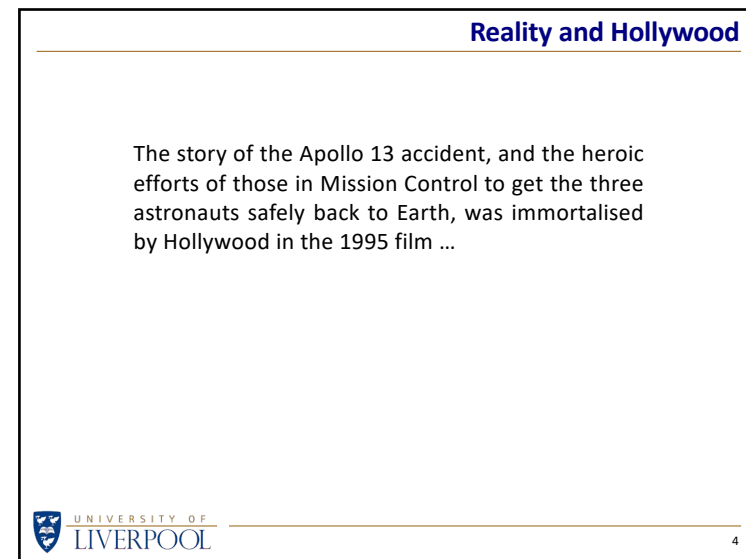
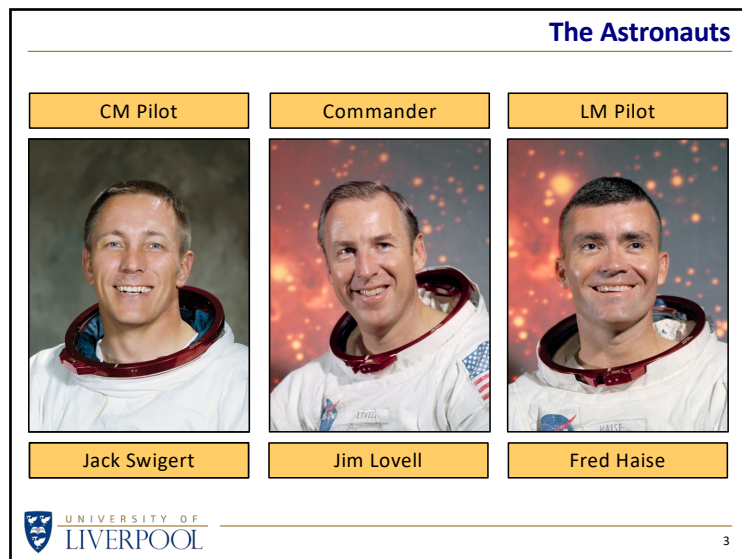


Apollo 13



Apollo 13

The Actors



Reality and Hollywood

The story of the Apollo 13 accident, and the heroic efforts of those in Mission Control to get the three astronauts safely back to Earth, was immortalised by Hollywood and also by ...

LEGO !

