

NewsLetter

Week of January 29, 2007

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Joint Lab-EPA program

ASPECT team responds to recent incidents

by Todd Hanson

It's nine o'clock Tuesday morning, January 16, in Brooks, Kentucky, a small town roughly thirty miles south of Louisville. A CSX Transportation train derails on the tracks that run through town. Some of the train cars explode and as fire fills the sky with thick black smoke, nearby residents, some of them exposed to the chemical plume, report skin irritation, a strange taste in their mouths, and an unpleasant feeling in their lungs.

Authorities evacuate residents within a one-mile radius of the accident. Based on shipping manifests, authorities determine that cyclohexane, a flammable, inhalation hazard, was one of the primary chemicals feeding the blaze. When the Environmental Protection Agency is called to the scene, it requests the ASPECT (Airborne Spectral Photometric Environmental Collection Technology) aircraft, a small, twin-engine plane carrying Los Alamos-built sensors stationed in Texas. Meanwhile in Los Alamos, 1

Kroutil and Dolin are an integral part of a multi-agency team that responds to special chemical incidents, like the Brooks derailment, as well as to real or potential homeland security threats in support of the Department of Homeland Security's Rapidly Deployable Chemical Defense System. The RDCDS system combines aircraft and ground-based chemical sensors into a system that can provide advanced warnings to the public in the event of a chemical release. RDCDS uses the Environmental Protection Agency's ASPECT for its rapidly deployable airborne chemical detection capability. Los Alamos developed the plane's onboard sensor technologies and is currently helping with the analysis of data. Data collected by ASPECT from its analysis at an emergency response is transmitted to the EPA for a rapid overall assessment of

a situation and is then provided to local incident commanders. Kroutil and Dolin's work with the EPA and DHS is an example of just one of the many ways in which the Laboratory is working with government agencies.

The ASPECT plane, a twin-engine Aero Commander 680 aircraft based in the Dallas, Texas, vicinity, is equipped with a multi-spectral infrared mapping system and a Fourier Transform Infrared spectrometer package called ASPECT. This spectrometer detects and locates chemical vapors and can see through smoke and dust to get a measurement of the location and concentration of the vapor plume. A second sensor, a high-resolution Infrared Line Scanner, records an image of the ground below, as well as plume information. This sensor package is the only "stand-off infrared" detection tool in the nation devoted to emergency domestic response applications. The technology provides first responders with critical information regarding the size, shape, composition, and concentration of gas clouds. The system uses Global Positioning System mapping data and digital images of the site to create exact maps and digital data overlays of chemical plumes, as well as low-area locations where toxin-laden air may accumulate.

Since its initial deployment in 2001, ASPECT has responded more than 65 times to emergencies across the country. Earlier this month, ASPECT was deployed through the DHS RDCDS program with the EPA to a mysterious bird kill in downtown Austin, Texas, as well as to the recent Tournament of Roses Parade and the Rose Bowl football game in Pasadena, California, on New Year's Day.



Pictured above is the Brooks, Kentucky, train derailment as seen by ASPECT on January 16. ASPECT (Airborne Spectral Photometric Environmental Collection Technology) is a small, twin-engine plane carrying Los Alamos built sensors that can detect and locate chemical vapors. Photo courtesy of ASPECT/Environmental Protection Agency

 **NewsLetter**

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U.S. DEPARTMENT OF ENERGY
NATIONAL NUCLEAR SECURITY ADMINISTRATION

AERIAL MEASURING SYSTEM (AMS)



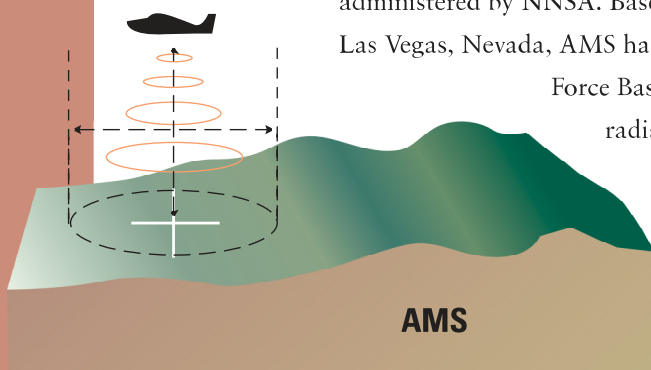
The Department of Energy's (DOE) National Nuclear Security Administration (NNSA) has the world's leading scientists, engineers and technicians from over 50 years of managing the nation's nuclear weapons program. When the need arises, DOE is prepared to respond immediately to any type of radiological accident or incident anywhere in the world with the following seven radiological emergency response assets.

AMS (Aerial Measuring System) detects, measures and tracks radioactive material at an emergency to determine contamination levels. **ARAC** (Atmospheric Release Advisory Capability) develops predictive plots generated by sophisticated computer models. **ARG** (Accident Response Group) is deployed to manage or support the successful resolution of a U.S. nuclear weapons accident anywhere in the world. **FRMAC** (Federal Radiological Monitoring and Assessment Center) coordinates Federal radiological monitoring and assessment activities with those of state and local agencies. **NEST** (Nuclear Emergency Support Team) provides the nation's specialized technical expertise to the Federal response in resolving nuclear/radiological terrorist incidents. **RAP** (Radiological Assistance Program) is usually the first NNSA responder for assessing the emergency situation and deciding what further steps should be taken to minimize the hazards of a radiological emergency. **REAC/TS** (Radiation Emergency Assistance Center/Training Site) provides treatment and medical consultation for injuries resulting from radiation exposure and contamination, as well as serving as a training facility.

INTRODUCTION

The Aerial Measuring System (AMS) is one of the emergency response resources, or assets, administered by NNSA. Based and operated out of Nellis Air Force Base in Las Vegas, Nevada, AMS has additional operational capability at Andrews Air Force Base near Washington, DC. The AMS aircraft carry

radiation detection systems which provide real-time measurements of extremely low levels of ground and airborne contamination. AMS can also provide detailed aerial photographs and multi-spectral imagery and analysis of an accident site.





