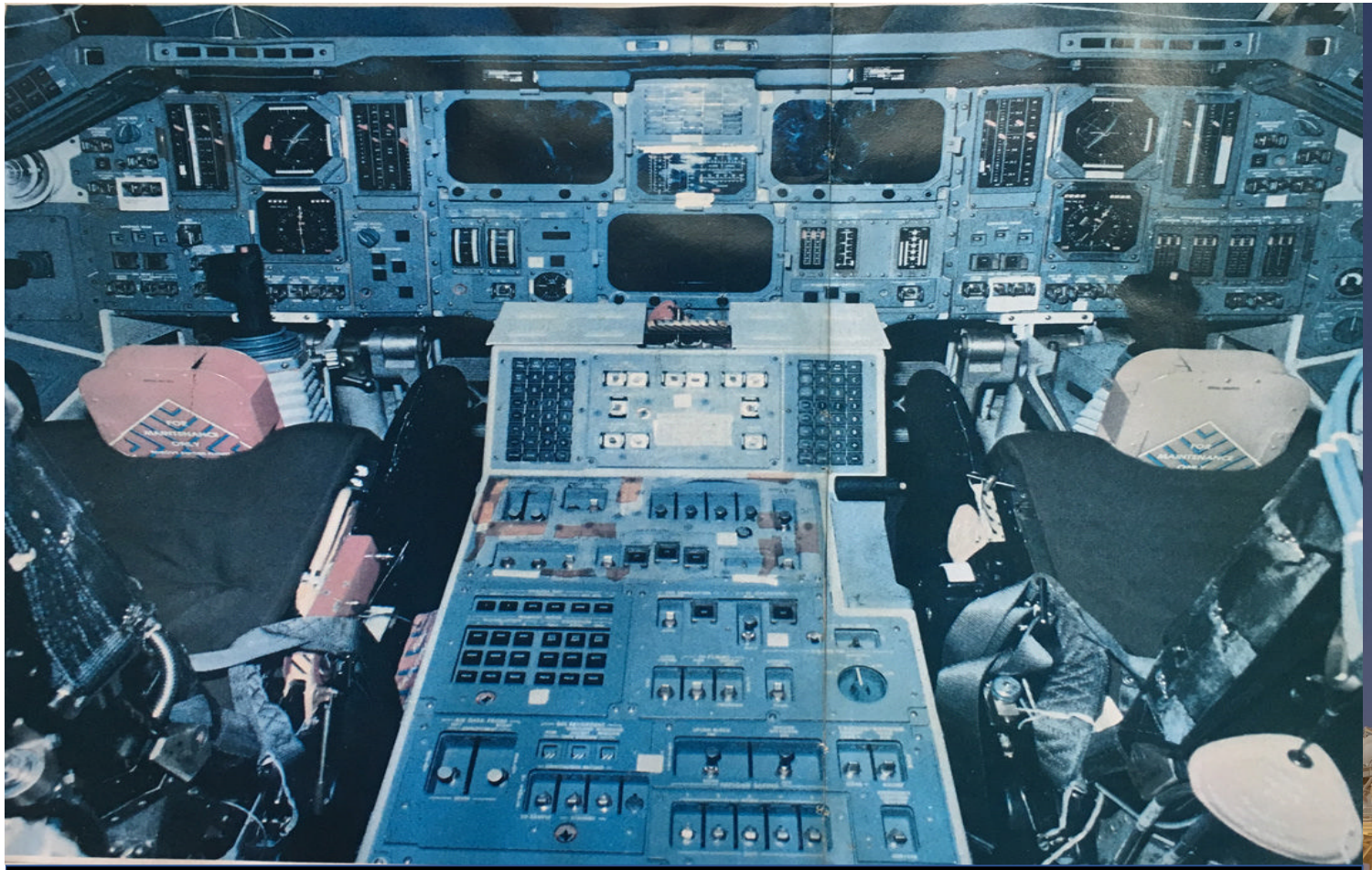
