CITY OF LOVELAND
FIRE AND RESCUE DEPARTMENT
410 E. Fifth Street • Loveland, Colorado 80537
(970) 962-2471 • FAX (970) 962-2912 • TDD (970) 663-5144

ARFF Operations

Developed by Engineer Josh Valerio
February 2013

- NFPA 405 & 402
- NFPA 1976

Task Skill description and detail

A. Airport Description & Layout
- Taxiways and Runways

B. Response
- Emergent and non-emergent

C. Aircraft Stand-by

D. Communications

E. ARFF Apparatus & Operations
- R4 vs R44

F. Aircraft Familiarization

G. Aircraft Incidents

Task Skill Instructional Requirements and Implementation

A. Airport Description and Layout

- The Fort Collins-Loveland Municipal Airport (FNL) is a Federal Aviation Administration (FAA) certified general aviation airport. The airport currently does not currently have commercial airline service, but mostly consist of general aviation air traffic and scheduled commercial flights.
- FNL is recognized by the FAA as an Index C Airport
- **FNL operates with an Index B Apparatus**
  - Determined by amount of foam, water, and pump capability per the FAA
- **FNL Index is only based on Rescue 4 and one person being ARFF certified. Rescue 44 is not included.**
  - Airport designation – FNL (Fort Collins / Loveland Airport)
  - Airport elevation – 5016'
  - No tower, but has a Fixed Base Operator (FBO)
    - Ft Collins-Loveland Jet Center
  - Two active runways
    - 15-33 is 8500' x 100'
    - 6-24 is 2273' x 40'
  - Nine taxiways
    - A, A1, A2, A3, A4, A5
    - B
    - C
    - D

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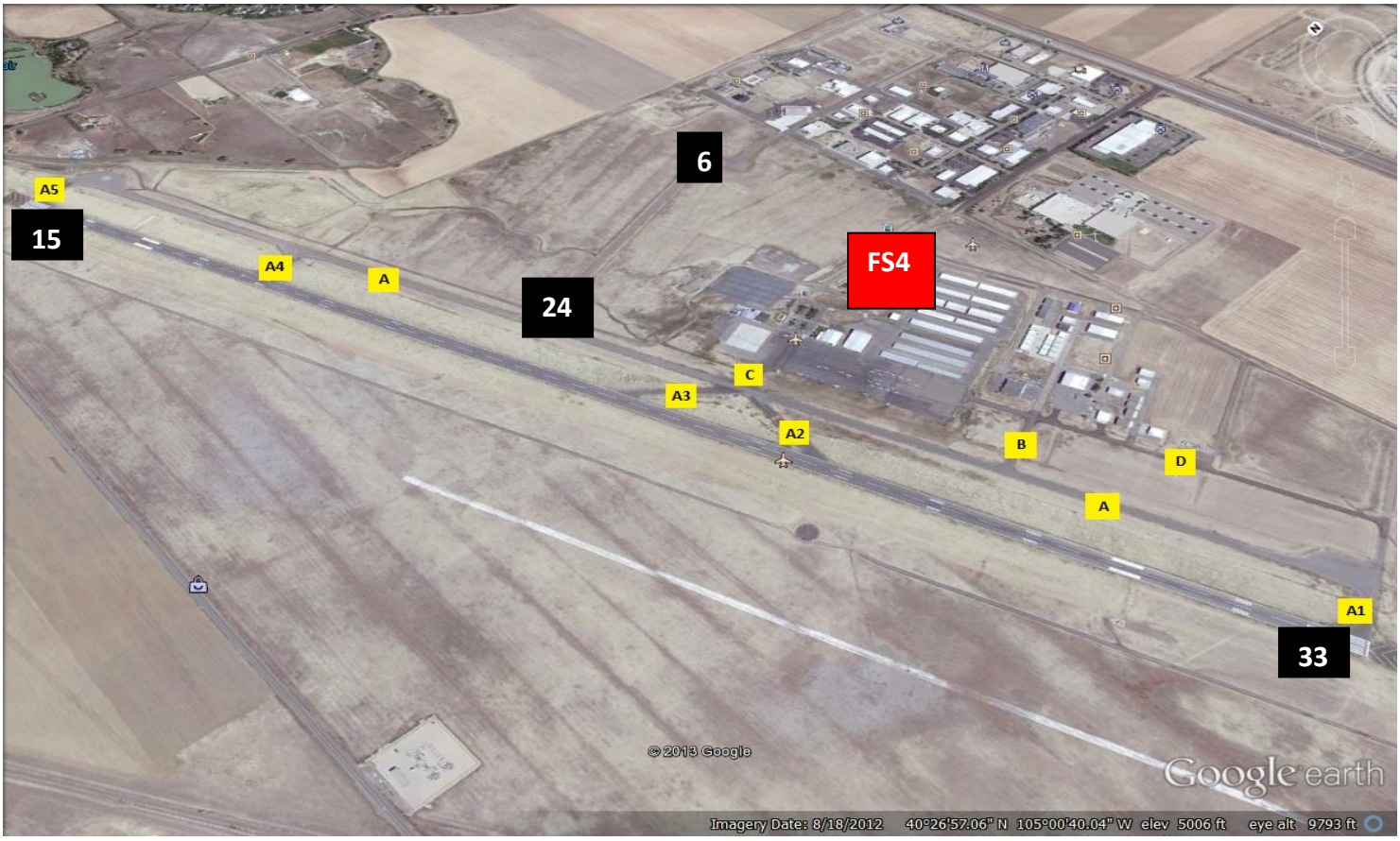