LEGO Apollo 13

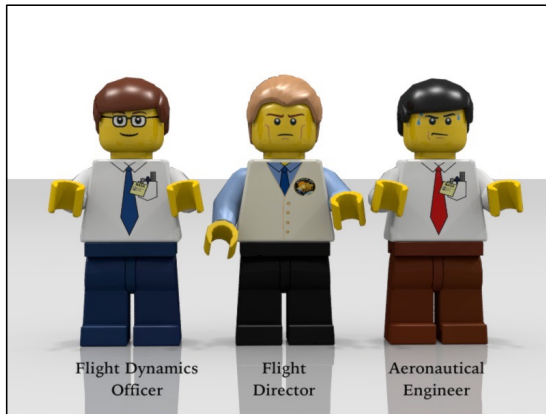


LEGO Mission Control

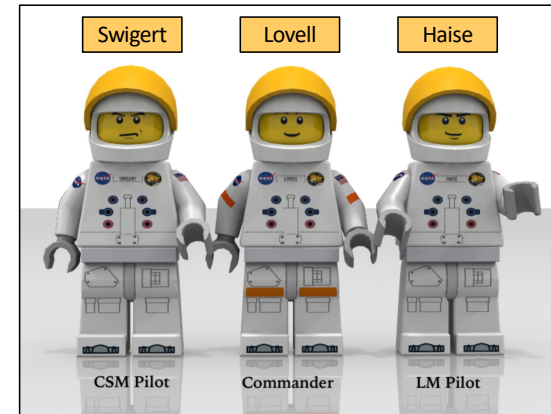


Apollo 13

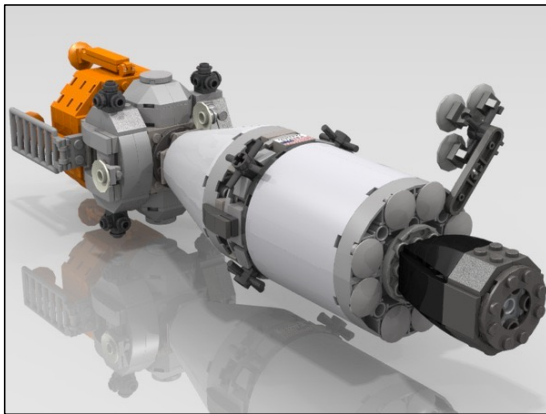
LEGO Mission Controllers



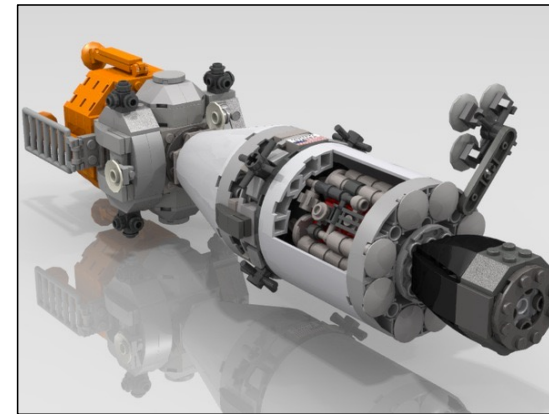
LEGO Astronauts



Pre-Explosion

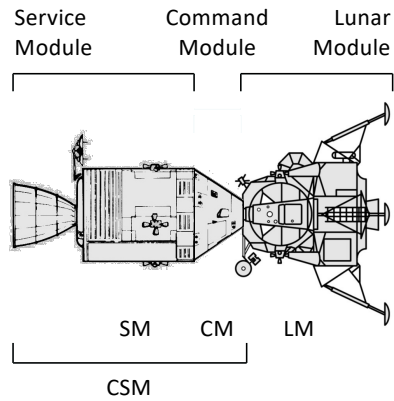


Post-Explosion



Apollo 13

Abbreviations

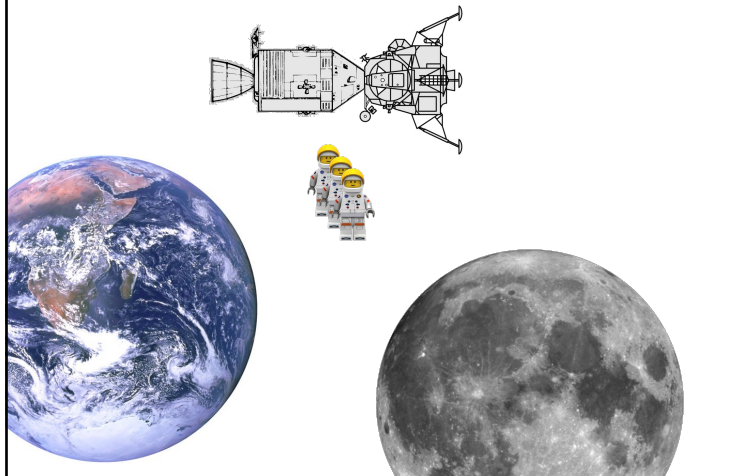


The Mission

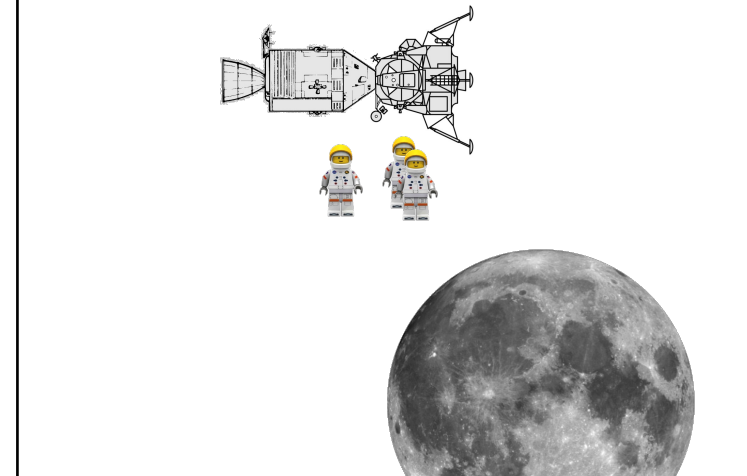
The mission ...