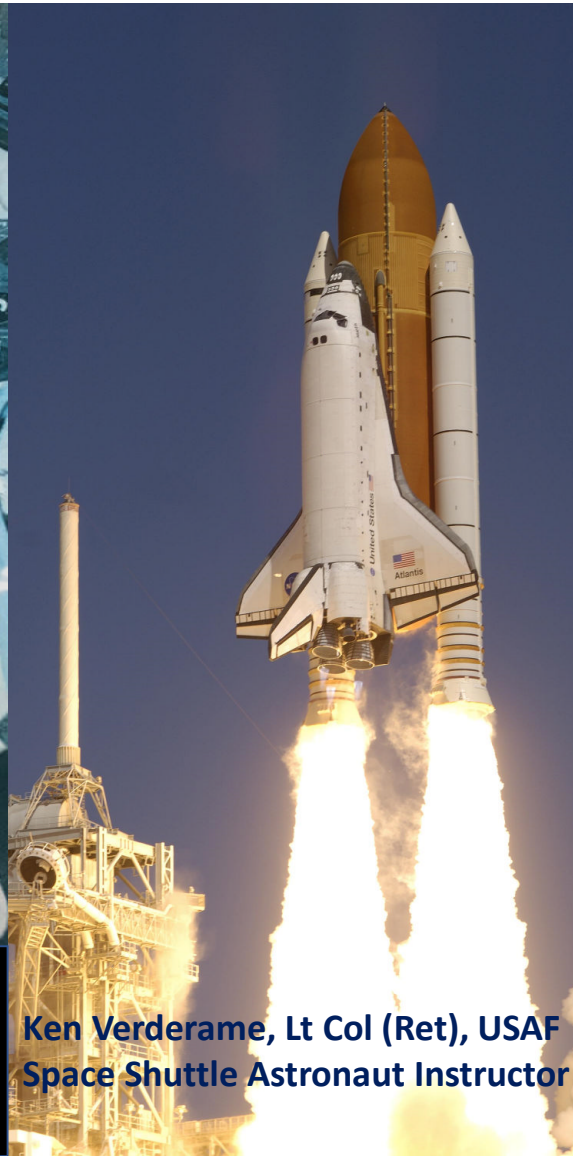


