ARFF VEHICLE REFERENCE GUIDE

OSHKOSH AIRPORT PRODUCTS

Airports demand the highest performing **ARFF trucks** available. Why? Because ARFF trucks protect the traveling public, while also providing a crucial service to commercial and private airports and the passengers and cargo they transport.

Let's take a look at this reference guide on ARFF vehicles.

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What does ARFF stand for?

ARFF is an acronym for aircraft rescue and fire fighting. According to **Firehouse Magazine**, the history of aircraft rescue firefighting (ARFF) trucks dates back to 1937 by Chief J.K. Schmidt at Elgin Air Force Base in Florida. The publication's article on the history of ARFF vehicles states:

> "Chief Schmidt modified a 750-GPM Peter Pirsch pumper, by replacing the hose bed with a 250-gallon water tank and using a high-pressure fog nozzle that was used by local citrus farmers. With these changes, Schmidt introduced the first apparatus specifically designed to combat aircraft and fuel fires."

As a result, ARFF trucks were born - **learn about** the history of the Oshkosh Corporation, Oshkosh Airport Products, and the evolution of our ARFF vehicles.

In 1968, the creation of the MB-5 for the U.S. Navy launched Oshkosh into a position of world leadership in the Aircraft Rescue and Firefighting (ARFF) industry. Soon after, the MB-1 was introduced as a 1,000-gallon capacity ARFF. With the M-Series, Oshkosh offered a civilian line of ARFF vehicles. Airport fire trucks have continued to evolve to this day.

What is an ARFF vehicle?

ARFF vehicles are aircraft rescue and firefighting apparatus, and they **differ from municipal rescue** and firefighting trucks. The reason is airport emergencies present different types of scenarios and require a unique response.

Airport fire trucks carry a larger water tank, capable of holding thousands of gallons. This is because they don't have access to water supplies when locations of emergencies vary and are uncertain. They also have to carry various firefighting agents, such as firefighting foam, dry chemicals, and clean agents, for situations which may stem from aircraft oil spills and electrical fires.

How are ARFF vehicles used in aircraft rescue firefighting?

ARFF trucks are used by airport fire departments to provide safety and emergency response and aircraft firefighting needs. These vehicles and their operators standby, ready at any moment for an incoming or outgoing airplane which presents an issue requiring response. Some types of services an airport fire truck may provide are typical of a firefighting department. This can include activities such as fire containment, fire suppression, medical response, passenger and crew extraction, and mutual aid to local departments near the airport.

However, there are services an ARFF truck is called upon to perform which differ from a typical fire department. Those services would include airframe and cargo preservation and maintenance of the incident site for an after-occurrence investigation.

ARFF vehicles are exceptional because they have great acceleration, despite their size and weight. They can navigate through the rough terrain of an airport's terminal and runway space. They are fitted with powerful, high-capacity pumps which spray water and foam from turrets which reach long distances.

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Why do airport fire trucks look different?

Most ARFF vehicles feature a slanted body with front bumper designed for maneuvering through ditches and rough terrain. Because ARFF vehicles do not need to navigate the confines of a city street, the apparatus is larger than municipal fire trucks. This allows them space to carry more water, necessary gear and equipment, and up to five personnel.

The other difference is these trucks are built for off-road driving. An ARFF apparatus may require the operator to drive over wreckage or reach an aircraft off a paved runway. They have large, wide tires and a long travel suspension which are suited for off-road navigation.

What are the key considerations when purchasing an ARFF truck?

When purchasing an ARFF truck, four considerations should be kept in mind, according to the FAA **150/5220-10E, Guide Specification for Aircraft Rescue and Fire Fighting (ARFF) Vehicles**.

1. Airport Indexes and Vehicle Class

In the United States, the **Federal Aviation Administration** (FAA) is the governing body of civil aviation which oversees, regulates, and coordinates airports and airspace operations. However, standards and procedures vary across the globe. The International Civil Aviation Organization (ICAO) is a specialized United Nations agency which coordinates and helps reach a global consensus on international civil aviation standards and recommended practices. These aviation agencies interact with one another to participate in global policy and procedure creation, including the determination of airport index assignments. The ICAO utilizes a numbers-based airport index category system (Category 1 to 10), and the FAA utilizes a letters-based system (Index A to E). Each agency then prescribes the minimum amount of firefighting agent which is required for a particular size airport which are covered under their jurisdiction.

The FAA classifies ARFF trucks by five categories - classes one through five. These classifications segregate vehicles by what types of fire suppression agent and how much of the agents are carried on a vehicle.