... as it was supposed to happen

Planned Moon Landing

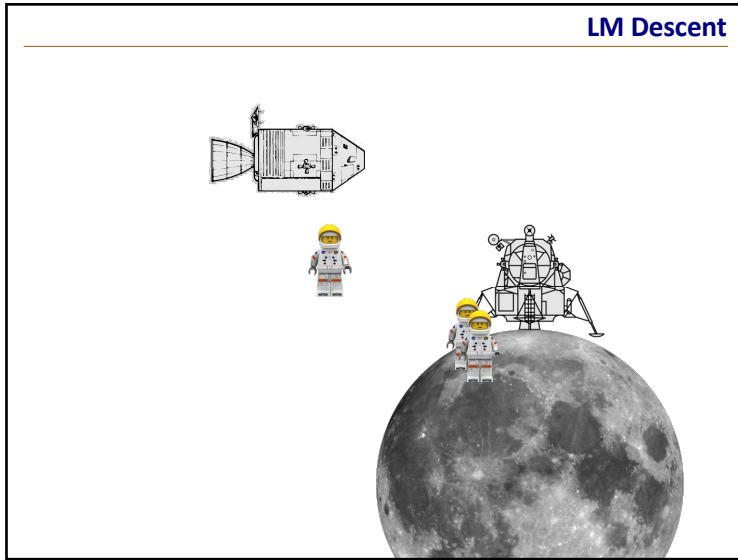


Crew Transfer to LM

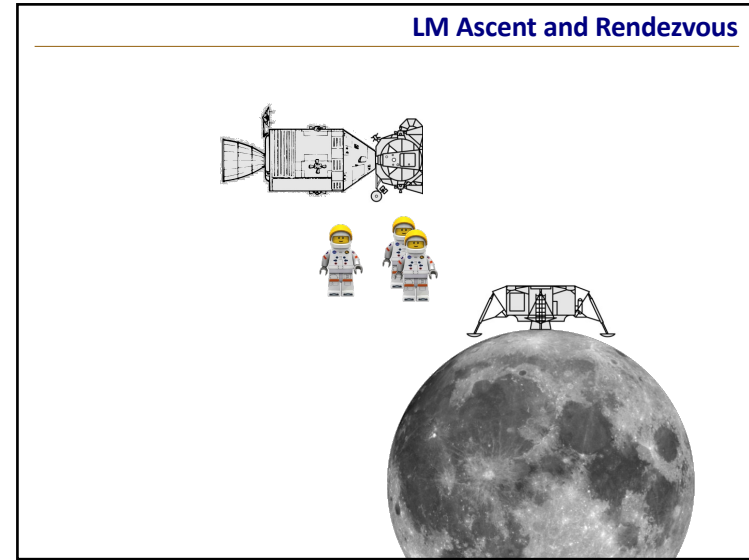


Apollo 13

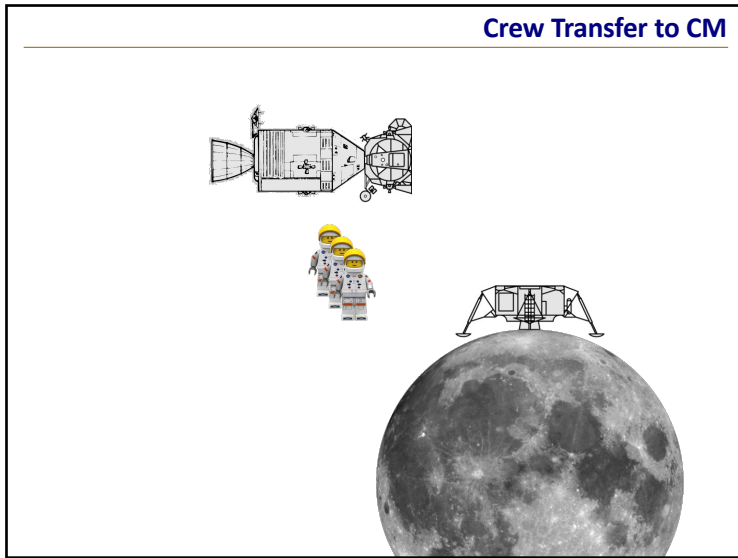
LM Descent



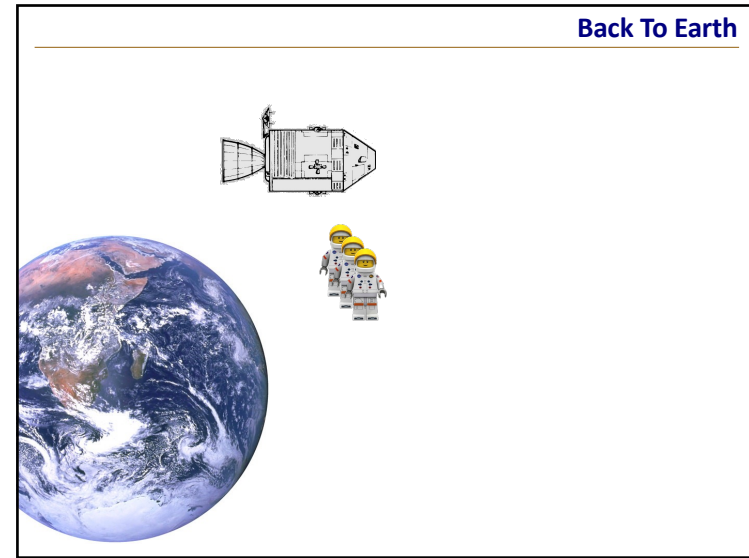
LM Ascent and Rendezvous



Crew Transfer to CM

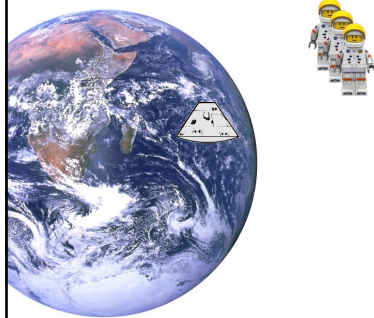


Back To Earth



Apollo 13

Splashdown

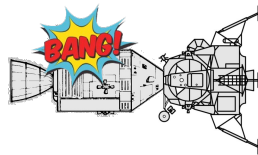


The Mission

The mission ...

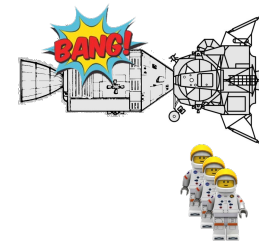
... as it actually happened

Houston, We've Had a Problem



A fan inside one of the oxygen tanks had faulty wiring insulation, so when the tank was stirred a spark caused the oxygen tank to explode, damaging the fuel cells and blowing out a side panel of the SM.

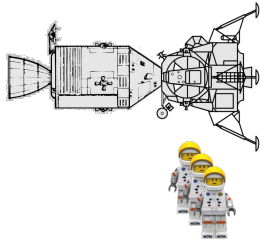
Into the LM Lifeboat



Contingency plans for a three-day flight returning from the Moon with a crippled CSM had been thought about, but Apollo 13 was at least four days from Earth.