U.S. DEPARTMENT OF ENERGY
NATIONAL NUCLEAR SECURITY ADMINISTRATION

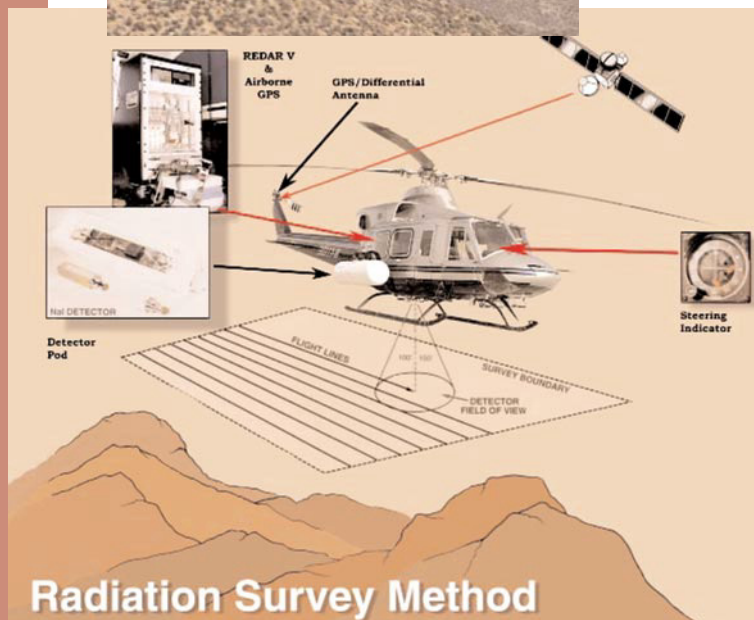
MISSION

The AMS mission is to provide rapid response to radiological emergencies with helicopters and fixed-wing aircraft equipped to detect and measure radioactive material deposited on the ground. The AMS team of scientists, technicians, pilots, and ground support personnel combine their talents and expertise to keep AMS in a constant state of readiness to respond to a major radiological emergency.

AMS uses a sophisticated radiation detection system to gather radiological information and store it on computers. These computers are used to produce maps of radiation exposure and concentrations. Detecting, tracking, and modeling of radiation is one of the first tools used to decide where to send state, NNSA, or other Federal agency ground monitoring teams.

STEPS IN THE AMS EMERGENCY RESPONSE

In the event of an accident or incident involving radiological materials, NNSA in consultation with state and/or other Federal partners will deploy AMS immediately to the accident site. The fixed-wing aircraft will normally arrive first.



Helicopters perform detailed surveys of ground contamination at low altitudes.

The fixed-wing aircraft is used to determine the path of the radioactive plume and to determine the location of any ground contamination. The helicopters are used to perform detailed surveys of any ground contamination. A four-wheel drive vehicle-based radiation detection system, named KIWI, can be used to develop highly detailed maps of any ground contamination.

NNSA scientists are then able to rapidly develop maps of the airborne and ground hazards. This enables the scientists to determine ground deposition of radiological materials and to project the radiation dose to which people and the environment are exposed. This information gives officials the information they need to effectively respond to the emergency.

ABOUT THE AIRCRAFT

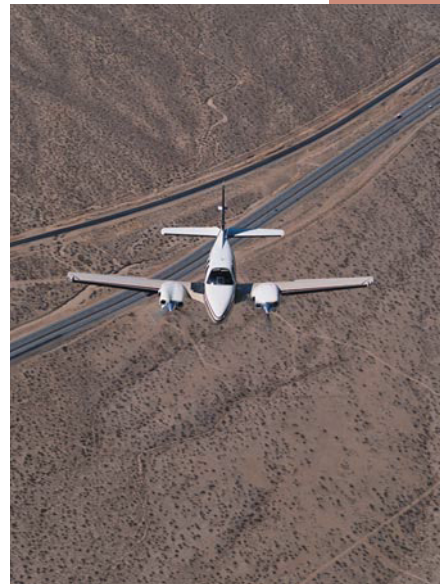
Each type of aircraft has its own specialization. Fixed-wing (Beechcraft B-200 or Cessna Citation) aircraft are faster, so they can arrive at the emergency scene sooner. They provide rapid mapping of the extent and levels of contamination.

Bell 412 helicopters are slower and are able to travel at lower altitudes, typically 150 feet. This allows more detail to complete the picture than with fixed-wing aircraft. They provide detailed and highly sensitive quantitative ground data mapping of contamination. Helicopters may be brought in to the emergency

scene after the fixed-wing aircraft have gathered the qualitative data to get a closer assessment.



Fixed-wing aircraft provide ground surveys.



measure
detect
track



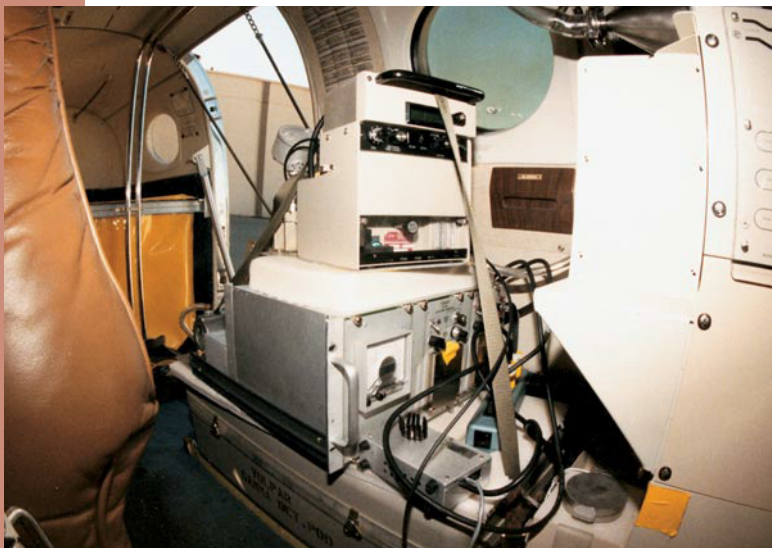
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NATIONAL NUCLEAR SECURITY ADMINISTRATION

AMS



WHEN THE JOB IS DONE

After measurements of radioactive material depositions and plume tracking and sampling have been completed, the role of AMS in the emergency response is accomplished. At that time, the Manager of the DOE Nevada Operations Office, in charge of activating, deploying, and deactivating AMS elements, as directed by NNSA Headquarters, authorizes deactivation of AMS.



