HOGAN LOVELLS US LLP
Trenton H. Norris (CA Bar No. 164781)
David M. Barnes (CA Bar No. 318547)
Four Embarcadero Center, 35th Floor
San Francisco, CA 94111-4024
Telephone: 415.374.2300
Facsimile: 415.374.2499
trent.norris@hoganlovells.com
david.barnes@hoganlovells.com

Attorneys for Settling Defendants

SUPERIOR COURT FOR THE STATE OF CALIFORNIA

FOR THE COUNTY OF ALAMEDA

CENTER FOR ENVIRONMENTAL HEALTH,

Plaintiff,

v.

AERODYNAMIC AVIATION, *et al.*,

Defendants.

Case No. RG-11-600721

Hon. Somnath Raj Chatterjee

DECLARATION OF CARSTEN HOYT IN SUPPORT OF DEFENDANTS' OPPOSITION TO MOTION TO ENFORCE AND MODIFY CONSENT JUDGMENT

Date: February 4, 2025
Time: 1:30 p.m.
Reservation Number: 690015831804

Complaint Filed: October 20, 2011

DECLARATION OF CARSTEN HOYT

I, Carsten Hoyt, declare:

1. I am the General Counsel and Director of Regulatory Affairs for the General Aviation Manufacturers Association ("GAMA"). I submit this declaration in support of Settling Defendants' Opposition to Plaintiff Center for Environmental Health's ("CEH") Motion to Enforce and Modify Consent Judgment in the above-captioned matter. I have personal knowledge of the matters set forth herein. If called and sworn as a witness, I could and would testify competently thereto.

2. GAMA is a more than 50-year-old international trade association that currently represents over 140 of the leading manufacturers of general aviation ("GA") aircraft, engines, avionics, and components, and operators of maintenance facilities, fixed base operations, aircraft fleets, and pilot and technician training facilities. GAMA's mission is to foster and advance the general welfare, safety, interests, and activities of general aviation.

3. GAMA fully supports the U.S. Federal Aviation Administration's ("FAA") ongoing mandate to develop a "transition plan to safely enable the transition of the piston-engine [GA] aircraft fleet to unleaded aviation gasoline ["avgas"] by 2030, *to the extent practicable*." [emphasis added] *See* FAA Reauthorization Act, Pub. L. 118-63 ("2024 FAA Reauth."), May 16, 2024, § 827(a)(2)(E).

4. First and foremost, GAMA asserts that any/all aviation fuel regulation, to include piston-powered avgas, is under the explicit authority of the FAA. The FAA, and the Environmental Protection Agency, were given explicit preemptive authority to establish and implement aviation fuel emission requirements. *See* 42 U.S. Code (USC) § 7571(a)(2)(b). The FAA further has exclusive authority to prescribe the composition or chemical or physical properties of an aircraft fuel (i.e. elimination of lead) and any regulations for carrying out and enforcing those standards to control or eliminate aircraft emissions. *See* 49 USC § 44714.

5. GAMA possesses significant expertise in the design and safety certification of aviation piston engines and aircraft and airworthiness assessment of new unleaded avgas as part of the fuels development and approval process. First, GAMA has been an active participant in the

public-private partnerships called the Eliminate Aviation Gasoline Lead Emissions ("EAGLE") program. The FAA, through the EAGLE program, was given the statutory mandate to develop a transition plan to remove lead from GA avgas, "without adversely affecting the *safe and efficient operation* of the piston-engine aircraft fleet." [emphasis added] *See* 2024 FAA Reauth., § 827(a)(2)(A).

6. GAMA also participates in the government-industry partnership Piston Aviation Fuels Initiative ("PAFI") testing program. GAMA possesses extensive subject matter expertise regarding the aircraft and product type certification ("TC") process, including how emerging piston aircraft fuels undergo testing, standards evaluation (i.e., the ASTM standards review process), and ultimate FAA approval for use in an aircraft (i.e. FAA TC and supplemental type certification ("STC") and fleet authorization)) and industry production and use approvals for commercialization (i.e., ASTM consensus standards production specification approval, aviation original equipment manufacturer ("OEM") approval,)). Second, because of GAMA's industry expertise, it was also invited to participate in the Unleaded Avgas Transition Aviation Rulemaking Committee, a public-private partnership, expert committee that made rulemaking and policy recommendations to the FAA, which resulted in the establishment of the PAFI and EAGLE initiatives.

7. Since the founding of the PAFI and EAGLE initiatives, several private entities have endeavored to invest in developing, obtaining FAA certification/authorization for, pursuing ASTM consensus standard commercial production specification for, and bringing to market a high-octane unleaded avgas variant. GAMA has closely followed and maintained a high degree of situational awareness, and/or process involvement, regarding unleaded avgas product development, unleaded avgas test & evaluation, and related FAA and industry consensus standards assessment and approval activities, etc.

8. In furthering GAMA's core mission of promoting the general welfare, safety, and interests of the GA aviation community, GAMA submits its strongest possible objection to the requested order to remove 100 Low Lead ("100LL") avgas from the distribution, sale and use by

the affected Fixed Base Operators and fuel distributors, which would prematurely force 100LL to be replaced with an unleaded variant.

9. GAMA's key concern is that the unleaded variant proposed has not undergone widespread assessment, testing, or a traditional consensus standards review process that would be appropriate for all key stakeholders—directly involved in making business risk decisions—to purchase, transport, dispense, support the continued airworthiness of aircraft and engines, and use of a new fuel. A potentially viable unleaded replacement for 100LL has not yet obtained an industry consensus production specification approval, has not been approved by major engine and aircraft OEMs for use in their respective products, and cannot be used in a variety of aircraft—to include critical mission public use aircraft.

10. The premature removal of 100LL from the marketplace will have an insurmountably damaging impact on California GA, the state's aviation economy, the wide range of GA jobs that support same, and the federal, state, and local government's ability to execute critical aviation missions such as forest management, firefighting, law enforcement, etc. In short, the premature forced removal of 100LL from California airports will effectively have negative impacts upon a staggering percentage of California GA aircraft ranging from a lack of continued airworthiness warranty support, operational safety risks, fuel shortages, to effectively grounding some aircraft.

11. GAMA further asserts the federally-preempted process for aviation fuel regulation and development must remain the national standard by which unleaded avgas standards and requirements are applied to all GA aircraft that operate in the U.S. National Airspace System.

<u>The proposed 100LL unleaded replacement has not undergone traditional standards review or testing, nor received OEM approval for use.</u>

12. The unleaded avgas variant that the CEH proposes to force on the marketplace, the General Aviation Modifications, Inc., ("GAMI's") G100UL, has not undergone the traditional peer-reviewed process.

13. In mid-2024, the National Air Transportation Association ("NATA") published the online article *Factors Affecting the Commercial Sale of Emerging Unleaded Aviation Fuels*

(“NATA publication”), which explains the importance of this peer review consensus process and an approved production specification for fuel distributors and FBOs. Attached hereto as **Exhibit A** is a copy of the NATA publication, which is available publicly at https://nata.aero/press/nata-clarifies-points-on-the-commercial-sale-of-unleaded-aviation-fuels/.

14. While GAMI’s G100UL has received FAA Approved Model List STC, this STC is predicated only upon showing compliance to the minimum airworthiness requirements for piston engine and airplane certification which is a limited data review that is *far narrower in scope and less rigorous* than the established industry peer review process and consensus standards articulated in Exhibit A. In fact, G100UL is the first aviation fuel that has not undergone a consensus standard stakeholder peer review process toward obtaining an ASTM production specification approval. Attached hereto as **Exhibit B** is a copy of Lycoming Engine’s Unleaded Fuels advisory, which explains the importance of this peer review process and which is available publicly at https://www.lycoming.com/fuels (“Lycoming Q&A notice”). As a result, OEMs, aircraft owners/operators, FBOs/fuel distributors, and others who transport and handle fuel, are not able to ascertain whether a new fuel is compatible with their specific systems and equipment that transport, store, dispense, or use a new fuel.

No piston aircraft OEMs have approved the unleaded variant for use in their aircraft.

15. As of January 2, 2025, no piston aircraft OEMs have approved G100UL for use in their respective aircraft fleets. This is the result of two primary factors. First, GAMI chose to not participate in the ASTM aviation fuel consensus process in which technical data regarding fuel composition, properties, performance and assessment are peer reviewed by industry stakeholder subject matter experts. Second, GAMI has not provided aircraft and engine OEMs with any technical data and/or product samples, which has prevented these companies from conducting an independent technical assessment, laboratory, and/or engine/aircraft testing. This analytic data is critical for the aircraft and engine OEMs to understand the new fuel and determine whether it is compatible with specific materials, fuel systems, operational durability, etc., within their respective in-service fleet.

16. This lack of access to technical data, coupled with public reports of potential G100UL material compatibility issues, has resulted in the issuance of OEM communications that affirmatively state that G100UL fuel is not approved or recommended for use in their aircraft. These include: Textron Aviation (affecting all Cessna and Beechcraft piston-powered single and multi-engine aircraft) (*see Textron Single-Engine Piston Communiqué SE-P-006* and *Multi-Engine Piston Communiqué ME-P-005*, December 19, 2024), *Lycoming Q&A notice*, and declarations submitted by, and applicable to all of their respective piston-powered aircraft, Piper Aircraft, Aviat Aircraft, Diamond Aircraft Industries, Enstrom Helicopters, Schweitzer, and the Robinson Helicopter Company. Attached hereto as **Exhibits C and D** are copies of Textron's *Communiqués ME-P-005* and *SE-P-006*, which are publicly available at https://www.avweb.com/uploads/2024/12/ME-P-005-Fuel-Approval-Final.pdf and https://www.avweb.com/uploads/2024/12/SE-P-006.pdf respectively.

17. Second, one OEM which did indeed have opportunity to test the G100UL variant, identified potential airworthiness and safety concerns. In mid-2024, Cirrus Aircraft independently evaluated and tested G100UL in their airplane and Continental Aerospace Technologies engine. In June 2024 (and updated in November 2024), Cirrus issued *Cirrus Service Advisory SA24-14R1*, which stated that: (1) Cirrus identified potential material compatibility issues with the fuel that caused airworthiness concerns; (2) Cirrus does not approve the fuel for use in its aircraft; and (3) any G100UL use would void Cirrus' warranty—and that of the associated Lycoming or Continental Aerospace Technologies engines. Attached hereto as **Exhibit E** is Cirrus' *Advisory SA24-12R1*.

18. Thus, a large number of GA OEMs—whose aircraft represent a large portion of GA aircraft and engines in the United States—have taken formal positions that G100UL should not be used in their aircraft.

<u>The premature marketplace removal of 100LL will cause harm to California Aviation.</u>

19. The premature removal of 100LL fuel from the California marketplace will adversely affect a substantially large number of GA aircraft owners and operators because their

aircraft will no longer be able to obtain fuel approved for use by the FAA and/or by the aircraft's respective OEMs. It will further unnecessarily force owners/operators to make the business and/or financially harmful operational decision to either (1) not fly their aircraft, or (2) assume substantial financial risk and/or liability (i.e., voiding aircraft and engine warranties, repair costs associated with any material incompatibility issues, lack of OEM continued airworthiness support, etc.) and potential safety risk (material incompatibility with fuel system, engine, etc.) because the OEM's warning regarding G100UL use is disregarded. For the same reasons, public-use aircraft (i.e., those owned and operated by a governmental organization) could experience significant operational and safety issues without 100LL, which will adversely affect forest management activities, aerial firefighting, etc. In short, piston-powered single and multi-engine aircraft owners will be forced to make one of the aforementioned decisions, while piston-powered helicopter (and several other aircraft types) owners and operators will be grounded without 100LL.

20. The number of potentially harmed aircraft owners and operators in California is unknown; however, the number of potentially affected aircraft is significantly large. According to 2023 FAA aircraft registration statistical data, there were approximately 272,800 GA aircraft registered in the United States (note: the survey dataset also includes 6,951gliders and lighter-than-air aircraft). *See* FAA, *General Aviation and Part 135 Activity Surveys - CY 2023* ["2023 FAA Survey Data"], *Chapter l: Historical General Aviation and Air Taxi Measures*, Table 2.1, which is publicly available at https://www.faa.gov/data_research/aviation_data_statistics/general_aviation/cy2023. Of these, the number of single-engine and multi-engine piston aircraft were approximately 128,000 and 12,000 respectively. Thus, in 2023, approximately 65% of GA aircraft used piston-powered engines. *Id.*

21. These piston-powered GA aircraft flew approximately 18,597,000 flight hours (i.e., 16,105,000 piston airplane, 668,000 piston rotorcraft, 1,237,000 amateur built, 109,000 exhibition aircraft, 143,000 experimental light sport aircraft, and 335,000 special light sport aircraft), which accounted for approximately 64% of all GA flight hours. *Id.*, at Table 1.3.

Attached hereto as **Exhibits F, G, and H** are copies of Tables 1.1, 1.3, and Chart 2 respectively, which are publicly available at the above link for the 2023 FAA Survey Data.

22. Additionally, piston-powered helicopters, experimental aircraft, or light sport aircraft cannot fly with G100UL without further FAA or industry approvals. FAA STC SA01967WI, which authorized G100UL for use in Title 14 Code of Federal Regulations (CFR) part 23 type certificated fixed-wing airplanes, *does not apply* to piston-powered helicopters, experimental aircraft, or light sport aircraft; therefore, the premature removal of 100LL from the marketplace *will effectively ground these aircraft* types.

23. While the exact number of affected aircraft in California is unknown, the FAA Survey data yielded the following numbers of such aircraft in the United States: (1) 2,900 piston-powered helicopters; (2) 30,000 experimental aircraft; and (3) 3,000 light sport aircraft. *Id*. Thus, according to the 2023 survey data, these aircraft represent nearly 17% of all GA aircraft in the United States. *Id*. Furthermore, these aircraft flew approximately 2,262,000 flight hours, which represented 17% of all piston-powered GA aircraft hours. *Id*.