Figure 1 – Layout of Fort Collins/Loveland Airport

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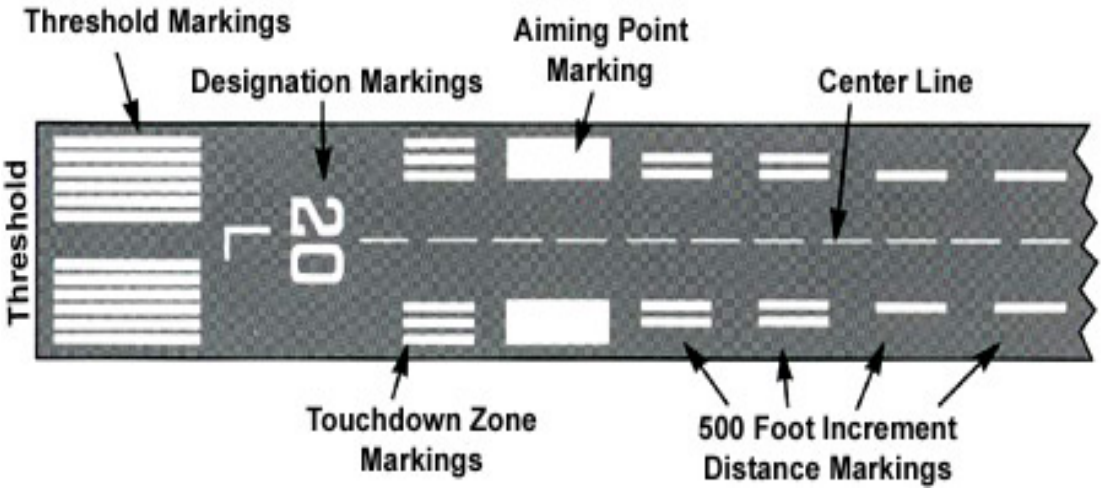
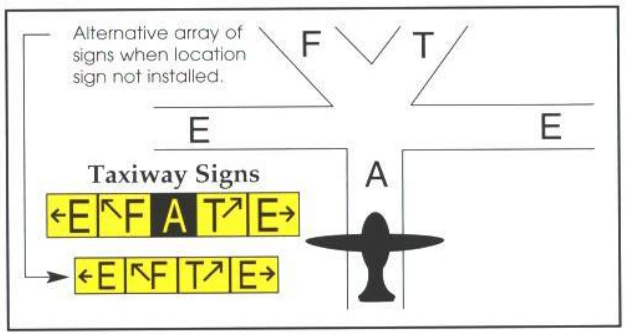
Runways

Have specific markings on them that are white. They will have numbers on each end and stripes down the middle with white lines on the edges. Runways that are served by an instrument approach will have more elaborate markings such as those shown in the figure. The most important thing to remember about a runway is that it is meant for aircraft use, so never drive your vehicle on it unless you are authorized to do so.



Taxiways

Areas used by the aircraft to get to and from the ramp and the runway. Taxiways look similar to runways, but are usually not as wide and they don't have the same kind of markings. Taxiway markings are yellow. Instead of numbers, taxiways use letters or letter/number combinations for designators. Like runways, taxiways are meant for aircraft use. Authorization is normally required before you operate a vehicle on runways or taxiways. Aircraft cockpit windows are designed for pilots to see other aircraft. It can be difficult or impossible for the flight crew of large aircraft to see vehicles, particularly behind the wings or under the nose of the aircraft.