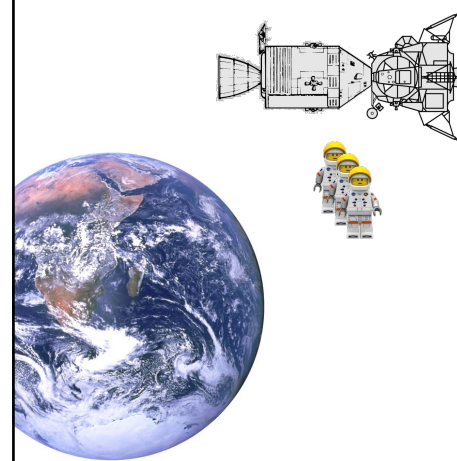
Apollo 13

Survival Mode

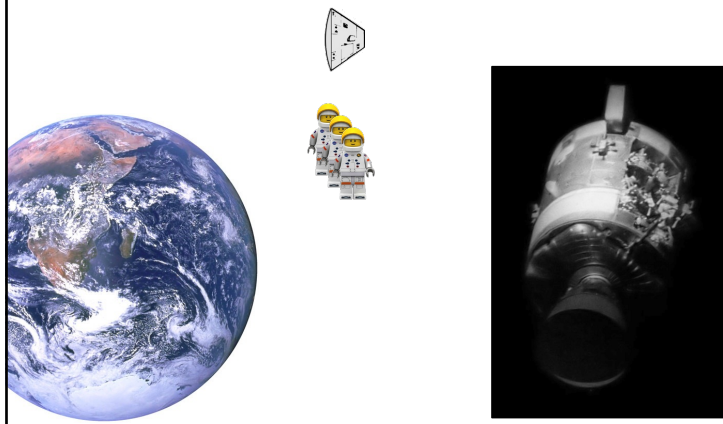


How could they ensure that the remaining oxygen, water and electrical power would last long enough to get them home safely?

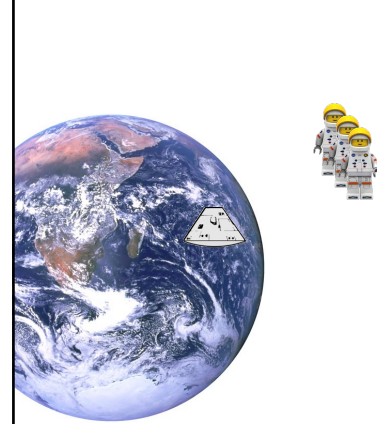
Crew Transfer to CM



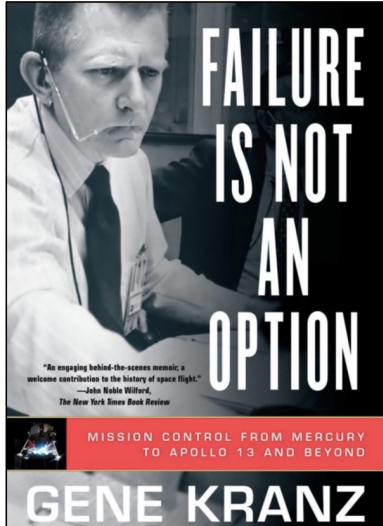
SM and LM Jettisoned



Splashdown




Apollo 13



Gene Kranz

That famous phrase was spoken by actor Ed Harris but not by Kranz himself.

However, Kranz used it for his autobiography because it reflected so succinctly the attitude of those working in Mission Control.




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What Happened To ...?

The Command Module (call sign 'Odyssey') made it safely back to Earth with its three occupants.

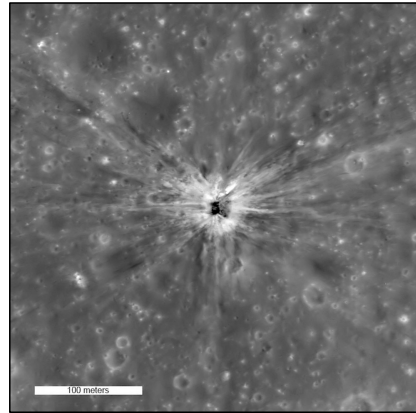
What about the rest of the Apollo hardware?


The third stage of the Saturn V rocket, after it had accelerated the CSM+LM spacecraft towards the Moon, was given one last task to perform ...