Let's Learn To Fly The Space Shuttle!



Ken Verderame, Lt Col (Ret), USAF
Space Shuttle Astronaut Instructor

Astronaut training in 3 phases

- Basic training
- Training pool
- Assigned crew

Basic Training

First year after being selected

Training Pool

One year after selection until flight assignment

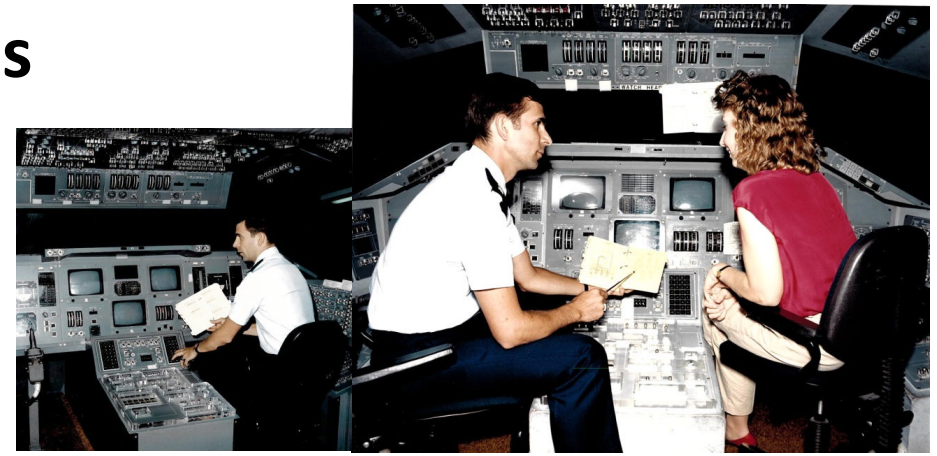
Specific Mission Training

Assigned as crew member to a specific mission

Training Methods

Lectures

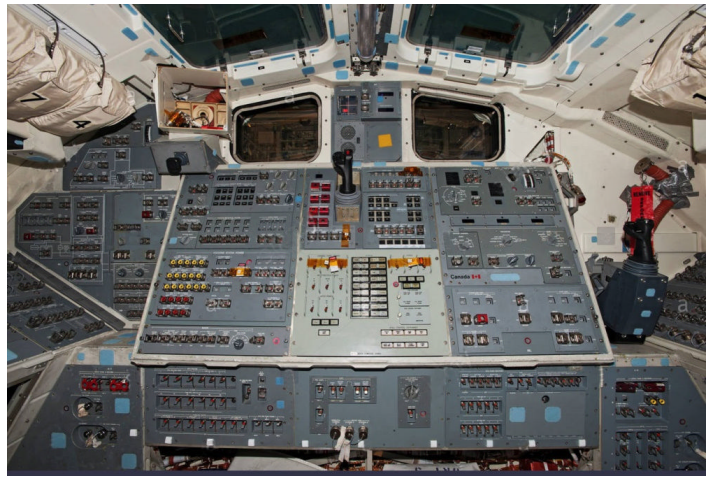
One-on-one
Single System Trainers



Simulators: 6 degrees of freedom motion based & fixed base

Motion base: primarily for ascent/entry training where high fidelity physiological flight training is required
Commanders/pilots/MS2

Fixed Base: primarily for on-orbit simulations where high fidelity rendezvous, payload and/or RMS training is required



Building 9A

Part Task Trainers

- Crew Compartment Trainer

- Full fuselage trainer
  - -- crew habitability training
  - -- Orbiter airlock operations
  - -- IFM/stowage procedures
  - -- Ingress/egress procedures

- RMS trainer
  - - - Specialized TV operations utilizing payload bay CCTV cameras
  - - - Orbiter remote manipulator system (RMS) training
  - - - CCTV training: payload deployment techniques training using the RMS

Flight Conditioning Trainers

T-38

- General flight environment conditioning (mission specialists) & travel transportation

KC-135 “Vomit Comet”

- Conditions crews for operating in a micro G environment & allows crews to test equipment for use in micro G

Shuttle Training Aircraft

(modified Gulfstream II)

- Trains Commanders & pilots to fly Orbiter approaches utilizing a modified aircraft with Orbiter hardware & software in the cockpit

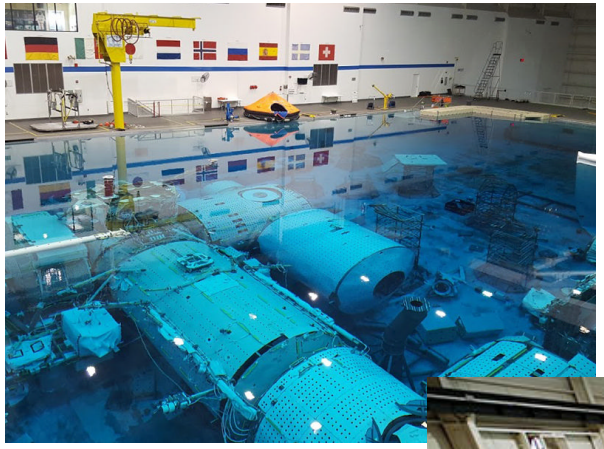
- Thrust reversers, direct-lift flaps & side-force generator

