GENERAL AVIATION FUELING

Arkansas Airport Operators Association Annual Meeting

ARKANSAS AIRPORT OPERATORS ASSOCIATION
A A O A

Argus

FUELING SYSTEM EXPERTS

ENGINEERING

ASSET INTEGRITY

PROGRAM MANAGEMENT

BUSINESS SOLUTIONS

PRESENTED BY:

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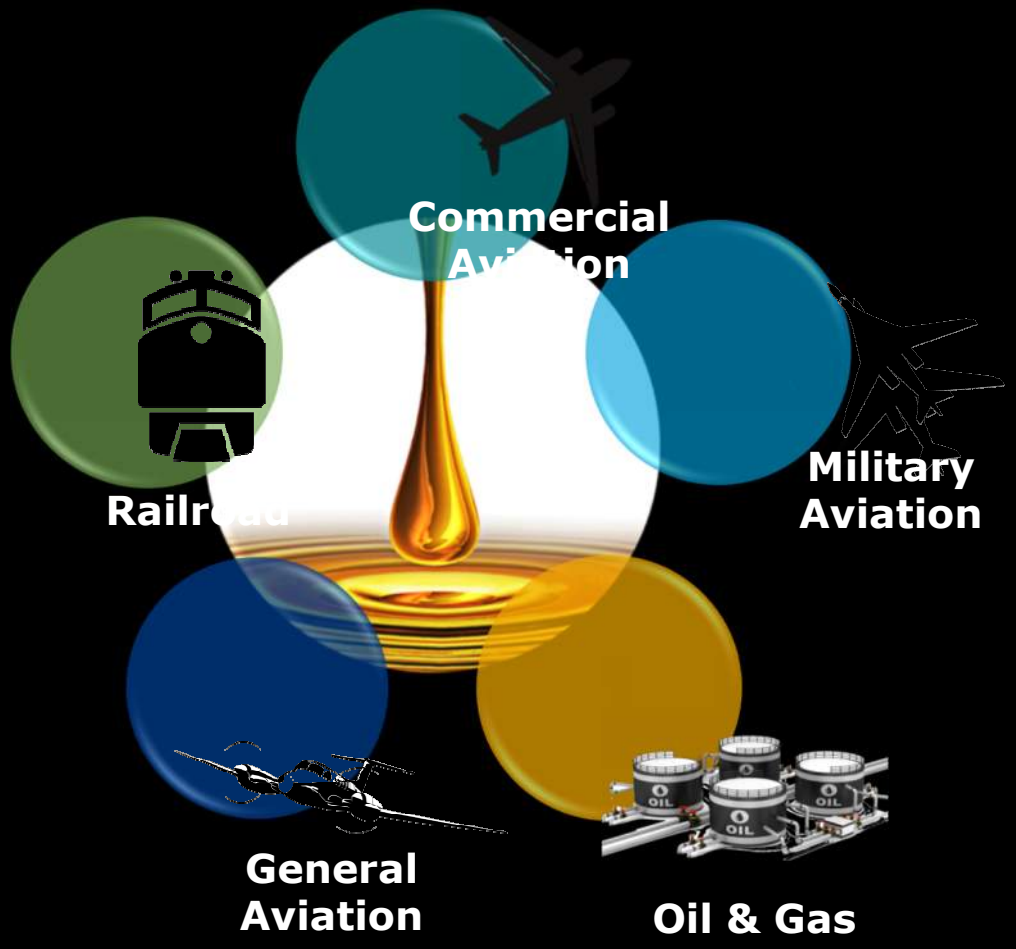
SEPTEMBER 18, 2018

At Argus, we think fuel.

