



# My Life as a NASA Test Subject

Joe McMann ■ January 2018 ■ Rev. October 14, 2021

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Graduated in 1959 with BS in Chemical Engineering from Univ. of Notre Dame



1959-1961: Application Engineer for Liquid Carbonic, Chicago, IL



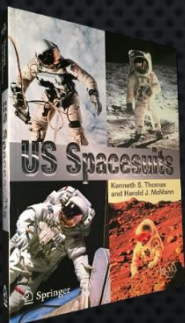
1961-1997: Project Engineer, and manager with NASA JSC - associated with environmental control systems and space suit systems-acted as test subject, real-time support engineer, subsystems manager, technical manager



1997-2002: Technical Specialist for Hamilton-Sundstrand - associated with space suit failure resolution - development of urine measurement system - teaching failure recovery planning - mentoring



2002 - present: Consultant to NASA and industry - co-authored "US Spacesuits" with Ken Thomas, formerly with Hamilton Sundstrand - participant in JSC Spacesuit System Knowledge Capture initiative - acted as consultant to Spacesuit Water Intrusion Mishap Investigation Board - NASA Engineering and Safety Center representative - Consultant on new spacesuit development

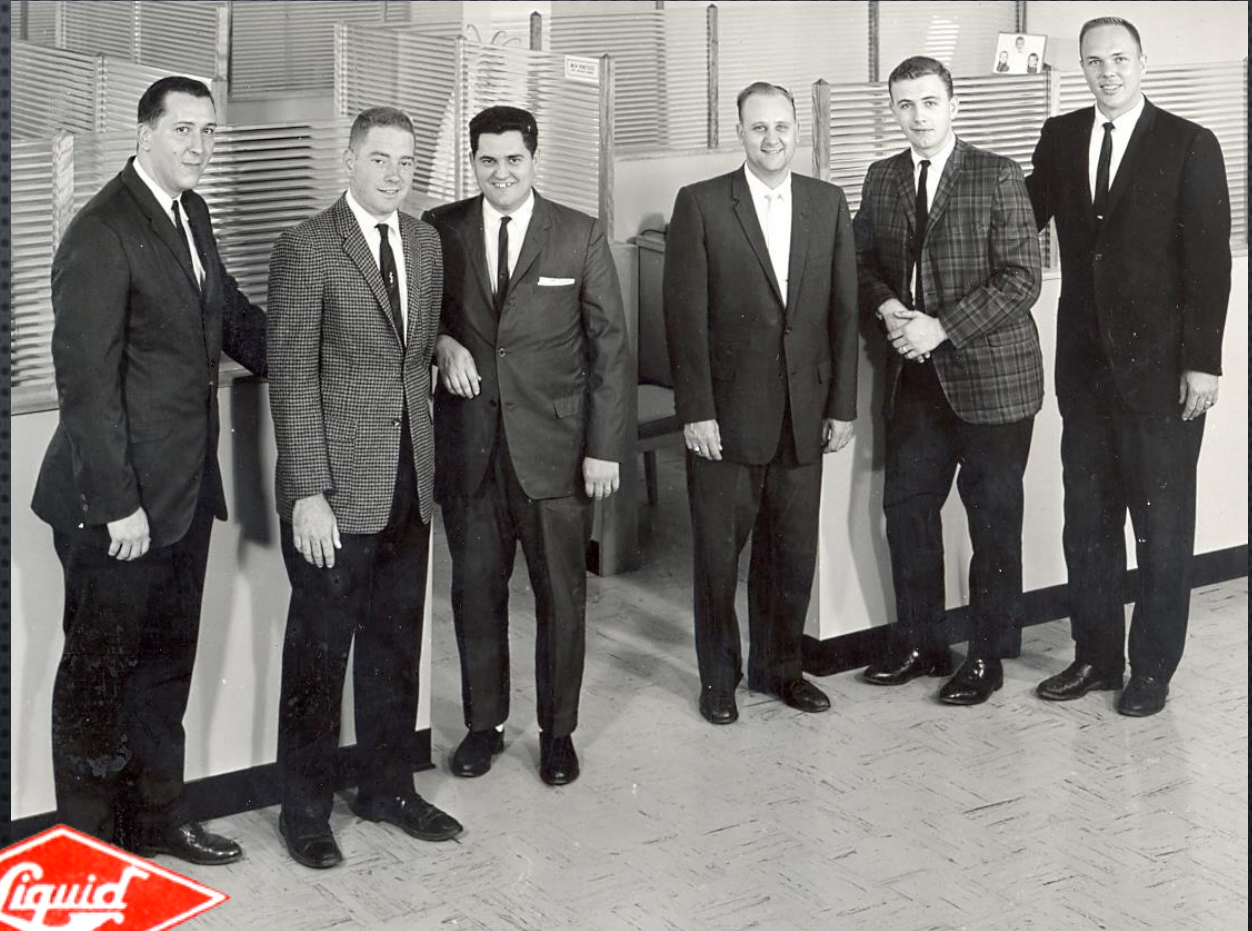


Most memorable EVA-related achievement: Was test subject for every EVA system for which he had responsibility: Gemini, Skylab and Shuttle/International Space Station (ISS) EVA Space Suit Life Support Systems