OTHER AMS ACTIVITIES

In addition to responding to emergencies, AMS operates on a multi-year survey schedule developed by the DOE Nevada Operations Office. This schedule includes surveys of DOE sites, participation in interagency exercises, and work for other Federal agencies, such as baseline surveys for the Nuclear Regulatory Commission. These activities are coordinated through NNSA Headquarters.

**Specialized equipment
detects and monitors
radiation levels.**

AMS conducts regularly scheduled surveys to create a baseline of radiological, multi-spectral analysis, thermal imagery, and other remotely sensed data. AMS has performed baseline radiation surveys of most nuclear facilities in the country. In an emergency situation, this baseline information can be compared to current emergency data to help in assessing the amount of contamination. The AMS capability can also be used to locate lost or stolen radiological materials.

FUTURE DIRECTION

The future for the AMS program is to move from man-intensive, specific air-frame dependent assets to remote-controlled, near real-time data production with low fixed-maintenance-cost equipment. Data and info acquired with the AMS will be transmitted and shared over intelligent data highways and networking systems. The results of these efforts will be improved scientific delivery capabilities with minimized operating costs.

For more information, contact:
Office of Emergency Response
U.S. Department of Energy
19901 Germantown Road
Germantown, MD 20874
301-903-3558

PARTNERS IN
Emergency
RESPONSE



www.fire.ca.gov



Firefighting Aircraft

Recognition Guide

CAL FIRE Aircraft Contact Frequency 122.925



www.fire.ca.gov

History

The CAL FIRE Air Program has long been the premier firefighting aviation program in the world. CAL FIRE's fleet of over 50 fixed wing and rotary wing, make it the largest department owned fleet of aerial firefighting equipment in the world. CAL FIRE's aircraft are strategically located throughout the state at CAL FIRE's 13 airbases and nine helicopter bases.

Airtanker Program

CAL FIRE first began using airtankers in the 1950s when agriculture spraying planes were used to drop water on fires. In 1958, CAL FIRE, then CDF, contracted with a private airtanker service for the use of their converted World War II aircraft. By 1970 the department began to evaluate the use of former military Grumman S-2 aircraft. Over the next ten years CAL FIRE continued to build up its fleet of S-2A airtankers.

In 1987, CAL FIRE began the process of upgrading the engines to turbine driven. By 2005 all of CAL FIRE's airtanker fleet had been converted to S-2T airtankers. The department once again made history in 2006 when it contracted with the first "Very Large Air Tanker", a converted DC-10.

Air Tactical Aircraft

In the mid 1970s the department found that the contractor-owned air attack planes did not provide the airspeed and safety needed for the new airtanker program. In 1974, the department acquired 20 Cessna O-2 aircraft from the United States Air Force, which had been used in Vietnam.

In 1993, CAL FIRE obtained 16 North American OV-10A aircraft from the US Navy. The OV-10s replaced the O-2s that had served the department well for more than 20 years. The OV-10's turbine-powered twin-engines helped meet the needs for the next-generation Air Attack platform.

Helicopter Program

CAL FIRE began using contractor-owned helicopters for fire control in the mid 1960s. In 1981, CAL FIRE obtained 12 Bell UH-1F series helicopters from the Air Force. In the late 1980s CAL FIRE began to phase out the "F" model and upgrade to newer, larger UH-1H helicopters. The UH-1H aircraft were significantly modified to meet the department's specialized needs. The modified helicopters were designated as "Super Huey's".

Firefighting Aircraft means support of the firefighters on the ground from aircraft in the air. Aircraft can access steep, rocky or unsafe areas before ground forces are able to gain entry. CAL FIRE has the largest state owned firefighting air fleet including 23 airtankers, 11 helicopters and 14 air attack aircraft.

Air Attack or Air Tactical Aircraft is an airplane that flies over an incident, providing tactical coordination with the incident commander on the ground, and directing airtankers and helicopters to critical areas of a fire for retardant and water drops. CAL FIRE uses OV-10As for its air attack missions.

Airtanker is a fixed-wing aircraft that can carry fire retardant or water and drop it on or in front of a fire to help slow the fire down. CAL FIRE uses Grumman S-2T airtankers for fast initial attack delivery of fire retardant on wildland fires. The S-2T carries 1,200 gallons of retardant and has a crew of one – the pilot.

Helicopter is a rotary-wing aircraft that can be fitted with a tank or carry a bucket with water or fire retardant. The tanks or buckets can be filled on the ground by siphoning water from lakes, rivers or other water sources. CAL FIRE uses UH-1H Super Huey helicopters for fast initial attack on wildfires. CAL FIRE's copters are able to quickly deliver a nine-person fire crew wherever needed as well as battle fires with water/foam drops.

Fire Retardant is a slurry mix consisting of a chemical salt compound, water, clay or a gum- thickening agent, and a coloring agent. The retardant is used to slow or retard the spread of a fire. At nine pounds per gallon, an S-2T can carry 10,800 pounds.

Military Helicopter Manager is a trained firefighter that flies aboard military helicopters when they are called to assist during major wildfires. The Military Helicopter Manager helps guide and coordinate military pilots, while communicating with the air tactical supervisor. This position ensures that military aircraft are used safely and efficiently during emergencies.

Initial Attack means the first attack on the fire. The number of resources sent on the first dispatch to a wildfire depends upon the location of the fire, the fuels in the area (vegetation, timber, homes, etc) and current weather conditions. Municipal fire departments would call this the first alarm. Most fires are caught within the first burn period (the first two hours). Therefore, the vast majority of the fires CAL FIRE responds to are considered initial attack fires.

Extended Attack means that the fire has burned beyond the area of origin, and beyond the initial attack phase, and additional resources are called. If the fire cannot be confined in the area of origin even with a substantial addition of resources, and a long-term resource commitment and logistical support will be required, then it is considered a major attack or a major fire.

CH-53E “Super Stallion”
United States Marine Firefighting Aircraft



Specifications:

Cruise Speed: 173 mph
Gallon Capacity: 2,000/bucket

Manufacturer
Sikorsky Aircraft Corp.