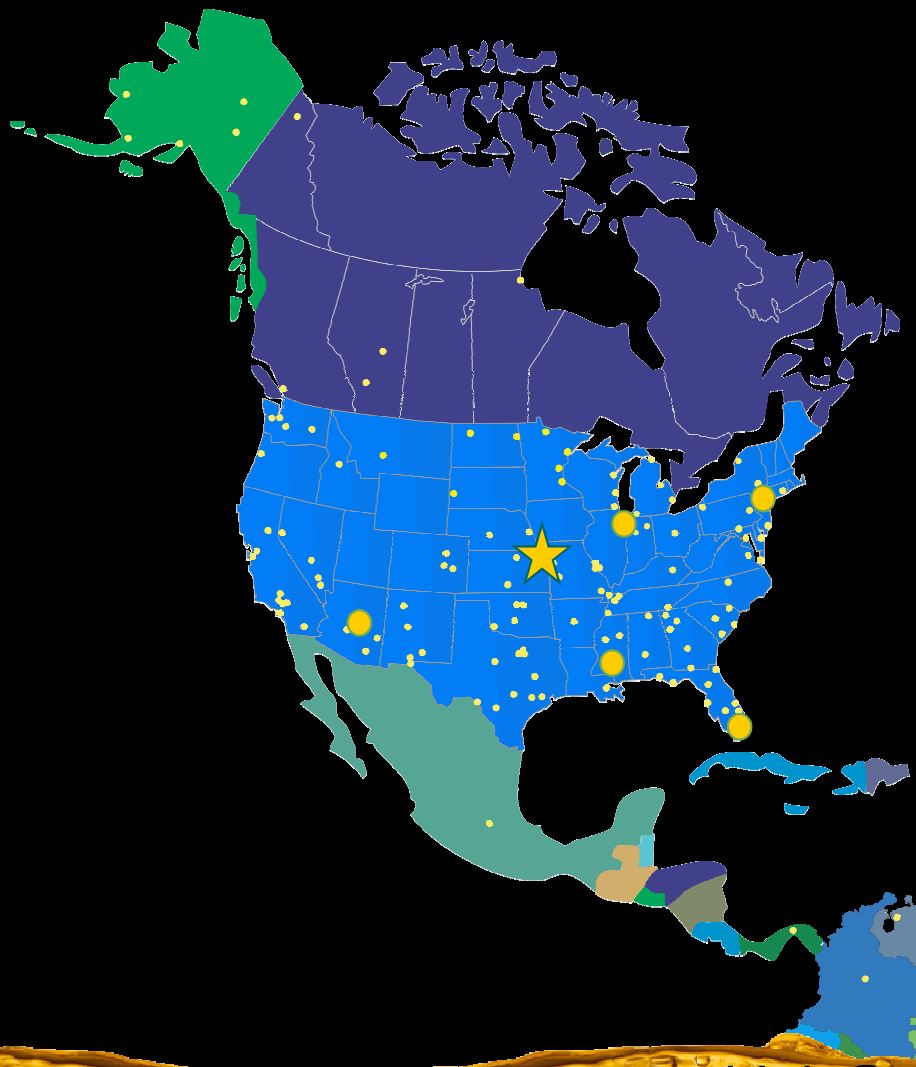
We know fuel. Founded in 1994, Argus is a consulting engineering firm specializing in programming, planning, design, and construction administration of facilities and systems that receive, store, distribute, and transport fuel.



think fuel

The Argus Difference

- Engineering firm specializing in aviation fuel system design, with more than 1,000 years of collective fueling experience.
- Worked at 70 of the top 100 airports in the U.S., including 47 of the top 50.
- Projects nationwide, Canada, and South America.
- Commercial, Military, and General Aviation Fuel System Design.
- Work for Airports, Airport Authorities, State DOT, Municipalities, and Other Consultants.
- Developed TXDOT General Aviation Fueling Standards.



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Specialized, Yet Multi-Disciplined

- Designing and 3D Modeling
- Project Management
- Scheduling and Estimating
- Construction Support Services
- Civil Engineering
- Mechanical Engineering
- Electrical Engineering
- Controls Engineering
- Structural Engineering
- Forensics Engineering
- Cathodic Protection Engineering
- Environmental Engineering
- Geotechnical Engineering
- Fire Protection Engineering
- Geology
- Project Studies
- Demolition/Decommissioning
- Procurement Services
- Surveying
- Site Planning
- Capital Planning
- Program Planning
- Fuel Master Planning
- Facility Condition Assessments
- Asset Integrity Management Analysis
- Maintenance Oversight
- Business Case Development
- Training

Agenda

- General Aviation Fuel Alternatives
- Codes and Standards
- Common Pitfalls – what to look for
- Fuel Quality
- Spill Prevention Control and Countermeasures (SPCC)
- Project Approach
- Project Profiles
- Questions and Answers

General Aviation Fueling

- Piston Alternative Fuels Initiative (PAFI) – two providers, Shell and Swift working on Phase 2 engine and aircraft testing. As of August 29th, Swift suspended work activities associated with PAFI and working on a separate initiative
- Testing scheduled to be complete Dec. '19
- Unknown when we will see in market
- Must be drop-in replacements for all material compatibility

