Fuel Injection

• These systems are similar to the Bendix/Stromberg pressure carburetors.

• Air / fuel metering is accomplished by one device, fuel distribution occurs by intake distribution pipes.
Fuel Injection

- Manufacturers
  - Bendix
  - Contentintal
Fuel Injection

• Bendix
• RS and RSA systems
• Has four main sections
  – Air metering and regulation
  – fuel regulation
  – fuel metering
  – fuel distribution
Fuel Injection

• Uses the same A, B, C, D, pressures
  A = Impact air pressure
  B = Venturi air pressure
  C = Metered fuel pressure
  D = Fuel inlet pressure
  and Flow divider discharge pressure
Fuel Injection

• Air metering and regulation
  – accomplished by throttle plate and a throttle body assembly.
  – impact air and venturi air pressures are sourced here.
  – automatic mixture control valve regulates pressure value of impact air with venturi air.
Fuel Injection

• Fuel regulation
  – diaphragms and poppet valve attached to throttle assembly.
  – fuel inlet pressure closes poppet valve
  – metered fuel pressure and A - B pressure differential open poppet.
Fuel Injection

– balancing springs alter diaphragm values for low airflow idle conditions.
– springs assist poppet valve to open for idle fuel delivery.
– idle rotary valve is linked to throttle valve.
Fuel Injection

• Fuel metering section includes:
  – 74 micron finger screen
  – idle/enrichment fuel control rotary valve.
  – main and enrichment metering jets.
  – manual mixture and idle cut off rotary valve.
Fuel Injection

- Fuel distribution
  - metered fuel passes the poppet valve into plumbing to the flow divider where it forces open the pressurizing valve.
  - it is then divided to each fuel injector nozzle.
Fuel Injection

– when metered fuel pressure drops low due to shut down, the divider pressure valve closes, stopping fuel flow.

– the injectors will be located in each intake runner, or just behind each intake valve.
Fuel Injection

• Injector nozzles:
  – are air bleed type for atomization.
  – air bleed sources from impact air or upper deck pressure.
  – are calibrated within 2% of each other.
Fuel Injection

• Automatic mixture control fully compensates for altitude changes.
• Manual mixture control used for best rich to best lean power adjustments.
• Starting procedures significantly different.
  – System is used to prime engine.
Fuel Injection

– Then engine is started with mixture in the idle cut-off position.
– Mixture is re-engaged after engine start.
– Injectors and distribution lines may empty after several hours of off time.
– Hot starts do not include priming.
Fuel Injection

- Continental Continuous Flow Fuel Injection
  - Includes engine driven fuel pump with vapor separator.
  - air throttle assembly
  - fuel control assembly
  - distribution manifold valve
Fuel Injection

- injector nozzles and plumbing

• System operation
  - air is metered in the throttle assembly by rotation of a throttle plate.
  - fuel inlet pressure is applied to the fuel control unit.
Fuel Injection

– fuel inlet pressure will be variable based upon engine RPM (5 - 35 psi)
– fuel regulator meters fuel by throttle position only (variable orifice valve)
– total fuel regulation occurs as a result of pump RPM and throttle position, not air mass measurement.
Fuel Injection

– manual mixture control occurs in fuel control regulator by variable orifice.
– metered fuel then goes to and opens fuel manifold valve.
– fuel then exits fuel discharge nozzles through a calibrated fixed orifice with bleed air added just prior to discharge.
Fuel Injection

– fuel pump may incorporate an aneroid valve for high altitude compensation.

– fuel pressure and mechanical linkage adjustments are critical on this system.

– engine will not start without auxiliary pumps.
Fuel Injection
Anti-Detonation Injection

• These systems will inject a mixture of water and alcohol into the air/fuel mixture.
• It will not add any power but will allow higher power settings without any detonation.
• For short term use only, (takeoff)
Anti-Detonation Injection

• May be referred to as “water injection”
• Straight water, unvaporized will raise compression some.
• But vaporizing action creates cooling action in combustion chamber.
• Alcohol aids in vaporization, in cooling combustion temp, and preventing freezing of anti-detonation fluid.
Anti-Detonation Injection

- Maximum power is achieved by leaning away from max rich condition towards best power.
- ADI makes up for loss of cooling fuel found at max rich power.
- Turning system on will also adjust air/fuel ratio in carburetor.
Anti-Detonation Injection

• The system can contain:
  – a holding reservoir
  – pumps
  – solenoid valves
  – controller/ regulator devices
  – injection nozzles and assorted plumbing.
Anti-Detonation Injection

• Three common regulators are:
  – fluid regulator - regulates the anti-detonation fluid to the discharge nozzles based on air/fuel flow.
  – supercharger reset regulator - adjusts the supercharger to a higher MAP for increased power.
Anti-Detonation Injection

– derichment valve - leans main fuel metering to higher power and makes up for added alcohol.
– control switches - pump on/off, ADI on/off.
– ADI on/off selects system solenoid or return solenoid for pump circulation.
Anti-Detonation Injection

SECTION END