The FAA explains ARFF vehicle class as the following:

Vehicle Class	Water/Aqueous Film-Forming Foam (AFFF) Requirement	Dry Chemical or Halogenated Agent Requirement	Vehicle Example
Class 1 ARFF	100 gallons	500 pounds of dry chemical (sodium or 450 potassium based) or 460 pounds of halogenated agent	
Class 2 ARFF	300 gallons	500 pounds of dry chemical or 460 pounds of halogenated agent	
Class 3 ARFF	500 gallons	500 pounds of dry chemical or 460 pounds of halogenated agent	
Class 4 ARFF	1,500 gallons		**Striker 4x4**
Class 5 ARFF	3,000 to 4,000 gallons		**Striker 6x6** and **Striker 8x8**

2. ARFF Firefighting Agents

ARFF vehicles carry a **variety of fire agents** (either as a single agent or in combination with another agent):

- sodium-based dry chemical or potassium-based dry chemical
- halogenated (gaseous clean agents)
- water and firefighting foams, such as AFFF, Film-Forming Fluoroprotein Foam (FFFP), and Fluorine Free Foam (FFF).

Water

Water has been the most popular fire suppressant throughout history and can be useful in fighting class A fires (fires made up of common combustible solids). Water is ineffective at suppressing oil and electrical fires (Class B and C fires) and can actually be dangerous if used on either. Water is also used to be mixed with foam.

Firefighting Foam

Firefighting foam was invented in the early 1900's and has evolved into various forms for different types of fires. Class A foam was originally made for use against forest fires and is used similarly to water. Class B foam is meant for liquid spills, and firefighting foams fall under this category. Firefighting foams can have a low viscosity and can quickly and efficiently cover large amounts of spilled jet fuel. Foam creates a vapor barrier between the fuel source and the oxygen in the atmosphere, suppressing the fire.

Dry Chemicals

There are also various types of dry chemicals made for different purposes. Some of the most popular are ABC chemical and BC chemical. ABC chemical is the most versatile and can be used to suppress all types of fires. Combining dry chemical powder into the water/foam solution is advantageous when dealing with a Class B fire.

Dry chemicals are frequently used in industrial settings, where chemical and electrical fires are at a high risk. Dry chemicals are only used when needed due to the fine particulates which spread easily over a large area and create cleanup challenges.

3. Compressed Air Foam for ARFF Vehicles

In an ARFF emergency scenario, fire suppression agent conservation is critical because, in most cases, everything needed must be transported to the scene and contained within the apparatus and equipment. Compressed air foam (CAFS) is not new in the use of structural fires; however, in recent years, it has been tested and proven effective for use in Class B/fuel fires. Traditionally, ARFF crews operated using aspirating turrets and nozzles. CAFS provides a simple system where air is injected into the water/foam solution before moving into the piping of the turret or hose line. Pressurized air injected into the water and foam solution expands the foam many more times than a conventional aqueous film-forming foam (AFFF) nozzle – which relies on mechanically mixing ambient air with the water and foam solution at the nozzle. The result is CAFS which has a thicker consistency and creates a superior foam blanket, with a lower amount of water required.

Oshkosh Airport Products' system uses an on-board air compressor which offers unlimited CAFS firefighting capability without having to recharge air cylinders. The attributes of CAFS allow foam to cling to vertical surfaces and provide a highly effective insulating effect. Thicker foam blankets mitigate fuel vapors for extended time periods, and higher expansion ratios mean responders need less water. In recent years, Oshkosh Airport Products has experienced increased industry demand for CAFS and has a system ready to go to market.

4. Input Based Foam Testing Systems:

Oshkosh's electric foam proportioning system (**Eco EFP**™) can test a vehicle's foam system to determine if the system is properly proportioning, without requiring foam to be discharged from the vehicle. It measures both the solution and foam flows on the vehicle and archives the testing data with a time and date stamp. This reduces the environmental impact of foam testing, along with reducing the cost of cleaning up the foam solution after the test.

What features should be considered when purchasing an ARFF vehicle?

The demand for safer, more maneuverable, and efficient fire apparatus continues to drive new technologies. Today's municipal and ARFF apparatus continue to evolve into complex, technology-driven vehicles. What technology developments will make the biggest impact on the life-saving functions of fire departments? Consider these three critical factors and the related advancements.