Crew
Pilot , Co-pilot and
a Military Helicopter Manager

Sikorsky CH-53E “Super Stallion” (Sikorsky S-80E)
The Sikorsky CH-53E, known as the Super Stallion, is the largest and heaviest helicopter used by the U.S. Marine Corps and Navy. It is one of the few helicopters in the world that uses three turbine engines and can be refueled in flight. The aircraft is used to transport personnel and equipment, and lift heavy loads. The CH53E is capable of lifting 16 tons, transporting the load 50 miles and then returning. The aircraft is a shipboard helicopter configured especially for caring cargo back and forth from military ships. The CH-53E is designated the model S-80 by Sikorsky. During major firestorms, the CH-53E can be used to augment CALFIRE’s own air fleet for fire suppression.

Information Facts and Photos
Table of Contents

This Guidebook has been assembled for those who want information on firefighting aircraft used by the local, state and federal agencies. The guide provides the most current facts, specifications and reference photos in four categories; air tactical, fixed-wing, rotor-wing and military aircraft.

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OV-10A "Bronco"

Air Tactical Aircraft



Specifications:

Cruise Speed: 258 mph

Gallon
Capacity: not applicable

Manufacturer

North American-Rockwell,
Columbus, Ohio.

Crew

Pilot and Air Tactical Group
Supervisor

Original Owner

U.S. Navy/Marines, 1968-1993. The OV-10A was used as a counter-insurgency (military intelligence) aircraft and close air-support to military ground forces.

Acquired by CAL FIRE

In 1993, CAL FIRE acquired 16 OV-10As from the Department of Defense. Fourteen of those have been converted and are available for use as air attack planes. The OV-10s replaced the original cessna O-2As that CAL FIRE had been using for air attack. The OV-10s are newer, larger, and faster, provide a larger field of vision for the crew and are more maneuverable than the older O-2As.

Mission

CAL FIRE uses OV-10As as aerial command and control of aircraft on wildland fires. The crew provides tactical coordination with the incident commander on the ground, providing information on the movement and spread of the fire. The OV-10A crew then directs CAL FIRE's airtanker and helicopter pilots where to make their retardant and water drops.

CH-47 "Chinook"

Military Helicopter



Specifications:

Cruise Speed: 137 mph

Gallon
Capacity: 2,000/bucket

Manufacturer

Boeing Company /
Vertol Aircraft Company

Crew

Pilot, Co-pilot and
a Military Helicopter Manager

CH-47 "Chinook"

The Boeing CH-47 "Chinook" has tandem rotors, and twin turbine engines. The Chinook is powered by two turboshaft engines, mounted on either side of the helicopter's rear end and connected to the rotors by driveshafts. The counter-rotating rotors eliminate the need for an anti-torque vertical rotor, allowing all power to be used for lift and thrust. If one engine fails, the other can drive both rotors. It was originally designed for the U.S. Army in the late 50's as a heavy lift helicopter and was used extensively in Vietnam. The civilian version of the CH-47 is the Boeing 234.

The Chinook is a multi-mission, heavy-lift transport helicopter. Its primary mission is to move troops, artillery, ammunition, fuel, water, barrier materials, supplies and equipment on the battlefield. Its secondary missions include medical evacuation, disaster relief, search and rescue, aircraft recovery, fire fighting, parachute drops, heavy construction and civil development.

The CH-47s provide the ability to carry heavy loads and operate with a large water bucket for wildland fire suppression. The lifting capability is between 15,000-26,000 pounds, depending upon temperature and elevation. The helicopter has excellent lifting capability for external and internal loads.

Boeing CH-46 "Sea Knight"

Military Helicopter



Specifications:

Cruise Speed: 140 mph

**Gallon
Capacity:** 224/bucket

Manufacturer

Boeing Company /
Vertol Aircraft Company

Crew

Pilot , Co-pilot and
a Military Helicopter Manager

Boeing CH-46 "Sea Knight"

The Boeing CH-46, known as the "Sea Knight", is the military version of the Boeing-Vertol 107. The CH-46 was designed in the late 50s for the U.S. Marine Corps to be a medium-lift helicopter, and is primarily used to transport cargo. The aircraft is able to provide all-weather, day-or-night assault transport of combat troops, supplies and equipment. Assault Support is its primary function, and the movement of supplies and equipment is secondary. Additional tasks include combat support, search and rescue, support for forward refueling and rearming points. The CH-46 and the CH-47 are most recognizable by their tandem rotors.

Beechcraft King Air 200

Air Tactical Aircraft



Specifications:

Cruise Speed: 333 mph

**Gallon
Capacity:** not applicable

Manufacturer

Hawker Beechcraft

Crew

Lead Plane Pilot and Air Tactical Group Supervisor

Mission

The King Air 200 is part of a line of twin-turboprop aircraft produced by the Beechcraft Division of Hawker Beechcraft. It is used by the U.S. Forest Service and BLM as an Aerial Supervisory Module, which can perform low level Airtanker leading. The U.S. Army, U.S. Air Force, U.S. Navy, and the U.S. Marine Corps all fly versions of the King Air 200 today.

AH-1 Firewatch "Cobra"

Air Tactical Aircraft



Specifications:

Cruise Speed: 172 mph

**Gallon
Capacity:** not applicable

Manufacturer

Bell Helicopters, Fort Worth, Texas

Crew

Pilot and Air Tactical Group
Supervisor

Acquired by USFS

In 2003, the U.S. Forest Service acquired 25 retired AH-1Fs from the U.S. Army. These have been designated Bell 209s and are being converted into Firewatch Cobras with infrared and low light sensors and systems for real time fire monitoring. The Florida Department of Forestry has also acquired 3 AH-1Ps from the U.S. Army. These are called Bell 209 "Firesnakes" and are equipped to carry a water/fire retardant system.

Mission

The Vietnam-era army attack helicopters have been stripped of their weapons and lasers. Cameras and infrared sensors have been added to convert them to Cobra Firewatch Helicopters.

In 1996, the U.S. Army retired 25 of its Cobra helicopters, which are able to reach speeds of 160 mph. The U.S. Forest Service eagerly accepted the hand-me-downs and refitted them with an arsenal of high-tech gadgets. The new Cobras don't extinguish fires by themselves. Their main purpose is to relay information to ground crews about the direction and strength of a blaze and to help larger planes make more accurate water or fire-retardant drops.