24. According to the Alliance for Aviation Across America ("AAAA"), California has 68,846 GA pilots and 24,756 registered GA aircraft. Attached hereto as **Exhibit I** is the *AAAA Summary of Economic Impact of General Aviation in California*, which is publicly available at https://aviationacrossamerica.org/economic-impact/california/#, citing FAA data. While it remains unknown how many of these 24,756 GA aircraft are Cessna, Beechcraft, Piper, Cirrus, or any other piston-powered aircraft that uses a Lycoming or Continental engine, these numbers illustrate, without equivocation, the extent of potential harm that the GA community would experience because of a premature removal of 100LL from the marketplace.

25. Furthermore, federal, state and local governmental functions could be disrupted by the premature removal of 100LL from the marketplace, which would directly impact forest management activities and aerial firefighting. For example, Cal Fire Air Operation publications state the firefighting agency uses a piston-powered multi-engine Beechcraft G58 Baron (specifically aircraft N457DF), which is operated at McClellan Airfield, Sacramento, CA. Attached hereto as **Exhibit J** is Cal Fire's *Firefighting Aircraft Recognition Guide*, which is

publicly available at www.fire.ca.gov. According to the FAA Aircraft Registry database, aircraft N457DF is owned by the U.S. Forest Service ("USFS") and the "CALIFORNIA DEPT FORESTRY & FIRE PROTECTION[.]" Attached hereto as **Exhibit K** FAA N-number registry for N457DF, which is publicly available at https://registry.faa.gov/aircraftinquiry/search/nnumberinquiry[.]"

26. If 100LL would be immediately banned, the Cal Fire G58 Baron—manufactured by Textron/Beechcraft—would be unnecessarily forced to make the risky operational decision to either (1) not fly the aircraft, or (2) modify its aircraft with the G100UL Approved Model List STC and use a fuel not approved by the aircraft or engine OEMs. If the second option is chosen, Cal Fire, like all other owners and operators affected, will be forced to accept the financial and safety risk implications that would be associated with forced G100UL use in the G58 Baron. These risks include the immediate voiding of aircraft and engine warranties, an inability to utilize OEM support for continued airworthiness issues (i.e., aircraft maintenance and ensuring the aircraft remains in accordance to its approved type design and a condition of safe operation, according to 14 CFR) if any issues associated with G100UL occur (i.e., material incompatibility, engine issues, staining, etc.) and the potential—and currently unknown—safety issues associated with the untested fuel. If Cal Fire cannot use its G58, its overall firefighting operations could be damaged, thereby endangering the state's environment, infrastructure, and communities.

27. Furthermore, while the exact location of the USFS' piston-powered aircraft has remained unknown, it is reasonable that USFS does and/or will operate in California in support of its Congressionally-mandated mission. The USFS operates, in addition to larger turbine-powered firefighting aircraft, a fleet of piston-powered Cessna 206, Aero Commander 500, DeHavilland DHC-2 Beaver, Piper Super Cub, and Cessna 185 aircraft for missions such as forest health and wildlife surveys, law enforcement, gathering infrared data, fire detection, and transporting personnel and cargo. Attached hereto as **Exhibit L**, *USFS Planes*, which is publicly available at https://www.fs.usda.gov/managing-land/fire/planes.

28. If 100LL were to be immediately banned, the USFS' fleet of Cessa 206 and 185s, manufactured by Textron/Cessna, would be subject the same operational and safety risks that

private owners/operators and Cal Fire would face. The same situation would occur for the USFS' Piper Cub aircraft. Therefore, if the USFS cannot use the majority of its piston-powered aircraft, its overall ability to support the aforementioned mission types could be diminished or experience an adverse safety issue, thereby causing potential harm to the public.

29. Local California governments will also be harmed with the immediate ban of 100LL avgas. The police departments in the Cities of Fontana and the San Bernardino, CA, currently fly the R-44 Raven II police helicopter. Attached hereto as **Exhibit M** is a Robinson Helicopter Company press release, which is publicly available at https://shop.robinsonheli.com/news/city-of-san-bernardino-gets-new-r44-raven-ii-police-helicopter/. According to the City of Fontana Police Department ("FPD"), the R-44 helicopters provide their community with 40 hours of flight time per week, performing missions such as aerial surveillance, photography, disaster response, and assistance to other San Bernadino County agencies—with a 90% "first on scene" response time. *See* https://www.fontanaca.gov/202/Air-Support. An inability to fly these piston-powered law enforcement helicopters because of a lack of approved avgas (i.e., 100LL) would hinder their ability to effectively serve their communities and combat crime, and thereby harm the same.

SUMMARY

30. For all of these reasons, GAMA does not support the premature removal of 100LL from the marketplace and the forced use of G100UL. This fuel has not undergone widespread testing or a traditional standards review process, has not been approved for use by major OEMs in their respective aircraft fleets, and will present multiple safety and operational issues for aircraft owners and operators—including critical mission, public use aircraft. GAMA strongly urges the Court to reject CEH's motion to prematurely remove 100LL avgas from the marketplace—and the arbitrary establishment of aviation fuel standards that differ from those established by the FAA—and force the premature sale of G100UL because of the significant and widespread harm that will befall California.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct. Executed this 10th day of January, at Washington, D.C.

By: Carsten G. Hoyt
Carsten Hoyt (DC Bar No. 1725290)
GAMA

EXHIBIT A

NATA Clarifies Points on the Commercial Sale of Unleaded Aviation Fuels

Washington, DC, May 6, 2024 – Recent media articles have disregarded key points outlined in NATA's latest white paper and mischaracterized its intent. The goal of **Factors Affecting the Commercial Sale of Emerging Unleaded Aviation Fuels** is to educate both aviation and community stakeholders on the dynamics of the commercial availability of unleaded avgas, including considerations on the status of UL fuels, paths to authorization, and safety concerns such as materials compatibility and misfueling.

NATA's work is tied to its mission to empower the safety and success of aviation businesses, which includes describing the operational environment and needs of FBOs, airports, fuel suppliers, and end users in fostering a safe and successful transition to unleaded aviation fuels.

One concern addressed in NATA's white paper is industry testing of fuels and their use in all fuel-wetted surfaces throughout the supply chain. While the FAA's STC process approves the use of fuels inside an engine/airframe, the Agency's responsibility stops there. The FAA's STC approval process does not consider commercial aspects of fuel properties related to global supply chain risks, fuel intermixability, issues impacting indemnities or product liability, or factors impacting materials compatibility in the supply chain. Historically, the testing of this broad range of aspects has been achieved by following ASTM International D7826 guidelines for approving an unleaded fuel – which is a precursor to earning an ASTM International fuel specification.

Just as aircraft owners and operators need assurances that the use of an alternative fuel will not compromise the integrity of any component of their aircraft nor void applicable warranties, the same is true for OEM engine manufacturers, fuel distributors, transport companies, airports, and FBOs. Businesses across the entire aviation supply chain rely on ASTM International specifications to minimize or eliminate the potential for degradation or contamination of either the fuel itself or the equipment used to transport, handle, and dispense it. The FAA does not certify fuels nor indemnify their use in the marketplace under the STC process. Instead, the Agency approves the use of fuels in those specified engines/airframes that have been issued as part of the STC process. Further, under the Fleet Authorization process, the publication of an ASTM production specification is an integral component. The ASTM International review process includes a collection of subject matter experts comprised of industry/OEMs to ensure that fuels are ready for use in the marketplace.

“Our white paper was crafted with factual input from member companies and peer reviewed by our GA Fuel Handling Subcommittee. For NATA’s FBO and fuel distributor members, an industry consensus standard such as ASTM International is an especially relevant component in bringing new fuels to market, as it evaluates compatibility with materials throughout the supply chain upstream of the aircraft,” stated NATA President and CEO Curt Castagna.

An additional concern is the compatibility of emerging unleaded fuels. While the FAA STC process has tested unleaded fuels against 100LL in the wings of aircraft, the FAA currently does not address the compatibility of mixing different unleaded fuels in aircraft, airport storage tanks, or refuelers. Further, the FAA has yet to communicate their role in testing the compatibility of unleaded fuels coming into the marketplace other than the assurance of an adequate detonation margin related to a fuel’s compatibility with 100LL. Testing intermixability of new fuels only after they enter the marketplace represents a new risk for the global aviation industry, disregarding the decades-long practice of earning an ASTM International specification along with the FAA engine/airframe certifications before commercializing new fuels in the marketplace.

Another concern is the issue of liability for aviation businesses selling fuels within the market. Most major aviation fuel distributors offer their customers umbrella liability protection of at least $50 million USD. This coverage has been offered under the assurances that come with an industry consensus standard such as ASTM International and a proven performance track record in piston engines/airframes. With current unleaded fuel alternatives still in the early phases of demonstrating performance, a published industry consensus standard is all the more relevant.

And while the issue of insurance should not be a limiting hurdle, the risk and indemnity needs associated with a proprietary fuel specification without an industry consensus standard is a legitimate point of discussion. Aviation businesses that sell fuel will likely expect similar risk liability and insurance protection for any new fuels.

NATA's goal remains clear: the safe and effective transition to an unleaded future, which includes educating stakeholders on the complexities of the decision to sell new fuels approved with only a proprietary specification. Also key to our collective success for a safe fuel transition is protecting our members and the industry from legislative efforts to prematurely ban 100LL before an unleaded replacement fuel is commercially viable, with ample consideration given to all factors that contribute to commercially viability. Such actions would ground thousands of GA aircraft and threaten the future of our vital industry.

Individual fuel suppliers, distributors, and airports consider multiple factors when determining if a fuel is commercially viable, including but not limited to the:

- Product's authorization or approval for use in specified engines, fixed wing aircraft, and rotorcraft (pursuant to Supplemental Type Certificate [STC] or another FAA program);
- Percentage of the active, piston-engine, certificated and non-certificated, fixed- and rotor-wing fleet operating out of the specific airport that can use the fuel;
- Availability of a published industry consensus standard detailing specific requirements for the quality and safe use, production, and distribution of the fuel;
- Sufficient quantity of active fuel production to ensure consistent availability through an established distribution network;
- Sufficient risk mitigation protection with established product liability insurance coverage as currently provided to airports and Fixed Base

Operators (FBOs) selling 100 low-lead (100LL); and
- Product's ability to be purchased by any interested party without restriction throughout the country.

Ultimately, it is up to each FBO and airport that provides fuel to the wing of aircraft to work with their fuel supplier to determine their risk and liability threshold for purchasing and selling emerging fuels.

EXHIBIT B

Learn More About Lycoming's Efforts Around Unleaded Fuels

Lycoming remains committed to finding a comprehensive fuel solution that will allow a fleet-wide transition to lead-free aviation fuels for piston-engine aircraft

TIPS

Lycoming Engines has been producing piston aviation engines for over 95 years, and we "build every engine as though we were going to fly it ourself!" Safety is an utmost priority, and we strongly support efforts to eliminate lead from aviation fuels. For this reason, Lycoming has been researching fuels for decades and is an industry leader in the Piston Aviation Fuels Initiative (PAFI) and the Eliminate Aviation Gasoline Lead Emissions (EAGLE) initiative.

As a result of these pathbreaking efforts, Lycoming has approved several unleaded fuels for use in Lycoming Engines.
Please reference our **Service Instruction 1070** for approved fuels for our aircraft engine models.

Through our progress, we remain committed to finding a comprehensive fuel solution that will allow a fleet-wide transition to lead-free aviation fuels for piston-engine aircraft that does not compromise the safety or economic health of the general aviation industry. We take our work seriously to keep our fleet safe, and our approvals process for new fuels follows strict FAA and industry standards and guidelines. This process includes both the evaluation of how fuels will perform in our engines and options for improving the design of our products to work with commercially available unleaded fuels.

Lycoming will continue to strive to support a future unleaded fleet while working to ensure that our products remain safe and reliable.

Q: What is PAFI?

A: The Piston Engine Aviation Fuels Initiative (PAFI) program was established in 2014 to support the evaluation of candidate-unleaded fuels to replace approved leaded gasoline, with the objective of ultimately qualifying a fleet-wide solution.

To learn more about PAFI, visit their website at www.faa.gov.

Q: What is the EAGLE initiative?

A: According to their website, Eliminate Aviation Gasoline Lead Emissions (EAGLE) is a broad and collaborative initiative among the Federal Aviation Administration (FAA), the general aviation (GA) community, fuel suppliers and distributors, airports, engine and aircraft manufacturers, research institutions, associations, local communities, environmental groups and other key stakeholders. EAGLE partners are committed to ensuring the GA sector can safely transition to a lead-free future by the end of 2030 (at the latest) without affecting the safe and efficient operation of the piston-engine fleet. EAGLE's initiative has four pillars: address the unleaded fuel evaluation and authorization; research, development, and innovation; supply chain infrastructure and deployment; and regulation policy and programmatic activities.

To learn more about EAGLE, visit their website at www.flyeagle.org.

Q: How are PAFI and EAGLE different?

A: PAFI was established in 2014 to support the evaluation of candidate-unleaded fuels to replace approved leaded gasoline, with the objective of ultimately qualifying a fleet-wide solution. Once a candidate fuel formulation is qualified for PAFI testing, the FAA tests it using methods created through collaboration with industry. In 2022, the FAA and industry groups (GAMA, AOPA, etc) recognized a need to implement a comprehensive cross-sector approach to safely eliminate leaded aviation fuel by the end of 2030 without impacting the safe and efficient operation of the piston-engine fleet. PAFI became an integral part of one of the four critical EAGLE pillars tasked with evaluation and authorization of the unleaded fuel (UL).

In addition to PAFI, EAGLE recognizes that the FAA has allowed an alternative pathway for unleaded fuels to become approved via the traditional Supplemental Type Certificate (STC) process.

Q: Why is Lycoming a proponent of PAFI versus STC?