General Aviation Fueling

- On the Jet-A side, Sustainable Aviation Fuels (SAF) Update
- ASTM D7566 – Standard Specification for Aviation Turbine Fuel Containing Synthesized Hydrocarbons
- ASTM D1655 – Standard Specification for Aviation Turbine Fuels
- Allowed to blend up to 50%
- Limited refining capabilities
- Expensive to distribute
- Commercial market is using on a limited basis at limited locations

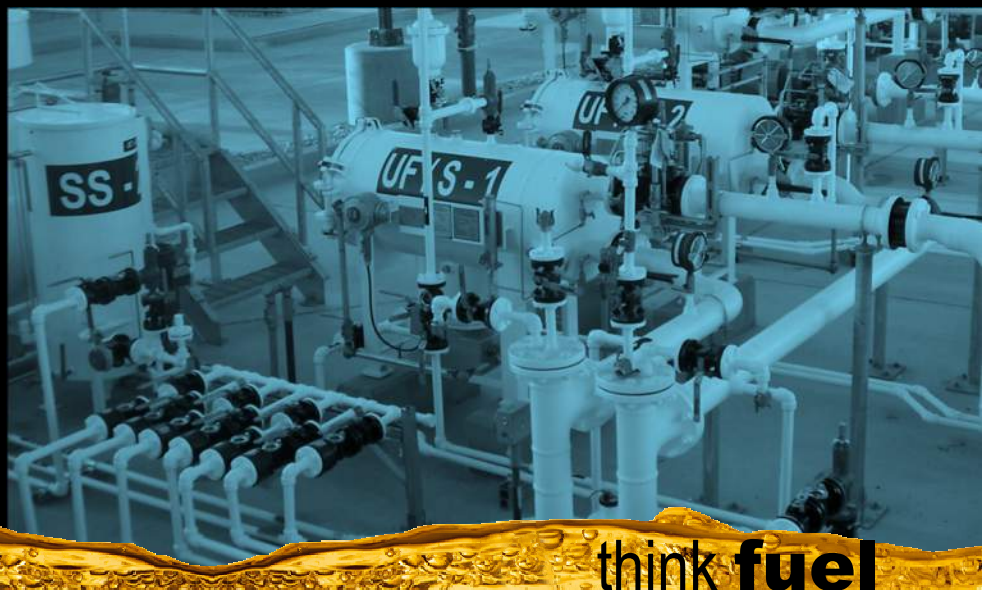
Definitions

- Bulk Fueling
  - Loading of Refueler vehicles, which in turn fuel aircraft

- Dispensing
  - Direct Fueling into aircraft
  - Usually attended with credit card reader

Codes and Standards

- **A4A 103** – Specification for Jet Fuel Quality
  - Provides the design and operation of Jet Fuel Systems, including tanks, hydrant systems, refuelers, hydrant carts, etc. No such document exists for Avgas.
- **NFPA 30** – Flammable and Combustible Liquids Code
- **NFPA 30A** – Motor Fuel Vehicle Dispensing and Repair Garages – Commonly misapplied
- **Article 58** - International Fire Code



Codes and Standards

- **NFPA 407**– Standard for Aircraft Fuel Servicing – referenced by both NFPA and IFC
- **NFPA 415** – Standard on Airport Terminal Buildings, Fueling Ramp Drainage, and Loading Walkways
- **National Electric Code**
- **Joint Industry Group** – Fueling Standards

NFPA 30 – Flammable and Combustible Liquids

- **Bulk Loading**
  - Refuelers to be loaded at approved load rack
  - Set Stop Meter to load a predetermined amount
  - Scully – secondary means of overfill protection
- **Required Offset Distances**
  - Avgas = 25 feet, Jet-A = 15 feet from tanks to dispenser and loading connection (Often obtain a waiver to reduce distance)
- **Maximum Tank Size for Double-Wall Tanks for Secondary Containment**
  - 12,000 Gallons for Class I Liquids (Avgas) pre-2015 edition
  - 20,000 Gallons for Class II Liquids (Jet-A) pre-2015 edition
  - 50,0000 Gallons – 2015 edition

International Fire Code

- **Bulk Loading**
  - Set Stop Meter to load a predetermined amount
  - Scully – secondary means of overfill protection
  - Refuelers to be loaded at approved load rack
- **Required Offset Distances**
  - Avgas = 25 feet, Jet-A = 15 feet from tanks to dispenser and loading connection
- **No Maximum Tank Size for Double-Wall Tank for Secondary Containment**