Location Sign

Guidance Sign

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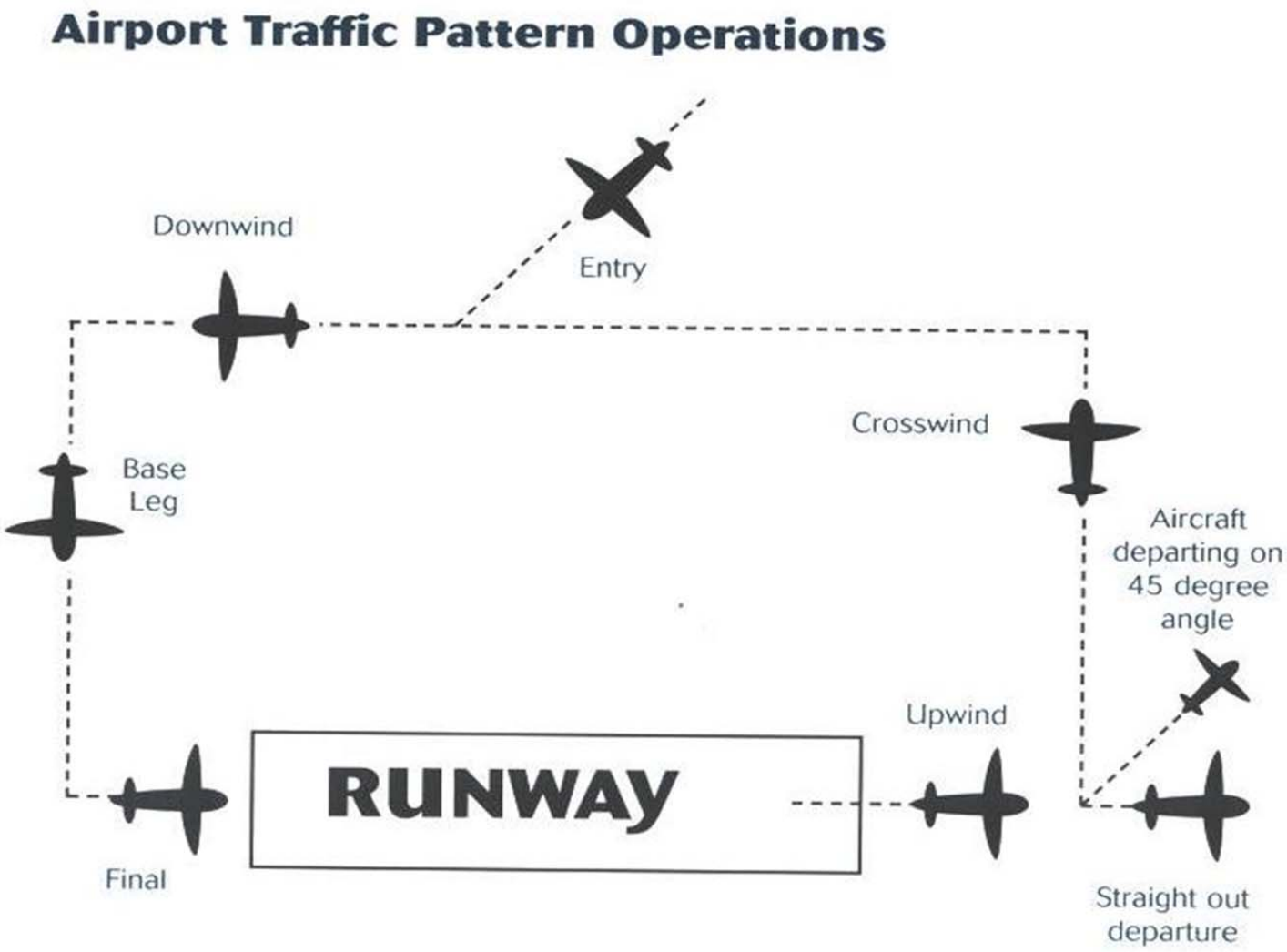
B. FNL Traffic Terminology



C. Response

LFRA responds to 3 different types of incidents with 3 different levels of response:

1. Stand-by & Ground emergency (single company)
2. In-flight Emergency
3. Plane Crash

ARFF - Stand-By / Ground Emergency	**ARFF 4**
ARFF - In Flight Emergency	**2 Engines / Truck / 2 ARFF / Tender / FIT / BC**
ARFF - Plane Crash	**2 Engines / Truck / 2 ARFF / 2 Tenders / Heavy Rescue / Brush / FIT / BC**

Contact information in case of an emergency on FNL
FNL Jet Center- (970) 667-2574
Airport Manager Jason Licon – (970) 818-6486 cell
Airport Operations Larry Mack- (970) 203-5382
FAA Regional Operations Center – (425) 227-2000
FAA North West Operations Center – (425) 227-1999 unpublished

D. Aircraft Stand-by

ARFF coverage is provided by LFRA on scheduled commercial air flights. It is essential that the aircraft stand-by crews arrive **15 minutes before** the scheduled flight landing time. The assigned crew will contact dispatch and place Aircraft Rescue 4 on an aircraft stand-by. During this time, it will allow the stand-by crews to track the flight and be prepared. Crews are required to remain on the stand-by **15 minutes after** the scheduled flight has departed the FNL airfield.

Flight Tracking
http://www.flightaware.com (on this site it use the live tracking, KFNL is the airport code and flight #)
www.flightview.com

Fort Collins / Loveland Air Traffic Communications

All Fort Collins / Loveland air traffic operates under the **UNICOM** radio frequency on channel **122.7.**

Proper radio terminology needs to be followed for all air traffic while on active and non-active areas of FNL (see example below).