A: Fuel manufacturers can pursue approval either via PAFI or through a traditional aftermarket STC process. As an OEM, Lycoming is committed to supporting PAFI because it provides for a holistic evaluation of the candidate fuels through the collaboration of government and industry partners. This evaluation includes material compatibility, evaluation of toxicity, engine testing for detonation, endurance, flight testing and operability; as well as review of operational concerns to determine that a fuel is fit-for-purpose. Safety is of utmost importance, and Lycoming wants to align with the collective industry expertise. Upon final testing, PAFI allows for the FAA administrator to grant fleet-wide approval for fuel.

Alternatively, Type Certificate (TC) holders like Lycoming do not typically support the STC process, and there is no FAA guidance or established industry process for a TC holder to evaluate an STC candidate fuel. Instead, a fuel manufacturer applying for a STC works directly with the FAA and without the benefit of TC holders like Lycoming. Often TC holders are not provided critical technical information that they would need to determine if the candidate fuel is safe. As a result, per 14 CFR 21.115, the STC holder is ultimately and exclusively responsible for demonstrating that its fuel meets the FAA's airworthiness requirements.

Because Lycoming believes that the flying public is best served by a transparent, collaborative, documented, and cross-industry process to ensure that each candidate fuel is safe, we urge each candidate fuel maker to pursue approval via PAFI.

Q: What is ASTM?

A: ASTM International states, "The high quality of ASTM International standards is driven by the expertise and judgment of members who represent industry, governments, academia, trade groups, small and medium size enterprises, consumers, and others. Their contributions, and the consensus process, are why ASTM international standards are known for high quality and market relevance across many industries." ASTM is broad reaching internationally accepted technical standards for a wide range of materials and products utilized by major industries, beyond just fuels and aviation.

When a fuel has received an ASTM specification, the industry can be assured that the specification is well conditioned, addressing the key facets of the fuel performance characteristics, compositional requirements, and that the tests for those pieces have been vetted for precision and accuracy. This is especially important for the novel ingredients of fuels offerings. Lycoming applies ASTM and other voluntary consensus specifications to identify potential fuels for approval. Learn more about ASTM at their website, www.astm.org.

Q: What fuels are approved by Lycoming Engines?

A: Approved fuels are identified in the most current revision of Service Instruction 1070: Specified Fuels for Spark-Ignited Gasoline Aircraft Engine Models.

Q: How does a fuel get added to Service Instruction 1070 as an approved fuel?

A: Safety of the Lycoming engine fleet is of the utmost importance. Before it approves a fuel for use in its engines, Lycoming must first undertake a rigorous evaluation to ensure that the fuel will operate predictably within the engine's entire operating regime. This evaluation includes a full certification plan & data package that is ultimately provided to the FAA. Once approved, the fuel becomes part of the engine's TC and is listed in SI 1070.

Q: Who decides which fuels are approved for use in Lycoming Engines?

A: After rigorous evaluation to demonstrate that the fuel will perform predictably and safely in all aspects of the engine's operating envelope, Lycoming submits its data and certification package to the FAA for review and approval. Please reference SI 1070 for the latest list of FAA approved fuels for use in Lycoming engines.

Q: Has Lycoming tested GAMI's G100UL fuel?

A: No. GAMI chose not to participate in the collaborative PAFI process and instead chose to pursue approval via a direct STC process. Because GAMI submitted its data direct to the FAA, Lycoming was not involved in the certification or testing of GAMI's G100UL fuel. In addition, because there is no method for a TC holder to obtain technical information related to an STC, Lycoming does not have the technical information necessary to make any determination as to the airworthiness of G100UL fuels when used in Lycoming engines.

Q: Why hasn't Lycoming approved GAMI's G100UL fuel?

A: Because STCs are separately approved by the FAA without TC holder involvement, holders like Lycoming do not typically separately approve them after the fact. In essence, GAMI chose to pursue an aftermarket approval instead of collaboratively working with industry partners through the PAFI process.

Notwithstanding GAMI's decision to pursue an STC, Lycoming is committed to finding an unleaded solution in any form, and we strongly encourage GAMI to resubmit its fuel for testing through the collaborative PAFI process.

In addition, Lycoming has remained willing to test any candidate fuel, including those submitted to PAFI or approved via STC (like G100UL), so long as we can ensure our testing supports the safety of the flying public. To do this, Lycoming must be provided with appropriate technical documentation so we know what we are testing, and we must be able to provide appropriate guidance to the FAA, the industry, and the flying public regarding the use of any tested fuel in our engines. To date, GAMI has advised that it will not provide Lycoming with access to any technical information related to G100UL fuel unless we agree that we will not disclose our findings. In other words, GAMI has demanded that as a condition to allowing Lycoming to test its fuel, Lycoming must agree to conditions that would limit our ability to disclosure.

To ensure the safety of the flying public and to meet its obligations as a TC holder, Lycoming has refused this "gag-restriction." If we determine that any candidate fuel creates a safety issue when used in our engines, we must be able to appropriately warn the public and the FAA. We hope that

GAMI will drop its gag-restriction and join the collaborative industry process so that G100UL can be evaluated and approved in a manner that ensures the safety of the flying public.

Q: What happens if I run GAMI's G100UL (or any fuel that is not listed in SI1070 as an approved fuel) in my Lycoming Engine?

A: G100UL has been approved via STC and not via PAFI. As a result, customers should contact GAMI as the STC holder for guidance regarding use of G100UL, including warranty coverage. Because we do not have technical information associated with the STC, Lycoming cannot provide guidance on use of G100UL.

Lycoming evaluates warranty claims on a case-by-case basis in accordance with the terms of its Limited Warranty. However, customers should be aware that Lycoming's Limited Warranty excludes damage associated with operations outside Lycoming's published specification, including the use of non-approved fuels. In addition, use of any STC approved fuel constitutes modification of the engine in a manner not approved by Lycoming, and the engine no longer meets its original type design.

Lycoming recommends customers use fuels identified in ***Service Instruction 1070***.

Stop back to this webpage for the most up-to-date information around Lycoming's unleaded fuel efforts.

Last Updated: July 18, 2024

Advanced Technology

Lycoming offers advanced technology services to learn how your engine is running including manufacturing, engine testing, diagnostics & material analysis.
Send your engine to our advanced facilities to undergo advanced testing or receive metallurgical analysis to diagnose your engine. Our flight simulators ensure a high degree of flight readiness are used to serve customers worldwide.

LEARN MORE

EXHIBIT C

Multi-Engine Piston Communiqué

Communiqué ME-P-005
December 19, 2024

ATA 28 – Use of Unleaded Fuels Not Yet Approved by Textron Aviation or Engine Manufacturers

Affected Models:
All Multi Engine Cessna and Beechcraft models that utilize aviation gasoline.

Textron Aviation has been working with FAA, fuel manufacturers and distributors, airports, and other Original Equipment Manufacturers for a number of years in an effort to identify, test and certify alternative fuels to replace leaded fuels in order to eliminate lead-based additives from aviation fuel. For example, Textron Aviation has previously approved UL91 and UL94 (manufactured under ASTM D7547) for use in certain Textron Aviation aircraft.

As a part of these ongoing efforts, Textron Aviation has been actively involved in and providing technical and in-kind support to both the FAA Piston Engine Aviation Fuels Initiative (PAFI) and in the Eliminate Aviation Gasoline Lead Emissions (EAGLE) programs. Each of these programs seeks to provide comprehensive testing of candidate replacement fuels for engine performance, materials compatibility, and operational safety.

Textron Aviation is aware that there are certain aviation fuels that have been granted Supplemental Type Certification (STC) for use in certain aircraft engines through the FAA in a process that is separate and apart from the PAFI and EAGLE programs. For example, the GAMI G100UL fuel received such an STC approval. Because the STC process, unlike the PAFI and EAGLE programs, does not involve broad aviation industry coalition participation, neither Textron Aviation nor its engine suppliers, Lycoming and Continental Motors, have had the opportunity to conduct the type of comprehensive and wide-ranging performance, compatibility and operational testing with respect to that fuel needed to provide a basis for approval of the fuel for use in Textron Aviation's current and legacy fleet of Cessna and Beechcraft aircraft.

Textron Aviation has been made aware that at least one other aircraft OEM has begun more comprehensive testing of GAMI G100UL in their airframes. Textron Aviation has also been made aware of reports indicating that two different OEMs have been advised of reported issues with fuel tank sealant degradation following exposure of those sealants to G100UL. These kinds of reported materials compatibility issues give rise to concerns about the continuing airworthiness of aircraft that may be operated on fuels that have not yet been comprehensively tested by Textron Aviation and/or by its engine suppliers.

The continued airworthiness and operational safety of our products and their reliable service to our customers and their passengers is of paramount importance to Textron Aviation. For these reasons, Textron Aviation has not yet approved G100UL for use in its piston engine products. Such approval can only be made by Textron Aviation if the fuel is approved by its engine suppliers and has also undergone testing to confirm its airframe fuel systems performance, compatibility, and operational safety.

Please refer to applicable Textron Aviation approved Owner’s Manuals, Pilot Operating Handbooks, Aircraft Flight Manuals, placards, and Service Bulletins SEB-28-04R1 or MEB-28-01 (or later revisions) for a listing of fuels that are Textron Aviation approved for use in your aircraft.

EXHIBIT D

Single-Engine Piston Communiqué

Communiqué SE-P-006
December 19, 2024

ATA 28 – Use of Unleaded Fuels Not Yet Approved by Textron Aviation or Engine Manufacturers

Affected Models:
All Single Engine Cessna and Beechcraft models that utilize aviation gasoline.

Textron Aviation has been working with FAA, fuel manufacturers and distributors, airports, and other Original Equipment Manufacturers for a number of years in an effort to identify, test and certify alternative fuels to replace leaded fuels in order to eliminate lead-based additives from aviation fuel. For example, Textron Aviation has previously approved UL91 and UL94 (manufactured under ASTM D7547) for use in certain Textron Aviation aircraft.

As a part of these ongoing efforts, Textron Aviation has been actively involved in and providing technical and in-kind support to both the FAA Piston Engine Aviation Fuels Initiative (PAFI) and in the Eliminate Aviation Gasoline Lead Emissions (EAGLE) programs. Each of these programs seeks to provide comprehensive testing of candidate replacement fuels for engine performance, materials compatibility, and operational safety.

Textron Aviation is aware that there are certain aviation fuels that have been granted Supplemental Type Certification (STC) for use in certain aircraft engines through the FAA in a process that is separate and apart from the PAFI and EAGLE programs. For example, the GAMI G100UL fuel received such an STC approval. Because the STC process, unlike the PAFI and EAGLE programs, does not involve broad aviation industry coalition participation, neither Textron Aviation nor its engine suppliers, Lycoming and Continental Motors, have had the opportunity to conduct the type of comprehensive and wide-ranging performance, compatibility and operational testing with respect to that fuel needed to provide a basis for approval of the fuel for use in Textron Aviation's current and legacy fleet of Cessna and Beechcraft aircraft.

Textron Aviation has been made aware that at least one other aircraft OEM has begun more comprehensive testing of GAMI G100UL in their airframes. Textron Aviation has also been made aware of reports indicating that two different OEMs have been advised of reported issues with fuel tank sealant degradation following exposure of those sealants to G100UL. These kinds of reported materials compatibility issues give rise to concerns about the continuing airworthiness of aircraft that may be operated on fuels that have not yet been comprehensively tested by Textron Aviation and/or by its engine suppliers.

The continued airworthiness and operational safety of our products and their reliable service to our customers and their passengers is of paramount importance to Textron Aviation. For these reasons, Textron Aviation has not yet approved G100UL for use in its piston engine products. Such approval can only be made by Textron Aviation if the fuel is approved by its engine suppliers and has also undergone testing to confirm its airframe fuel systems performance, compatibility, and operational safety.

Please refer to applicable Textron Aviation approved Owner’s Manuals, Pilot Operating Handbooks, Aircraft Flight Manuals, placards, and Service Bulletins SEB-28-04R1 or MEB-28-01 (or later revisions) for a listing of fuels that are Textron Aviation approved for use in your aircraft.

EXHIBIT E

SR2X
Service Advisory

Number: **SA24-14R1**
Issued: 18 Jun 2024
Revised: 05 Nov 2024

SUBJECT: Transition to Unleaded Fuel and Use of Non-Cirrus Approved Fuel in SR Series Aircraft

As part of our proactive participation in the unleaded fuel initiative, Cirrus has been collaborating with potential fuel producers conducting materials compatibility and on-aircraft fuel performance testing for over a decade.

Cirrus is engaged in a comprehensive testing and evaluation program of the GAMI G100UL fuel. Working in coordination with GAMI, our key powerplant partners (Continental and Lycoming), and the FAA during this process, the goal is to ensure operational safety of both the powerplant and airframe fuel systems. **While some aspects of the initial Cirrus testing of the GAMI G100UL fuel are encouraging, Cirrus has identified specific concerns regarding material compatibility. Lab and on-aircraft testing, in coordination with FAA representatives, revealed degradation of tank sealant when in contact with GAMI G100UL fuel that could result in airworthiness concerns. At this time, Cirrus does not approve the use of GAMI G100UL fuel in any Cirrus SR Series airplanes.** Additionally, Cirrus currently does not warrant or represent in any way an operator's use of the GAMI G100UL fuel in SR Series airplanes.

Per Continental and Lycoming, only approved fuels may be used for an engine to be covered by warranty. **As the GAMI G100UL fuel is a non-approved fuel per Continental and Lycoming, engines known to have run this fuel may not be covered by the current OEM engine warranty.** For specific details, please refer to the respective Continental and Lycoming engine warranty documents.

Cirrus is dedicated to proactively addressing the evolving landscape of sustainability regulations, particularly the shift away from leaded aviation fuels. We continue to actively support industry efforts to develop, evaluate, and advance new fuels while supporting a safe industry transition to a future unleaded fuel environment.

These efforts include working directly with industry associations and all stakeholders including AOPA, GAMA, the FAA, and the FAA-Industry EAGLE program through the PAFI certification program. EAGLE is actively pursuing three potentially viable alternatives/replacements for 100LL: GAMI G100UL, LyondellBasell/VP Racing UL100E, and Swift 100R. Cirrus is dedicated to supporting all major fuel companies in their pursuit to bring alternative high-octane fuels to market.