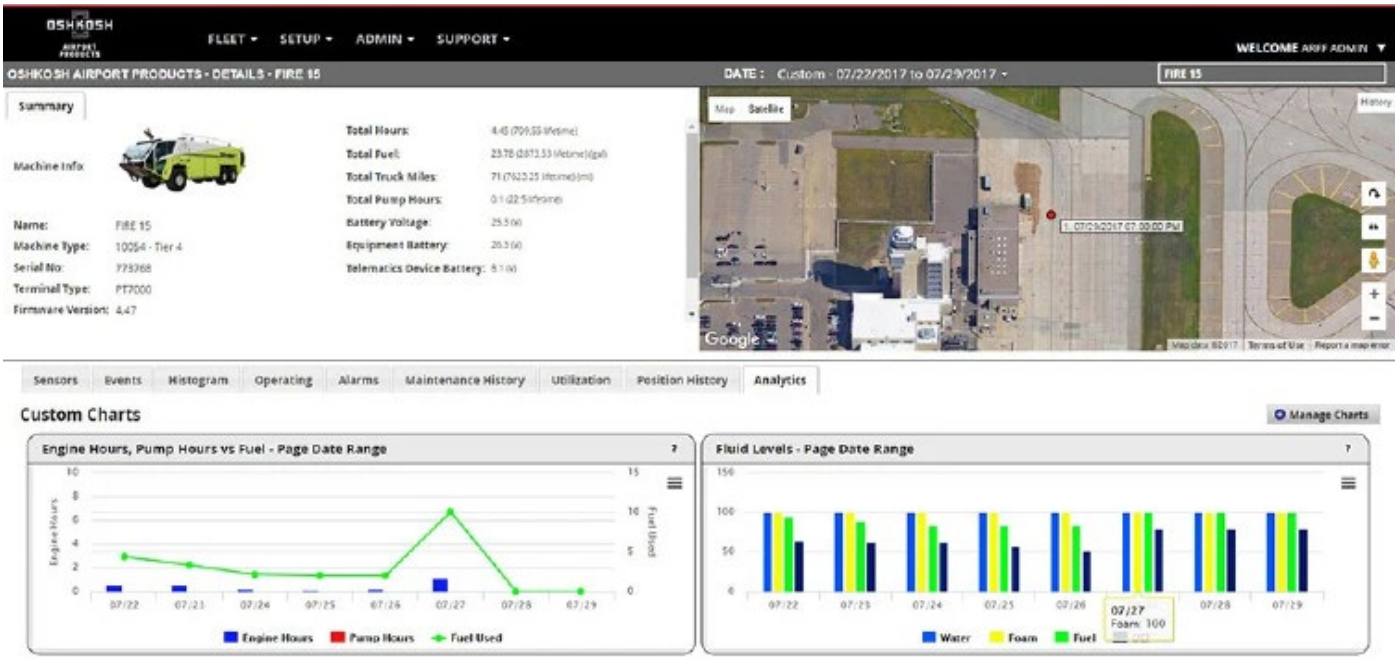
1. ARFF Safety:

When designing a fire apparatus, safety is a top priority. Advancements in lighting, situational awareness, collision mitigation, and carcinogen reduction are just a few safety innovations which have come to the forefront in recent years. One of the most notable safety technology advancements and fire apparatus features is **Electronic Stability Control_(ESC)** - a feature tied in with the braking system which slows the vehicle down by depowering the engine and applying the brakes when it senses an imbalance event due to low friction surfaces or rollover events.

Side curtain airbags and seat belt pretensioners are also optional items a fire department may consider specifying in the cab. During a side rollover event, the outer seats have the added protection to keep the firefighter safe.

2. ARFF Maneuverability:

When an ARFF apparatus operator is navigating the diverse elements of an airfield, maneuverability and maximum control are crucial. Developed by Oshkosh, **TAK-4® Independent Suspension** has set the bar for mobility in heavy-duty vehicles and fire apparatus. TAK-4 independent front and rear suspensions increase vehicle mobility and improves ride quality while lowering life cycle costs. For the highest level of maneuverability, TAK-4 independent rear suspension is also available with a mechanical rear steering system, which reduces tire wear, decreases turning diameter, and helps firefighters overcome challenging terrains at mission-critical speeds.



3. ARFF Fleet Standardization and Telematics:

The automotive industry isn't the only space where telematics technology is evolving rapidly. Fire apparatus vehicle **telematics systems** are now providing firefighters with fleet standardization efficiencies and maintenance personnel with critical data. Oshkosh Airport Products' Runway Ready™ technology is an integrated telematics system which provides full diagnostics and the overall readiness of a fleet all within a moment's notice.

Why choose the Oshkosh Striker ARFF vehicle?

The Oshkosh Striker ARFF has optimized vehicle performance, response flexibility, true pump and roll in any condition, and it offers the **Snozzle**® HRET as an available option. With this apparatus, aircraft rescue and firefighting crews can take on hazards with extreme precision in the most unforgiving conditions.