Airport — Radio Frequency — Unit Calling — Where you are at and what you want to be on

"Fort Collins/ Loveland Unicom this is Loveland Fire Aircraft Rescue 4, we are on the hold short for runway 33 any traffic in the pattern please advise, Fort/Love"

End radio transmission with airport

(If using the active wait for any response and repeat before proceeding)

E. ARFF Apparatus and Operations

Aircraft Rescue 4

- 1250 GPM Single Stage Pump
- 300 GPM Bumper Turret
- 350/750 GPM Roof Turret
- 1500 Gallons of Water
- 200 Gallons of Class B Foam
- 500 Pounds of Dry Chemical
- Nitrogen System
- Class B Index

Aircraft Rescue 44

- 500 GPM Two Stage Pump
- 250 GPM Bumper Turret
- 500 Gallons of Water
- 70 Gallons of Class B Foam
- 500 Pounds of Dry Chemical
- Nitrogen System

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Apparatus Operations

Aircraft Rescue 4

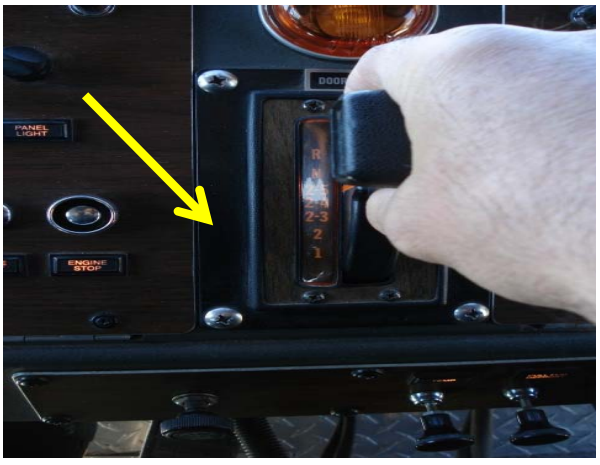
Driving Operations

1. **Master battery**

2. **Engine Start**

3. **Emergency Brake**

4. **Gear Selector**



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Inside Cab Pump Operations

1. **Water**

2. **Bumper Turret Power**

3. **Foam Agent (AFFF 3% Mil Spec Foam)**

4. **Deluge**

5. **Roof Turret Power and Controls**

Roof Turret Hand Control (Hold on, Release off)

High or Low Flow

Solid or Disperse Stream

6. *Nitrogen Agent

***Accidental activation has been an issue with this option. Please use caution and do not activate unless in the case of an emergency.**

7. Generator (Preheat & Start)

8. *Emergency Warning Lights & Amber Beacon

***The amber beacon must be used at *all* times while on all non-active areas of the airport. The emergency lights must be used while responding to an emergency, on and off all airport property. This allows all air traffic to recognize that there is an emergency on the active or non-active areas of the airport.**

Outside Cab Pump Operations

1. Panel Power

2. Tank to pump

3. Water

4. Foam

5. Outside Pump Panel

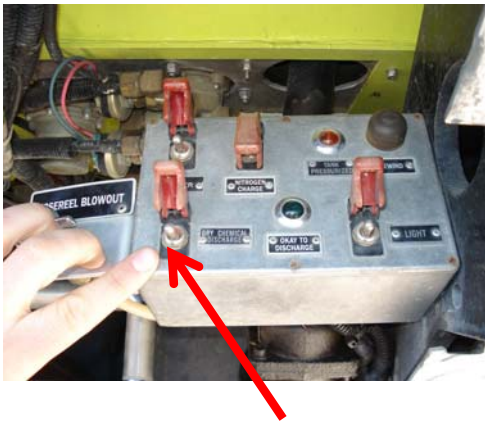
Pump Throttle

Front Bumper Hand Line

1. Compartment Light

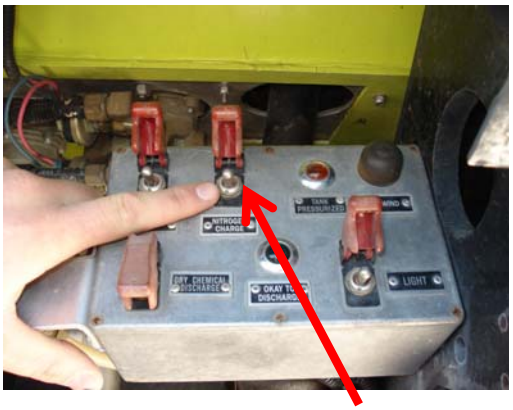
2. Water

3. *Dry Chemical Agent



***The dry chemical agent can be used along with water for the 3 dimensional fires**

4. *Nitrogen Agent



***Accidental activation has been an issue with this option. Please use caution and do not activate unless in the case of an emergency.**

Side Hose reel

F.