The Firewatch's infrared thermal imager can detect the heat of a wildfire even through thick smoke. Its low-light and color cameras can pick up fine resolution images of the fire, and then its transmission equipment can send those images—in real time—to firefighting crews up to 30 miles away. Also, the Cobra can direct larger water haulers by providing precise GPS coordinates.

UH -60 "Blackhawk"

Military Helicopter



Specifications:

Cruise Speed: 183 mph

**Gallon
Capacity:** 780/bucket

Manufacturer

Sikorsky Aircraft Corp

Crew

Pilot, Co-pilot and a Military Helicopter Manager

UH -60 "Blackhawk"

The UH-60 was originally designed for the U.S. Army in the 1970s as a light transport helicopter, air assault and a military medevac helicopter. The aircraft is a four bladed, twin engine helicopter. The popular UH-60 has a civilian version called a S-70 "Firehawk". Today CAL FIRE and other fire agencies train with members of the California and Nevada National Guard to use their aircraft as surge capacity during major wildfire events.

Lockheed C-130

Type I Airtanker - Modular Airborne Firefighting System



Specifications:

Cruise Speed: 275 mph

Gallon Capacity: 3,000

Original Owner

U.S. Air Force
Air National Guard
Air Force Reserve

Crew

Pilot, Co-pilot and Flight Engineer

Mission

A MAFFS (Modular Airborne Firefighting System) unit is a 3,000 gallon pressurized tank installed on a military Lockheed C-130 cargo/utility aircraft. Retardant or water is dropped out of the tank in under five seconds through two tubes at the rear of the plane or through one tube out of the side in the newer models. The retardant dropped can cover an area of one quarter mile long and 60 feet wide to act as a fire barrier. The objective of the MAFFS program is to provide additional emergency aircraft to supplement the existing airtankers during major fire sieges. The MAFFS is not used for initial attack.

History

Congress established the MAFFS program after the 1970 Laguna Fire overwhelmed the existing aviation firefighting resources. The U.S. Forest Service was directed to develop a program in cooperation with the Air National Guard and Air Force Reserve to produce the equipment, training and operational procedures to integrate military air tankers into the national response system. In 2009 the MAFFS 2 was unveiled as the next-generation portable retardant dispersal system. The MAFFS 2 is more efficient and effective in its retardant dropping capabilities.

DC-10

Very Large Air Tanker



Specifications:

Cruise Speed: 600 mph

Gallon Capacity: 12,000

Manufacturer

McDonnell Douglas

Crew

Pilot, Co-pilot and Flight Engineer

Original Owner

Originally delivered as a civil passenger plane to National Airlines in 1975, it subsequently flew for Pan Am, American Airlines, Hawaiian Airlines and Omni International.

Acquiring/Contracting

In 2006, the aircraft was operated on a limited evaluation contract from the State of California. In 2006, it was offered on a "call-when-needed" basis. Governor Schwarzenegger authorized a contract for exclusive use of the aircraft for the 2007-2009 fire seasons.

Mission

The DC-10 is the only wide-body jet air tanker currently in the fire service. The aircraft, operated by 10 Tanker Air Carrier, is used for fighting wildfires, typically in rural settings. The turbofan-powered craft carries up to 12,000 gallons of fire retardant in an exterior belly-mounted tank, which can be released in eight seconds. This aircraft will not be used on all fires, and will not be used on initial attack. It is utilized in extended attack fires as it is limited in time effectiveness for reloading fire retardant as well as its need to reload and refuel at an equipped aerial firefighting base (currently Victorville and McClellan are the only bases in California serviceable for this large an aircraft). One drop for the DC-10 is equivalent to 12 drops of an S2-T or a line of retardant that is 300 feet wide by one mile in length.

Boeing 747

Very Large Air Tanker



Specifications:

Cruise Speed: 565 mph

Gallon
Capacity: 24,000

Manufacturer

Boeing Aircraft

Crew

Pilot, Co-pilot and Flight Engineer

Mission

The Evergreen Supertanker has a pressurized system that can disperse retardant under high pressure, or drop retardant equivalent to the speed of falling rain. This system allows the aircraft to operate within its design criteria. Using the pressurized system, the aircraft can deliver retardant to the scene of a fire while flying at a height of 400 to 800 ft, at approximately 140 kts, configured as if it were on approach for landing.

The Evergreen Supertanker's tank system can be configured for segmented drops, allowing the contents of the tank to be released at multiple intervals while in flight.

Alouette 316B

Type III Helicopter



Specifications:

Cruise Speed: 115 mph

Gallon
Capacity: 180

Manufacturer

Aérospatiale

Crew

Pilot

Alouette 316B

The Alouette III is a French helicopter that has the same power plant and rotor system as the "Lama", but unlike the Lama, the Alouette has wheels instead of skids for landing gear. The helicopter has good visibility for observation and reconnaissance. They are used for a variety of activities such as aerial reconnaissance, aerial ignition, and wildland fire suppression.

Unfortunately, the Alouette III has limitations similar to the Lama. Because of older technology the helicopter is maintenance intensive and extremely noisy. It is slow compared to other helicopters and burns about one gallon of fuel per minute. Due to main rotor blade design, the main rotors have a low droop at the front of the aircraft. Passenger seating is limited to one in the front and three in the rear. The helicopter has a cargo basket on each side.

Aérospatiale SA 315B "Lama"

Type III Helicopter



Specifications:

Cruise Speed: 115 mph

Gallon
Capacity: 180

Manufacturer

Aérospatiale

Crew

Pilot

Aérospatiale SA 315B "Lama"

The Lama is a French helicopter originally designed in the late 60s for high altitude work. It holds the altitude record for helicopters, reaching an altitude of 40,820 feet. It is a virtual workhorse for its size and weight. It is one of few helicopters that can actually lift its own weight.

The helicopter has outstanding visibility for observation and reconnaissance. They are used for a variety of activities: aerial reconnaissance, aerial ignition, and wildland fire suppression.

Passenger seating is limited to one in the front and three in the rear. The helicopter has a cargo basket on each side.