Shell recently announced that 100VLL will be shipping to airports in Europe beginning in April 2024. Cirrus confirms this fuel can be used in all Cirrus SR Series airplanes as it complies with the ASTM D910 standard specification for leaded aviation gasoline. Please refer to FAA SAIB NE-11-55 “Grade 100VLL Aviation Gasoline,” for additional details.

The continued safe operation of all Cirrus aircraft around the world remains our top priority. As progress continues, we will provide updates as soon as they are available. We look forward to ensuring a safe and smooth transition to unleaded fuel for all Cirrus SR Series owners.

EXHIBIT F

Table 1.1 - GENERAL AVIATION AND PART 135 NUMBER OF ACTIVE AIRCRAFT BY AIRCRAFT TYPE 2012-2023

AIRCRAFT TYPE	2023	2022	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012
Fixed Wing: Total	166,788	164,567	164,282	161,638	166,525	167,560	167,082	166,167	164,293	161,321	158,911	165,257
% Std. Error	1.5	1.4	1.4	1.5	1.4	1.3	1.4	1.4	1.5	1.5	1.4	1.5
Piston: Total	139,300	137,728	138,621	136,006	141,396	143,040	142,916	142,638	141,141	139,182	137,655	143,160
% Std. Error	2.0	1.9	1.9	2.0	1.8	1.7	1.9	1.8	1.9	1.9	1.8	2.0
1 Engine: Total	127,573	126,076	126,735	124,059	128,926	130,179	129,833	129,652	127,887	126,036	124,398	128,847
% Std. Error	2.2	2.1	2.1	2.2	2.0	2.0	2.1	2.1	2.2	2.2	2.1	2.3
2 Engine: Total	11,727	11,652	11,885	11,947	12,470	12,861	13,083	12,986	13,254	13,146	13,257	14,313
% Std. Error	1.1	1.1	1.0	1.0	1.0	0.9	0.9	0.9	0.9	0.9	0.9	1.0
Turboprop: Total	10,951	10,713	10,391	10,317	10,242	9,925	9,949	9,779	9,712	9,777	9,619	10,304
% Std. Error	0.3	0.4	0.4	0.3	0.3	0.4	0.3	0.3	0.2	0.2	0.3	0.3
1 Engine: Total	6,124	5,843	5,550	5,292	5,111	4,919	4,800	4,566	4,391	4,590	4,478	5,090
% Std. Error	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.3
2 Engine: Total	4,827	4,870	4,841	5,024	5,131	5,005	5,149	5,212	5,321	5,188	5,140	5,215
% Std. Error	0.4	0.5	0.4	0.4	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.3
Turbojet: Total	16,537	16,126	15,270	15,316	14,888	14,596	14,217	13,751	13,440	12,362	11,637	11,793
% Std. Error	0.3	0.2	0.3	0.2	0.3	0.3	0.3	0.3	0.2	0.3	0.2	0.3
Rotorcraft: Total	10,051	9,769	10,032	9,745	10,199	9,990	10,511	10,577	10,506	9,966	9,765	10,055
% Std. Error	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.5	0.4
Piston: Total	2,909	2,748	3,012	2,930	3,089	3,082	3,270	3,344	3,286	3,154	3,137	3,292
% Std. Error	1.0	1.1	0.8	0.9	0.8	0.9	0.8	0.7	0.8	0.8	0.8	0.8
Turbine: Total	7,142	7,021	7,020	6,816	7,109	6,907	7,241	7,233	7,220	6,812	6,628	6,763
% Std. Error	0.4	0.4	0.4	0.4	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.2
1 Engine: Turbine	5,427	5,223	5,107	5,100	5,262	5,210	5,380	5,467	5,458	5,127	5,032	5,100
% Std. Error	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Multi-Engine: Turbine	1,715	1,798	1,913	1,715	1,847	1,697	1,861	1,766	1,762	1,685	1,596	1,663
% Std. Error	0.5	0.3	0.3	0.3	0.3	0.4	0.3	0.4	0.3	0.2	0.3	0.1
Other Aircraft: Total	4,262	4,476	4,271	3,818	4,133	4,114	4,692	4,986	4,941	4,699	4,277	5,006
% Std. Error	2.0	1.8	1.9	2.3	2.1	2.1	1.8	1.7	1.7	1.8	1.9	1.5
Gliders	1,505	1,628	1,717	1,519	1,517	1,772	1,747	1,789	1,870	1,791	1,594	1,820
% Std. Error	1.7	1.5	1.4	2.0	2.1	1.7	1.7	1.5	1.4	1.5	1.7	1.4
Lighter-than-air	2,757	2,848	2,554	2,299	2,617	2,343	2,945	3,197	3,071	2,908	2,684	3,186
% Std. Error	2.3	2.2	2.5	2.6	2.2	2.4	1.8	1.9	2.0	2.1	2.2	1.5
Experimental: Total[1]	30,114	28,062	27,960	26,367	27,449	27,531	26,921	27,585	27,922	26,191	24,918	26,715
% Std. Error	2.3	2.3	2.3	2.4	2.2	2.1	2.3	2.1	2.0	1.9	2.2	2.1
Amateur	24,092	22,127	21,953	20,567	21,591	21,216	20,434	20,490	21,195	18,873	17,503	18,843
% Std. Error	2.5	2.6	2.5	2.6	2.3	2.3	2.5	2.3	2.1	2.1	2.5	2.4
Exhibition	2,029	1,819	1,905	1,828	1,998	1,979	1,969	2,015	1,966	1,893	1,908	1,923
% Std. Error	1.7	1.7	1.6	1.7	1.5	1.4	1.4	1.4	1.3	1.3	1.3	1.2
Experimental Light-sport	3,255	3,457	3,435	3,295	3,183	3,580	3,743	4,264	3,942	4,204	4,157	4,631
% Std. Error	2.7	2.3	2.3	2.6	2.6	2.3	2.5	2.1	2.4	2.2	2.2	2.1
Other Experimental	738	658	667	677	676	755	776	816	820	1,221	1,350	1,317
% Std. Error	0.9	1.1	1.0	1.0	1.0	0.9	0.9	0.8	0.8	1.2	0.9	1.4
Special Light-sport	3,007	2,666	2,650	2,570	2,675	2,554	2,551	2,478	2,369	2231	2,056	2,001
% Std. Error	0.4	0.5	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3
All Aircraft	214,222	209,540	209,195	204,138	210,981	211,749	211,757	211,793	210,030	204,408	199,927	209,034
% Std. Error	1.5	1.4	1.4	1.5	1.4	1.3	1.4	1.4	1.4	1.4	1.4	1.4

Table Notes:

Columns may not add to totals due to rounding.

Estimates of light-sport aircraft for which airworthiness certificates are not final are included with experimental light-sport aircraft.

End of Worksheet

Table 1.1 - GENERAL AVIATION AND PART 135 NUMBER OF ACTIVE AIRCRAFT BY AIRCRAFT TYPE 2012-2023

AIRCRAFT TYPE	2023	2022	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012
Fixed Wing: Total	166,788	164,567	164,282	161,638	166,525	167,560	167,082	166,167	164,293	161,321	158,911	165,257
% Std. Error	1.5	1.4	1.4	1.5	1.4	1.3	1.4	1.4	1.5	1.5	1.4	1.5
Piston: Total	139,300	137,728	138,621	136,006	141,396	143,040	142,916	142,638	141,141	139,182	137,655	143,160
% Std. Error	2.0	1.9	1.9	2.0	1.8	1.7	1.9	1.8	1.9	1.9	1.8	2.0
1 Engine: Total	127,573	126,076	126,735	124,059	128,926	130,179	129,833	129,652	127,887	126,036	124,398	128,847
% Std. Error	2.2	2.1	2.1	2.2	2.0	2.0	2.1	2.1	2.2	2.2	2.1	2.3

EXHIBIT G

Table 1.3 - GENERAL
AVIATION AND PART 135
TOTAL HOURS FLOWN BY
AIRCRAFT TYPE 2012-2023
(HOURS IN THOUSANDS)

AIRCRAFT TYPE	2023	2022	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012
Fixed Wing: Total	23,575	22,515	21,889	18,620	20,977	21,113	20,274	20,102	19,200	18,461	18,428	19,358
% Std. Error	1.2	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.3
Piston: Total	16,105	14,431	14,302	12,939	14,431	13,785	13,583	13,548	12,825	11,967	12,352	13,206
% Std. Error	2.0	2.1	1.8	2.0	1.8	1.7	1.7	1.7	1.8	1.6	1.8	2.1
1 Engine: Total	14,613	12,999	12,808	11,603	12,700	12,092	12,047	11,865	11,217	10,395	10,706	11,441
% Std. Error	2.3	2.4	2.1	2.4	2.1	2.1	2.0	2.1	2.1	1.9	2.2	2.5
2 Engine: Total	1,492	1,432	1,494	1,336	1,731	1,694	1,536	1,683	1,608	1,573	1,646	1,765
% Std. Error	3.4	3.5	3.3	2.9	3.0	2.5	2.9	2.6	2.6	2.4	2.5	2.9
Turboprop: Total	2,841	2,846	2,720	2,344	2,619	2,736	2,625	2,707	2,538	2,613	2,587	2,733
% Std. Error	1.5	1.5	1.4	1.3	1.2	1.2	1.3	1.5	1.1	1.2	1.1	1.0
1 Engine: Total	1,723	1,635	1,544	1,308	1,441	1,395	1,448	1,376	1,237	1,280	1,310	1,371
% Std. Error	2.0	1.8	1.4	1.5	1.4	1.7	1.7	1.8	1.4	1.4	1.3	1.5
2 Engine: Total	1,119	1,211	1,176	1,037	1,178	1,341	1,177	1,331	1,301	1,333	1,277	1,362
% Std. Error	2.1	2.7	2.8	2.3	2.2	1.8	1.8	2.3	1.7	2.0	1.7	1.3
Turbojet: Total	4,628	5,238	4,868	3,336	3,926	4,592	4,065	3,847	3,837	3,881	3,488	3,418
% Std. Error	1.0	1.0	1.3	1.2	1.0	1.1	1.0	1.0	0.9	1.0	0.8	0.9
Rotorcraft: Total	2,907	2,775	2,756	2,408	2,997	2,922	3,320	3,128	3,294	3,242	2,949	3,454
% Std. Error	1.3	1.3	1.2	1.0	1.3	1.1	1.2	1.1	1.2	1.0	1.1	1.3
Piston: Total	668	537	578	537	628	601	782	780	798	818	636	731
% Std. Error	4.7	5.1	3.4	3.6	2.7	3.1	2.9	3.1	3.7	2.8	2.8	3.2
Turbine: Total	2,239	2,238	2,178	1,871	2,369	2,322	2,538	2,348	2,496	2,424	2,312	2,723
% Std. Error	1.2	1.1	1.2	0.9	1.3	1.0	1.2	1.1	1.1	0.9	1.1	1.3
1 Engine: Turbine	1,678	1,644	1,572	1,361	1,813	1,753	1,992	1,810	1,912	1,871	1,797	2,131
% Std. Error	1.5	1.4	1.4	1.2	1.6	1.2	1.4	1.3	1.3	1.2	1.3	1.7
Multi-Engine: Turbine	561	594	606	510	556	569	545	538	584	553	515	592
% Std. Error	2.0	1.7	2.1	1.5	2.3	1.8	1.9	2.4	2.1	1.4	1.6	1.4
Other Aircraft: Total	132	153	156	86	135	131	168	193	162	158	135	180
% Std. Error	5.2	6.0	10.4	7.4	5.5	6.6	6.5	9.2	4.7	6.0	5.3	4.6
Gliders	67	76	92	50	71	73	93	87	94	79	68	91
% Std. Error	6.7	7.8	12.9	8.7	8.3	6.3	9.0	13.7	5.2	6.3	6.9	6.6
Lighter-than-air	65	77	64	36	64	58	75	106	68	80	67	89
% Std. Error	6.6	8.1	8.8	10.8	5.3	12.4	8.2	11.2	6.4	10.5	7.2	5.6
Experimental: Total[1]	1,594	1,279	1,394	1,176	1,269	1,153	1,241	1,224	1,295	1,244	1,191	1,243
% Std. Error	3.7	3.0	2.4	2.4	2.5	2.5	2.7	2.9	2.6	2.7	3.2	2.6
Amateur	1,237	1,001	1,106	944	1,006	880	950	890	1,000	834	785	847
% Std. Error	3.2	3.4	2.9	2.8	2.7	2.8	3.0	2.6	2.7	2.4	3.9	2.6
Exhibition	109	74	93	64	82	75	88	89	76	79	78	88
% Std. Error	7.4	7.7	6.8	7.5	5.5	7.1	5.8	6.5	5.4	4.9	5.8	8.8
Experimental Light-sport	143	139	149	118	118	122	139	152	132	142	135	151
% Std. Error	7.5	7.5	7.7	8.3	7.8	7.2	10	5.5	6.4	6.8	5.3	6
Other Experimental	106	65	47	50	63	75	65	93	87	189	193	157
% Std. Error	16.1	13.3	9.3	8.7	11.7	8.0	8.7	11.4	9.8	7.7	6.0	8.0
Special Light-sport	355	231	245	202	189	187	209	187	191	165	173	169
% Std. Error	3.8	4.2	3.5	3.8	3.0	3.0	2.9	2.7	2.9	3.0	3.5	2.8
All Aircraft	28,563	26,953	26,441	22,492	25,566	25,506	25,212	24,833	24,142	23,271	22,876	24,403
% Std. Error	1.1	1.1	1.1	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.1

Table Notes:

Columns may not add to totals due to rounding.

Estimates of light-sport aircraft for which airworthiness certificates are not final are included with experimental light-sport aircraft.