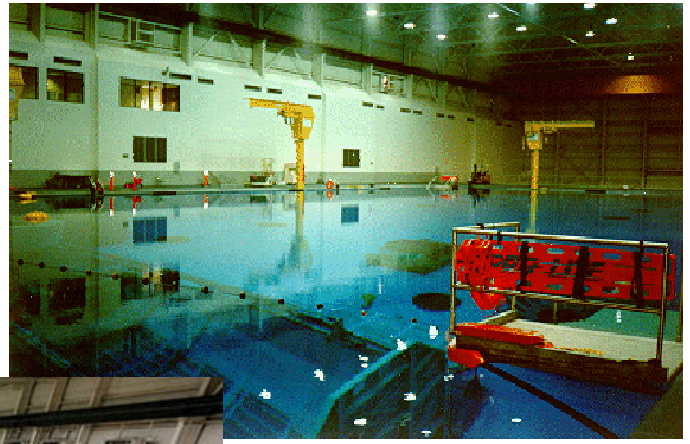
Crewmember Position Specific Training

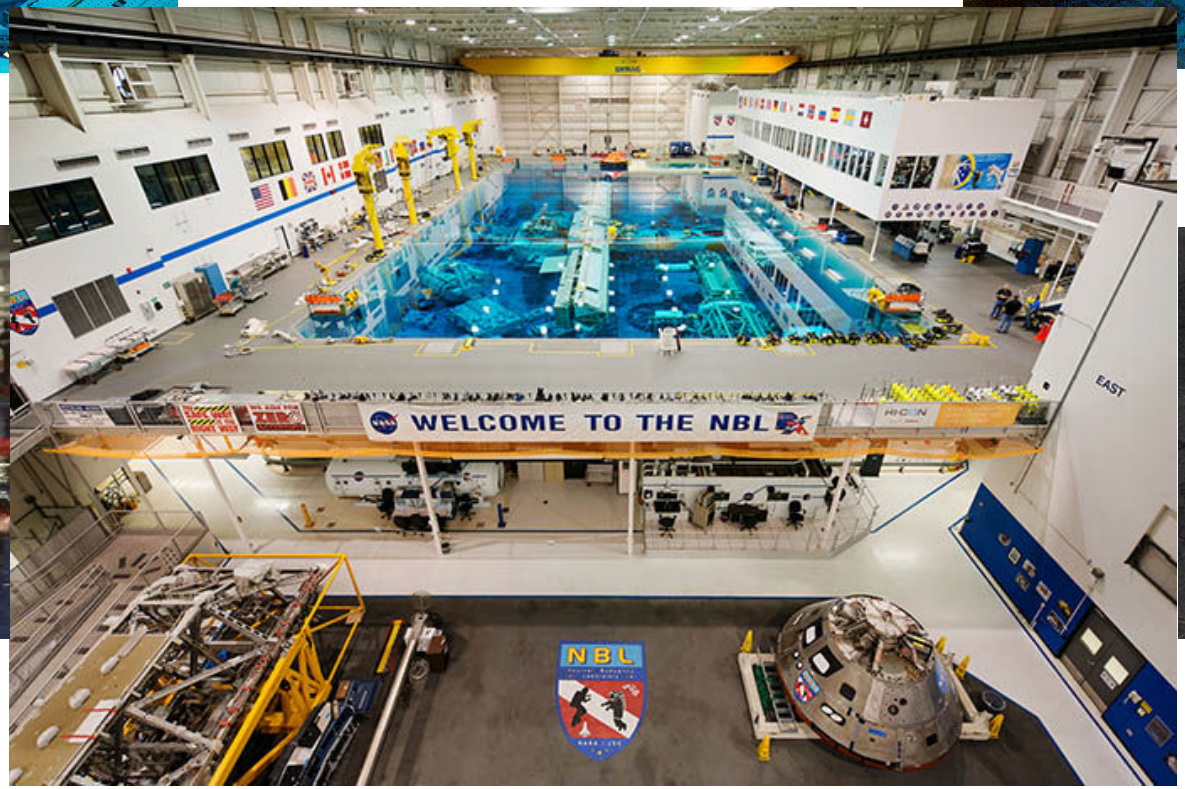
- Commanders, pilots/MS2: ascent & re-entry training
- -- SMS (both motion & fixed base)
- Mission Specialists: RMS/payload ops training/EVA training
  -- IG trainers
- Payload Specialists:
  -- Join the crew ~ 3 months before scheduled launch
  -- Receive basic Shuttle fam training & emergency egress training
  -- Practice executing their experiments in Shuttle environment

Neutral Buoyancy Lab

EVA Training







That’s me!