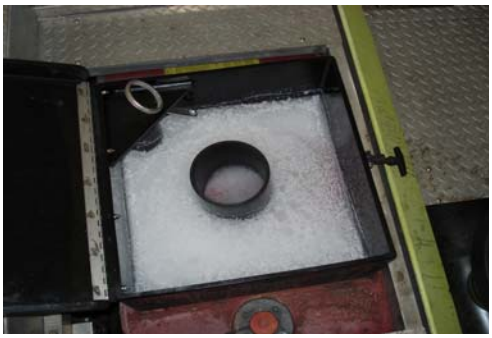
1. Water

Top of Apparatus

Direct Water Fill

Nitrogen Cylinder

Direct Foam Fill



Manual Roof Turret Control

Aircraft Rescue 44

Inside Cab Pump Operations

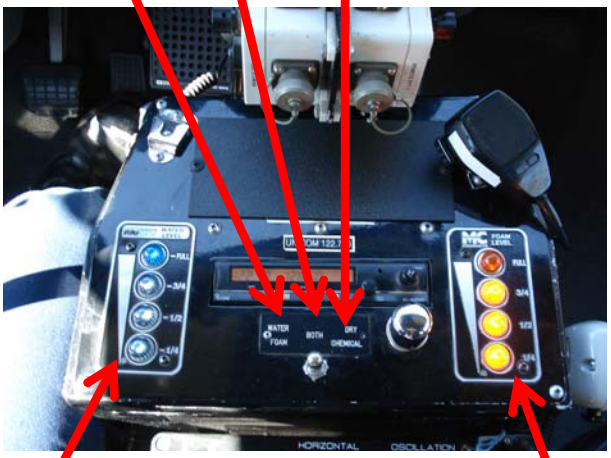
1. Turret Power

2. Pump Start

3. Auto Pump Activation

4. Foam Valve

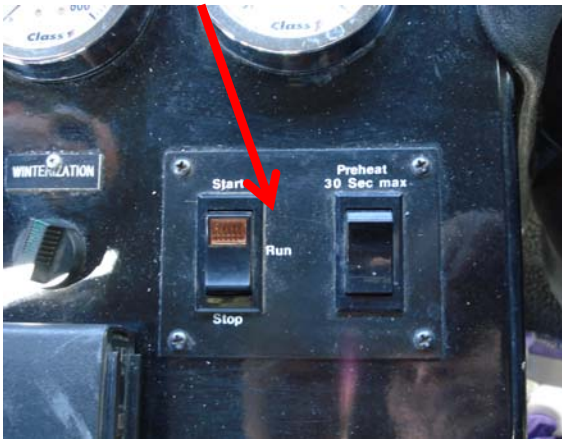
5. Water/Foam , Dry Chemical or Both



Water Level

Foam Level

6. Generator Start



7. *Amber Beacon & Emergency Warning Lights

Unicom Radio

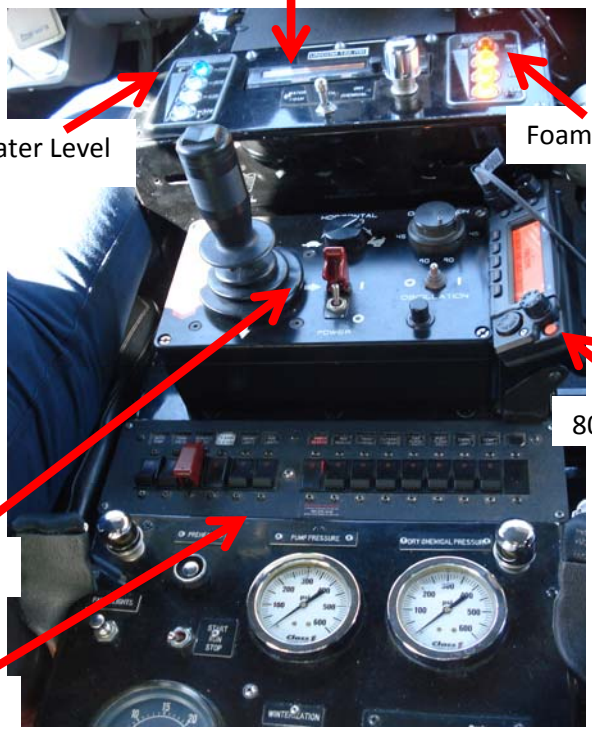
Water Level

Foam Level

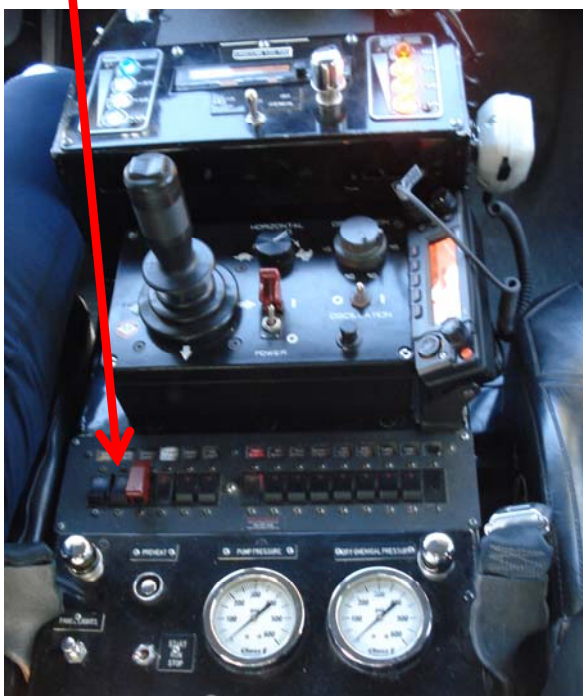
800 Radio

Turret Controls

Pump/Foam & Light Controls



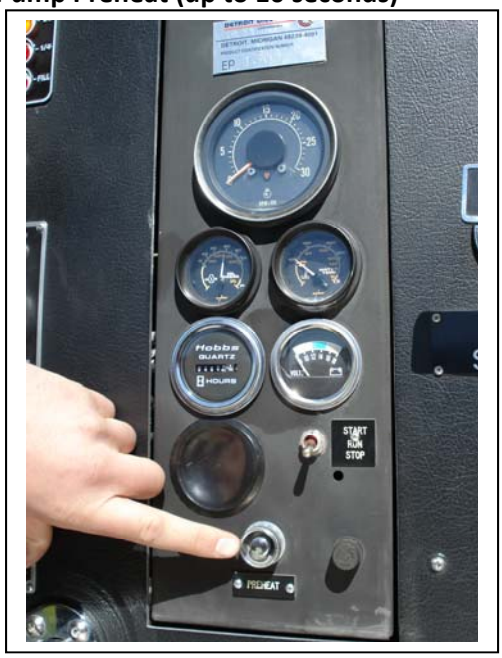
8. *Nitrogen Agent



***Accidental activation has been an issue with this option. Please use caution and do not activate unless in the case of an emergency.**

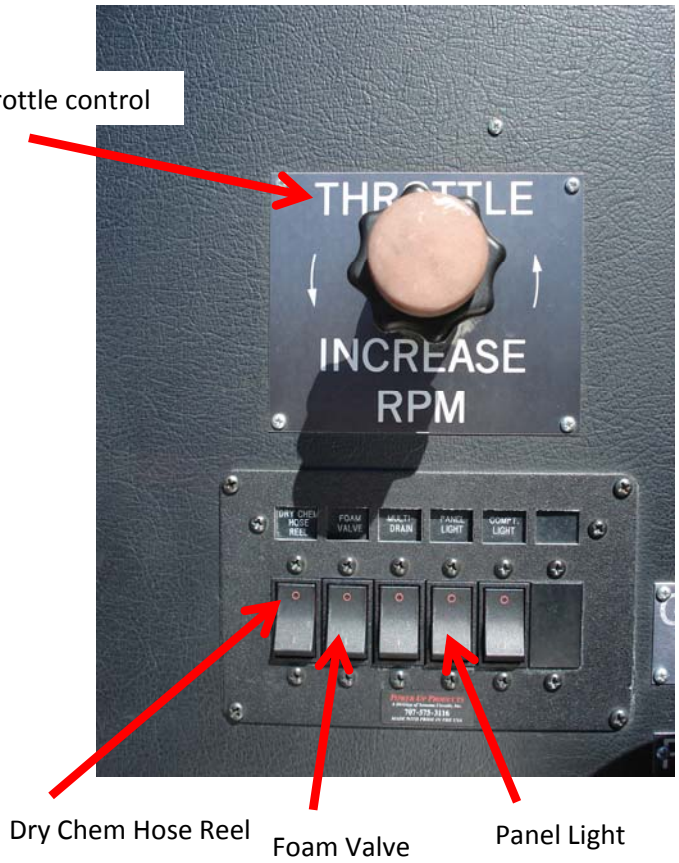
Outside Cab Pump Operations

1. Pump Preheat (up to 10 seconds)



2. Pump Start/Stop

3. Throttle Control



F. Aircraft Familiarization

Aircraft Types

Narrow body air carrier

- 2-3 jet engines
- 5,000-12,000 gallons of Jet A
- 30-200 passengers (flight crew is 2-3 officers and up to 5 flight attendants & one center isle)

General Aviation (GA)

- Single or twin engine
- Carry 1-6 passengers
- 30-90 gallons of aviation gas (av gas)
