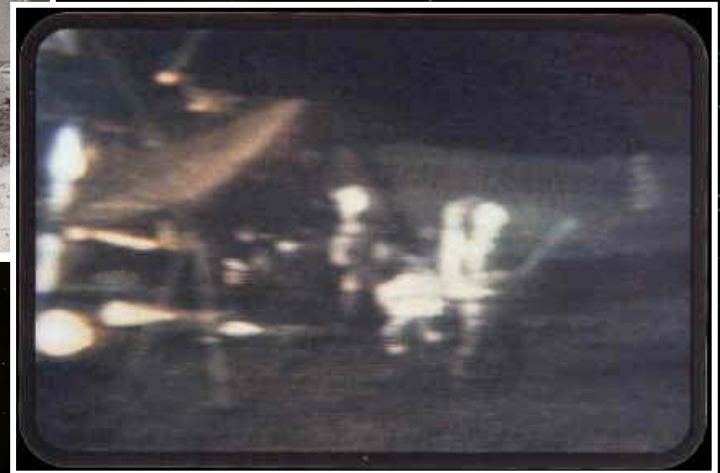
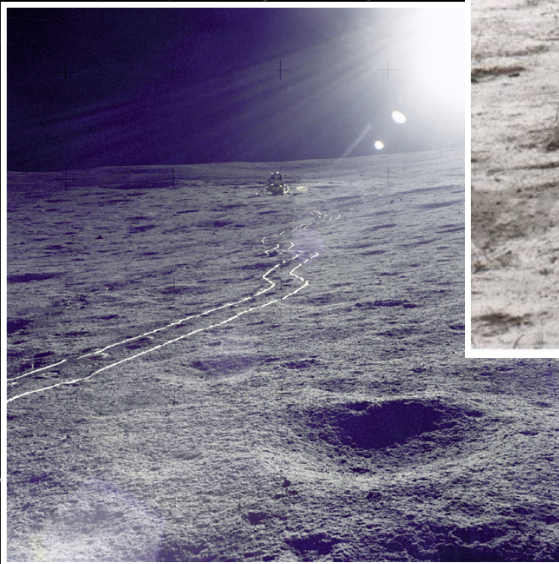
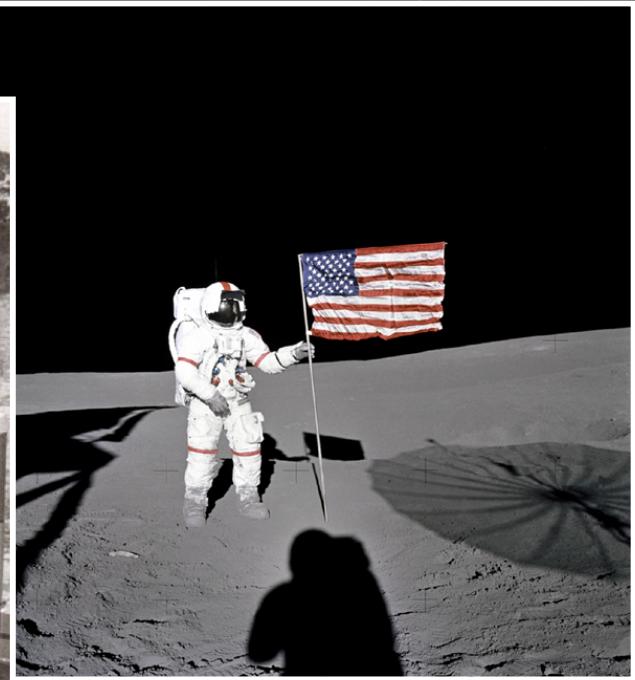
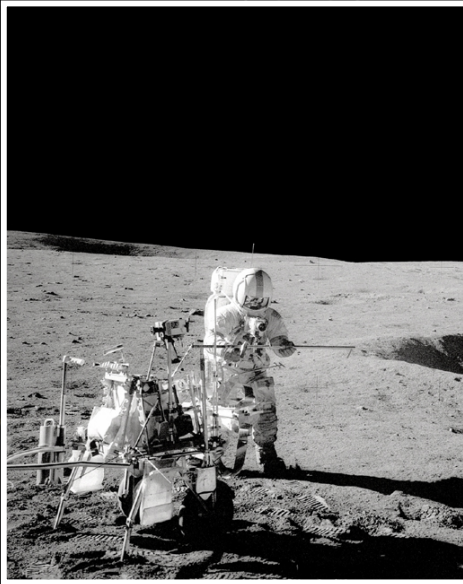
CM “Kitty Hawk”

LM “Antares”





