T-6B On-Board Oxygen Generation System (OBOGS)
Objectives

• Identify components and understand operation of OBOGS

(Utilize OBOGS system schematic while reviewing this slideshow)
References

• T-6B NATOPS Manual
  • Section 1
    • On-Board Oxygen Generating System (OBOGS)
      • Oxygen Pressure Regulator
      • Oxygen Pressure Regulator Supply Lever
      • Oxygen Pressure Regulator Concentration Lever
      • Oxygen Pressure Regulator Pressure Lever
      • Oxygen Pressure Regulator BIT Button
      • Oxygent Pressure Regulator Flow Indicator
**OBOGS System Overview**

- Provides each pilot with automatically regulated oxygen supply
- Uses conditioned bleed air from engine by pressure swing absorption using a molecular sieve
- Oxygen provided at a slight positive pressure
- Plenum provides a limited amount of oxygen in case of OBOGS failure
- Each cockpit has pressure regulator
**Bleed Air Supply**

- **Left Side P3 Port**
  - Tap off compressor section of engine
  - Supplies engine bleed air to OBOGS only

- **Shutoff Valve**
  - Controlled by supply lever on Oxygen Pressure Regulator
  - Allows the flow of bleed air into the OBOGS
Heat Exchanger

- Cools bleed air for use in OBOGS
- Divided into 2 sections:
  - Cooling for anti-G/canopy seal/OBOGS (left side)
  - Cooling for all other ECS functions
- Air directed to heat exchanger by cooling air inlet duct on nose
- On ground, flap covers inlet duct and WOW switch activates blower to push air across heat exchanger
Supply Line

- High Temperature Switch
  - Measures temperature in OBOGS ducting
  - A OBOGS TEMP caution illuminates if temperature exceeds 200°F in OBOGS ducting
  - Indicates heat exchanger not sufficiently cooling bleed air

- Condensation Drain
  - Actually multiple drains in the system (3 total)
  - Removes moisture from lines as a direct result of cooling through heat exchanger

- Low Pressure Switch
  - Senses bleed air pressure upstream of the OBOGS concentrator
  - An OBOGS FAIL warning illuminates to indicate low bleed air pressure in system
  - OBOGS Fail Message critical action items requires advancing PCL to see if warning extinguishes
OBOGS Unit

- Located in left avionics bay (and labeled OXYGEN)
- Powered by Hot Battery Bus
- Activation and functional settings controlled by Oxygen Pressure Regulator (either cockpit)
- Extracts oxygen from conditioned bleed air by pressure swing absorption using a molecular sieve
- Oxygen stored in Plenum and pushed to pilots at a low positive pressure
- Internally:
  - Shutoff Valve
  - Composition Controller
  - Concentrator
  - Monitor
- An **OBOGS FAIL** warning illuminates to indicate internal failure of system
OBOGS Unit

- **Water Separator**
  - Internal system to actively remove water from bleed air
  - Drains water to external vent

- **Pressure Regulator/Shutoff Valve**
  - Controlled by supply lever on regulator
  - Turning supply lever on in *either* cockpit opens valve and allows oxygen production

- **Concentrator**
  - Sets oxygen concentration as selected by concentration lever on regulator
  - Concentration is based on current altitude
  - When concentration levers are in NORMAL:
    - Oxygen concentration is 25% – 70% for altitudes up to 15,000 ft MSL
    - Oxygen concentration is 45% - 95% for altitudes above 15,000 ft MSL
  - When *either* concentration lever is in MAX:
    - OBOGS supplies highest possible oxygen concentration to both regulators
    - Concentration as low as 55% or as high as 95% oxygen depending on factors (individual concentrator efficiency, bleed air press., cabin alt, aircrew breathing demands)
    - Maximum concentration light (green) illuminates on regulator

- **Composition Controller**
  - Controls the gas composition (mixture) of the product

- **Monitor**
  - Monitors composition and concentration of air being created
  - An **OBOGS FAIL** warning illuminates to indicate low oxygen concentration from the system

**OBOGS Fail Message Summary**

- An **OBOGS FAIL** warning illuminates to indicate:
  - Low bleed air pressure
  - Low oxygen concentration
  - Internal system failure
- You can only affect the failure due to low pressure by advancing the PCL!