# My Path to NASA...

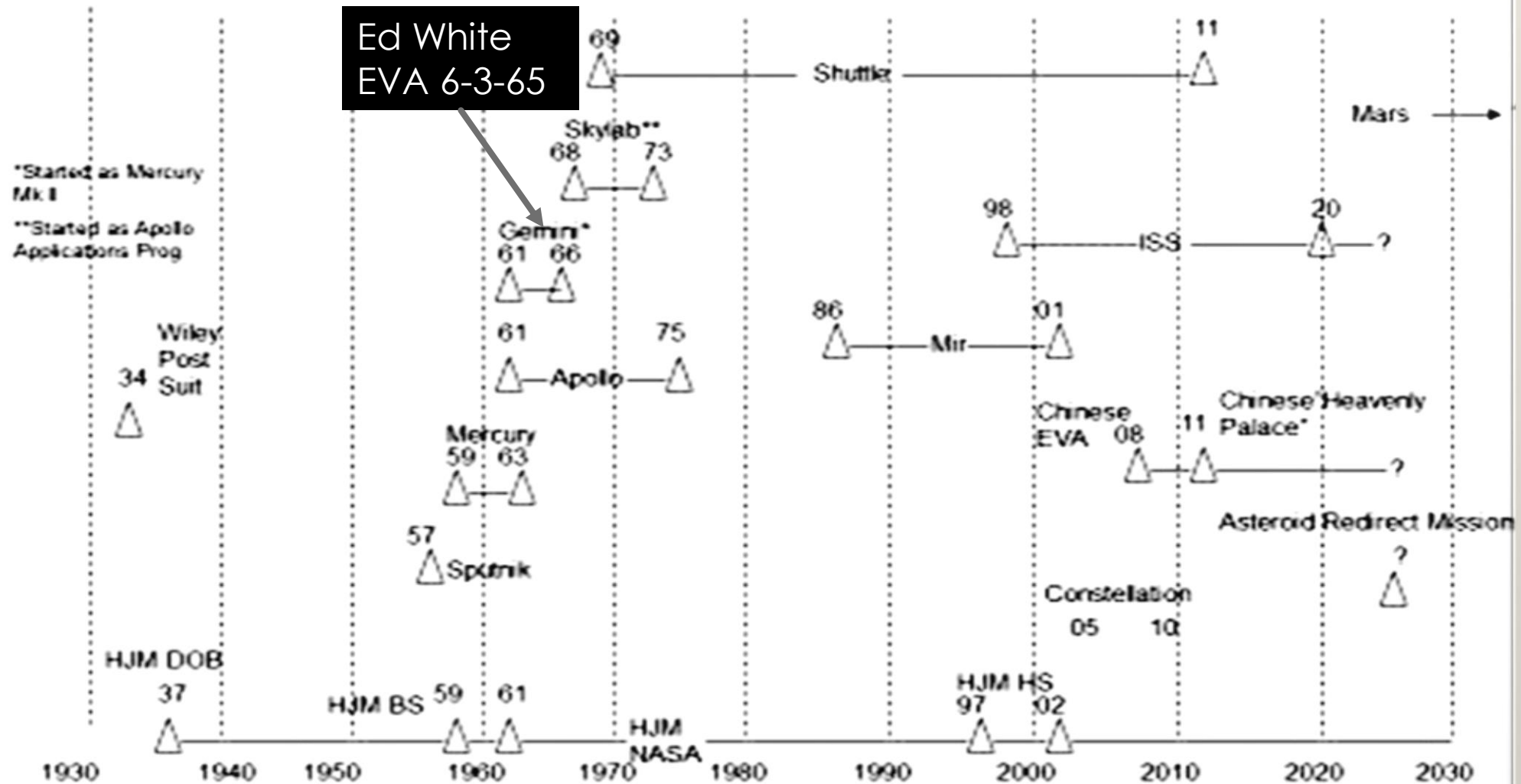


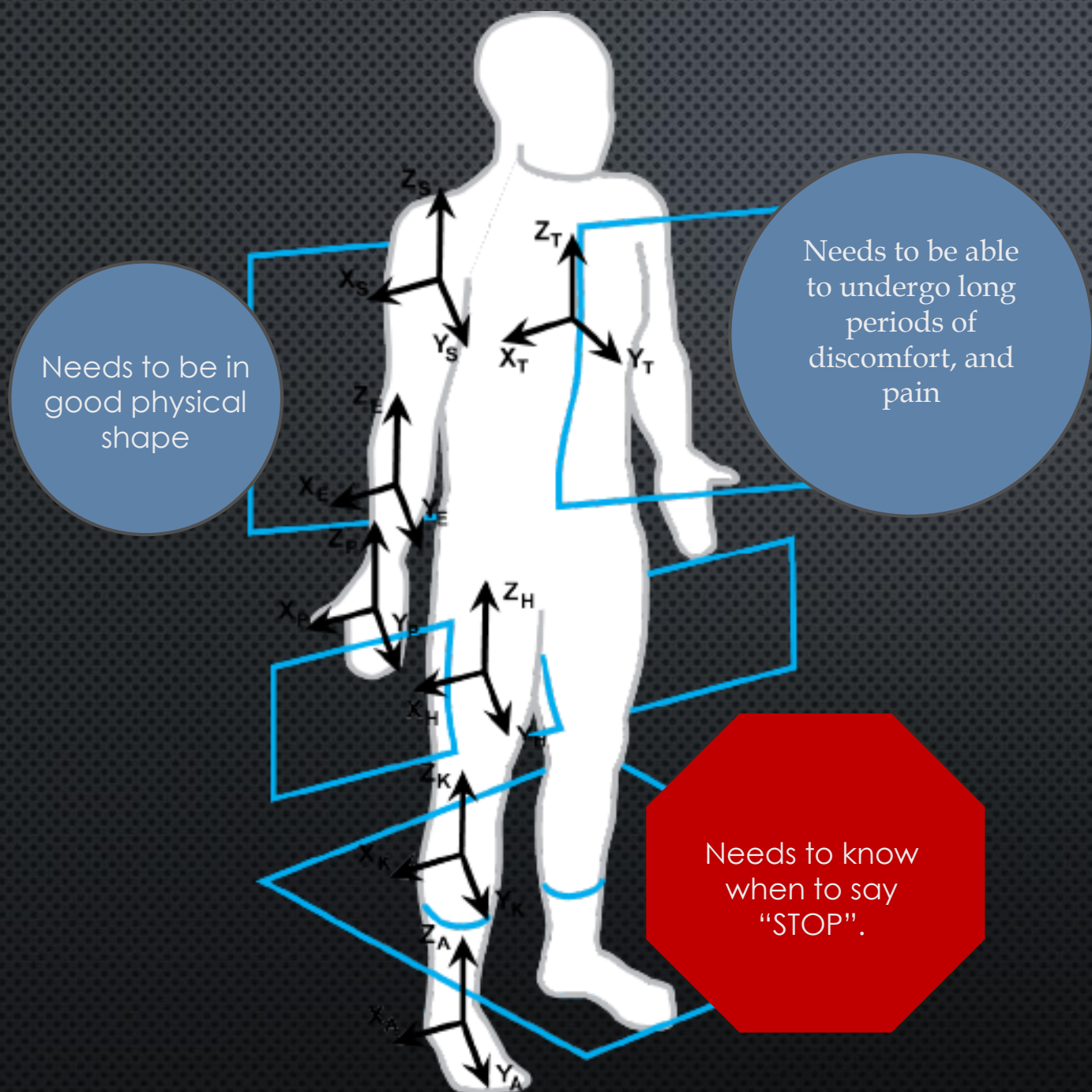
1950



1960 – at Liquid Carbonic

# A Brief History of Human Space Programs Rev. B





Needs to be in good physical shape

Needs to be able to undergo long periods of discomfort, and pain

Needs to know when to say "STOP".

## What is a NASA test subject?

Someone who acts in place of an astronaut

- Tries out the item or activity first
- Helps identify and correct problems before the crew sees them

*Wait a  
Minute...*

*Are Only  
Humans  
Allowed to be  
NASA Test  
Subjects?*



*(he's the one in the middle)*

- Before Mercury, US and Russia launched animal subjects such as monkeys, mice, dogs and fruit flies
- Laika, a Russian dog was launched on a one-way trip onboard Sputnik 2 in November 1957 – she died in orbit
- In January 1961, 71 days before Yuri Gagarin's flight, a chimp named Ham made a suborbital flight for the US



## Not Every Proposed “Animal-naut” Made the Cut...

- NASA, in its biomedical wisdom, decided that a pig would be a suitable test subject
  - They have the same thoracic and abdominal organs as humans
  - Pig valves have been used in humans for 30 years
- Accordingly, a porcine-compatible capsule was designed, and a sketch is shown on the following slide

## Pig-a-naut Saga...

- NASA went to a farmer, and purchased a pig
- They then proceeded to instrument the pig and place it in a specially designed couch
- They gleefully instrumented the pig and started to gather data
- The pig promptly died
- Incensed, NASA returned to the farmer and said that he had sold them a defective pig
- He denied this, and asked them exactly what they had done, and they explained