# APOLLO 14 – Luna, regione del cratere Fra Mauro





# APOLLO 15

David R. Scott – CDR

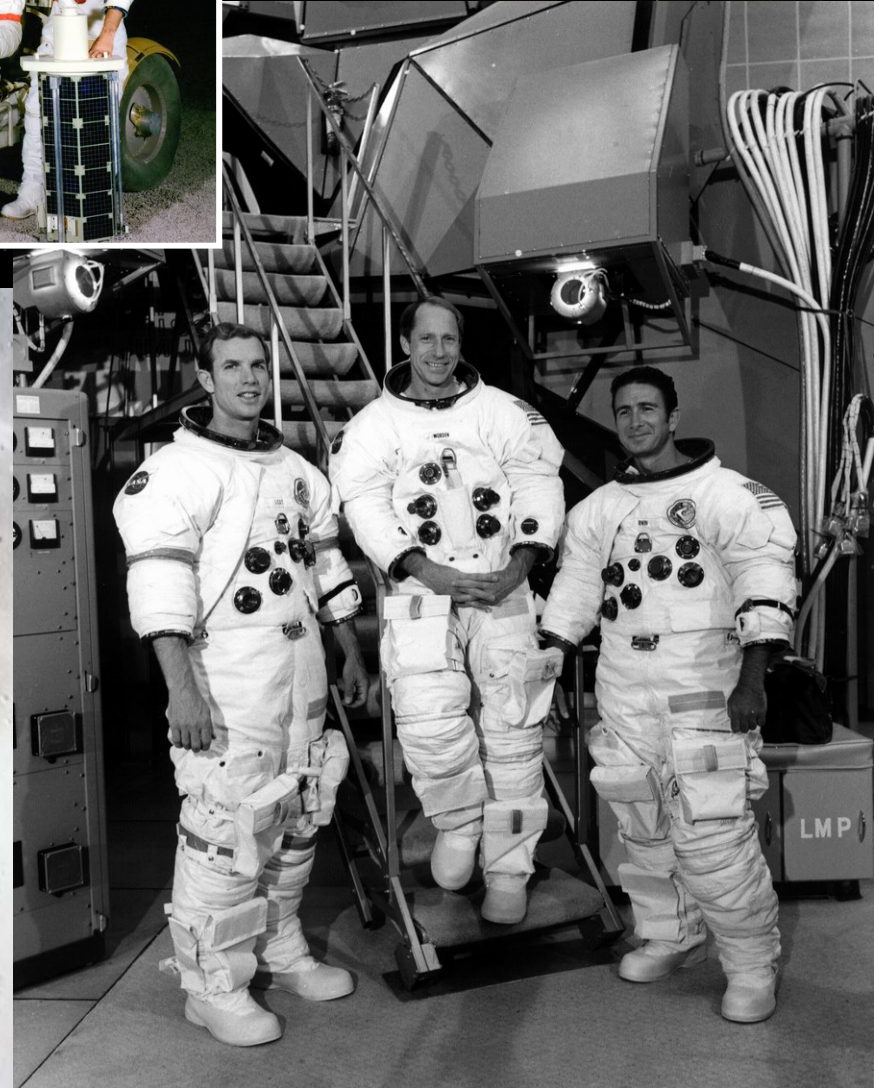
Alfred M. Worden - CMP

James B. Irwin – LMP

26/7-7/8/1971

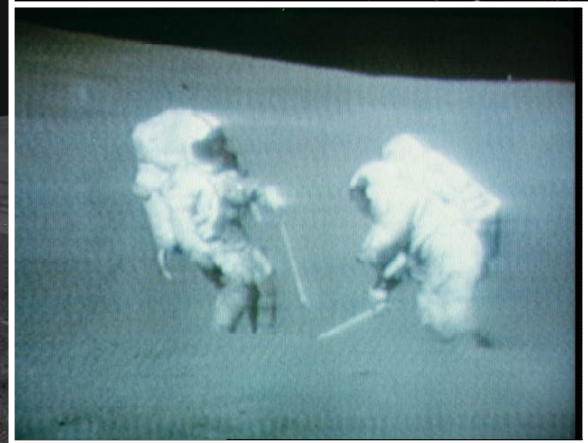
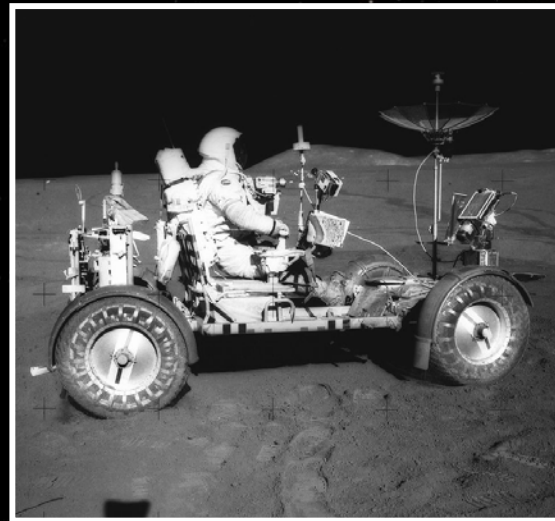
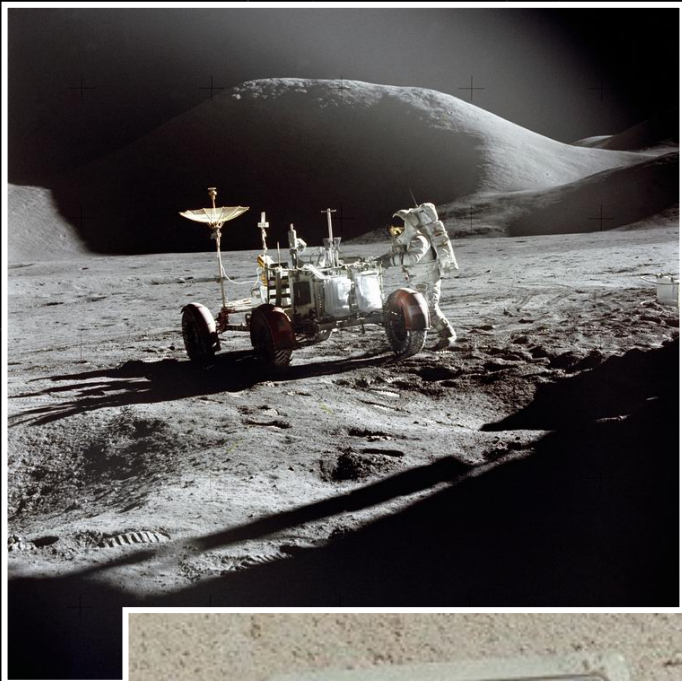
CM “Endeavour”