Astronaut Instructors

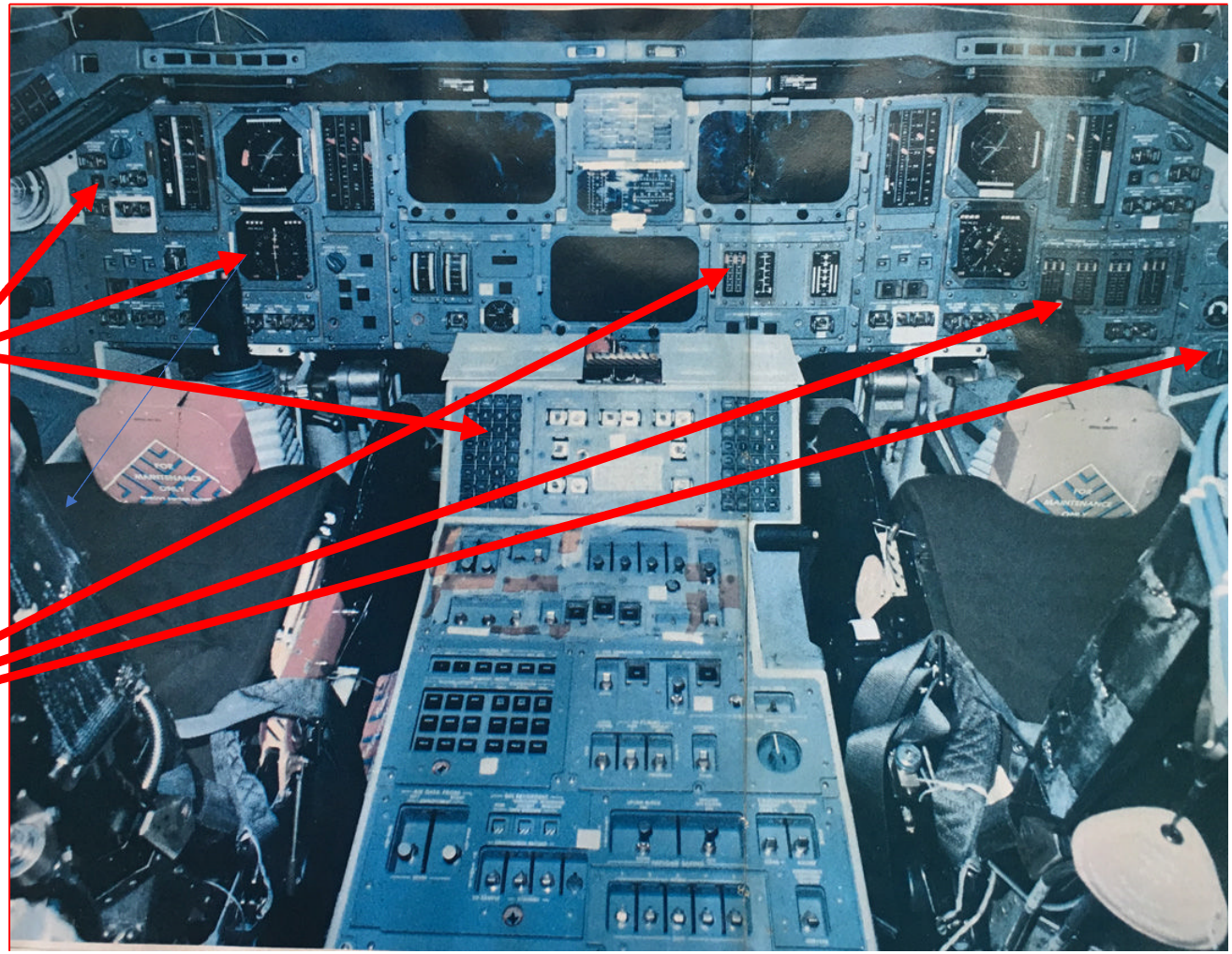
Instructors come in 3 disciplines

Data Processing System

-- 5 General Purpose Computers
-- Associated data buses/
-- NAVAIDS (MLS & TACANS)