30

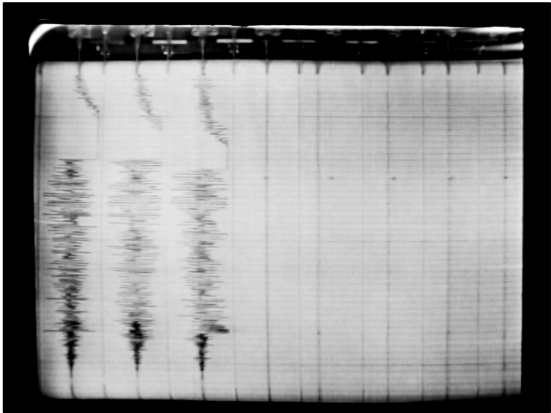
Saturn S-IVB Impact Site






31

Apollo 12 Seismometer





32

Apollo 13

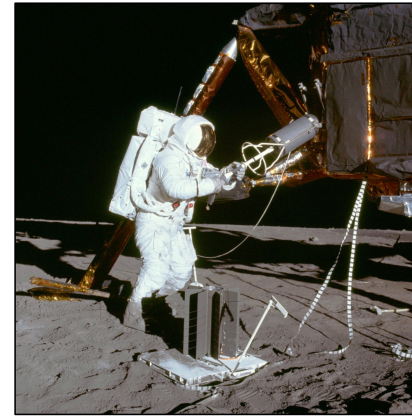
What Happened To Aquarius?

After the Lunar Module (call sign 'Aquarius') was jettisoned it re-entered the Earth's atmosphere and disintegrated.

However, it was important to ensure that its re-entry was controlled to ensure that any surviving components fell into the deepest Pacific trench.

In particular ...

Plutonium Power



Alan Bean (Apollo 12) removes the plutonium fuel cask from the LM to transfer it to the RTG in front of him that powers the experiments on the lunar surface.

RTG = Radioisotope
Thermoelectric
Generator

Jim Lovell and Tom Hanks



Read All About It!

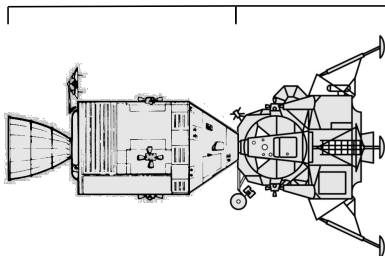


Apollo 13

Who Made What

Command and Service
Modules

Lunar
Module



North American Rockwell

Grumman Aerospace

Grumman Invoice To North American

GRUMMAN AIRCRAFT ENGINEERING CORPORATION PURCHASE REQUISITION									
A374979					North American Rock				
1	400,000	HT	Traveling, \$4.00 first mile, \$1.00 each additional mile						\$400,000.00
2	1	KM	Provisionally, first service						4.05
3	500	#	Provisionally, first service						200.00
4	1		Provisionally, first service						30.00
5			Provisionally, first service						30.00
6			Provisionally, first service						30.00
7			Provisionally, first service						30.00
Sub Total									\$400,368.05
20% commercial discount + 25 cash discount (net 30 days)									\$3,118.81
Total									\$397,249.24

Grumman Invoice To North American

GRUMMAN AIRCRAFT ENGINEERING CORPORATION PURCHASE REQUISITION									
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5			Provisionally, first service						30.00
6			Provisionally, first service						30.00
7			Provisionally, first service						30.00
Sub Total									\$400,368.05
20% commercial discount + 25 cash discount (net 30 days)									\$3,118.81
Total									\$397,249.24

Towing, \$4 first mile, \$1 each additional mile

Grumman Invoice To North American

GRUMMAN AIRCRAFT ENGINEERING CORPORATION PURCHASE REQUISITION									
A374979					North American Rock				
1	400,000	HT	Traveling, \$4.00 first mile, \$1.00 each additional mile						\$400,000.00
2	1	KM	Provisionally, first service						4.05
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5			Provisionally, first service						30.00
6			Provisionally, first service						30.00
7			Provisionally, first service						30.00
Sub Total									\$400,368.05
20% commercial discount + 25 cash discount (net 30 days)									\$3,118.81
Total									\$397,249.24

Sleeping accommodation for 2, no TV,
air conditioned, with radio, with view

Prepaid

Apollo 13

Grumman Invoice To North American

[illegible]

Additional guest in room at \$8/night



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Epilogue – Recovery of Odysseus



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Epilogue – NASA's Finest Hour



Duke, Lovell, Haise, Kranz, Lunney, Griffin, Brand, Lousma, Kerwin (2015)

APOLLO 13

www.liverpool.ac.uk/~sdb/Talks

Dr Steve Barrett
GSRC 6 Dec 2023