LM “Falcon”

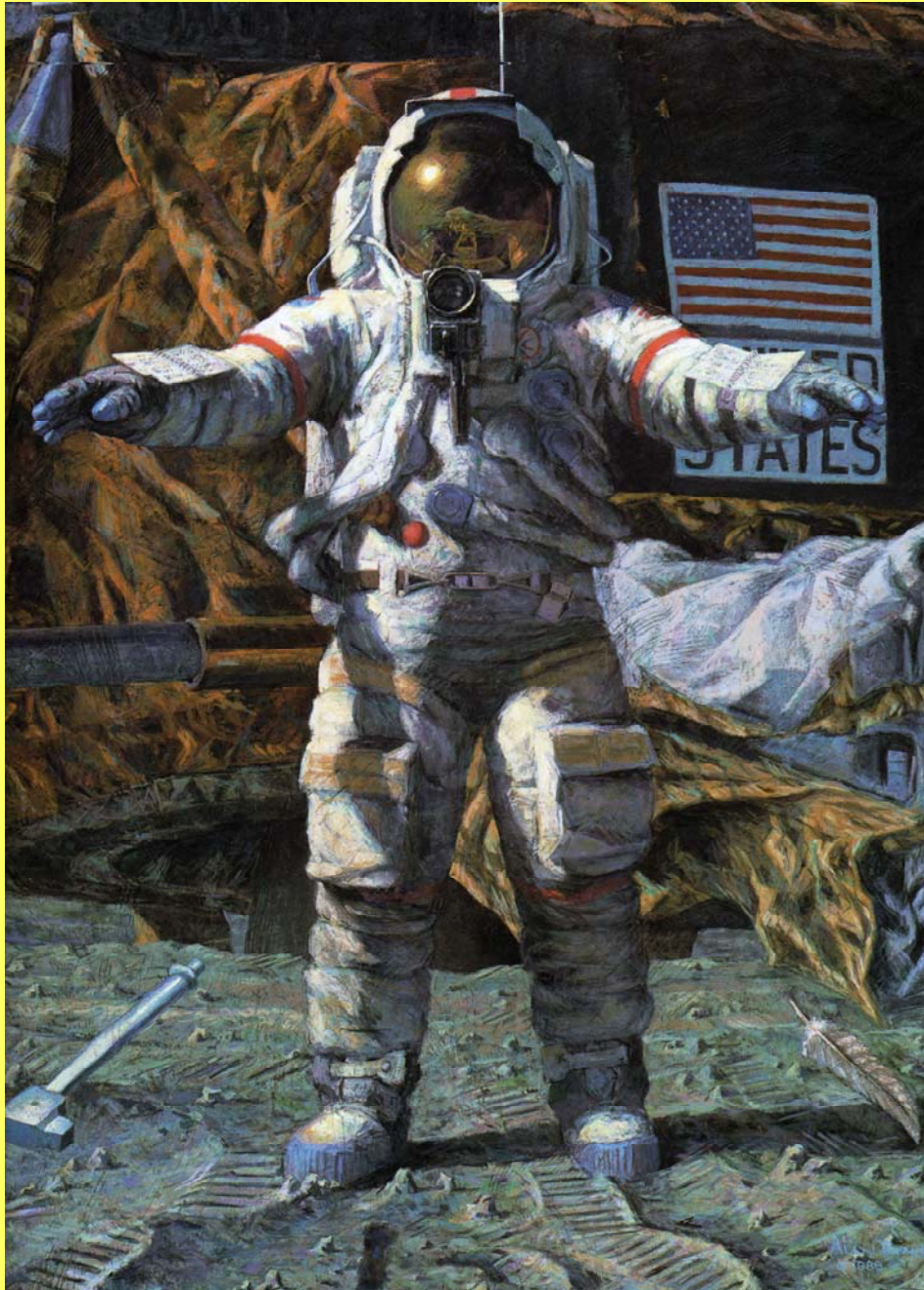




# APOLLO 15 – Luna, regione di Hadley, Appennini Lunari

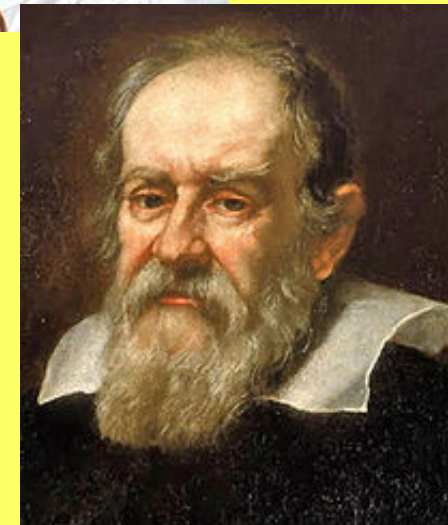
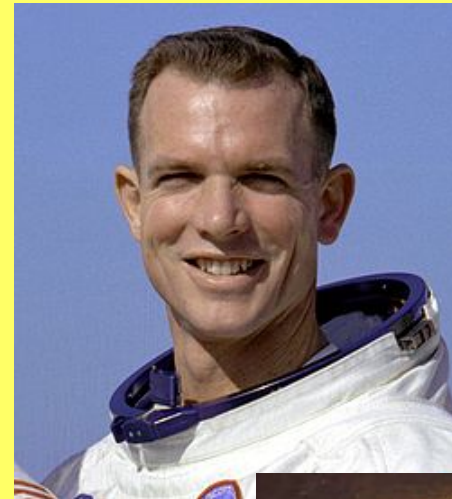