Martin Mars

Type I Airtanker



Specifications:

Cruise Speed: 190 mph

Gallon
Capacity: 7,200

Manufacturer

Glenn L. Martin Company

Crew

Pilot, Co-pilot and two Flight Engineer

Mission

The Martin Mars was originally used as a bomber for long range missions and patrols. The production aircraft were redesigned and classified for long-range general transport because of the demonstrated heavy-lift capability of the prototype. The Martin Mars established airlift and endurance records which remain valid today and logged some 87,000 accident-free hours before being retired by the U.S. Navy and sold to Flying Tankers.

After the aircraft were retired from the Navy, they were transformed into firefighting aerial tankers. The aircraft can carry 7,200 gallons of water or retardant and their drop can cover an area of up to 4 acres. The Mars are also equipped to deliver fire retardant gel as well as sea or fresh water. The Martin Mars can fill its tanks by skimming over a large waterway.

Lockheed P-3 Orion

Type I Airtanker



Specifications:

Cruise Speed: 380 mph

Gallon
Capacity: 3,000

Manufacturer

Lockheed Corporation

Original Owner

United States Navy

Crew

Pilot, Co-pilot and Flight Engineer

Mission

Lockheed P-3 Orion, was developed in 1959 during the Cold War as a maritime patrol aircraft. It has been used by numerous military forces around the world, primarily for maritime patrol, reconnaissance, anti-surface warfare and anti-submarine warfare. The P-3's primary mission was to track and eliminate ballistic missiles and fast attack submarines in the event of war in international waters.

Aero Union, Inc. operates eight ex-USN P-3As configured as air tankers, which are leased to the U.S. Forest Service, CAL FIRE and other agencies for firefighting use.

MD 500D

Type III Helicopter



Specifications:

Cruise Speed: 144 mph

Gallon
Capacity: 120

Manufacturer

Hughes Helicopters /
McDonnell Douglas

Crew

Pilot

MD 500D

The 500D was originally manufactured by Hughes Helicopters, which is now owned by McDonnell Douglas Corporation. The civilian Model 500 is a direct descendent of the U.S. Army's OH-6A, originally designed as an observation helicopter during the Vietnam conflict. The egg shape design provided excellent crash survival characteristics. The 500 model is very maneuverable. They are used for a variety of activities such as aerial reconnaissance, aerial ignition, and wildland fire suppression.

There are several unique features of this aircraft. The engine exhaust pipe is directly under the tailboom. Seating in the 500D is extremely cramped. There are three seats in the back, but they can actually accommodate only two. Front seat passenger sits on the right side instead of the left.

Eurocopter AS350 AStar

Type III Helicopter



Specifications:

Cruise Speed: 161 mph

**Gallon
Capacity:** 180

Manufacturer

Aérospatiale / Eurocopter Group

Crew

Pilot

Eurocopter AS350 AStar

The AStar series was originally designed by the French manufacturer, Aerospatiale, to compete with Bell Helicopter's JetRanger. It was the first helicopter to be predominantly constructed of composite materials. It is one of the quietest helicopters manufactured. It's worth noting that the main rotor blades on French made helicopters turn counter clock-wise, the opposite direction as American made helicopters.

As with most light helicopters, The AS350s have the ability to take-off and land in relatively small areas. They are used for a variety of activities: aerial reconnaissance, aerial ignition, and fire suppression. The AS350 B3 has increased speed, lifting capability and improved density altitude performance making this helicopter ideal for wildland fire initial attack. The helicopter has passenger seating for four, one in the front and three in the back. It has a cargo compartment in the tail boom. Some AStars may have cargo baskets to provide additional space for cargo.

Lockheed P-2 Neptune

Type II Airtanker



Specifications:

Cruise Speed: 403 mph

**Gallon
Capacity:** 2,700

Manufacturer

Lockheed Corporation

Crew

Pilot, Co-pilot and Flight Engineer

Mission

The P-2V Neptune was a naval patrol bomber and anti-submarine warfare aircraft for the United States Navy. The P-2 Neptune replaced the PV-1 Ventura and PV-2 Harpoon and is being replaced, in turn, with the P-3 Orion.

The P2V aircraft were rebuilt and converted into aerial tankers with a maximum fire retardant capacity of 2,700 gallons with six door retardant dispensing tanks. Over 8 P2Vs are currently employed in aerial firefighting roles by operators such as Aero Union and Neptune Aviation Services.

Douglas DC-6

Type I Airtanker



Specifications:

Cruise Speed: 315 mph

Gallon
Capacity: 2,800

Manufacturer

Douglas Aircraft Company

Original Owner

United States Air Force
United States Navy

Crew

Pilot, Co-pilot and Flight Engineer

Mission

The DC-6 is a piston-powered airliner and transport aircraft. Manufactured from 1946 to 1959, the aircraft was originally intended as a military transport during World War II. It was reworked after the war to compete with the Lockheed Constellation in the long-range transport market. The DC-6 was known as the C-118 Liftmaster in United States Air Force service, and as the R6D in United States Navy service. More than 700 were built and many still fly today in cargo, military and wildfire control roles.

Bell 206L-III "LongRanger"

Type III Helicopter



Specifications:

Cruise Speed: 120 mph

Gallon
Capacity: 120

Manufacturer

Bell Helicopter

Crew

Pilot

Bell Jet Ranger 206 L-III

The Bell 206L-III was built on the same platform as the 206B "JetRanger", but has more room to carry passengers. Two seats were added providing seating for a total of six passengers, one in the front and five in the rear. In addition, they added a larger engine, increasing performance. As with most light helicopters, they have the ability to take-off and land in relatively small areas.

The Bell 206L-III can be used for a variety of activities including aerial reconnaissance, aerial ignition, and wildland fire suppression. The easiest way to identify the Long Ranger is by the center window, which extends the appearance from the side. The larger engine also has a rectangular, instead of round turbine tailpipe. Another identifier is the vertical wings attached to the horizontal stabilizer on the tail section.

Bell 206B "JetRanger"

Type III Helicopter



Specifications:

Cruise Speed: 115 mph

**Gallon
Capacity:** 120/bucket

Manufacturer

Bell Helicopter

Crew

Pilot

Bell Jet Ranger 206B

The Bell 206B, also known as the "JetRanger", was designed in the 1960s for the U.S. Army. After the original Bell 206 was developed it did not win the Army's contract. Bell completed modifications, which made the series one of the most popular helicopter manufactured. The Bell 206B is also one of the first light helicopters built using a turbine engine power plant. This series is one of the most dependable helicopters ever built.