End of worksheet

Table 1.3 - GENERAL AVIATION AND PART 135 TOTAL HOURS FLOWN BY AIRCRAFT TYPE 2012-2023 (HOURS IN THOUSANDS)

AIRCRAFT TYPE	2023	2022	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012
Fixed Wing: Total	23,575	22,515	21,889	18,620	20,977	21,113	20,274	20,102	19,200	18,461	18,428	19,358
% Std. Error	1.2	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.3
Piston: Total	16,105	14,431	14,302	12,939	14,431	13,785	13,583	13,548	12,825	11,967	12,352	13,206
% Std. Error	2.0	2.1	1.8	2.0	1.8	1.7	1.7	1.7	1.8	1.6	1.8	2.1
1 Engine: Total	14,613	12,999	12,808	11,603	12,700	12,092	12,047	11,865	11,217	10,395	10,706	11,441
% Std. Error	2.3	2.4	2.1	2.4	2.1	2.1	2.0	2.1	2.1	1.9	2.2	2.5

Table 1.3 - GENERAL AVIATION AND PART 135 TOTAL HOURS FLOWN BY AIRCRAFT TYPE 2012-2023 (HOURS IN THOUSANDS)

AIRCRAFT TYPE
Fixed Wing: Total
% Std. Error
Piston: Total
% Std. Error
1 Engine: Total
% Std. Error
2 Engine: Total
% Std. Error
Turboprop: Total
% Std. Error
1 Engine: Total
% Std. Error
2 Engine: Total
% Std. Error
Turbojet: Total
% Std. Error
Rotorcraft: Total
% Std. Error
Piston: Total
% Std. Error
Turbine: Total
% Std. Error
1 Engine: Turbine
% Std. Error
Multi-Engine: Turbine
% Std. Error
Other Aircraft: Total
% Std. Error
Gliders
% Std. Error
Lighter-than-air
% Std. Error
Experimental: Total[1]
% Std. Error
Amateur
% Std. Error
Exhibition
% Std. Error
Experimental Light-sport
% Std. Error
Other Experimental
% Std. Error
Special Light-sport
% Std. Error
All Aircraft
% Std. Error

Table Notes:

Columns may not add to totals due to rc

Estimates of light-sport aircraft for whicl

End of worksheet

Table 1.3 - GENERAL AVIATION AND PART 135 TOTAL HOURS FLOWN BY AIRCRAFT TYPE 2012-2023 (HOURS IN THOUSANDS)

AIRCRAFT TYPE
Fixed Wing: Total
% Std. Error
Piston: Total
% Std. Error
1 Engine: Total
% Std. Error

EXHIBIT H

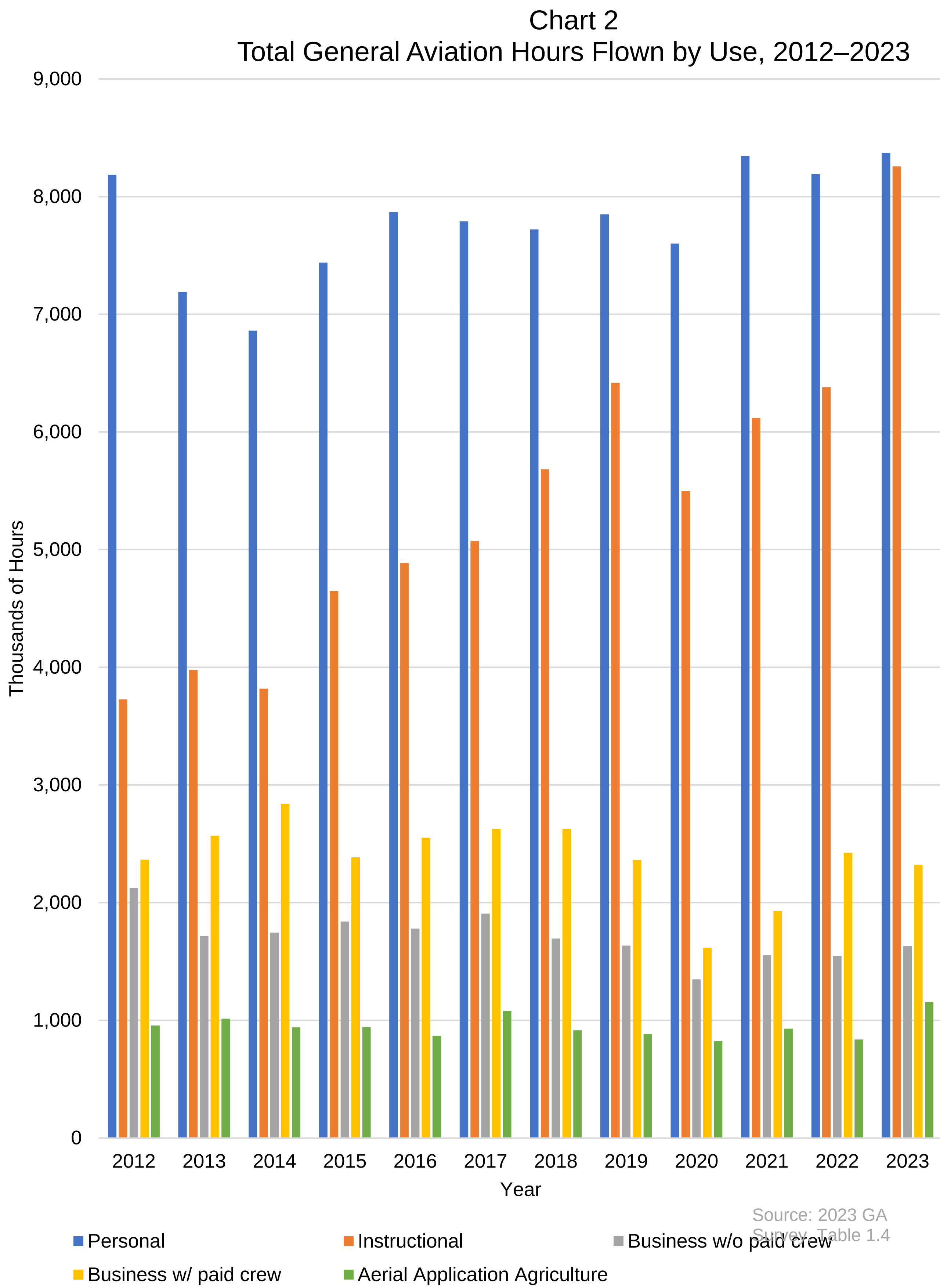


Chart 2
Total General Aviation Hours Flown by Use, 2012–2023
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
Thousands of Hours
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
Year
Source: 2023 GA Survey, Table 1.4
Personal
Instructional
Business w/o paid crew
Business w/ paid crew
Aerial Application Agriculture

EXHIBIT I

Summary of Economic Impact of General Aviation in California

According to the PricewaterhouseCoopers study, ***Contribution of General Aviation to the US Economy in 2018****, general aviation in California contributes over $32.7 billion to the state's total economic output.*

Map data © 2023 Google, INEGI

Hyundai Motor Group has picked Irvine for the engineering headquarters of its newly formed division, called **Supernal**, which aims to get flying taxis into service in 2028. **Joby Aviation**, based in Santa Cruz, **Overair**, based in Santa Ana, and **Kitty Hawk Corp.**, located in Mountain View, are all developing electric vertical takeoff and landing (eVTOL) aircraft. Joby and Germany's **Volocopter** each are promising to have aircraft in service by 2024. **ZeroAvia**, based in Hollister, is developing a hydrogen fuel cell-driven electric powered aircraft, and **Ampaire**, located in Hawthorne, is developing electric hybrid aircraft, among many others.

AVIATION BY THE NUMBERS

According to Aviation in California: Fact Sheet, California has 214 general aviation airports, which, according to the FAA, support 68,846 pilots and 24,756 registered aircraft.

NUMBER OF JOBS

According to PricewaterhouseCoopers' study, **Contribution of General Aviation to the US Economy in 2018**, general aviation supports 148,300 jobs in California, resulting in over $11.3 billion in labor income.

ECONOMIC IMPACT

According to the same study, general aviation in California contributes over $32.7 billion to the state's total economic output.

According to the FAA, California is home to 555 repair stations, 65 FAA-approved pilot schools, 25,562 student pilots and 10,353 flight instructors. According to Helicopter Association International, there are 503 heliports in California. In addition, there are 232 fixed-base operators according to the AC-U-KWIK directory.

According to the University Aviation Association, flight departments in California include California Aeronautical University in Bakersfield, California Baptist University in Riverside, Cal State LA Department of Technology in Los Angeles, Mt. San Antonio College in Walnut, San Jose State University in San Jose, and University of Southern California in Los Angeles.

EXHIBIT J

AIR OPERATIONS

FIREFIGHTING AIRCRAFT RECOGNITION GUIDE

CAL FIRE AIRCRAFT CONTACT FREQUENCY 122.925
CDF AIR TO GROUND 151.2200 TONE 16
CDF AIR TO GROUND 159.2625 TONE 16
CDF AIR TO GROUND 159.3675 TONE 16

WWW.FIRE.CA.GOV

With a fleet consisting of more than 60 fixed and rotary wing aircraft, CAL FIRE boasts the largest civil aerial firefighting fleet worldwide. Strategically positioned across California, CAL FIRE's aircraft can be found at 14 air tanker bases, 10 CAL FIRE helitack bases, and one CAL FIRE/San Diego County Sheriff helitack base. In as little as 20 minutes, these aircraft can reach even the most remote State Responsibility Area (SRA) fires. The CAL FIRE Aviation Management Unit is located at Sacramento McClellan Airport and operates with support from contractors *DynCorp/Amentum* and *Logistics Specialties Incorporated* (LSI).

Airtanker Program

Aircraft were first proposed for fighting California's wildland fires in 1931, and again in the late 1940s after World War II. CAL FIRE used several small airtankers on a Call-When-Needed basis between 1954-1957, and in 1958, the Department contracted with private aviation companies for airtanker services. The air program expanded until the early 1970s, when CAL FIRE owned and operated 14 turboprop air tactical aircraft and seven multi-engine retardant/water dropping aircraft. Early aircraft included SOCATA TBMs, Grumman F7Fs, Consolidated PBYs, and a Boeing B-17.

By the late 1970s, CAL FIRE made the Grumman S-2 its primary airtanker. In 1987, the Department began upgrading to turbine-driven engines and, by 2005, all airtankers had been converted to the Grumman S-2T model. In 2006, CAL FIRE placed the first Very Large Air Tanker on contact, a converted McDonnell Douglas DC-10, further enhancing initial and extended attack capabilities.

In July 2018, California obtained approval for the acquisition of seven C-130H aircraft for CAL FIRE to further improve firefighting capabilities. The 2019 National Defense Authorization Act allowed for the transfer of the planes from the United States Coast Guard to California, following modifications by the United States Air Force, including the replacement of center wing boxes and outer wings, general programmed depot level maintenance, painting, and retardant dispersal system installation. Once complete, the United States Coast Guard can transfer ownership to CAL FIRE. The first transferred C-130Hs will be response-ready in the near future, following extensive wing-box modifications, RDS contracting/installation by the United States Air Force, and pilot training and certification.

Air Tactical Aircraft

In 1974, CAL FIRE acquired 20 Cessna O-2 aircraft from the US Air Force, previously used during the Vietnam War, for use as an Air Attack platform to direct airtankers, helicopters, and provide incident updates to ground resources.

In 1993 the Department replaced the aging O-2 platform with 16 North American OV-10A aircraft, which were obtained from the Department of Defense. The OV-10s were equipped with turbine-powered twin engines and served as the next-generation Air Attack platform. The current fleet consists of 15 "A" models and one "D" model.

To support fleet maintenance and surge capacity, CAL FIRE recently acquired four additional OV-10 Air Tactical Aircraft from NASA. These aircraft will undergo extensive refurbishment before entering service in the coming years.

Helicopter Program

In 1981, CAL FIRE took a significant step towards strengthening its fleet by acquiring 12 Bell UH-1F series helicopters from the United States Air Force. These helicopters were a valuable addition to the Department's operations as they provided exceptional agility and maneuverability during firefighting operations.

As CAL FIRE continued to expand its services, it became increasingly evident that the "F" model helicopters were no longer suitable for their needs. This prompted CAL FIRE to initiate a phase-out of the "F" model and an upgrade to newer, larger UH-1H helicopters in the late 1980s. These UH-1H aircraft were significantly modified to meet the Department's specialized needs and provide enhanced capabilities during firefighting operations.

The modified helicopters were designated as Super Hueys, a name that perfectly reflected their superior performance and exceptional capabilities. The modifications included upgraded engines, advanced communication systems, and specialized equipment for fire suppression and search and rescue operations. These helicopters were truly a game-changer in CAL FIRE's firefighting operations, as they provided enhanced maneuverability, greater lift capacity, and faster response times.

In 2018, CAL FIRE embarked on a mission to modernize and bolster our aerial firefighting fleet capabilities. To achieve this, we sought approval from the Governor's Office to purchase up to 12 new Sikorsky S70i helicopters. The approval was granted, and by the spring of 2023, all 12 of these state-of-the-art helicopters had been acquired and were in service, responding to emergencies such as vegetation fires and rescue missions.

In the 2022-2023 fiscal year, the Governor's Office provided additional funding for the purchase of 4 more CAL FIRE HAWK helicopters. These additional helicopters are being acquired to increase surge capacity and to ensure operational readiness during mandatory maintenance cycles.

The new generation of S70i CAL FIRE HAWK helicopters have brought a myriad of improvements to the firefighting operations. With improved flight safety features, higher payload capacity, increased power margins, and the ability to operate at night, CAL FIRE can now tackle emergency situations more efficiently and effectively. These state-of-the-art helicopters have proven to be a valuable asset to the firefighting fleet, enabling CAL FIRE to respond more quickly to emergency situations and providing a greater degree of safety for firefighters and residents alike.

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.