Systems

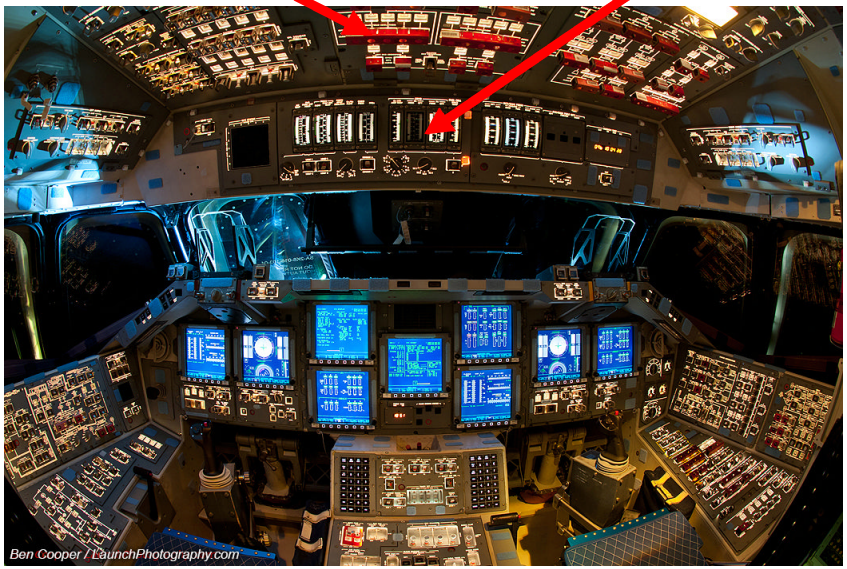
-- Electrical power
-- Hydraulics
-- APUs
-- Environmental