*You sold us  
a defective  
pig.*

*What did you  
do to the  
poor pig?*



## A Pig's Gotta Know His Limitations....

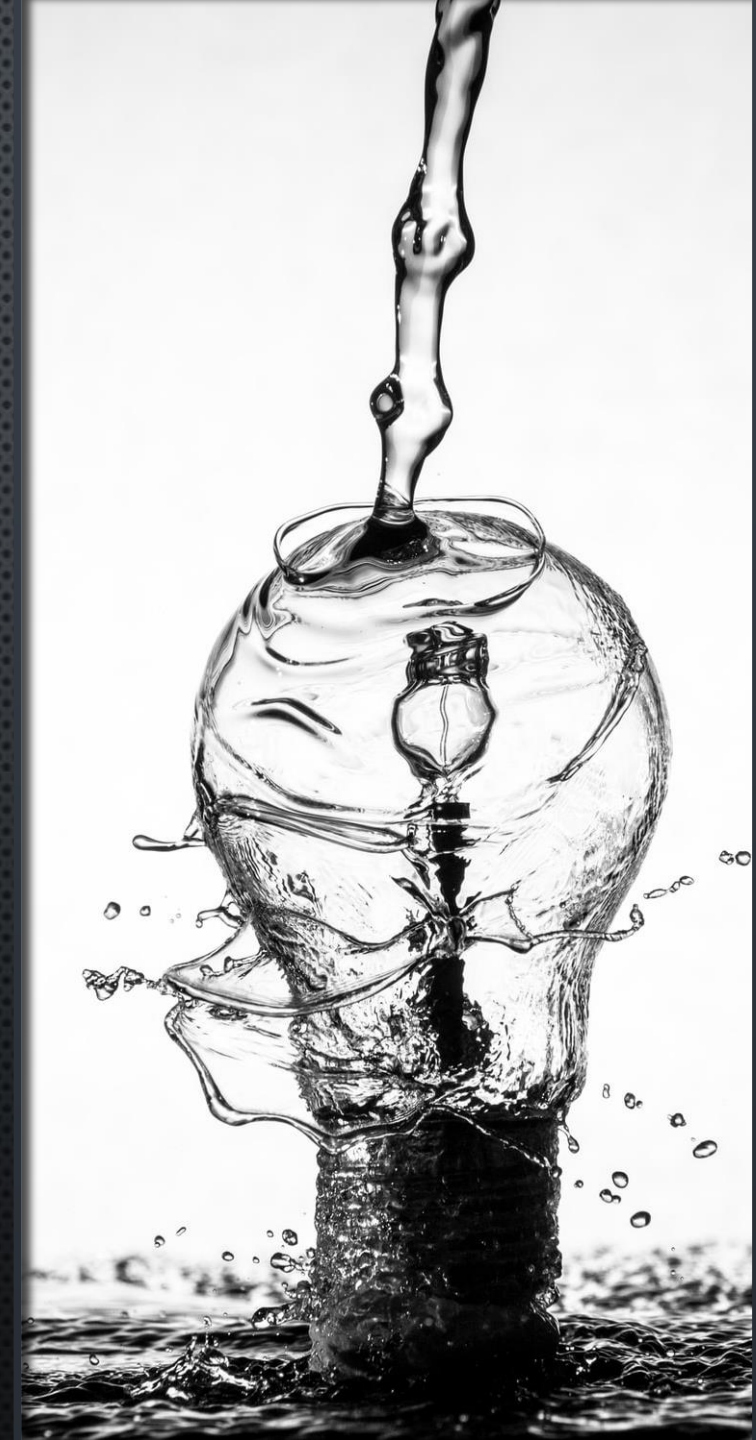
*\* I can't find corroboration of this, but  
I know that we never flew a pig!*

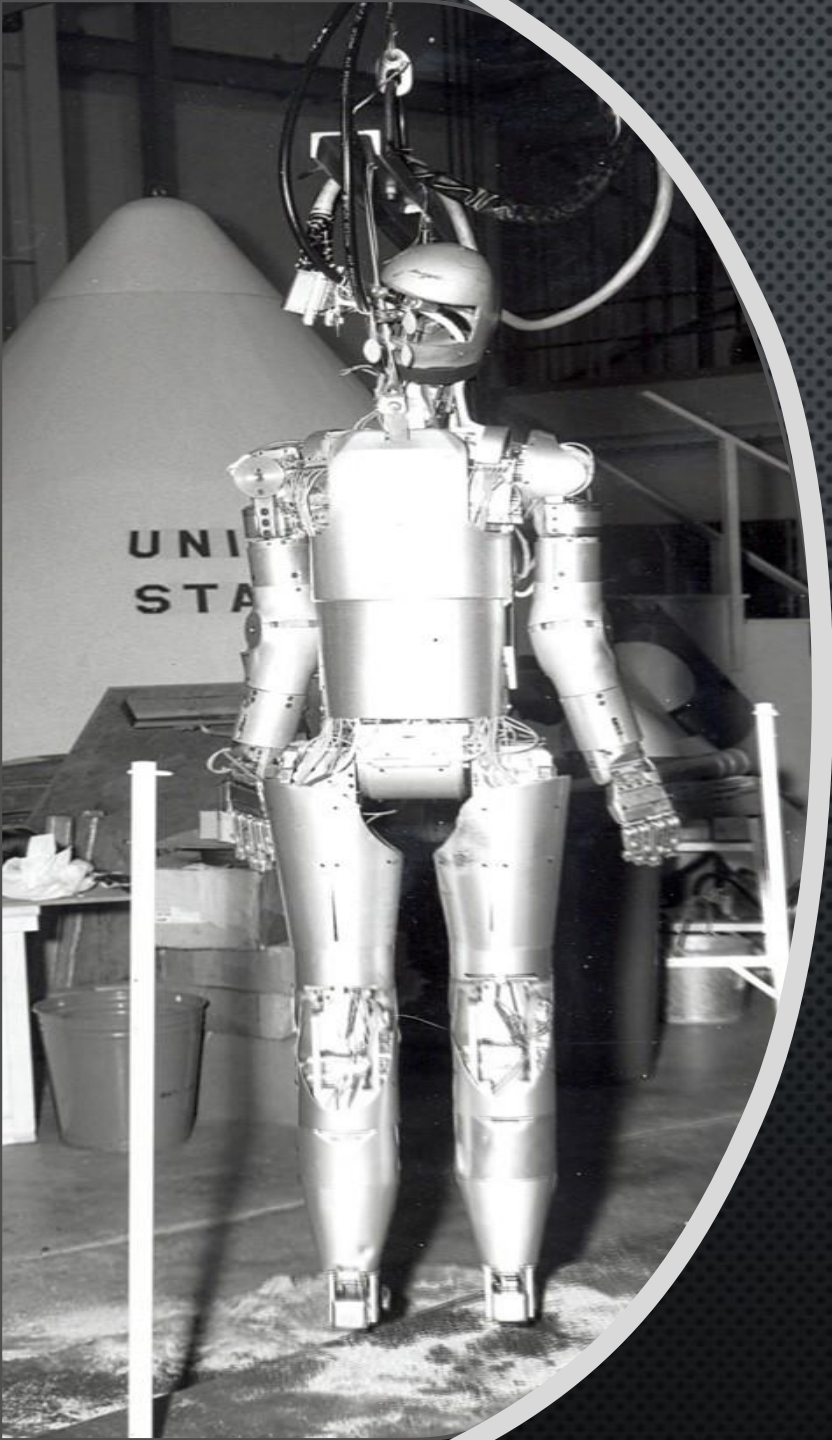
The Farmer replied...

