HIGH ALTITUDE OPERATIONS

FULFILLS PA.I.G, CA.I.G, AI.II.N/AI.II.O

Objective	
The student shall understand the relevant systems and aeromedical considerations when operating at high altitudes. The student shall become familiar with the regulations regarding high altitude operations.	
Instructor Actions	**Student Actions**
- Discuss the regulations regarding oxygen requirements - Highlight the types of oxygen and the difference of Aviator's Breathing Oxygen (ABO) - Discuss the operation of pressurization systems and possible failure modes - Provide high altitude resources to student	- Take notes and participate in instructor's discussion - Read resources from instructor - Research attending a high altitude chamber
Case Studies	**Equipment**
- Hypoxic Pilots in Learjet 25	- Additional resources - Computer - FAR/AIM - PHAK - White Board
Completion Standards	
The student shall explain the oxygen requirements at different altitudes and the operation of pressurization systems.	

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ELEMENTS

RESOURCES

FAA-S-ACS-6C Private Pilot ACS - Area I Task G
FAA-S-ACS-7B Commercial Pilot ACS - Area I Task G
FAA-S-ACS-25 CFI ACS - Area II Task O, Area II Task N

FAA-H-8083-2 Risk Management Handbook
FAA-H-8083-3C Airplane Flying Handbook
FAA-H-8083-9 Aviation Instructors Handbook
FAA-H-8083-25C PHAK Chapter 7: Aircraft Systems
FAA-H-8083-25C PHAK Chapter 17: Aeromedical Factors

14 CFR 61.31(g) High Altitude Endorsement
14 CFR 91.211 Supplemental Oxygen

AC 68-107B CHG 1 – Operations Above 25,000 Feet MSL or Mach Greater Than .75

Sporty's Pressurization System Video

1. OXYGEN SYSTEMS

1.1. Oxygen Regulatory Requirements

Oxygen requirements are outlined in 91.211 and are tabulated below.

If altitude is greater than (cabin pressure altitude)	**Flight Crew**	**Passengers**
>15000 feet	–	Must be provided oxygen
>14000 feet	Must USE oxygen immediately	No requirement
>12500 feet	Requires USE oxygen after 30 minutes	No requirements

For an aircraft with a pressurized cabin,

If altitude is greater than (cabin pressure altitude)	**Flight Crew**	**Passengers**
>FL410	One pilot must wear mask	–
>FL350	One pilot must wear mask while other steps away	–
>FL250	10 minute supply available	10 minute supply available

1.2. Aviators Breathing Oxygen (ABO)

ABO is different than other grades due to its low moisture content. It is imperative that any moisture not freeze in the supply lines at high altitudes.

1.3. Physiological Factors (impairment, Hypoxia, Time of Useful Consciousness)

1.4. Delivery Types

Continuous flow – delivers constant stream of oxygen. Most wasteful.

Demand – delivers during inhalation, properly diluted with cabin air.

Pressure-demand – forces oxygen into lungs with positive pressure.

2. PRESSURIZATION SYSTEMS

Five components – source of bleed air, cooler, outflow valve, safety dump valve, cockpit indicators

Three types of depressurization

i. Gradual – hard to detect since hypoxia takes effect quickly

ii. Rapid – decompression in 1-10 seconds, noted by fog from condensation in cockpit

iii. Explosive – associated with explosive violence in under 0.5 seconds. Unsecured items may become airborne

2.1. Failure Modes

Cannot pressurize – valve stuck open

Cannot depressurize – outflow valve is blocked. Can depressurize with safety dump valve

3. HIGH ALTITUDE ENDORSEMENT

Per 61.31(g), required for pressurized aircraft with a service ceiling or max operating altitude above FL250.

No time requirement, just ground and flight training.