  - **A good rule of thumb is 15 gallons of fuel per seat**
- Most are not designed for high altitude pressurization
  - **Doors are easy to open or force**

Business, Corporate, and Executive

- Can operate by through the different engines:
  - **Reciprocating** - gas power, piston driven, internal combustion engine that turns a propeller
  - **Turbo prop** - jet engine that turns a propeller, as well as produces thrust
  - **Jet engines** - sole means of propulsion is caused by thrust out the back of the engine
- Several hundred gallons to over 1,000 gallons of fuel
- Predominately pressurized and have plug-type doors and hatches

Commuter

- Twin engines
- 12-30 passengers
- Most are pressurized
- Access and cargo doors are usually on the left
- Most are not equipped with an evacuation slide

Helicopters

- Rotary wing
- Reciprocating and turbine (jet) engines
- Fuel tanks in various locations (often under the seats or in the belly)
- Upwards of several hundred gallons of fuel

Common Fuel Types

Jet Fuel

- Larger Aircraft
- Flash Point 95° F
- Flame Spread is less than 100 feet per minute
- Auto Ignition Temperature 464° F
- Flammable Limits
  - Lower 1.3 %
  - Upper 8.0 %
- Specific Gravity is 0.75 to 0.80
- Appearance: Colorless to Pale amber liquid
- Vapor Density - Not Given
- Weight – 6.7 lbs/gal
- High-grade kerosene