***You dummies! You  
can't put a pig on  
his back for a  
prolonged time  
'cause he'll  
suffocate!''\****

# How About Non-living Test Subjects?

- Testing of spacesuits' mobility and dexterity by humans turns out to be largely subjective
  - Some subjects find tasks easy to do; others have more difficulty
  - A NASA manager decided that he would pursue a more quantitative approach
  - A contract was let to produce an articulated dummy, which would have the capability to give accurate force measurements
- The following slide shows the resulting product – an electro-hydraulically-operated robotic, anthropomorphic “dummy”





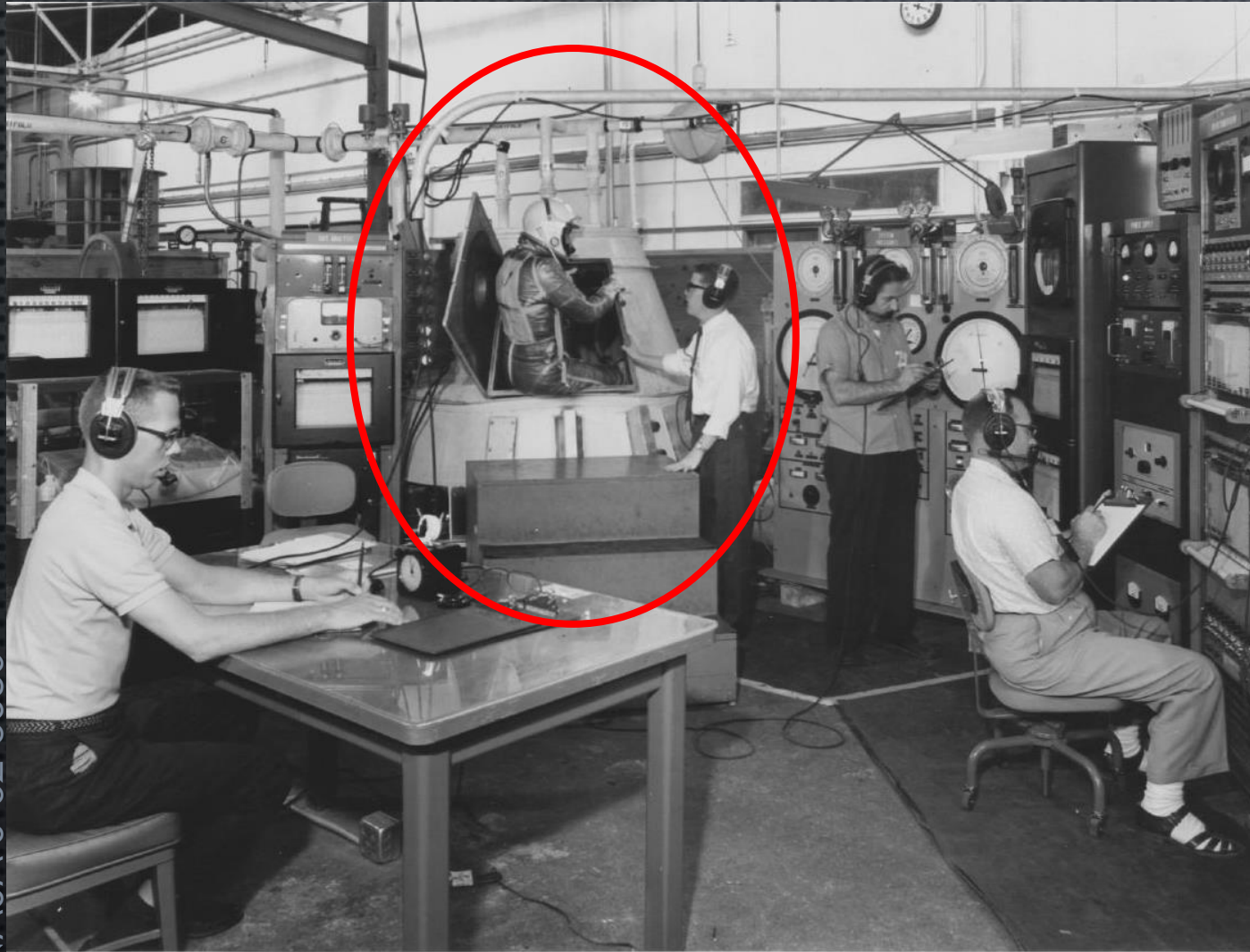
## Articulated Dummy...1965

- Dummy controlled from console, not shown
- Sawdust sopping up leaking hydraulic fluid

# Sounded Like a Good Idea at the Time....

- There were two major problems:
  - When the operator told the dummy to raise an arm, it raised a leg
  - When the operator told the dummy to raise a leg, it raised an arm
  - Hydraulic fluid leaked all over the place
    - This would ruin the spacesuit test articles
- It was decided to live with human evaluators