## APOLLO 15

**“Mr. Galileo was right”**





# APOLLO 16

John W. Young – CDR

Thomas “Ken” Mattingly - CMP

Charles M. Duke – LMP

16-27/4/1972

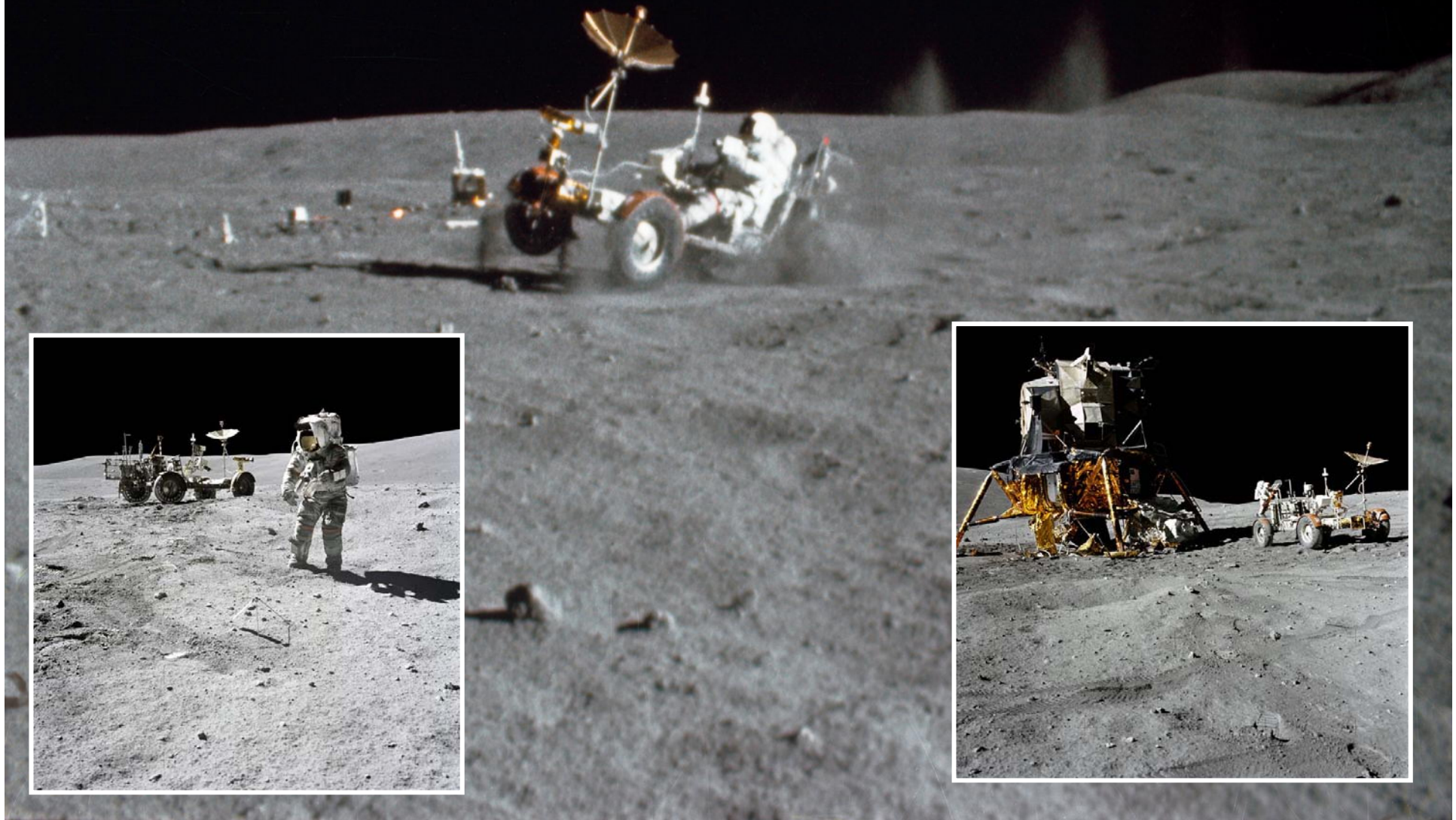
CM “Casper”