NFPA 407 – Standard for Aircraft Fueling Servicing

- Adopted by IFC, so this standard applies regardless of what national fire code has been adopted.
- Applies to all aircraft fuel servicing (piston and turbine). As an engineer, even if this hasn't been adopted, standards to be followed in all designs.
- Self-Service Aircraft Fueling only where approved by the Authority Having Jurisdiction (AHJ).
- Materials of Construction
  - Cast-iron, copper, galvanized steel piping, valves and fittings are not permitted. Ductile iron is permitted.
  - Aluminum piping, valves, fittings shall be used only where specifically approved by AHJ. Aluminum meters are very common in aviation. Install downstream of a fusible link valve

NFPA 407 – Standard for Aircraft Fueling Servicing

- Hydrostatic test – 150 percent working pressure for 4 hours
- All underground piping shall be welded. No mechanical joints or flanges.
- A fusible link valve to be provided on loading/dispensing operations immediately upstream of loading hose.
- Welded joints shall be made by qualified welders, in accordance with ASME B31.3. Required testing including radiograph and hydrostatic.
- Buried flanges and valves shall not be permitted.

NFPA 415 – Standard on Airport Terminal Buildings, Fueling Ramp Drainage, and Loading Walkways

- Potential Fuel Spill Points (PFSP) defined.
- Where PFSP are located within 100 feet from glazing material, to be provided with automatic water spray system or approved fire shutter system.
- Fuel ramp shall slope 1% away from building for first 50 feet, then 0.5%.
- HVAC air intakes on building shall be 10 feet above and 50 feet from any point of flammable vapor release.

Issues in the General Aviation Fueling Industry

- Aviation Fueling Systems differ from Automotive, therefore, require aviation specific knowledge.
- Prepackaged Units – 99% do not meet all codes.
  - Misconception that because they are pre-manufactured by reputable companies, that they meet all the code requirements.
- Lack of Standards, specifically on the Avgas side, and uninformed customers.
- Never an apples-to-apples comparison with pre-manufactured equipment, unless bid documents and qualified person is reviewing bids. Price driven market.

Common Pitfalls

- No Secondary Containment or breached secondary containment
- Non-UL Listed Tanks or underground tanks converted to aboveground tanks
- Dispensing Hoses that extend to building openings
- Grading that does not meet NFPA 415 – 1% away from building for first 50 feet

Common Pitfalls

- Loading refueler vehicles(bulk loading) at a non-approved load rack
  - No EFSO
  - No Containment
  - No Secondary Overfill Protection
  - No Set Stop to load a predetermined amount
  - Generally see refueler vehicles being loaded through a dispensing system by changing overwing nozzle to single point/dry break

Common Pitfalls

- Thermal relief valves installed horizontally
- Annual testing/certification of pressure relief valves per ASME
- Tank Inspections per STI every 10 years

Common Pitfalls

- Dispenser within hazardous area (within 10’ of tank shell)
- Hold open device on overwing nozzle
- Air Eliminator and thermal relief valves have too small of a discharge. Can not be smaller than the inlet.
- Poor maintenance
  - Coatings
  - Soil washed out onto pump skids

Common Pitfalls

- No operating instructions or emergency contact phone number
- Emergency Fuel Shut Off Devices and Signage
- No Smoking Signage
- Clear Product signage

Common Pitfalls

- National Electrical Code and adherence to the Hazardous Areas
  - Non-rated equipment in hazardous areas
  - Dispensers located in hazardous areas
  - Improper seal off of conduit existing hazardous areas
  - Card readers in a hazardous area

Common Pitfalls

- No static relaxation – code requires 30 seconds of relaxation between filtration and fuel entering a tank or refueler vehicle.
- No thermal relief or reduced piping on discharge
- No air bulk elimination
- Coated piping only after filter
- Improper routing of air relief and thermal relief piping

Common Pitfalls

- Wrong Materials of Construction - Aluminum, Brass and Cast-Iron Components
- Poor Fuel Quality
- Poor Maintenance
- No SPCC Plan in Place

Fuel Quality

- Essential to Aircraft Safety
- **Five Components to a Good Design to Ensure Fuel Quality**
  - Internally-Coated Tanks and Piping or Stainless
  - Filtration and Water Detection
  - Floating Suction
  - Sloped Tanks to promote water migration to sump or low end of tank
  - Water Draw-Off Capabilities

