



HELICOPTER AUTONOMY

WHAT HAS BEEN DONE, WHO SELLS IT, WHAT IT COSTS

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A survey of fully autonomous and optionally piloted helicopter programmes relevant to a civilian wildfire and SAR fleet: the technical building blocks, the programmes that have flown, the civilian providers and their price points, the certification picture, and what it implies for a Bell 205 / UH-1H fleet. Market facts are as of November 2026 and should be re-verified before any commitment.

01

What “autonomous” means on a helicopter

The industry uses one word for four very different things. Being precise about which one is being bought avoids most of the confusion in vendor claims.

Level	Who is flying	What the machine does	Representative systems
Pilot-assist	Pilot on board, hands on	Stability augmentation, envelope protection, hover hold, auto-approach, obstacle warnings	Modern SAS/AFCS; Skyryse SkyOS in its piloted form
Optionally piloted (OPV)	Pilot on board, hands off, or no pilot	Full mission flight from a tablet; pilot is a supervisor who can take over	Sikorsky MATRIX Black Hawk, Aurora AACUS UH-1, Kaman K-MAX Titan
Remotely piloted (RPAS)	Remote pilot on the ground, VLOS or BVLOS	Fly-by-wire aircraft with no one aboard; automation handles patterns, return-to-home	Rotor Technologies R550 Sprayhawk / Airtruck
Fully autonomous	No one; mission autonomy on board	Finds the target, plans the drop, flies it, refills, repeats; humans set intent and limits	Rain + MATRIX Black Hawk live-fire demo; XPRIZE finalists at small scale

For a wildfire fleet the useful target is optionally piloted with mission autonomy: the aircraft can be flown conventionally when the airspace or the agency requires it, flown hands-off with a pilot supervising at night or in smoke, and flown with nobody aboard when the mission is dangerous enough to justify it. That is also where the serious money has gone.

02

The building blocks every programme shares



Figure 1 — the autonomy stack. The lower four layers are aircraft-specific and certification-heavy; the top two are where mission value lives.

Fly-by-wire and flight control

A legacy helicopter has mechanical linkages from the cyclic, collective and pedals to the hydraulic servos. Autonomy needs electric or electro-hydraulic actuators that can move those controls on command, with enough redundancy that a single failure leaves the aircraft controllable. Sikorsky's approach on the Black Hawk adds actuators in parallel with the mechanical controls so a pilot can still fly it; Skyryse replaces the whole control path with a triple-redundant fly-by-wire system and new cockpit inceptors. Either way this layer is a supplemental type certificate (STC) on its own, and the FAA has already issued special conditions for the Skyryse R66 installation (effective June 2026), which is the first civil template for how such a modification is certified.

Navigation

GNSS with inertial backup, a radar altimeter for low-level work, and a terrain and obstacle database. Every mature system treats GNSS as untrustworthy at some point in the mission and carries enough inertial and perception-based navigation to land safely without it.

Perception

LiDAR and/or radar to see wires, towers, trees and the landing zone in real time, plus EO/IR for the mission. Aurora's AACUS kit on the UH-1 combined radar, LiDAR and autonomy algorithms to select routes, avoid obstacles and adjust landing zones from a handheld tablet; MATRIX uses a similar sensor set. This is the layer that separates a demo from an operational system: an autonomous helicopter that cannot see a wire has no business near a fire line.

Mission autonomy

The layer that knows what a water drop is. Rain's software, running on the MATRIX Black Hawk, found and tracked fires, planned the suppression and navigated the aircraft to drop on target, with a tablet letting operators order area searches, single drops and bucket fills. This is the layer the CCR architecture replaces or wraps.