LM “Orion”





# APOLLO 16 – Luna, Descartes Highlands





# APOLLO 17

Eugene "Gene" Cernan – CDR

Ronald "Ron" Evans - CMP

Harrison "Jack" Schmitt – LMP

7-19/12/1972

CM "America"

LM "Challenger"





# APOLLO 17 – Luna, Taurus-Littrow





# Moonwalkers





## TABELLA RIEPILOGATIVA ALLUNAGGI MISSIONI APOLLO

MISSIONE	COM/LMP	DATA ALLUNAGGIO	DATA DECOLLO	SITO	DURATA PERMANENZA SUL SUOLO LUNARE	N. EVA EFFETTUATE	DURATA TOT. EVA	KG REPERTI
APOLLO 11	Armstrong, Aldrin	20/7/1969	21/7/1969	Mare della Tranquillità	21 h, 38 m	1	2 h, 31 m	22
APOLLO 12	Conrad, Bean	19/11/1969	20/11/1969	Oceano delle Tempeste	31 h, 31 m	2	7 h, 45 m	34
APOLLO 14	Shepard, Mitchell	5/2/1971	6/2/1971	Fra Mauro	33 h, 31 m	2	9 h, 23 m	43
APOLLO 15	Scott, Irwin	30/7/1971	2/8/1971	Appennini lunari	66 h, 54 m	3	18 h, 35 m	77
APOLLO 16	Young, Duke	21/4/1972	24/4/1972	Altopiano Cartesio	71 h, 2 m	3	20 h, 14 m	96
APOLLO 17	Cernan, Schmitt	11/12/1972	14/12/1972	Taurus-Littrow	74 h, 59 m	3	22 h, 4 m	110

TOTALE REPERTI RIPORTATI SULLA TERRA: KG 382



**ROCCE LUNARI**  
**A sin.: la “pietra della Genesi”**  
**(Apollo 15); a destra:**  
**anortosite lunare (Apollo 16)**





## Sistema di rotazione degli equipaggi del Programma APOLLO

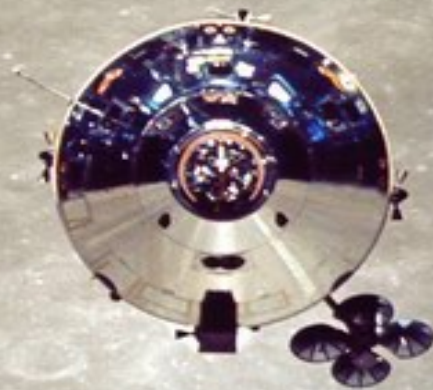
MISSIONE	EQUIPAGGIO (CDR-CMP-LMP)	BACK-UP
Apollo 7	Schirra – Eisele - Cunningham	Stafford – Young - Cernan
Apollo 8	Borman – Lovell – Anders	Armstrong – Aldrin - Haise
Apollo 9	McDivitt – Scott - Schweickarth	Conrad – Gordon - Williams
Apollo 10	Stafford – Young – Cernan	Cooper – Eisele - Mitchell
Apollo 11	Armstrong – Aldrin - Collins	Lovell – Anders - Haise
Apollo 12	Conrad – Gordon – Bean	Scott – Worden - Irwin
Apollo 13	Lovell – Mattingly - Haise	Young – Swigert - Duke
Apollo 14	Shepard – Roosa – Mitchell	Cernan – Evans - Engle
Apollo 15	Scott – Worden - Irwin	Gordon – Brand - Schmitt
Apollo 16	Young – Mattingly - Duke	Haise – Roosa - Mitchell
Apollo 17	Cernan – Evans – Engle	Young – Roosa - Duke



# RICADUTE TECNOLOGICHE

Sono oltre 160.000 i brevetti tecnologici – gli “spinoffs” - scaturiti dal Programma Apollo e dalle altre imprese spaziali, e moltissimi di questi riguardano lo sviluppo di oggetti di uso comune nella vita di ognuno di noi. E' stato calcolato che per ogni dollaro speso nella corsa alla Luna ne siano stati generati almeno tre negli anni successivi grazie alle ricadute economiche di questi brevetti.