Aviation Fuel

- General Aviation Aircraft
- Flash Point -50° F
- Flame Spread is 700 to 800 feet per minute
- Flammable Limits
  - Lower 1.3 %
  - Upper 7.6 %
- Specific Gravity - 0.72 to 0.76
- Appearance: Clear Blue Liquid
- Vapor Density - 3.5 (Heavy)
- Weight – 6 lbs/gal
- 100 octane low-lead

G. Aircraft Incidents

Ground Emergencies

- Involve aircraft conducting operations on the ground
- Could involve an aircraft and a ground vehicle, structure, or another aircraft
- May range from simple inspection to a multi-jurisdictional response

Ground emergencies may include:

1. Overheated wheel assemblies
2. Tire/wheel failures
3. Combustible metal fires
4. Fuel leaks and spills
5. Engine fires or APU fires
6. Uncontained engine failures
7. Aircraft interior (or "cabin") fires

1. Overheated Wheel Assemblies

- Concern with normal and emergency landings
- Landing gear oleo-strut dangerous
- Combustible metals present
- Overheated brakes may ignite and burn remaining grease or hydraulic fluid
  - Wheel grease -long flames coming out slowly from bottom of wheel,
  - Rubber tires ignite at 500º to 600ºF,
  - What is burning? Dry powder should be used if it can be applied safely
  - **No** Class D agents available - mass application with turrets

2. Tire/Wheel Failures

- Most wheels are equipped with fusible plugs incorporated into the rims which melt, deflating the tire usually around 300º to 400ºF
- Rapid cooling may crystallize and shatter wheels
- Water fog may be used in short, intermittent bursts (5 to 10 seconds, every 30 second) so cooling can occur slowly
- Wheel fires threaten the aircraft through the ignition of magnesium rims
- Most wheel assemblies are made of aluminum alloy
- Fires delayed because of the lag time
- Approaching the tire/wheel from the front or rear and applying dry-chemical agents usually achieves rapid knockdown if only the tire is burning
- Re-ignition may occur
- **Dry chemical** - recommended for tire fires
- If all of the fusible plugs have deflated all the tires then water may be used in short intermittent burst

3. <u>Combustible Metal Fires</u>

Magnesium

- Lightweight, silvery white metal,
- Ignition temperature - 1,202°F
- Used on large propeller driven aircraft and early jets in landing gear, engine mountings, wheel cover plates, and engine components

Titanium

- Silver gray metal, strong as steel but only 56% as heavy,
- Ignition temperature - 3,140°F
- Used in engine parts and nacelles
- Used in landing gear assemblies

- Large amounts of water may cool overheated magnesium, but once burning, water increases the intensity of fire
- Water may be used in copious amounts to cool uninvolved metal
- Special agents must be used such as MET-L-X® and G-1 powder

4. <u>Fuel Leaks and Spills</u>

Incidents where fuel has spilled but not ignited

- Attempt to shut off fuel at source
- Avoid actions that may provide an ignition source
- Evacuate aircraft if spill poses a threat to occupants
- Keep area clear of non-essential personnel
- Use full PPE and SCBA
- If necessary, blanket exposed fuel with AFFF
- Contain spilled fuel to as small an area as possible
- Prevent leaking/spilled fuel from entering runoffs, drains, buildings, etc.
- Keep apparatus & equipment ready to protect rescue operations
- Position apparatus upwind and uphill

Each spill involves several variables:

- Size of spill
- Terrain
- Equipment
- Weather conditions
- Type of flammable liquid
- Aircraft Occupancy
- Emergency equipment and personnel

If spill occurs during servicing:

- Personnel most stop the fueling operations
- Non-essential personnel should leave the area until the hazard is neutralized and area is safe
- Safety personnel should be notified of such incidents so determination can be made to allow operations to remain in progress or terminate them until the problem has been corrected

Small Spills (less than 18 inches)

- Minor danger but caution must be exercised

Small or Medium Spills (not over 10 feet)

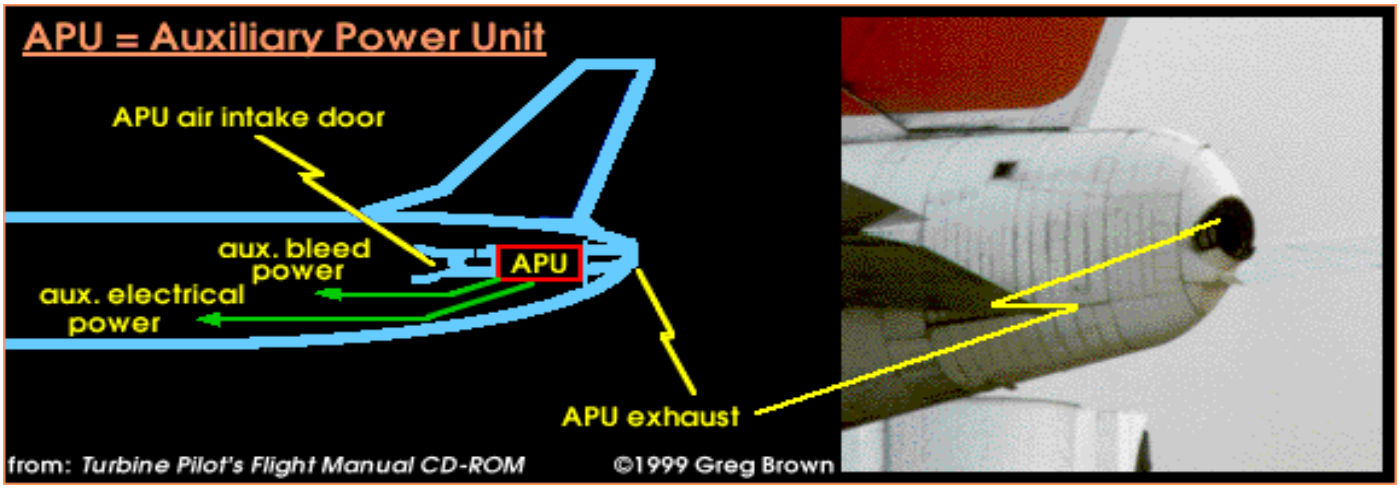
- Post fire watch and absorbent materials or emulsion compounds applied then picked up and disposed of properly