AIR
CAL FIRE
OPERATIONS

AIR OPERATIONS

UH-1 Fleet

UH-1 C-620 (N491DF)
UH-1 C-621 (N499DF)
UH-1 C-622 (N498DF)
UH-1 C-623 (N488DF)
UH-1 C-624 (N495DF)
UH-1 C-909 (N481DF)
UH-1 C-914 (N497DF)

S70i Fleet

S70i C-601 (N482DF)
S70i C-602 (N479DF)
S70i C-603 (N487DF)
S70i C-604 (N477DF)
S70i C-605 (N478DF)
S70i C-606 (N485DF)
S70i C-607 (N486DF)
S70i C-608 (N476DF)
S70i C-609 (N484DF)
S70i C-610 (N480DF)
S70i C-611 (N483DF)
S70i C-612 (N492DF)
S70i C-613 (N451DF)
S70i C-614 (N452DF)
S70i C-615 (N453DF)
S70i C-616 (N454DF)

Helicopter Bases

Kneeland - KNE-HUU
UH-1
S70i TBD

Bieber - BBR-LMU
UH-1
S-70i TBD

Vina - VNA-TGU
S70i

Howard Forest - HFS-MEU
S70i

Boggs Mountain - BGS-LNU
S70i

Alma - ALM-SCU
S70i

Columbia - CBA-TCU
S70i

Hollister - CVH-BEU
S70i

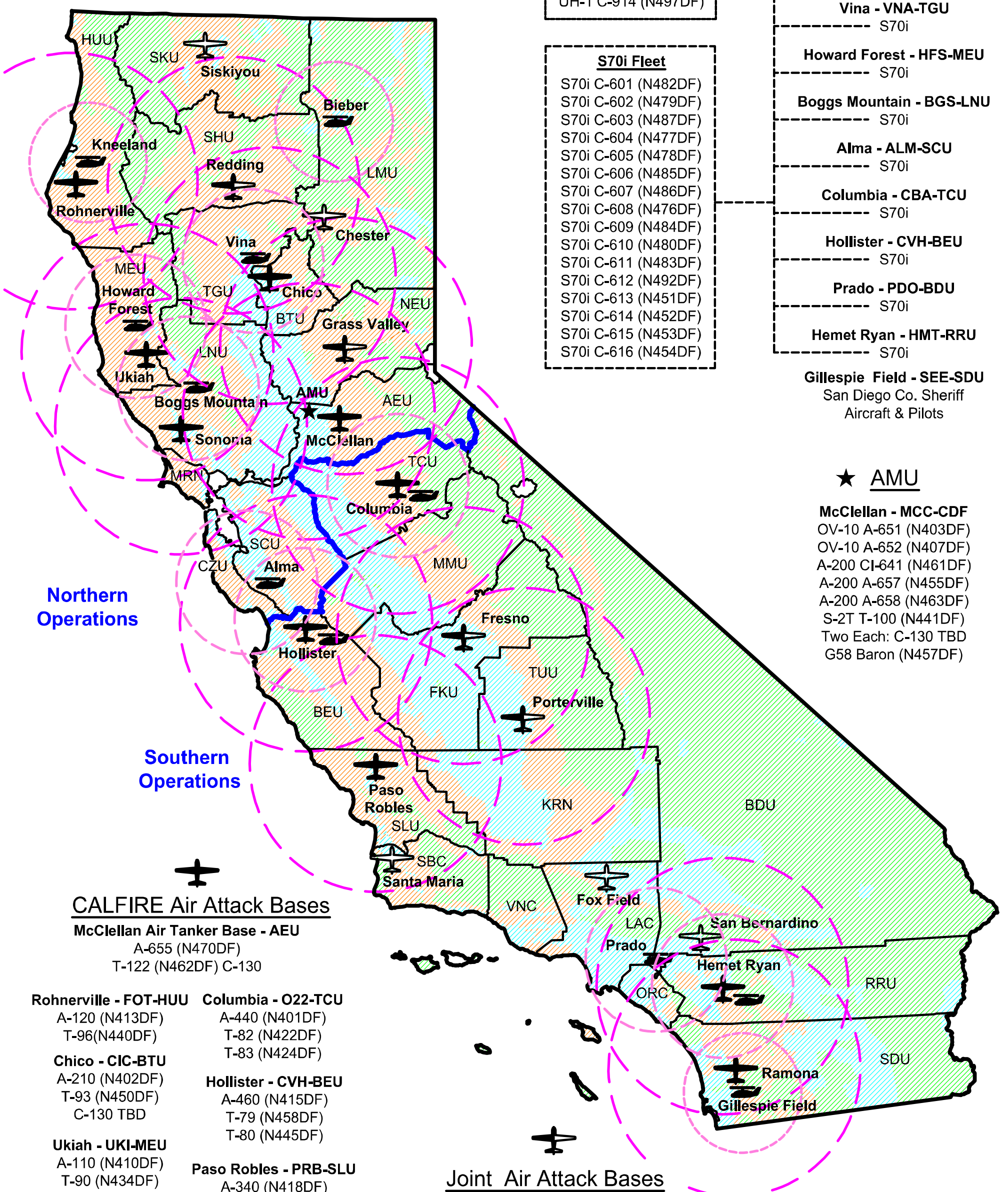
Prado - PDO-BDU
S70i

Hemet Ryan - HMT-RRU
S70i

Gillespie Field - SEE-SDU
San Diego Co. Sheriff
Aircraft & Pilots

★ AMU

McClellan - MCC-CDF
OV-10 A-651 (N403DF)
OV-10 A-652 (N407DF)
A-200 CI-641 (N461DF)
A-200 A-657 (N455DF)
A-200 A-658 (N463DF)
S-2T T-100 (N441DF)
Two Each: C-130 TBD
G58 Baron (N457DF)



CALFIRE Air Attack Bases

McClellan Air Tanker Base - AEU
A-655 (N470DF)
T-122 (N462DF) C-130

Rohnerville - FOT-HUU
A-120 (N413DF)
T-96(N440DF)

Chico - CIC-BTU
A-210 (N402DF)
T-93 (N450DF)
C-130 TBD

Ukiah - UKI-MEU
A-110 (N410DF)
T-90 (N434DF)
T-91 (N428DF)

Sonoma - STS-LNU
A-140 (N414DF)
T-85 (N438DF)
T-86 (N433DF)

Ramona - RNM-SDU
A-330 (N409DF)
T-70 (N427DF)
T-71 (N432DF)
C-130 TBD

Columbia - O22-TCU
A-440 (N401DF)
T-82 (N422DF)
T-83 (N424DF)

Hollister - CVH-BEU
A-460 (N415DF)
T-79 (N458DF)
T-80 (N445DF)

Paso Robles - PRB-SLU
A-340 (N418DF)
T-74 (N439DF)
T-75 (N444DF)
C-130 TBD

Hemet Ryan - HMT-RRU
A-310 (N429DF)
T-72 (N435DF)
T-73 (N437DF)

Joint Air Attack Bases

Redding - RDD-SHU
A-240 (N421DF)
T-94 (N442DF)
T-95 (N448DF)

Fresno - FAT-FKU
A-430 (N430DF)
C-130 TBD

Grass Valley - GOO-NEU
A-230 (N408DF)
T-88 (N426DF)
T-89 (N425DF)

Porterville - PVT-TUU
A-410 (N400DF)
T-76 (N436DF)
T-78 (N431DF)

Federal Air Attack Bases

Siskiyou - SIY-SKU
Chester-O05-LMU
Santa Maria - SMX-SBC
Fox Field - WJF-LAC
San Bernardino - SBD-BDU

Index

SPECIFICATIONS:

Cruise Speed:
258 mph

Gallon Capacity:
not applicable

Manufacturer
North American-Rockwell, Columbus, Ohio.

Crew
Pilot and observer (Chief Officer or Fire Captain).

Original Owner
United States Navy/Marines, 1968-1993. The OV-10 was used as a counterinsurgency aircraft and close air-support to military ground forces.

Acquired by CAL FIRE
In 1993, CAL FIRE acquired 15 OV-10As from the Federal Excess Personal Property (FEPP) program. These have since been converted for use as air attack platforms replacing the original Cessna 0-2As that CAL FIRE had been using. The OV-10As are newer, larger, faster, provide a larger field of vision for the pilot and air attack officer and are more maneuverable than the older O-2As. In 2009, CAL FIRE also acquired three OV-10Ds, of which one has been converted and is in use.

Mission
CAL FIRE uses the OV-10s as the primary command and control platform on wildland incidents. The air attack officer, a highly trained and experienced fire officer, coordinates with the incident commander on the ground, providing a unique aerial perspective on fire conditions, anticipated resource needs and potential threats to life and property.

The Air Attack Officer is also responsible for the safe coordination of all aerial resources on an incident and where to make retardant and water drops based upon the Incident Commander's control objectives. The OV-10 can be utilized as a lead plane, for Very Large Air Tankers (VLAT) when not assigned as a command and control platform.

Beechcraft King Air 200

Original Owner
United States Army

Acquired by CAL FIRE
In service operationally for CAL FIRE 2010

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.

CAL FIRE operates two King Air 200's as Air Tactical Group Supervisor (ATGS) training platforms.

SPECIFICATIONS:

Cruise Speed:
333 mph

Gallon Capacity:
not applicable

Manufacturer
Hawker Beechcraft

Crew
Pilot and Air Tactical Group Supervisor

SPECIFICATIONS:

Cruise Speed:
485 mph

Gallon Capacity:
9,400

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 aircraft, operated by 10 Tanker Air Carrier, is used for fighting wildfires, typically in rural settings. The turbofan-powered craft carries up to 9,600 gallons of fire retardant in an exterior belly-mounted tank, which can be released in eight seconds. 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 appropriately equipped aerial firefighting base (currently McClellan, Castle, San Bernardino and Santa Maria 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.

Lockheed C-130 Hercules

Type I Airtanker Large Air Tanker (LAT)

Original owner

United States Coast Guard, 1985-present (USCG HC-130H)

Acquired by CAL FIRE

In July 2018, California secured approval to acquire seven C-130H aircraft for CAL FIRE. This addition to the firefighting fleet was solidified in December 2023 with the passage of the National Defense Authorization Act (NDAA) by Congress. Signed into law by President Biden later that month, the NDAA authorized the transfer of these C-130Hs from the United States Coast Guard to California.

Since 2018 the United States Air Force and the United States Coast Guard played a pivotal role in maintaining the aircraft including the replacement of the inner and outer wing boxes, paint, and providing spare provisions to ensure the aircraft will remain in service.

The first CAL FIRE C-130H went into service on Monday August 26, 2024.

Mission

The C-130Hs will be used for rapid initial attack delivery of fire retardant on wildand fires. These 7 new airtankers will support CAL FIRE's existing fleet of aircraft from air attack bases strategically located throughout California.

SPECIFICATIONS:

Cruise Speed:

360 mph

Gallon Capacity:

4,000 gallons long-term fire retardant

Manufacturer

Lockheed Martin, Marietta Georgia

Crew

Three-person crew; pilot, co-pilot, and flight engineer

British Aerospace Bae 146/ Avro RJ85

Type I Airtanker

SPECIFICATIONS:

Cruise Speed:
380 mph

Gallon Capacity:
3,000

Manufacturer
British Aerospace / Avro

Crew
Pilot, Co-pilot

Original Owner

The British Aerospace 146 (also BAe 146) is a short-haul and regional airliner that was manufactured in the United Kingdom by British Aerospace, production ran from 1983 until 2002. The 146 was introduced into Royal Air Force service in 1986 as a VIP transport and is operated by 32 (The Royal) Squadron. Manufacture of an improved version known as the Avro RJ began in 1992.

Mission

The BAe 146 is powered by four Avco Lycoming ALF 502 turbofan engines, which are fixed on pylons underneath the aircraft's high wing. The AVRO RJ85 is powered by four LF 507 Turbofan engines. The aircraft is equipped with the Retardant Aerial Delivery System II "RADS II" and the system is internal to the aircraft. The RADS II tank is scale-able to any size or type of aircraft, enabling it to be installed in aircraft ranging in size from the BAE146 to the C-130.

PHOTO © JEREMY ULLOA

Original Owner

McDonnell Douglas launched development of the MD-87 on January 3 1985, following the placement of launch orders from Finnair and Austrian in December 1984. First flight took place on December 4 1986 and US FAA certification was granted on October 21 1987. The MD-87 is a shortened version of its predecessors.

Mission

This aircraft can operate from most existing Airtanker Bases with little or no impact. Large Air Tankers (LATs), like the MD-87 can be used in challenging terrain. The MD-87 is relatively agile for its size and requires some planning by the supervising aircraft to provide a stabilized path for delivery. Flight paths for pattern speeds of 130 to 140 knots on final should be planned.

SPECIFICATIONS:

Cruise Speed:
400 mph

Gallon Capacity:
3,000

Manufacturer
McDonnell Douglas

Crew
Pilot, Co-pilot

SPECIFICATIONS:

Cruise Speed:
517 mph

Gallon Capacity:
4,000

Manufacturer:
Boeing

Crew:
Pilot and Co-pilot

Original Owner

The Boeing 737 is a narrow-body aircraft produced by Boeing Commercial Airplanes at its Renton Factory in Washington. Developed to supplement the Boeing 727 on short and thin routes, the twinjet retains the 707-fuselage cross-section and nose with two underwing turbofans. Envisioned in 1964, the initial 737-100 made its first flight in April 1967 and entered service in February 1968 with Lufthansa. The lengthened 737-200 entered service in April 1968. It evolved through four generations, offering several variants for 85 to 215 passengers.

Mission

The newest addition to the firefighting fleet are the Coulson 737 FIRELINER's. Coulson Aviation is the first in the world to convert Boeing's 737 commercial airliners into FIRELINER's. Coulson has six 737's in line for conversation, each receiving 43,000+ technician hours to become fully compliant and operational. The FIRELINER is the only multi-use Large Air Tanker in the world and can carry retardant and up to 72 passengers without re-configuring the airplane.

CL-215/ Bombardier 415 Super Scooper

Type II Airtanker

Original Owner

Both the CL-215 and Bombardier 415 are Canadian aircraft built specifically for fire suppression and are known in the U.S. as Super Scoopers. 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.