03

Programmes that have flown

Sikorsky MATRIX — the Black Hawk reference

MATRIX is Sikorsky's autonomy suite, developed under DARPA's ALIAS programme and now the most-flown optionally piloted helicopter system in the world. In March 2026 Sikorsky completed integration of the suite on the U.S. Army's experimental UH-60MX, delivered for optionally piloted and fully autonomous flight. For wildfire, the relevant milestone is the Rain partnership: in late April 2025 at Hesperia, California, an optionally piloted MATRIX Black Hawk running Rain's wildfire mission autonomy found and suppressed live brush-pile fires set by San Bernardino County Fire, with CAL FIRE, Orange County Fire Authority and the U.S. Forest Service observing, and demonstrated radio interoperability with a crewed helicopter in the same fire traffic area. In September 2025 Sikorsky and CAL FIRE signed a five-year collaboration that explicitly includes exploring an autonomous S-70i FIREHAWK. Sikorsky describes a layered approach in which the incident commander chooses the level of autonomy for each mission — the same philosophy as FireCopter's.

Status: military-funded, demonstrated at scale on live fire, not yet a civil product with a price list. A FIREHAWK itself runs roughly US$ 30–40 M; a county recently paid about US$ 38 M for one crewed aircraft.

Aurora Flight Sciences AACUS — the UH-1 precedent

The most directly relevant programme for a Bell 205 fleet. Under the Office of Naval Research's AACUS programme, Aurora fitted a UH-1H (“AEH-1”) with a kit of radar, LiDAR and autonomy software and, in December 2017 at Quantico, flew a fully autonomous resupply mission — route selection, obstacle avoidance, landing-zone adjustment and final approach — commanded from a handheld tablet by a Marine with minutes of training. The kit was designed to be installed on existing airframes. Aurora (now Boeing) continues to market vertical-flight autonomy development and test services in 2026, including hardware-in-the-loop simulation and optionally piloted surrogate testing. The programme proves the Huey airframe is a viable autonomy host; it did not become a product, but the engineering and the certification arguments exist.

Kaman K-MAX and Near Earth Autonomy

The unmanned K-MAX flew cargo for the Marines in Afghanistan (2011–2014) as a remotely piloted aircraft. Kaman and Near Earth Autonomy have since added true autonomy (K-MAX Titan, first flight April 2021); Kaman took a US$ 10 M minority stake in Near Earth and is developing the Titan autonomy as a retrofit kit for commercial K-MAX helicopters. K-MAX operators hold firefighting contracts, so this is the one heavy-lift civil platform where an autonomy retrofit and a firefighting role already overlap. Near Earth itself sells autonomy for a range of rotorcraft and is a credible integration partner.

Skyryse SkyOS — the civil-certification pathfinder

Skyryse replaces the conventional controls of a Robinson R66 with a triple-redundant fly-by-wire system and a simplified cockpit (Skyryse One), is flying FAA for-credit certification tests, and raised over US$ 300 M at a US$ 1.15 B valuation to finish certification. The FAA published final special conditions for the modified R66 in May 2026. In June 2026 Robinson and Skyryse announced an uncrewed R66 for defence ISR and teaming missions, and Skyryse separately announced a CAL FIRE partnership on safer firefighting with SkyOS. Skyryse also announced a universal emergency autoland for SkyOS-equipped aircraft. Relevance: the first civil STC for a full fly-by-wire conversion of a light helicopter, and the regulatory precedent every later programme will cite.

Rotor Technologies R550 — the one you can buy

Rotor converts overhauled Robinson R44 airframes into remotely piloted, fly-by-wire aircraft with radar, downward LiDAR, radar altimeter and automated patterns. Published 2024/2025 pricing: R550 Airtruck (with ground station and trailer) US$ 1.35 M list, Sprayhawk ready-to-spray US$ 1.5 M, and retrofit kits for an existing R44 at US$ 550 k (Airtruck) and US$ 700 k (Sprayhawk), with introductory discounts of roughly 30 %. Specs: 110 gal / 416 L payload, 2,500 lb MTOW, 50 min endurance, VLOS-only 8 km range, minimum crew of three (remote pilot, observer, loader), operating under FAA exemption 44807. Relevance: the only published civil price for a converted-helicopter autonomy package, and a useful floor for what a Bell 205 conversion would cost.