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OBOGS Unit

- **Built-in-Test (BIT)**
  - Power up BIT to check system on initial start up
  - System enters a 4-minute, sensor warm-up period when first activated
  - The OBOGS FAIL warning inhibited during the warm-up period (4 minutes) for concentration & internal failure (still works for low pressure)
  - At end of BIT system will activate OBOGS FAIL warning if internal failure
    - Warning remains illuminated until failure is cleared by the self-test or by resetting regulators

- **Initiated Built-in-Test (I-BIT)**
  - Use button on regulator to initiated the BIT at times other than the power up BIT
  - Provides verification that OBOGS monitor is working along with fail warning
  - Momentarily pushing button:
    - Opens valve in concentrator allowing ambient air into the concentration monitor
    - Concentration drops below normal (20-30 seconds)
    - The OBOGS FAIL warning illuminates for low concentration
    - Once valve closes and concentration returns, warning extinguishes (within 2 minutes)

- **Operations with mask down or loose fitting:**
  - May induce OBOGS FAIL warning
  - Ensure mask secure
  - If extended mask down operation is desired, place respective OBOGS supply lever to OFF
**OBOGS Unit**

- Provides a limited supply of oxygen in the event OBOGS fails

- Duration of Plenum depends on:
  - Cockpit pressurization
  - Aircraft pressure altitude
  - Pilot regulator settings
  - Pilot demand

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**OBOGS Unit Diagram**

1. **Lt Side P3 Port**
2. **Shutoff Valve**
3. **Heat Exchanger**
4. **High Temp Switch**
5. **Condensation Drain**
6. **Low Press Switch**
7. **Water Separator**
8. **Pressure Regulator/Shutoff Valve**
9. **Concentrator**
10. **Monitor**
11. **Composition Controller**
12. **Non-return Valve**
13. **Plenum**

**Built In Test (BIT):**
- Initiated upon first activation of system
- Sensor warm-up period of 4 min
- OBOGS FAIL inhibited (by Monitor for concentration)
- At end of 4 min = OBOGS FAIL if internal failure

**Initiated Built In Test (I-BIT):**
- Initiated by BIT on regulator after 4 min warm-up
- Verification that OBOGS sensor & OBOGS FAIL work
- Use:
  - Momentarily push button
  - Oxy concentration purposely drops
  - Get OBOGS FAIL from Monitor (for concentration)
  - Warning extinguishes within 2 min
Pressure Regulator

- Panel-mounted regulator on right side console of each cockpit
- Controls OBOGS electrical power and oxygen flow for respective cockpit
- Can be “gang-loaded” in event of hypoxia symptoms or loss of cabin pressure (ON/MAX/EMERGENCY)
**Pressure Regulator**

- **Supply Lever**
  - Controls power to OBOGS & oxygen flow to respective regulator
  - **ON**
    - Opens P3 Shutoff Valve (left side)
    - Opens Regulator Shutoff Valve (internally) for respective regulator
  - **OFF**
    - Cuts OBOGS power & oxygen flow to respective regulator
    - Both regulator supply levers must be OFF to disable the OBOGS system

- **Concentration Lever**
  - Sets oxygen concentration
  - Concentration is based on current altitude
  - When concentration levers are in **NORMAL**:
    - Oxygen concentration is 25% – 70% for altitudes up to 15,000 ft MSL
    - Oxygen concentration is 45% - 95% for altitudes above 15,000 ft MSL
  - When either concentration lever is in **MAX**:
    - OBOGS supplies highest possible oxygen concentration to both regulators
    - Concentration as low as 55% or as high as 95% oxygen depending on factors (individual concentrator efficiency, bleed air press., cabin alt, aircrew breathing demands)
    - Maximum concentration light (green) illuminates on regulator
Pressure Regulator

- **Pressure Lever**
  - EMERGENCY – Provides pilot with positive pressure oxygen flow needed during emergencies
  - NORMAL – Provides a slight positive pressure of oxygen flow
  - TEST MASK – Provides highly pressurized flow to check face-to-mask seal

- **BIT Button**
  - Pressing momentarily activates an I-BIT

- **Flow Indicator**
  - Provides visual indication of oxygen flow through regulator
  - Each inward breath activates a flow indicator (white)
  - Can indicate leak in mask or hose assembly
Pressure Regulator

- 3 Anti-Suffocation Valves (ASV)
  - One in oxygen regulator (low resistance)
  - After engine start and OBOGS powered on, held closed during normal operations to prevent mixing of cabin and OBOGS air supply
  - One at base of main oxygen supply hose (high resistance)
  - One in CRU-60/P connector
  - ASVs ensure pilot can breathe in event OBOGS fails
Conclusion

- Identified components and described operations of OBOGS

Abnormal OBOGS Scenarios located in Procedures Section/EPs