Mission

These turbine aircraft scoop water from oceans, 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. These aircraft have been leased for use during fire season in numerous counties including Los Angeles and San Diego. The U.S. Forest Service also has some of these aircraft on Exclusive use contracts.

SPECIFICATIONS:

Cruise Speed:
189/233 mph

Gallon Capacity:
1,300/1,621

Manufacturer
Canadair / Bombardier, Canada

Crew
Pilot and Co-pilot

SPECIFICATIONS:

Cruise Speed:
270 mph

Gallon Capacity:
1,200 gallons long-term fire retardant

Manufacturer
Grumman Aerospace, Bethpage, New York

Crew
One pilot

Original Owner
United States Navy, 1958-1975; The S-2E/G carrier-based anti-submarine warfare airplane.

Acquired by CAL FIRE
In 1996, CAL FIRE acquired 26 S-2E/G planes from the Federal Excess Personal Property (FEPP) program. Marsh Aviation converted the planes to a firefighting configuration and were retrofitted with modern, powerful turboprop engines. The completely reconditioned S-2Ts are faster, safer, more maneuverable, and carry a larger retardant payload than the original S-2A airtankers CAL FIRE had used since the 1970s. The final three S-2Ts were completed and delivered in 2005. CAL FIRE has 23 S-2T one of which is in Sacramento at CAL FIRE's Aviation Management Unit (AMU) as maintenance relief.

Mission
The S-2T airtankers are used for rapid initial attack delivery of fire retardant on wildland fires. These airtankers are strategically located throughout California responding to the most remote State Responsibility Areas (SRA) within approximately 20 minutes.

Air Tractor AT-802A

Type III Airtanker

Original Owner
The Air Tractor AT-802 is an agricultural aircraft that may also be adapted into fire-fighting or armed versions. It first flew in the United States in October 1990 and is manufactured by Air Tractor Inc. The AT-802 carries a chemical hopper between the engine firewall and the cockpit. In the U.S., it is considered a Type III SEAT, or Single Engine Air Tanker.

Mission
Used by sub-contractors a fast-initial attack aircraft for water, phosphate based retardant, gel, and foam fire retardants. Sub-contractors supply field service vehicles which allow the aircraft to be operated from remote bases. Aircraft can be dispatched in groups to allow for larger coordinated drops

SPECIFICATIONS:

Cruise Speed:
180 mph

Gallon Capacity:
800

Manufacturer
Air Tractor, Inc. Olney, TX, USA

Crew
Pilot

Air Tractor AT-802A Fire Boss

SPECIFICATIONS:

Cruise Speed:
170 mph

Gallon Capacity:
800 lbs.

Manufacturer
Air Tractor, Inc. Olney, TX, USA

Crew
Pilot

Original Owner

The Air Tractor AT-802 is an agricultural aircraft that may also be adapted into fire-fighting or armed versions. It first flew in the United States in October 1990 and is manufactured by Air Tractor Inc. The AT-802 carries a chemical hopper between the engine firewall and the cockpit. In the U.S., it is considered a Type III SEAT, or Single Engine Air Tanker.

Mission

Used by sub-contractors a fast-initial attack aircraft for water, phosphate based retardant, gel, and foam fire retardants. Aircraft can be used as a land based or a water scooping aircraft. The FireBoss aircraft's capability to operate either as wheeled to floated operations allowed the aircraft to be dispatched from an airport to a river or lake for multiple water drops on one fuel cycle. Sub-contractors supply field service vehicles which allow the aircraft to be operated from remote bases. Aircraft can be dispatched in groups to allow for larger coordinated drops.

C-23B Sherpa (SD3-30)

Original Owner

The Short C-23 Sherpa is a twin-engine turboprop aircraft a small military transport aircraft built by Short Brothers in Belfast, Ireland. It was designed to operate from unpaved runways and make short takeoff and landings. It features a large squared fuselage with a full-width rear cargo door/ramp. It was produced from 1984 to 1990.

Mission

In its current configuration, it flies an initial attack load of 10 smokejumpers plus cargo with an endurance of 3 hours. From Redding, the Sherpa has the ability to initial attack all North Ops forests and some of the more northerly South Ops forests without a fuel stop. The aircraft is also available for Para-cargo missions, with up to 4,500 pounds of cargo deliverable via parachute or delivery to a suitable airport.

SPECIFICATIONS:

Cruise Speed:
230 mph

Payload
4,500 lbs.

Manufacturer
Short Brothers

Crew
Pilot, Co-pilot

Dornier Do-228

SPECIFICATIONS:

Cruise Speed:
250 mph

Payload:
3,500 lbs.

Manufacturer
Dornier GmbH

Crew
Pilot and Co-pilot

Original Owner

The Dornier Do-228 is a twin-turboprop STOL utility aircraft, designed and first manufactured by Dornier GmbH (later DASA Dornier, Fairchild-Dornier) from 1981 until 1998, 245 were built in Oberpfaffenhofen, Germany.

Mission

It is configured to deliver an initial attack load of 8 smokejumpers plus cargo with an endurance of 3 hours. From Redding, the Dornier has the ability to initial attack all North Ops forests and some of the more northerly South Ops forests without a fuel stop. However, the Dornier is often positioned in Porterville (PTV) for a majority of the summer. The aircraft is also available for Para-cargo only missions, with up to 3,500 pounds of cargo deliverable via parachute or delivery to a suitable airport.

Sikorsky S-61

Type I Helicopter

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.

SPECIFICATIONS:

Cruise Speed:
154 mph

Gallon Capacity:
1,000

Manufacturer
Sikorsky Aircraft Corp

Crew
Pilot and Co-pilot

AIR OPERATIONS

Sikorsky S70i CAL FIRE HAWK

SPECIFICATIONS:

Cruise Speed:
160 mph

Gallon Capacity:
Fixed tank - 1000 gallons of water/foam with pilot controlled drop volumes.

Manufacturer
Sikorsky Aircraft, Stratford, Connecticut (Built in Mielec, Poland)

Crew
One pilot, two Helitack Captains, an operations supervisor, and up to nine personnel.

Original Owner
CAL FIRE, 2019

Acquired By CAL FIRE
In 2018 funding was secured for the purchase of 12 of CAL FIRE's next generation helicopter, the Sikorsky S70i CAL FIRE HAWK. S70i CAL FIRE HAWK helicopters bring enhanced capabilities including flight safety, higher payloads, increased power margins, and night flying capabilities.

In Fiscal Year 2022-2023 additional funding was approved to purchase four additional S70i Fire Hawk Helicopters to increase surge capacity and to maintain operational capabilities during required maintenance cycles.

Mission
The CAL FIRE HAWKs primary mission is responding to initial attack wildfires and rescue missions. When responding to wildfires, the helicopter can quickly deliver up to a 9-person Helitack Crew for ground firefighting operations and quickly transition into water/foam dropping missions.

The helicopters are deployed for a variety of tasks including transporting cargo, firing operations, mapping, medical evacuations and other emergency missions not related to fires.

CAL FIRE HAWKs are equipped with external hoists, enabling the crew to conduct complex hoist rescue operations. Highly skilled crewmembers are deployed from the hovering aircraft to reach individuals in areas inaccessible by ground crews. After securing the patient in a specialized rescue device, both the crewmember and the rescued person are hoisted back into the helicopter for transport to a designated landing zone for medical care.

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.

SPECIFICATIONS:

Cruise Speed:
140 mph

Gallon Capacity:
1,100/bucket

Manufacturer
Boeing Company / Vertol Aircraft Company

Crew
Pilot and Co-pilot

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.

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.

SPECIFICATIONS:

Cruise Speed:
91 mph

Gallon Capacity:
660

Manufacturer
Boeing Company / Vertol Aircraft Company

Crew
Pilot

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.

Original Owner

United States Army, 1963 to 1975. The UH-1H was used as a troop/cargo transport and for specialized operations.

Acquired By CAL FIRE

In 1981, CAL FIRE acquired 12 UH-1F helicopters through the Federal Excess Personal Property (FEPP) program. In 1990 they were replaced by newer, highly modified, Vietnam-era UH-1H helicopters referred to as the Super Huey.

Mission

The CAL FIRE Super Huey's primary mission is responding to initial attack wildfires and rescue missions. When responding to wildfires, the helicopter can quickly deliver up to a 9-person Helitack Crew for ground firefighting operations and quickly transition into water/foam dropping missions.

The helicopters are also used for firing operations using either a Helitorch or a Plastic Spherical Dispenser (PSD) on wildland fires or prescribed burns, transporting internal cargo loads, mapping, medical evacuations and numerous non-fire emergency missions.

In 1997, CAL FIRE personnel were trained to do "short haul" rescues. Since 2011 CAL FIRE has moved away from the Short Haul program and started utilizing the Hoist program. This specialized rescue technique involves highly trained firefighters being lowered from a hovering helicopter to an injured or trapped person below. Once secured to a rescue device, both the victim and rescuer are then hoisted into the helicopter and flown to a landing zone.

CAL FIRE continues to place our Super Huey helicopters in reserve status as CAL FIRE HAWKS are placed in service.

SPECIFICATIONS:

Cruise Speed:

126 mph

Gallon Capacity:

Bucket operations: 324 gallons of water/foam

Fixed tank: 360 gallons of water/foam with pilot controlled drop volumes

Manufacturer

Bell Helicopters, Fort Worth, Texas

Crew

One pilot, two Helitack Captains, and eight personnel.

SPECIFICATIONS:

Cruise Speed:
115 mph

Gallon Capacity:
360

Manufacturer
Bell Helicopter

Crew
Pilot, two Fire Captains and eight Firefighters

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.

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.

SPECIFICATIONS:

Cruise Speed:
140 mph

Gallon Capacity:
360

Manufacturer
Bell Helicopter

Crew
Pilot

Bell 205 A++

SPECIFICATIONS:

Cruise Speed:
125 mph

Gallon Capacity:
360 plus
324/bucket

Manufacturer
Bell Helicopters, Fort Worth, Texas

Crew
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.

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.

SPECIFICATIONS:

Cruise Speed:
115 mph

Gallon Capacity:
120/bucket

Manufacturer
Bell Helicopter

Crew
Pilot

AIR OPERATIONS

PHOTO BY STEVE WHITBY PHOTOGRAPHY

SPECIFICATIONS:

Cruise Speed:
152 mph

Gallon Capacity:
180

Manufacturer
Bell Helicopter

Crew
Pilot

Bell 407

The Bell 407 is one 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.

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.

SPECIFICATIONS:

Cruise Speed:
161 mph

Gallon Capacity:
180

Manufacturer
Aérospatiale / Eurocopter Group

Crew
Pilot

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 Bell206L-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.

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.

SPECIFICATIONS:

Cruise Speed:
144 mph

Gallon Capacity:
120

Manufacturer
Hughes Helicopters / McDonnell Douglas

Crew
Pilot

PHOTO © JEREMY ULLOA

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.

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.

SPECIFICATIONS:

Cruise Speed:
140 mph

Gallon Capacity:
224/bucket

Manufacturer
Boeing Company / Vertol Aircraft Company

Crew
Pilot, Co-pilot and a Military Helicopter Manager

SPECIFICATIONS:

Cruise Speed:
183 mph

Gallon Capacity:
780/bucket

Manufacturer
Sikorsky Aircraft Corp

Crew
Pilot, Co-pilot and a Military Helicopter Manager

Sikorsky UH-60 Black Hawk

The Sikorsky UH-60 was originally designed for the U.S. Army in the 1970s as a light transport helicopter, air assault and a military medievac helicopter. The aircraft is a four bladed, twin engine helicopter. The popular Sikorsky 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.

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.

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

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.

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, 12 helicopters and 17 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 and King Air A200s 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.

Use of Fire Suppressant/Retardant Chemicals to Aid in Control of Wildfires

- CAL FIRE uses a variety of fire Suppressant/ Retardant chemicals in controlling wildfires.
- The Department's use of these materials, to enhance its fire fighting capabilities in protecting life and property, is a foreseeable occurrence.
- CAL FIRE's use of fire Suppressant/Retardant chemicals is a discretionary action subject to the California Environmental Quality Act (CEQA).
- CAL FIRE has adopted a mitigated negative declaration that described the Department's use of these chemicals and analyzed the potential of these chemicals to cause environmental impacts. This analysis identified particular situations where these chemicals have the potential to cause impacts to biological resources and water quality. The Department adopted seven (7) mitigation measures that substantially reduce the potential for these impacts to occur. Those mitigation measures have been incorporated into the Department's Wildland Fire Chemical Policies and firefighter training.

Summary of Mitigation Measures

1. CAL FIRE will limit the use of fire suppressant/retardant chemical mixtures in areas adjacent to waterways.
2. Proper protective clothing shall be worn while mixing and loading long term retardants.
3. All airbases which mix and load fire suppressant/retardant chemicals will be designed to contain any accidental spills of fire suppressant/ retardant chemicals.
4. Mobile mixing plants deployed at major fires will be located away from waterways.
5. CAL FIRE will establish jettison areas nearby air retardant bases to minimize potential for contamination.
6. CAL FIRE shall notify the Department of Fish and Game and regional water quality control boards when accidental contamination has occurred that may result in harm to fish or wildlife.
7. CAL FIRE uses only retardants which are approved for use by the USFS WFCS.

Fire Suppressant/Retardant Chemicals and the Enviroment

There are no known adverse effects to domestic or farm animals which eat small amounts of foliage covered with retardant; however reactions of animals may vary by species. A veterinarian should be contacted if your animals eat significant amounts or fire suppression/ retardantcoated vegetation.

Like fertilizer, retardants which are not removed from vegetation, may cause the foliage to turn brown and plant to wither. After rain, how ever, the plant should return to normal and growth may be enhanced due to the added plant nutrients.