As with most light helicopters, the 206B has the ability to take-off and land in relatively small areas. The aircraft are used for a variety of activities: aerial reconnaissance and aerial ignition. The helicopter has passenger seating for five including the pilot. The Jet Ranger has a cargo compartment in the tail boom and no cargo baskets. The 206B does not perform as well when temperature and elevation increases. The Jet Ranger is normally not the helicopter to use for take-off and landings at altitudes of 9,000 feet or greater.

Douglas DC-7

Type I Airtanker



Specifications:

Cruise Speed: 355 mph

**Gallon
Capacity:** 3,000

Manufacturer

Douglas Aircraft Company

Original Owner

United States Air Force
United States Navy

Crew

Pilot, Co-pilot and Flight Engineer

Mission

The DC-7 is an American transport aircraft built from 1953 to 1958 and was the last major piston engine powered transport made by the Douglas Aircraft Company.

Three hundred forty-eight DC-7s were produced and about 40 are still in service today flying cargo, military, and wildfire control roles.

CL-215/ CL-415 "Superscooper"

Type II Airtanker



Specifications:

Cruise Speed: 189/233 mph

Gallon
Capacity: 1300/1621

Manufacturer

Canadair / Bombardier, Canada

Crew

Pilot, Co-pilot and Flight Engineer

Contracting

These aircraft have been leased for use during fire season in numerous counties including Los Angeles and San Diego.

Mission

Both the CL-215 and CL-415 are Canadian aircraft built specifically for fire suppression and are known in the U.S. as Superscoopers. CL-215 and the Bombardier 415 are amphibious aircraft, which can operate on land and water. The CL-215 was first built in 1969 and was later replaced by the Bombardier 415 in 1994. These turbine aircraft scoop water from lakes and reservoirs which can be dropped as regular water or be mixed with a foam retardant. The aircraft can also be utilized for maritime search and rescue.

Bell 407

Type III Helicopter



Specifications:

Cruise Speed: 152 mph

Gallon
Capacity: 180

Manufacturer

Bell Helicopter

Crew

Pilot

Bell 407

The Bell 407 is one of the newest additions to the Jet Ranger family. The 407 is based on the older Bell 206L-3. The aircraft has some major modifications from older models including a four-bladed main rotor system, increased engine performance and slightly expanded inside cabin area. Passenger seating is the same as the Bell Long Ranger, providing seating for a total of six passengers excluding the pilot. As with most light helicopters, they have the ability to take-off and land in relatively small areas.

The Bell 407 can be used for a variety of activities including aerial reconnaissance and aerial ignition. For wildland fire use, it is becoming the light helicopter of choice at many bases. The helicopter's increased speed, lifting capability and improved density altitude performance makes this helicopter ideal for wildland fire initial attack.

Bell 412

Type II Helicopter



Specifications:

Cruise Speed: 140 mph

Gallon
Capacity: 360

Manufacturer

Bell Helicopter

Crew

Pilot and Co-pilot

Bell 412

The Bell 412 was developed in the late 1970s and is essentially a Bell 212 with a four bladed rotor system. It can perform slightly better than the 212 at higher altitudes. This aircraft can also carry passengers, cargo, and do long line work. Many local fire departments use the Bell 412 for fire suppression. The Bell 412 can have a large tank mounted on the bottom or can carry a bucket.

Grumman S-2T

Type III Airtanker



Specifications:

Cruise Speed: 305 mph

Gallon
Capacity: 1,200

Manufacturer

Grumman Aerospace, Bethpage,
New York

Crew

Pilot

Original Owner

U.S. Navy, 1954-1972. The S-2E/G was used as a carrier-based anti-submarine warfare airplane.

Acquired by CAL FIRE

In 1996, CAL FIRE acquired 26 S-2E/G planes from the Department of Defense. CAL FIRE had the aircraft converted for fire-fighting configuration and fitting them with modern, powerful turboprop engines. The completely reconditioned S-2Ts are faster, safer, and more maneuverable. They can carry a larger retardant payload than the older S-2A air tanker CAL FIRE utilized since the 1970's. The S-2T air tanker is part of CAL FIRE's air program modernization efforts that will result in the safest and most efficient mix of aircraft to carry out the fire fighting mission. CAL FIRE currently has 23 S-2Ts that are utilized state-wide.

Mission

CAL FIRE utilizes the S-2T air tankers for fast initial attack delivery of fire retardant on wildland fires.

Sikorsky S-61

Type I Helicopter



Specifications:

Cruise Speed: 154 mph

**Gallon
Capacity:** 1,000

Manufacturer

Sikorsky Aircraft Corp

Crew

Pilot and Co-pilot

Sikorsky S-61

This aircraft is used primarily for external cargo and water bucket operations. In the late 1950s and early 1960s the U.S. Navy worked with Sikorsky Aircraft to create a very high performance helicopter with the latest technologies. The aircraft uses two large twin turbine engines and a boat-type hull with retractable landing gear. The S-61 requires a two-person crew to fly it, but can carry a large number of passengers. Today the S-61 is used extensively for logging operations in the commercial sector.

Bell 205 A++

Type II Helicopter



Specifications:

Cruise Speed: 125 mph

**Gallon
Capacity:** 360 plus
324/bucket

Manufacture

Bell Helicopters, Fort Worth, Texas

Crew

Pilot, Co-pilot, and nine Firefighters

Mission

The Bell 205 is the civilian version of the UH-1H that CAL FIRE uses for its helicopter fleet. Their missions are identical. In San Diego County, CAL FIRE jointly staffs a Bell 205-A1++ with the sheriff's department. The 205-A1++ has an improved rotor system and more powerful engine than the original 205. With seating for up to 9 passengers, this aircraft can be used for initial-attack fire missions as well as crew transport. A tank can be equipped on the belly of the aircraft that can hold 375 gallons.

UH-1H "Super Huey"

Type II Helicopter



Specifications:

Cruise Speed: 125 mph

**Gallon
Capacity:** 360 plus
324/bucket

Manufacture

Bell Helicopters, Fort Worth, Texas

Crew

Pilot, two Fire Captains
and eight Firefighters

Original Owner

U.S. Army, 1963 to 1975. The UH-1H was used as a troop and cargo transport and specialized operations.