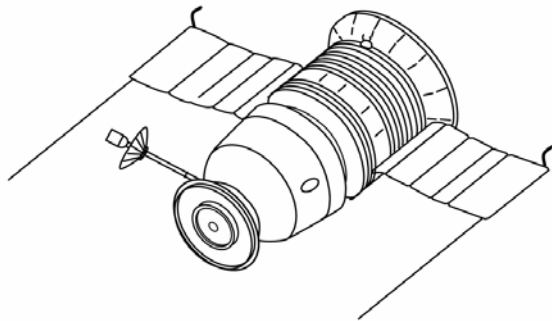
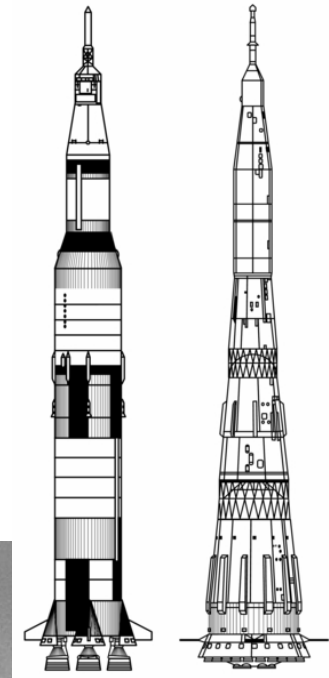
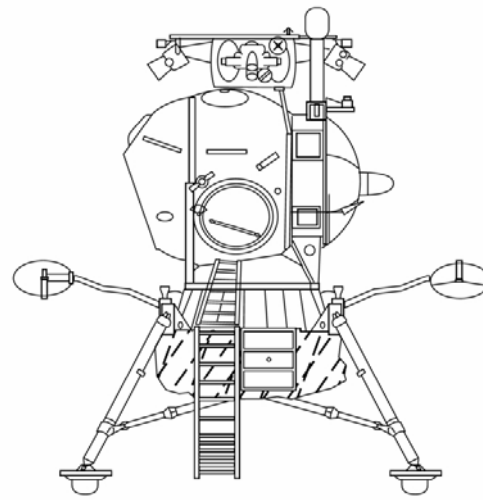
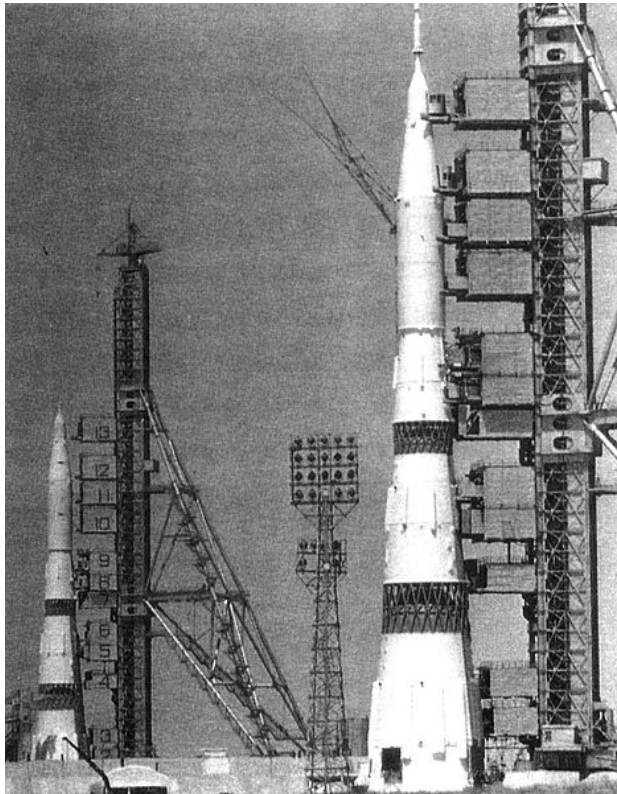
Qualche esempio?