Retardants have been tested for toxicity to fish and water dwelling invertebrates. The result, presented in the MSDS, indicate a relatively low order of acute toxicity to these organisms. This indicates that runoff from the application of retardants is unlikely to pose a serious threat to aquatic life. However, the free ammonia present in all fire suppression/ retardantsolutions can be quite toxic to aquatic life when directly applied. Care is recommended, and is exercise by the using agencies during applicationof the retardant, to minimize introduction into streams, ponds, and the like.

How Are Retardant Solutions Removed?

Wildland fire retardants are generally quite water soluble and can be removed with little effort prior to drying. When allowed to dry, however, the gum thickener can form films which tend to hold the dried retardant component rather tightly to that on which it lands. This is desirable when it lands on wildland fuels. It is less desirable, how ever, when trying to remove it from other areas. Retardant residues should consequently be removed as soon as possible. After drying, some scrubbing or power washing of structures and equipment may be required. A mild surfactant may assist in removal.

Solutions in general can increase the slipperiness of most surfaces. Retardant solutions are not exceptions and care should be taken when working in and around spilled or applied retardant. Spills should be cleaned up as soon as possible to avoid possible falls. Care needs to be taken by personnel working in areas treated with wildland fire retardants.

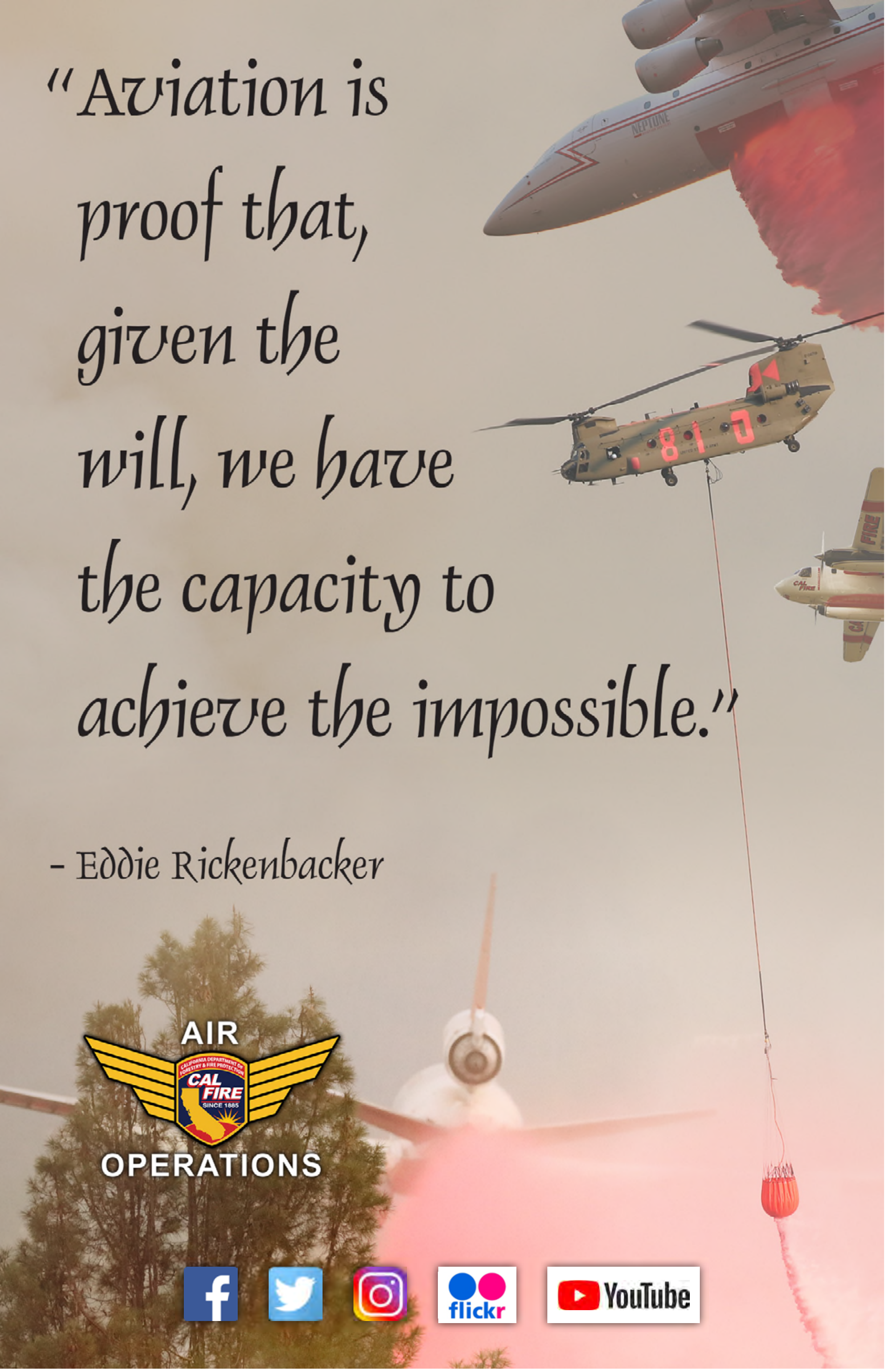

"Aviation is proof that, given the will, we have the capacity to achieve the impossible."
- Eddie Rickenbacker
AIR
CAL FIRE
OPERATIONS
flickr
YouTube

EXHIBIT K

FAA REGISTRY

N-Number Inquiry Results

N-NUMBER ENTERED: 457DF

AIRCRAFT DESCRIPTION

Serial Number	TH-1354	Status	Valid
Manufacturer Name	BEECH	Certificate Issue Date	04/16/1991
Model	58	Expiration Date	01/31/2030
Type Aircraft	Fixed Wing Multi-Engine	Type Engine	Reciprocating
Pending Number Change	None	Dealer	No
Date Change Authorized	None	Mode S Code (base 8 / Oct)	51306156
MFR Year	1982	Mode S Code (Base 16 / Hex)	A58C6E
Type Registration	Government	Fractional Owner	NO

REGISTERED OWNER

Name	USDA FOREST SERVICE FEPP		
Street	5500 PRICE AVE		
City	MCCLELLAN	State	CALIFORNIA
County	SACRAMENTO	Zip Code	95652-2421
Country	UNITED STATES		

AIRWORTHINESS

INFORMATION PROVIDED HERE SHOULD NOT BE USED TO DETERMINE THE AIRWORTHINESS OF AN AIRCRAFT.

Refer to 14 CFR Parts 39, 43, 91, and FAA Order 8130.2 for airworthiness regulations and guidance.

Type Certificate Data Sheet	None	Type Certificate Holder	None
Engine Manufacturer	CONT MOTOR	Classification	Standard
Engine Model	IO 520 SERIES	Category	Normal

A/W Date	06/01/1982	Exception Code	No

The information contained in this record should be the most current Airworthiness information available in the historical aircraft record. However, this data alone does not provide the basis for a determination regarding the
airworthiness of an aircraft or the current aircraft configuration. For specific information, you may request a copy of the aircraft record at https://aircraft.faa.gov/e.gov/ND/

OTHER OWNER NAMES

CALIFORNIA DEPT FORESTRY & FIRE PROTECTION

AVIATION MANAGEMENT

TEMPORARY CERTIFICATES

None

FUEL MODIFICATIONS

None

DEREGISTERED AIRCRAFT

None

The duration of aircraft registration certificates has been extended up to 7 years. The Registry will be issuing revised certificates in batches based on the former expiration date. For verification purposes, even though the expiration date on the registration certificate may not match the expiration date in the FAA Aircraft Registration database, any registration certificate displaying an expiration date of January 31, 2023 or later is still valid. This applies to all foreign Civil Aviation Authorities or anyone else with a verification need.

- ***Any communications or data transiting or stored on this information system may be disclosed or used for any lawful Government purpose.***

EXHIBIT L

Planes

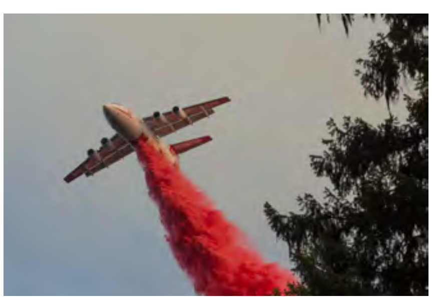
The Forest Service uses planes of many types and sizes to manage wildland fires. Some are owned by the Forest Service, many are leased or contracted and during times of high fire activity, military aircraft may be activated. When aircraft aren't being used to support wildland fires, they may be used for other natural resource management activities, such as conducting aerial surveys of wildlife populations and forest health.

Single Engine Airtanker (SEAT)

Single Engine Airtankers (SEATs) can deliver up to 800 gallons of fire retardant to support firefighters on the ground. These small airplanes can reload and operate in areas where larger airtankers cannot. Aircraft types: Air Tractor AT-802.

Large Airtankers

Large Airtankers (LATs) can deliver from 2,000 to 4,000 gallons of fire retardant to support firefighters on the ground. Aircraft types: P2V, HC-130H, BAe-146, MD-87, C-130Q, RJ85, C-130 H & J equipped with Modular Airborne Fire Fighting Systems (MAFFS).



Very Large Airtankers (VLAT)

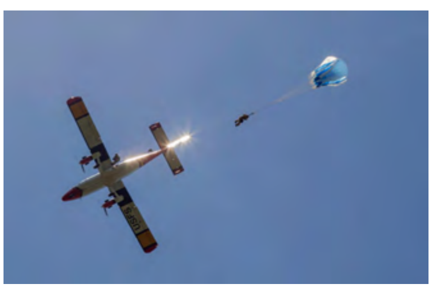
Very Large Airtankers (VLATs) are capable of delivering over 8,000 gallons of fire retardant to support firefighters on the ground. Aircraft Type: DC-10.

Water Scooper

Water Scoopers are amphibious aircraft that skim the surface of a water body and scoop water into an onboard tank and then drop it on a fire. Aircraft types: Bombardier CL-415 and Air Tractor Fire Boss.

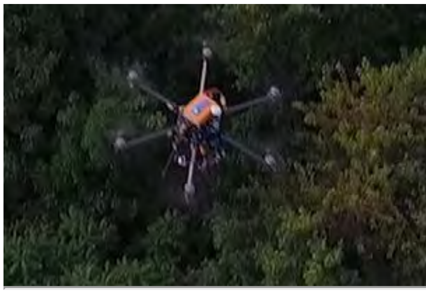
Smokejumper Aircraft

Smokejumper aircraft deliver smokejumpers and cargo by parachute for initial attack and extended support of wildland fires. Each of the aircraft can carry eight to ten Smokejumpers and their initial supply of gear. Aircraft types: DeHavilland DH-6 300 series Twin Otter, Shorts Sherpa C-23A and SD3-60, Dornier 228, and CASA 212.



Unmanned Aircraft Systems

Unmanned Aircraft Systems (UAS) have great potential for use on wildland fires and in natural resource management. In contrast, unauthorized public UAS flights over or near wildfires threaten the safety of aerial and ground firefighters and users are encouraged to “know before you fly”.



Aerial Supervision Module/Lead Plane

Aerial supervision modules/leadplanes coordinate, direct, and evaluate airtanker operations. Aerial supervision module/lead plane pilots and/or air tactical supervisors communicate with firefighters on the ground, other fire aircraft, and airtanker pilots. They release white smoke to show airtanker pilots where to drop fire retardant. Aircraft types: Beechcraft King Air 90 and Beechcraft King Air 200.

Air Attack

Air tactical or air attack planes coordinate aerial firefighting aircraft over wildland fires. They provide vital eyes in the sky for firefighters on the ground, and ensure safe aviation operations. Aircraft types: Twin Commander 500 and 600 are most common.

Resource Management

The Forest Service uses airplanes for a wide variety of other missions in managing public lands. These missions include forest health – and wildlife surveys, law enforcement, gathering infrared data, fire detection, and transporting personnel and cargo. Aircraft types: Cessna 206, Aero Commander 500, King Air 200, DeHavilland DHC-2 Beaver, Piper Super Cub, and Cessna 185.

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EXHIBIT M

City of San Bernardino Gets New R44 Raven II Police Helicopter

Torrance, CA — A new Robinson R44 Raven II Police Helicopter patrols above the City of San Bernardino through a contract with airborne law-enforcement specialist California Aviation Services. Deployed to support the city's anti-crime program, Operation Phoenix, the R44 Raven II Police Helicopter is on duty 40 hours a week. Following the success of Fontana, the City of San Bernardino is now the second city within San Bernardino County to utilize an R44 Police Helicopter in their law-enforcement programs.

"The R44 is a great way to get an aerial program off the ground. It's affordable, fast, and has a good maintenance profile," says Capitan Steve Klettenberg, San Bernardino Police Aviation Division and Administration Services. While the county sheriff had always been accommodating about providing San Bernardino with air support, the city wanted a helicopter dedicated to their police program and Operation Phoenix. To achieve these goals the city contracted with California Aviation Services to supply a new R44 Raven II Police Helicopter, experienced police pilots, fuel, maintenance, and insurance.

"With its bird's eye view, the R44 makes a very effective command platform especially during car chases and searching for criminals. It's able to direct ground units in advance of the chase so they can clear the way of civilians. Equally important is that the R44 makes it a lot safer for responding ground units by giving them the lay of the land, what the situation is, where the criminal is," explains Capitan Klettenberg.

According to California Aviation Services' Leo Bell, the R44 Raven II Police Helicopter addresses the law-enforcement needs of the City of San Bernardino better than getting helicopter support from the county sheriff. "The sheriff covers a really large area and needs a variety of helicopters, while the city basically needs a flying squad car for night patrols, surveillance, and ground support," explains Bell.

The R44 Police Helicopter cruises at 130 mph, carries three people, and is equipped with state-of-the-art policing technology including the FLIR Systems Mark II infrared sensor, Spectrolab SX-5E searchlight, Flight Management Systems' Moving Map system, FM police radios, public address speaker/siren, and Lo Jack receiver.

Robinson Helicopter Company is the world's leading manufacturer of civil helicopters. For additional information about Robinson, visit the website at www.robinsonheli.com.

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2901 Airport Drive | Torrance, CA 90505 | 310-539-0508