# The Move to Houston - 1962



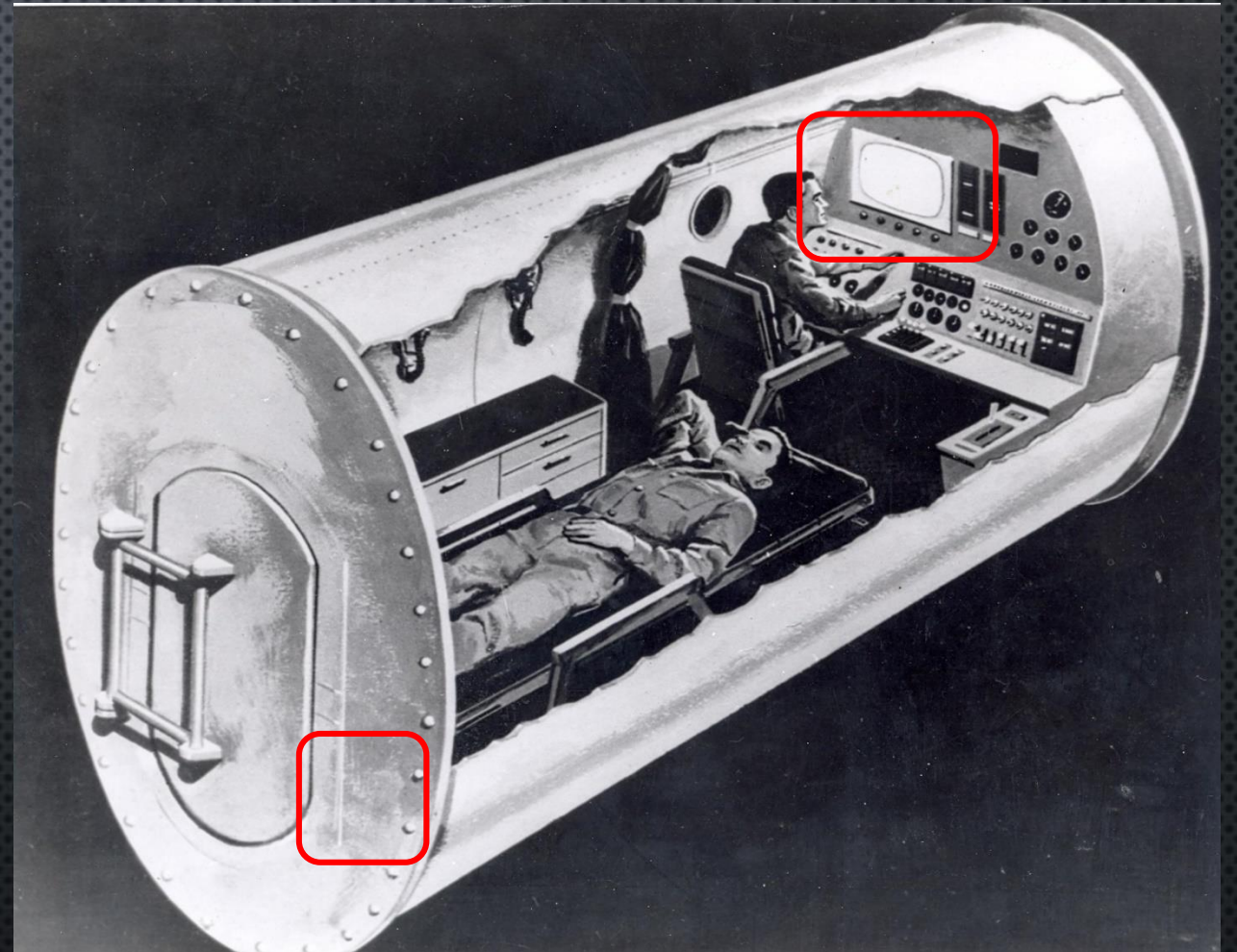
Mercury test capsule



The Lane-Wells Building – one of 17 occupied by NASA throughout Houston before the Johnson Space Center was opened in 1964

“Psychomotor” panel

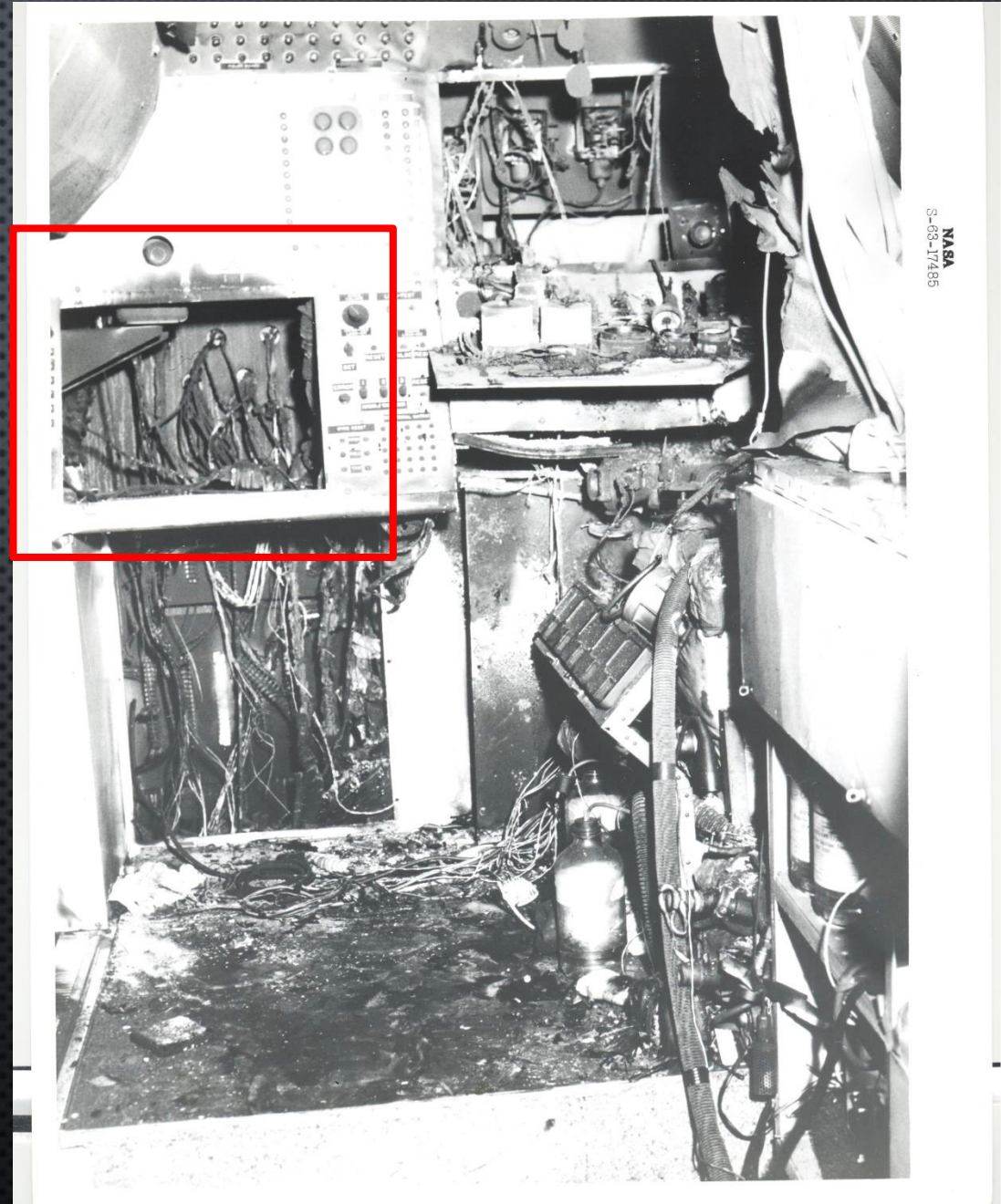
Altitude chamber at  
Brooks AFB, San  
Antonio - 1962



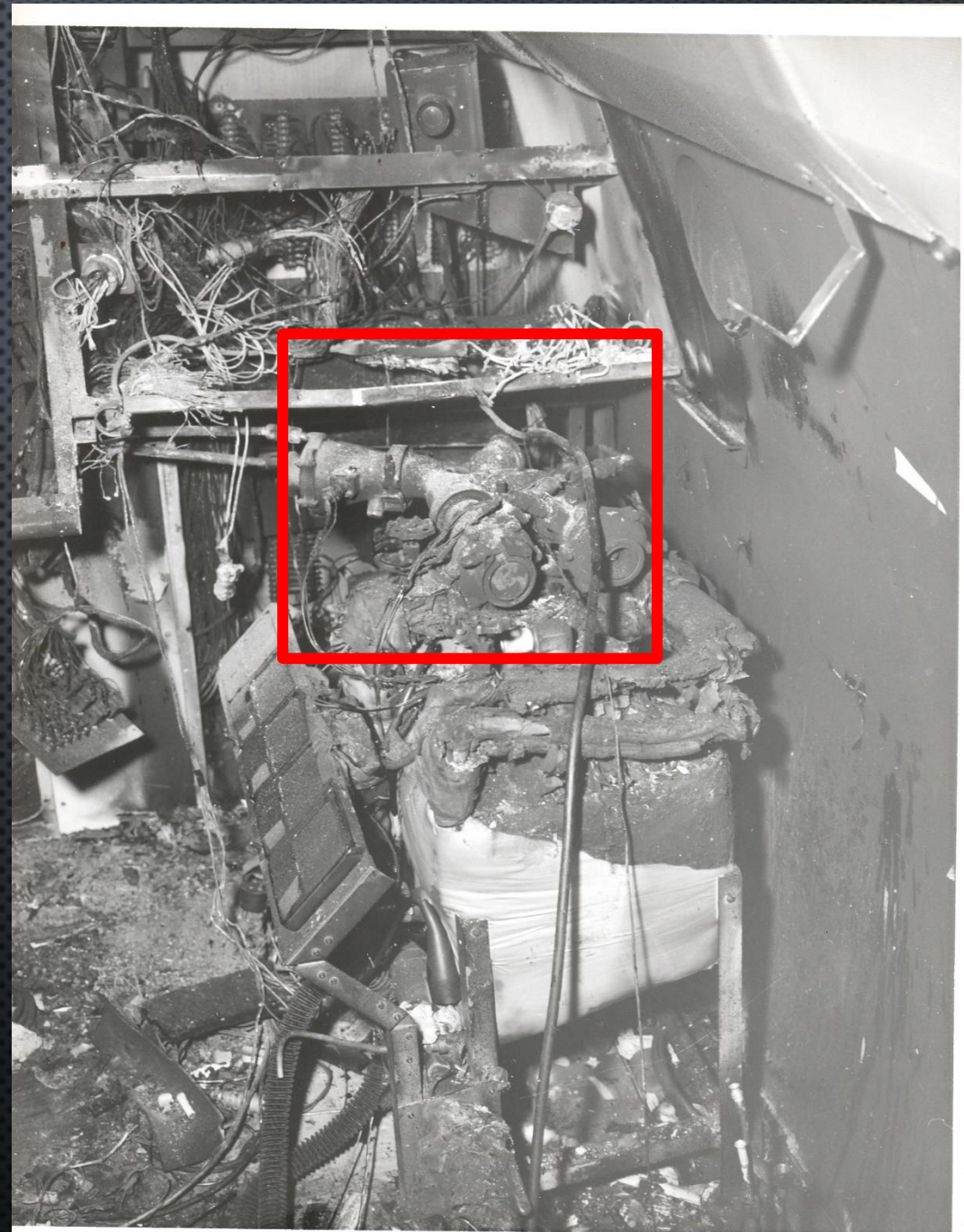
Port for attaching “torpedo tube”  
to insert food, etc.