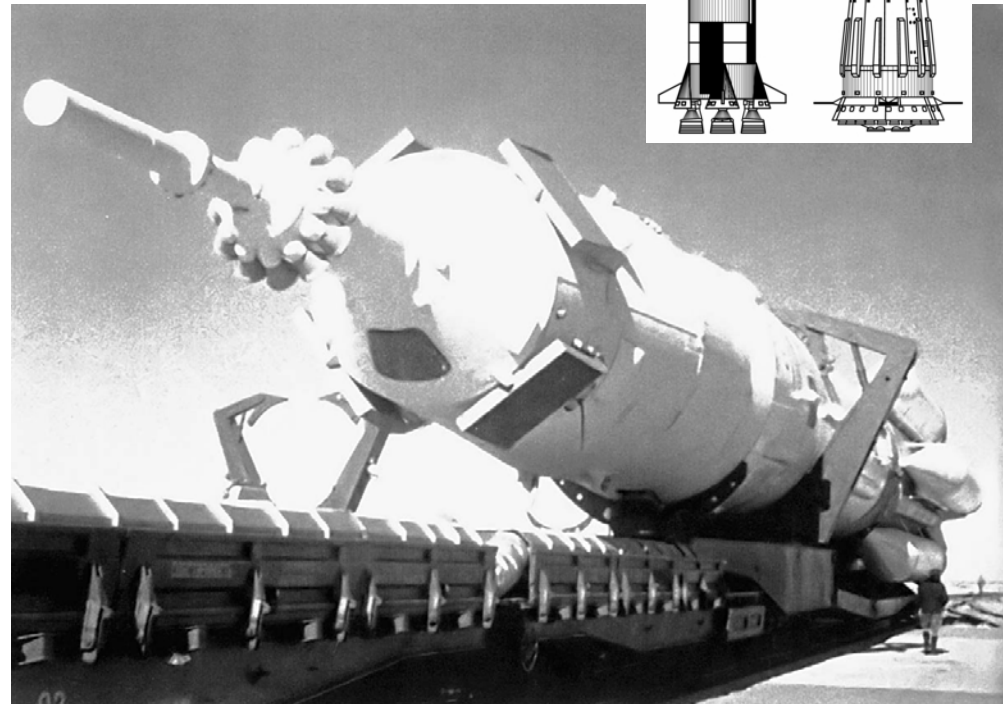
Il Teflon per antiaderenti, le fibre e i tessuti isolanti (Gore-tex) per abbigliamento e calzature, le attrezzature di monitoraggio medico, i cibi liofilizzati e a lunga conservazione, le lenti antigraffio per occhiali, gli utensili ed elettrodomestici senza filo, i joystick, i micro-chip (con tutte le loro molteplici applicazioni), elmetti e caschi di particolare resistenza, la penna che non risente della forza di gravità, plastiche particolari per contenitori di cibi e bevande.