Known as the most capable ARFF vehicle ever built and custom-engineered to deliver rapid response, the **Striker 8x8** reaches 50 mph (80 kph) in less than 20 seconds with fewer emissions while exceeding NFPA, ICAO, and EU standards. The operator-friendly cab is virtually interchangeable with the **Striker 4x4** and **Striker 6x6** models and offers superior mobility, speed, and precision which maximizes innovation in the runway response industry.

Oshkosh Airport Products continues to innovate and introduce upgraded and new features on the **Striker ARFF vehicle**. In January 2021, the next generation Striker ARFF was released.

While retaining all its remarkable legacy features, the Striker ARFF vehicle maximizes innovation in the runway response industry. Features of the new Oshkosh Striker ARFF vehicle include:

Unparalleled Performance and Safety

- Enhanced visibility
- Optional Electronic Stability Control (ESC)
- Optional Side Curtain Airbags
- Optional 360-degree Camera

Custom Chassis Performance

- Exceeds NFPA and ICAO firefighting requirements
- Chassis designed to meet US DOT/FMVSS and EU regulations
- Oshkosh patented TAK-4 all-wheel independent suspension
- Center steer for greater all-around visibility and control
- Optional Oshkosh mechanical rear steer
- ARFF-Manueverability

Optimized Cockpit

- Modular cab design with ergonomic control placement
- Spacious cab seating for up to 5 firefighters
- Increased forward and side visibility
- Updated Oshkosh Command Zone™ software with diagnostic support
- Oshkosh C.A.R.E.™ (Carcinogen Awareness and Reduction to Exposure) Clean Options
- Optional bus-style doors

Innovative Fire Suppression

- **Oshkosh power divider** allows for pump and roll in any condition
- **Snozzle HRET** available in 50’ (15.25 m) or 65’ (19.8 m)
- Oshkosh **K-Factor**™ system, which rapidly displays the position of the Snozzle HERT’s piercing tip to the fuselage, eliminating depth perception issues to maximize precision
- **ECO EFP** Foam Test system for easy measurement of foam percentages from every discharge on the vehicle, without discharging foam
- Oshkosh Striker ARFF available with different firefighting systems
- Available with:
  - » Standard pressure
  - » Ultrahigh pressure
  - » CAFS
  - » NOVEC 1230 - a fire suppression agent that removes heat instead of oxygen, and safer to use in occupied spaces because it does not pose a suffocation risk for people.

In recent years, airports worldwide have made green initiatives an integral priority, compelling fire departments to seek environmentally conscious fire apparatus which reduce emissions, minimize fuel consumption, and produce less noise. The need was met in June 2021, with the announcement of **the revolutionary Striker Volterra™ performance hybrid**. Based on Oshkosh proprietary technology, the new Striker Volterra performance Aircraft Rescue and Fire Fighting (ARFF) hybrid electric vehicle (HEV) has been developed to meet the growing emergency response and environmentally conscious needs among airports of all sizes.

What are the latest options in ARFF training?

Virtual reality has grown in popularity among many applications and industries as an essential tool for training. Specifically, for emergency first responders, the trend has advanced to a level of realism which allows ARFF teams to simulate real-life situations and learn how to properly use the critical equipment which helps save lives.

ARFF truck simulation for training purposes has given airport emergency responders the opportunity to gain knowledge on handling a wide variety of scenarios, without the cost and safety concerns associated with real vehicle use or live fire training. A “green solution” with zero environmental impact, some simulators are engineered to depict a nearly endless array of emergency situations and scenarios.

Striker Simulator

Oshkosh Airport Products’ **Striker Simulator** is one of the first virtual resources for training firefighters to extinguish aircraft fires on grounded planes and has been engineered with authentic tools and graphics which are customizable for any airport. The system incorporates video footage and illustrated environments of **Striker ARFF trucks** (4x4, 6x6, and 8x8) in action—with views both inside and outside the cab, along with a full audio track.

Crews can train on a laptop or a fully immersive wrap-around simulator on many tactics, including the proper delivery of firefighting agents such as dry chemical, foam, water, and even clean agents. In addition, the Striker Simulator can mimic scenarios which can’t be safely accomplished at a traditional training center, such as a fuel spill or people exiting an airplane. The simulator command center has great flexibility with creating custom-designed scenarios. For example, the experience can feature a large number of airplanes, multiple fires and fuel spills, people on the ground, and so much more.

While ARFF emergency responders are typically required to take part in real-world training once every year, the simulator training can be incorporated into ongoing and regularly scheduled training.

With technology innovations emerging faster than ever, it is essential to anticipate the future needs of firefighters, and how the next generation of fire apparatus will meet the demands these brave men and women around the world face each day.

What questions do you have about ARFF vehicles and how to select the best fire apparatus for your operation? Oshkosh Airport Products' knowledgeable and experienced team is ready to help.

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