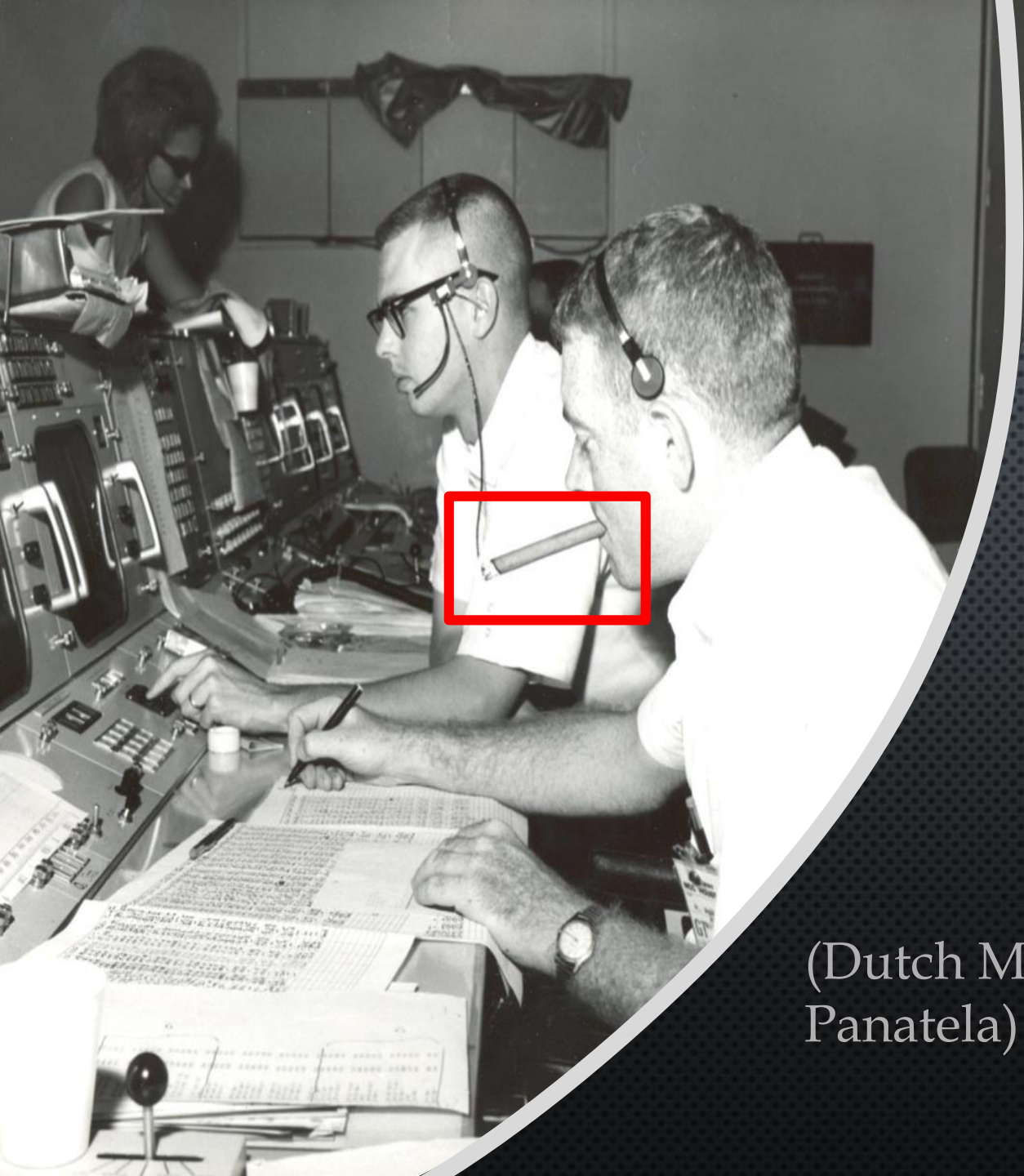
Flash fire on Sept. 9, 1962  
(day 13 of 14-day test in 5  
psia pure oxygen)

Fire started in psychomotor panel  
and resulted in smoke inhalation  
and temporary lung damage to  
two Air Force test subjects in  
partial-don suits