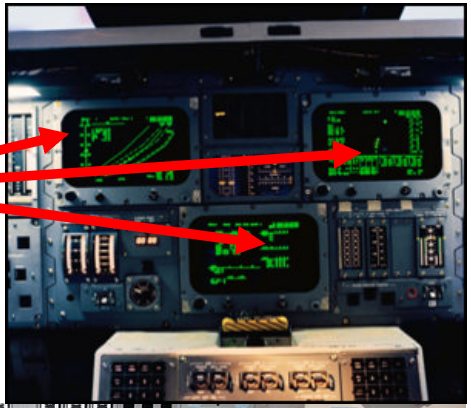
Flight Control/Propulsion

Orbital maneuvering system

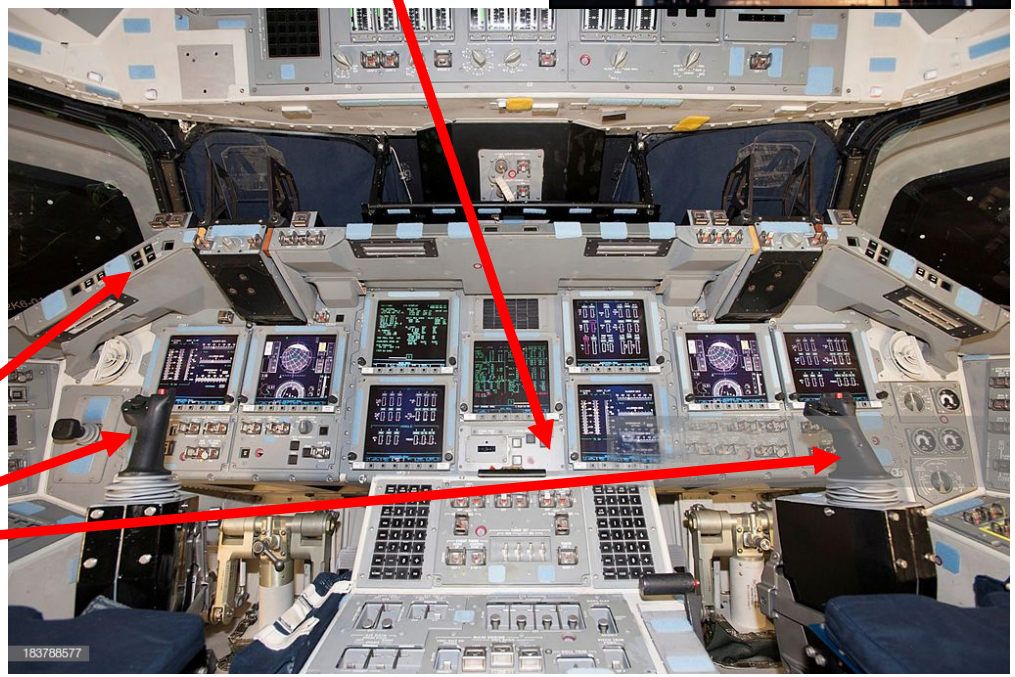
Reaction control system



Ascent/entry guidance



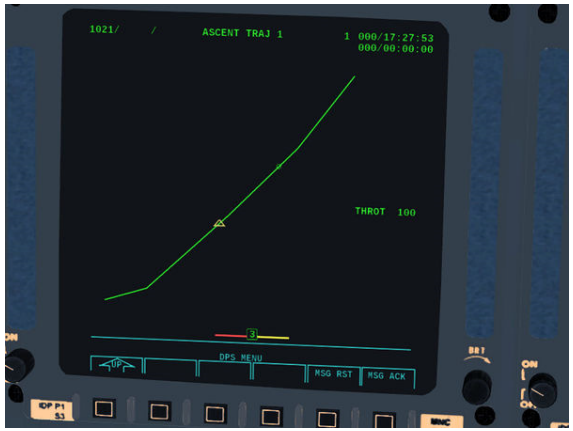
Main propulsion system



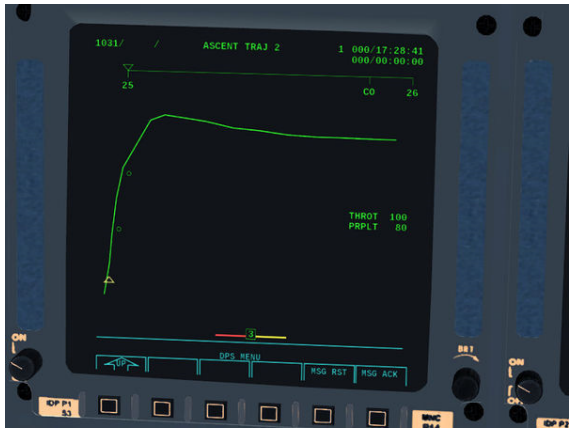
Flight controls (elevons/rudder/speedbrake

Manual flight techniques (ascent/entry)

Abort Training



Nominal ascent profile



4 intact abort modes

- -- RTLS - Return To Launch Site
- -- TAL – Transatlantic abort
- -- AOA – Abort once around
- -- ATO – Abort to orbit

Display during an RTLS abort

"Nominal" aborts flown on auto pilot

Commander takes over manual control at Mach 1 & 50,000'

HOWEVER …. All Commanders & Pilots spend a significant amount of time training to fly all 4 aborts MANUALLY

Astronaut Training Flow

Astronaut Selection

Basic Training

Training Pool

Flight Assignment

Shuttle Mission

Ken Verderame
STS-30
QUESTIONS ?
SPACE SHUTTLE
Ken Control/Prop