Large Spills (Over 10 feet)

- Stay upwind and uphill

5. Engine/APU Fires

- Cockpit crew may make first attempt to extinguish fires
- Directing a water or AFFF stream into the air inlet will not always extinguish the fire
- Safest method - fire shutdown systems in the cockpit or external panel
- May have to open engine cowlings or APU access panel doors
- Hot or burning liquids or parts may be trapped inside
- Consider using piercing tools to apply agents prior to opening
- Some aircraft may have fire extinguishing access ports or knock in panels
- Another type of fire is a tail cone fire
    - Occurs when too much fuel is ejected into engine during start up
    - This cause fuel and fuel vapors to be emitted through the engine
    - Upon reaching tailpipe assembly, it ignites because of the high temperatures



6. Uncontained Engine Failures

- Occurs when fan or compressor blades separate or the turbine section disintegrates
- Fragments tear through engine cowling and can penetrate aircraft structure
- Similar problem can occur when a propeller blade separates
- Worst case scenario - fragments piercing the fuselage and /or wing causing injuries, puncturing fuel tanks, severing fuel and hydraulic lines, or damaging flight controls

Uncontained Engine Failures

7. Aircraft Interior Fires

- Examine the interior and the exterior
- Confirmed fire - flight crew will initiate an evacuation
- Common sources of smoke
  - Overheat fluorescent light ballasts
  - Food preparation areas
  - Lavatories
  - Cockpit area
  - Avionics and electronics equipment compartment
  - Cargo compartments
  - Overheated electrical components
- Overheated light ballasts are common
- Kitchen components must be checked
- Smoke detectors are located in lavatories
- In the cockpit area there are many circuit breakers
- Fires may originate in places other than the main cabin
- Fires in concealed spaces may travel between skin and interior liners
- Portable handheld thermal imaging cameras can be used
- On the exterior, look for blistering paint or discoloration
- Apply a water mist and look for areas where water turns to steam
- If no sign of evacuation on landing, ARFF personnel must immediately gain access to begin rescue operations
- Use caution as interior fires may lack oxygen and opening doors may cause flashover or rollover
- A free burning fire in an aircraft vents itself by burning through the skin in early stages and backdraft is unlikely
- DO NOT impede the egress of occupant evacuation, look for alternatives for entry or ventilation
- Over wing exit size will usually allow for entry
- Once inside advancement may be difficult
- Structural techniques are recommended, proper ventilation, followed by a coordinated interior attack
- Class A and Class B foam can be used, clean agents can only be used if the aircraft is unoccupied
- Attempt to locate fire and determine the extent before attempting entry, then ventilate as quickly as possible
- Pre-emergency plans of structures in conjunction with training to examine the most effective means for dealing with structures should be developed

Unoccupied Aircraft

- Develop into Major incidents
- Opening the doors is extremely hazardous
- Hoselines and ability to ventilate must be established

Cargo Aircraft

- Interior fires differ from passenger aircraft
- Hazardous cargo is possible with either type
- The flight crew is usually able to exit
- Once the crew is accounted for, focus on fire attack
- If cargo doors cannot be opened, penetrating nozzles may be needed
- Unload the aircraft
- Before entry, determine the type and locations of cargo
- Information on dangerous cargo can be found on the waybill located in the cockpit area or on the entrance door

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ADDITIONAL REFERENCE INFORMATION

Fort Collins / Loveland Airport Emergency Plan
V:\Fire\Suppression\Station 4 ARFF\ARFF Operations Training Manual

Response and Ground Operations
V:\Fire\Suppression\Station 4 ARFF\ARFF Operations Training Manual

Airport Familiarization
V:\Fire\Suppression\Station 4 ARFF\ARFF Operations Training Manual

Aircraft Air Traffic Pattern Terminology
V:\Fire\Suppression\Station 4 ARFF\ARFF Operations Training Manual

Aircraft Rescue 4 Operators Manual
V:\Fire\Suppression\Station 4 ARFF\ARFF Operations Training Manual

Aircraft Familiarization
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