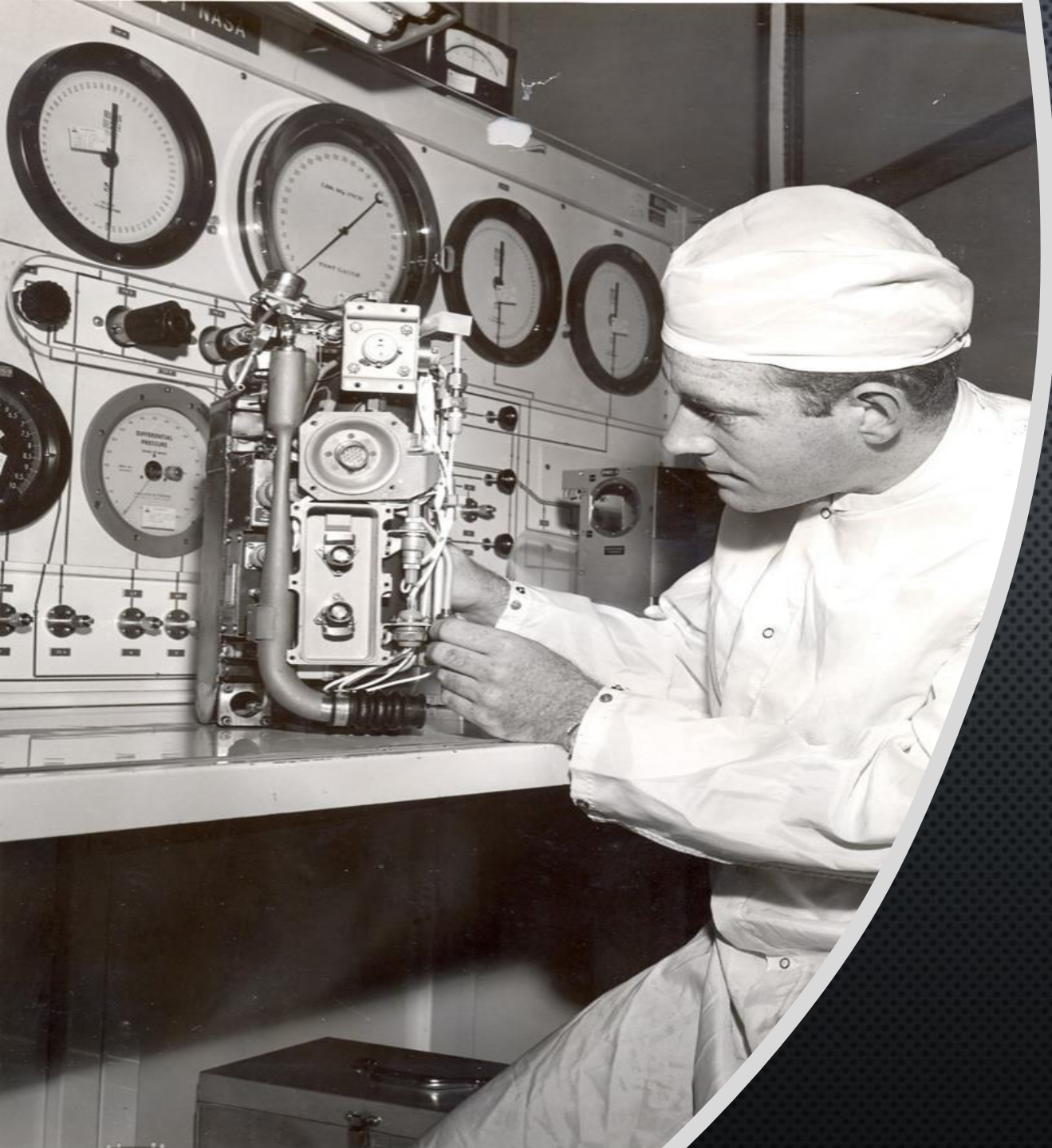
Four Project Mercury suit ventilating compressors furnished by NASA and used to ventilate the two test subjects





Gemini Mission  
Control Staff  
Support Room –  
1965

(Dutch Masters  
Panatela)



With Gemini  
Extravehicular Life  
Support System (ELSS)  
chestpack - 1966  
This picture was  
staged - they were  
very nervous about  
letting me into the lab



Testing Early Apollo  
Suit on treadmill -  
1969  
Oxygen intake and  
carbon dioxide  
generation were  
measured to give a  
calculation of  
metabolic rate vs  
treadmill speed and  
heart rate

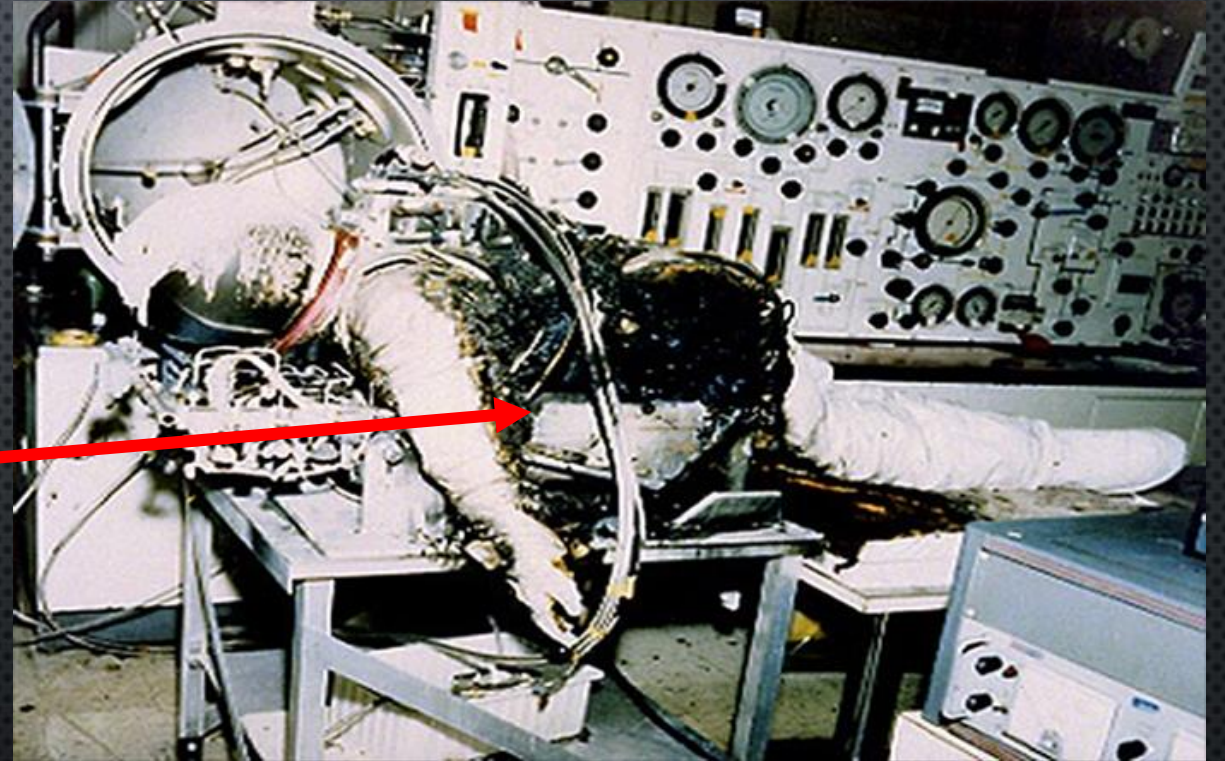
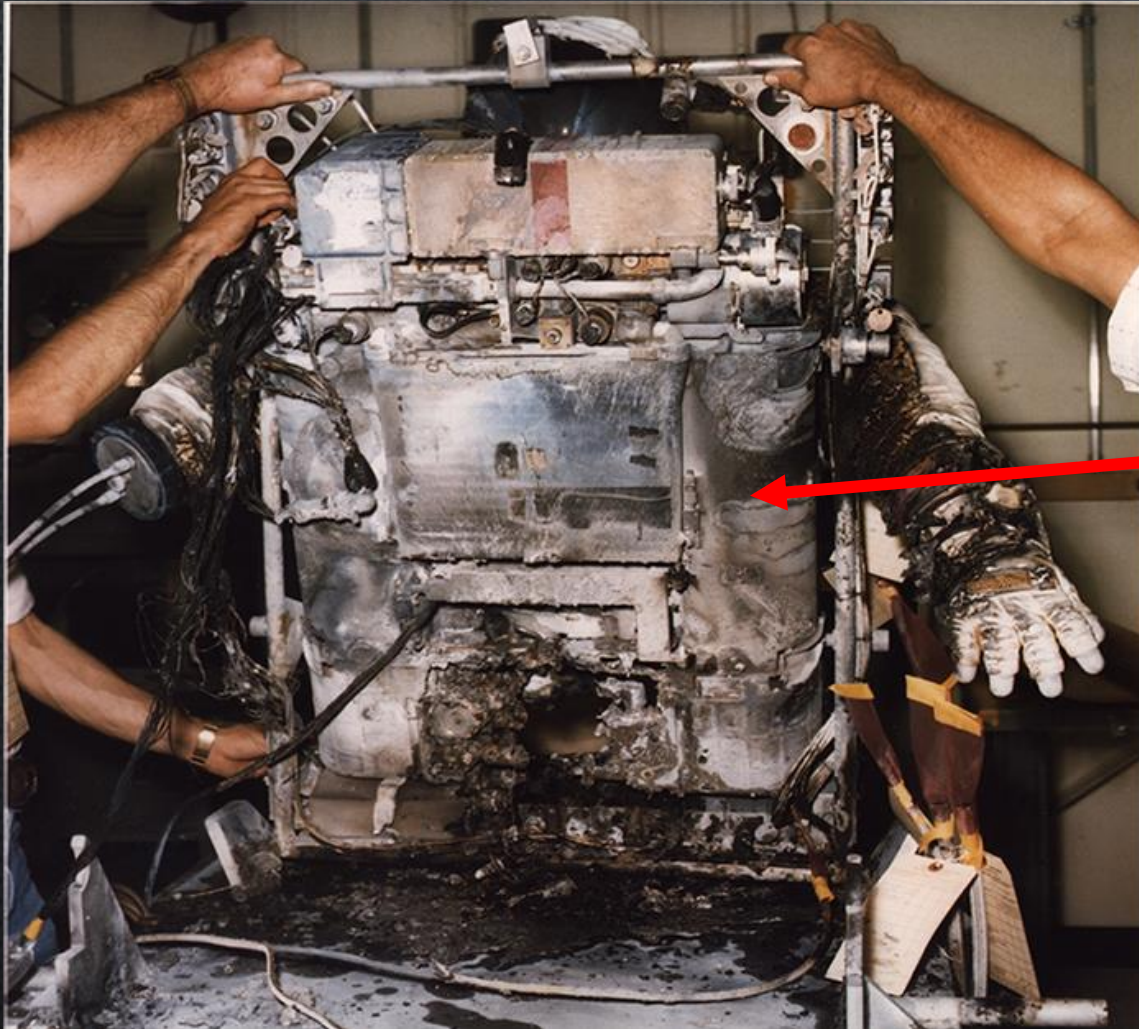