Internal/External Coatings

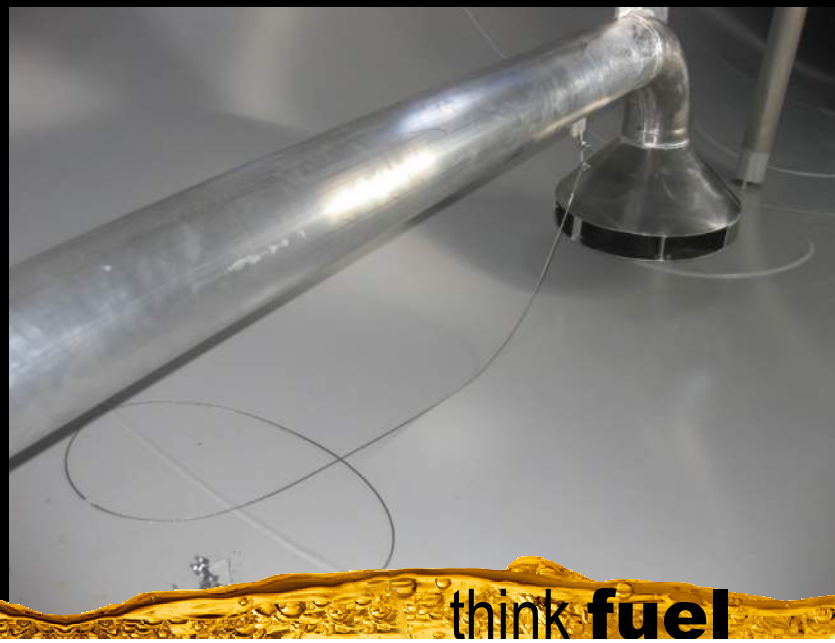
- Internal Coatings vs. Bare Carbon Steel
  - Tanks to be internally epoxy-coated (2 coats)
  - Tanks and piping to be externally coated with epoxy primer and urethane top coat
  - All piping, both before and after filter, shall be coated or use stainless steel
  - Impractical to coat piping less than 3” diameter, therefore, use stainless steel
- Use a High Quality Coating System, one that lasts longer than your 1 year warranty
- Insist on Extended Warranty for Coating System
- Insist on NACE Third-Party Inspections

Filtration & Water Detection

- Filter Separator to Remove Particulate and Water
- Differential Pressure Gauge
- Drain Sump Daily

Floating Suction

- Ensures cleanest fuel is being removed from tank.
- Mount floating suction assembly in manway of tank to facilitate easy removal.
- May be installed on the bottom of a submersible pump.



Tank Slope

- Tank shall be sloped a minimum of 2.5% to allow water in tank to migrate to a low point where it can be removed.

Water Draw-Off Connection

- Provides means to remove water from tank.
- Hand-operated piston pumps work best, rather than rotary vane pump.
- Need anti-siphon valve on tank.

EPA SPCC Requirements

- Facilities with greater than 1,320 gallons aboveground or 42,000 gallons below ground are required to have an Spill Prevention Controls and Countermeasures Plan.
  - **40 CFR Part 112.7**
- Requires spill containment for refueler loading operations.
- General containment for piping and dispensing.
- General containment for unattended parking of refueler vehicles.
- Site specific and operation specific

Common Approach to New Projects

- **Site Inspection/Kickoff Meeting**
  - Conduct Kickoff Meeting
  - Perform Site Survey and develop AutoCAD base files with known utilities.
- **Prepare Preliminary Engineering Report.**
  - Basis of Design Report
  - Code Review
  - Includes site plans and flow diagrams
  - Engineer's Estimate – how much is this project going to cost
- **Detailed Design**
  - Prepare Drawings and Specs for Bidders

Common Approach to New Projects

- **Bidding**
  - Conduct Pre-bid Meeting
  - Answer Bidders' Questions
  - Tabulate Bids and Make Award Recommendation
- **Construction Support Services**
  - Conduct Preconstruction Conference
  - Perform Periodic Site Visits
  - Review Compliance Submittals
  - Assist in Start-up and Commissioning
  - Review Close-outs and Testing Submittals
  - Prepare As-builts
  - Prepare SPCC Plan

Portfolio of Projects

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Hearne Municipal Airport, TX

Van Zandt County Regional Airport, TX

Cleveland Municipal Airport, TX

Victoria County Regional Airport, TX

Houston County Airport, TX

Clarence E Page Airport, OK

Las Cruces International Airport, NM

Old Crow, Yukon

Edinburg, TX

JET-A

EMERGENCY FUEL SHUTOFF PUSH
DOLLARS
GALLONS
PRICE/GAL
JET-A
AVGAS 100LL

Greenville Municipal Airport, TX

Eastern Iowa Airport, Cedar Rapids, IA

Coal Harbour Airport, Vancouver BC

Questions?

Thank You!

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