Acquired by CAL FIRE

In 1981, CAL FIRE acquired 12 helicopters from the Department of Defense. They were heavily modified by CAL FIRE for firefighting use and went into service in 1989. CAL FIRE has 9 helicopters available state-wide with two reserve helicopters available from CAL FIRE's Aviation Management Unit (AMU) in Sacramento to fill in behind scheduled maintenance.

Mission

CAL FIRE utilizes the Super Hueys for fast initial-attack on wildland fires. The copters are able to quickly deliver a nine- person fire crew wherever needed as well as battle fires with water/foam drops. The copters are also utilized for medical evacuations, backfiring operations, (internal and external loads), infra-red mapping of incidents and numerous non-fire emergency missions. CAL FIRE helicopter crews are highly trained for "short-haul" rescues. A short-haul involves a crew-member being lowered from a hovering helicopter to an injured or trapped person below. Once hooked to a harness or stokes basket, the victim and crew-member are then carried a short distance to safety.

Sikorsky S-64 "Skycrane"

Type I Heavy Lift Helicopter



Specifications:

Cruise Speed: 105 mph

**Gallon
Capacity:** 2,650

Manufacturer

Sikorsky Aircraft Corp / Erickson Air-Crane

Crew

Pilot and Co-pilot

Sikorsky S-64

The S-64 "Skycrane" was originally designed for the military and had interchangeable pods that fit underneath for troop transport and cargo movement. The S-64 has six rotor blades and two turbine powered jet engines, which allows it to carry heavy loads. In 1992 Erickson Air Crane purchased the manufacturing rights to the S-64 and modified it to carry a 2,650 gallon tank. The tank can be filled by a draft hose in less than one minute, while the helicopter is hovering. The S-64 requires a pilot and co-pilot to fly it and typically has a 6 to 8 person support crew.

Sikorsky S-70 "Firehawk"

Type I Helicopter



Specifications:

Cruise Speed: 183 mph

Gallon
Capacity: 1,000

Manufacturer

Sikorsky Aircraft Corp

Crew

Pilot, Co-pilot and a Military Helicopter Manager

Sikorsky S-70 "Firehawk"

The Firehawk is the civilian version of the U.S. Army's popular Blackhawk or UH-60 and the U.S. Navy's Seahawk. The UH-60 was originally designed for the U.S. Army in the 1970s as a light transport helicopter used for air assault and as a military medievac helicopter. The aircraft is a four bladed, twin engine helicopter. For water or retardant delivery, the S-70 can have a large tank mounted on the bottom or can carry a bucket.

Bell 212

Type II Helicopter



Specifications:

Cruise Speed: 115 mph

Gallon
Capacity: 360

Manufacturer

Bell Helicopter

Crew

Pilot and Co-pilot

Bell 212

The Bell 212 was introduced by Bell Helicopter in 1968. The 212 aircraft is used for passenger transport and cargo movement, both internal and external. This aircraft has twin engines and two rotor blades. The 212 is one of the most popular Type 2 helicopter on the national call-when-needed helicopter contract. The Bell 212 is the civilian version of the UH-1N "Twin Huey". Many local fire departments use the Bell 212.

Kaman "K-Max"

Type I Heavy Lift Helicopter



Specifications:

Cruise Speed: 91 mph

Gallon
Capacity: 700

Manufacturer

Boeing Company / Vertol Aircraft Company

Crew

Pilot

Kaman "K-Max"

The K-MAX, also called the "Air Tractor," is designed specifically as a heavy lift helicopter. The aircraft, which is built for a pilot only, has a tandem, counter rotating, intermeshing rotor system.

The K-MAX can fly a variety of different missions ranging from logging and thinning to firefighting.

Eurocopter AS332L "Super Puma"

Type I Helicopter



Specifications:

Cruise Speed: 156 mph

Gallon
Capacity: 2,000

Manufacturer

Aerospatiale / Eurocopter

Crew

Pilot and Co-pilot

Eurocopter AS-332L

The AS332L "Super Puma" is a twin engine medium-weight helicopter that has a large cabin which works well for passenger transport. The AS332L first flew in 1978 and flown for both civilian and military use. The aircraft is often used by oil companies to ferry personnel and equipment to and from oil platforms. In 2000 the U.S. Forest Service in California used this aircraft for initial attack with a "Heli-Shot" crew. These aircraft are not very common on California wildfires.

Boeing-Vertol 107 "Vertol"

Type I Heavy Lift Helicopter



Specifications:

Cruise Speed: 140 mph

Gallon
Capacity: 1,100/bucket

Manufacturer

Boeing Company / Vertol Aircraft Company

Crew

Pilot and Co-pilot

Boeing-Vertol BV 107

The Boeing-Vertol (BV)107, often referred to as the "Vertol", is the civilian version of the U.S. Marine Corps' CH-46 "Sea Knight". The aircraft was originally designed by the Vertol Aircraft Company in the late 50s. The company was purchased by Boeing in 1960. The BV 107 was designed to be a medium-lift helicopter, and is primarily used to transport cargo. Both the BV 107 and the BV 234 are used for timber harvesting in the commercial sector. The BV 107 has a little less than half the lifting capability as compared to the BV 234. The BV 107 (CH-46) and the BV-234 are most recognizable by their tandem rotors.

Boeing 234 "Chinook"

Type I Heavy Lift Helicopter



Specifications:

Cruise Speed: 137 mph

Gallon
Capacity: 3,000/bucket

Manufacturer

Boeing Company / Vertol Aircraft Company

Crew

Pilot and Co-pilot

Boeing 234

The Boeing 234 is the civilian version of the U.S. Army's CH-47 "Chinook". The aircraft was originally designed by the Boeing Company in the early 60s, to be a medium-lift helicopter to transport cargo and military personnel. Both the BV 107 and the 234 are used for timber harvesting in the commercial sector. The Boeing 234 (CH-47) and the BV-107 (CH-46) are most recognizable by their tandem rotors. The 234 has almost twice the lifting capability (between 15,000-25,000 pounds) of the smaller BV-107, which allows it to operate with a larger water bucket for fire suppression.