Evaluating early  
concept of Skylab  
Astronaut Life  
Support Assembly -  
1970



...staying in  
shape...taken after the  
Houston Marathon,  
January 1979

# Aftermath of Shuttle EMU fire – April 1980

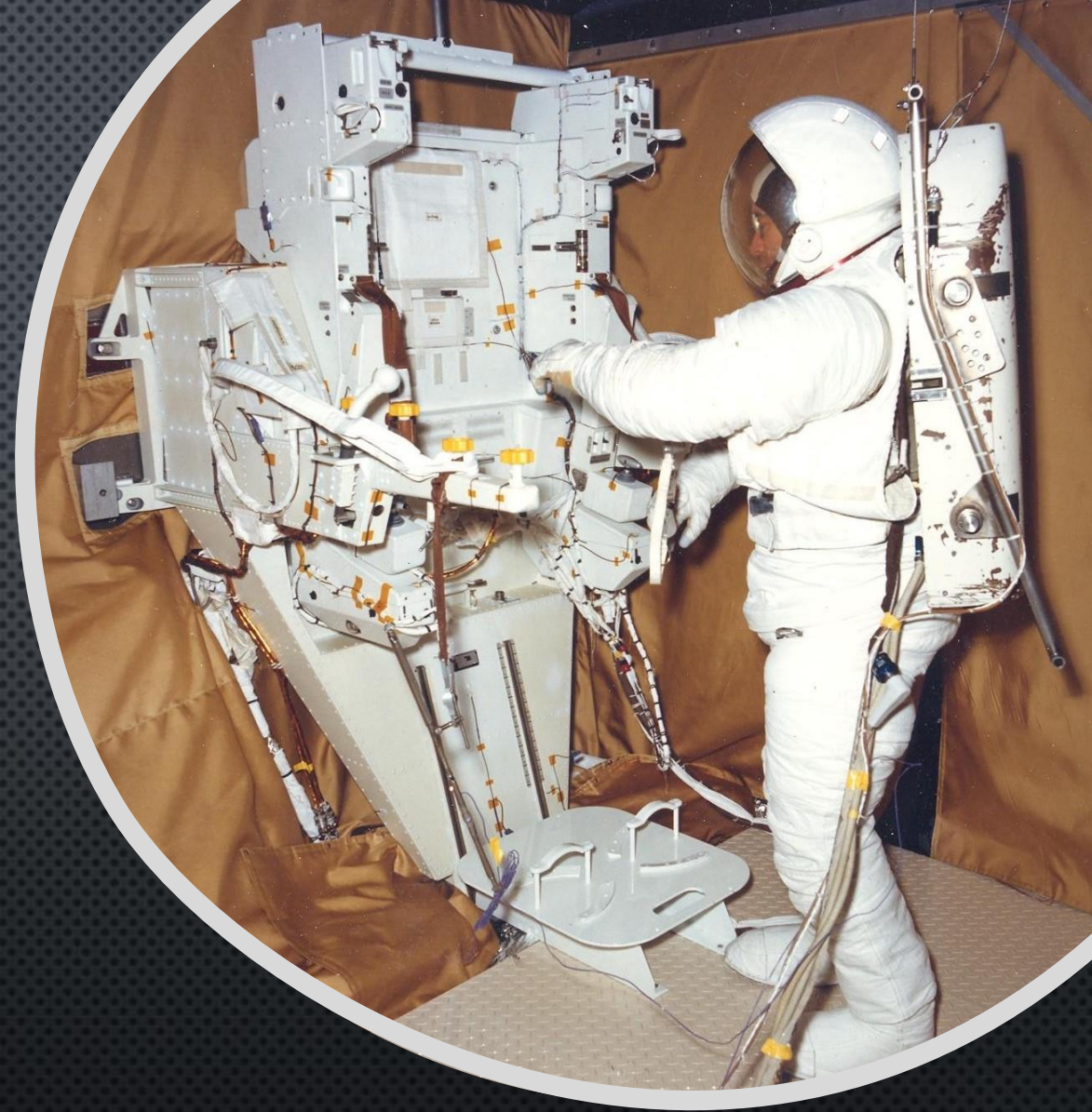


The next time that this system was to be used was for a manned test....I was the backup test subject



Preparing for  
thermal vacuum test  
of Shuttle  
Extravehicular  
Mobility Unit (EMU)  
- 1981

- Dry run for test with Manned Maneuvering Unit (MMU) in thermal vacuum chamber - ~1982
- The next day, I performed the test at vacuum





- Donning Russian Orlan Space Suit - ~2000
- The advanced suit that NASA is working on has a rear entry



Joe in the  
Orlan;  
Russian in the  
Shuttle EMU -  
~2000

# *Wrap-up...*

- Was test subject for about 18 years
- Tested every system for which I was the responsible engineer
- Got the “bends” (DCS) twice during testing to develop the pre-breathe protocol for Shuttle and used on ISS
- Tested in both simulated space cold and heat at vacuum
- Flew 0-G aircraft to evaluate systems
- Learned to never let them know I was having fun