# Anche i Sovietici volevano andare sulla Luna...



Zond, N1 e modulo lunare





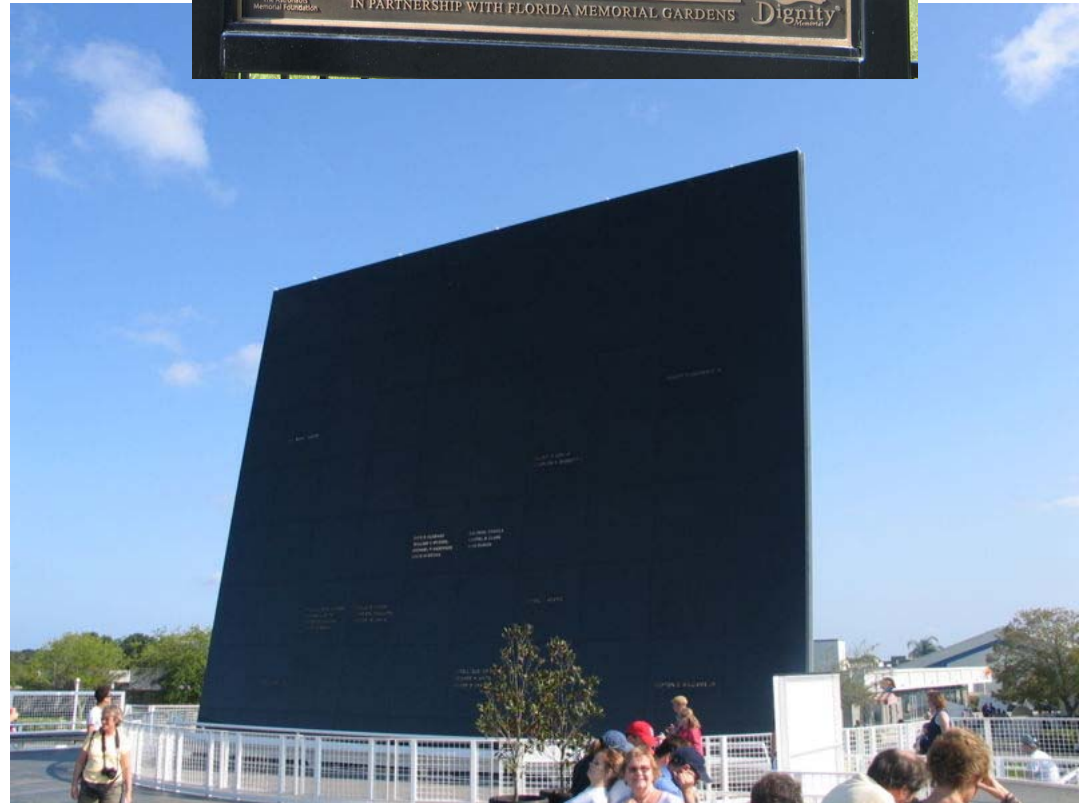
# Eroi



**Cape Canaveral, Launch Complex 34**



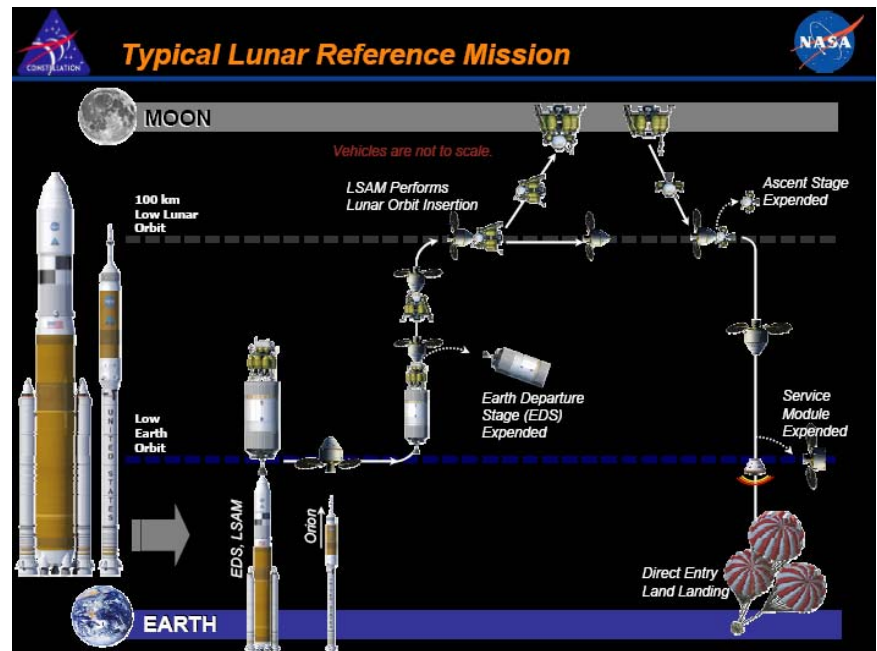
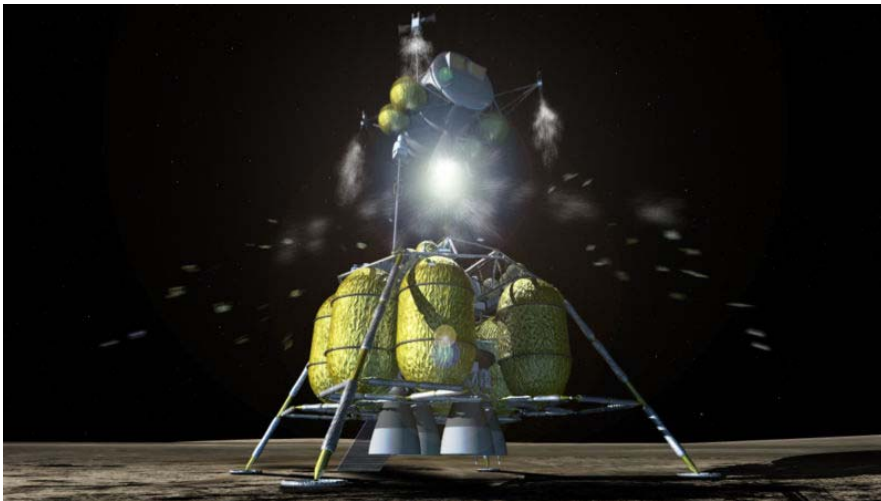
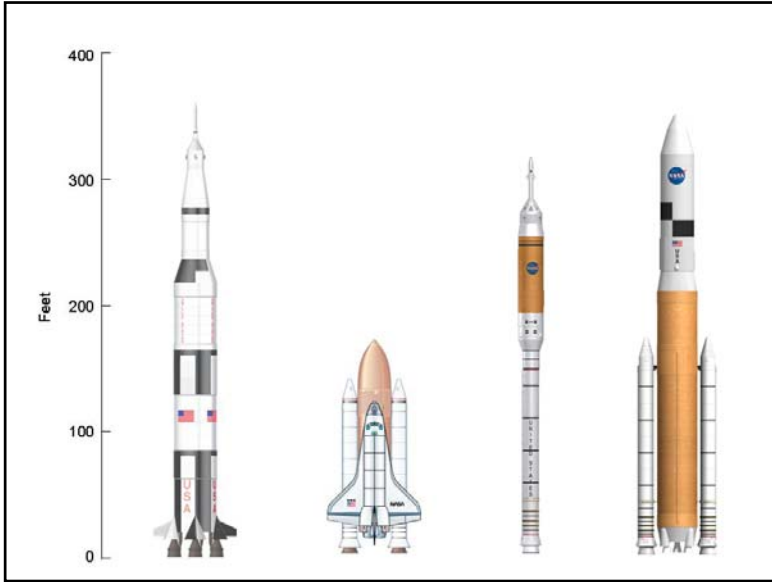
# Eroi



**John F. Kennedy Space Center, Space Mirror Memorial**



# Domani...







Crediti per le immagini.

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A.L. Bean, A. Chaikin: "Apollo: An Eyewitness Account"

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# GRAZIE!