Airbus and Shield AI

Airbus completed its first autonomous H145 flight with Shield AI's Hivemind in 2025 and plans a fully autonomous MQ-72C derivative of the H145/UH-72B by 2029, aimed at the U.S. Marine Corps. On the firefighting side Airbus demonstrated in March 2026 a networked system in which a ground command vehicle consolidates imagery from drones, an ATR 72, SR20s and an H130 FlightLab to improve drop accuracy and shorten detection-to-extinguishment time. Airbus is therefore building both halves — aircraft autonomy and incident data fusion — but on its own airframes.

XPRIZE Wildfire (September 2026) — the small-scale reality check

The Autonomous Wildfire Response track was won by Anduril (US$ 1.2 M plus a US$ 1 M Lockheed Martin detection prize) using a thermal sentry tower, a drone swarm and a Ghost-X autonomous helicopter-drone dropping retardant balls; Dryad Networks and AURA Foresight placed second and third. All three detected the test fire in under ten minutes and put suppressant on target autonomously, and none extinguished it: the grand prize went unclaimed because small autonomous aircraft could not deliver enough suppressant. The lesson is exactly FireCopter's thesis — autonomy is solved enough; what is missing is autonomy on an airframe that carries a real load.

04

Civilian providers at a glance

Provider	Offering	Airframes	Maturity	Price signal
Sikorsky (Lockheed Martin) + Rain	MATRIX autonomy + Rain wildfire mission autonomy	UH-60 / S-70i FIREHAWK, S-92 roadmap	Live-fire demo 2025; Army UH-60MX 2026; CAL FIRE 5-yr programme	Not published; Black Hawk-class aircraft US$ 30–40 M
Aurora Flight Sciences (Boeing)	AACUS-derived autonomy kits; dev & test services	UH-1H, Bell 206, H-6U demonstrated	Demonstrated 2017; services offered 2026	Programme / NRE basis
Near Earth Autonomy	Autonomy stack for rotorcraft; K-MAX Titan	K-MAX, various	Flying; retrofit kit in development	Not published
Skyryse	SkyOS fly-by-wire + automation; uncrewed R66	Robinson R66 (One); more types planned	FAA for-credit testing; special conditions 2026	Not published; retrofit model
Rotor Technologies	R550 Airtruck / Sprayhawk RPAS, R44 retrofit	Robinson R44	Delivering 2025 under exemption 44807	US$ 1.35–1.5 M aircraft; US$ 550–700 k retrofit
Airbus Helicopters + Shield AI	Hivemind autonomy; networked firefighting C2	H145 / UH-72B, H130 FlightLab	First autonomous H145 flight 2025; MQ-72C by 2029	OEM programme
Anduril	Ghost-X autonomous aircraft + sensor fusion	Own airframes (small)	XPRIZE winner 2026	Defence pricing

05

What it costs — building a realistic budget

There is no catalogue price for “make my Bell 205 autonomous”, so the budget has to be assembled from the published anchors above and from the structure of the work.

Item	Basis	Order of magnitude per aircraft
Fly-by-wire actuation + flight control computers	Rotor R44 retrofit (US$ 550–700 k) scaled to a 9,500 lb aircraft with hydraulic servos; Skyryse-class redundancy	US$ 1.0–1.8 M
Navigation + perception suite	RTK GNSS/INS, radar altimeter (~US$ 7 k class unit), obstacle LiDAR/radar, EO/IR turret	US$ 250–500 k
Mission autonomy + supervision software	Licensed stack (Near Earth / Rain-class) or in-house CCR; ground station, tablets, datalinks	US$ 200–600 k licence or NRE share
Certification (STC) and flight test	Shared across the fleet; first aircraft carries most of it	US$ 5–15 M programme, amortised
Fleet of 20 — indicative all-in	Above, with the STC amortised	US$ 2–3.5 M per aircraft; US$ 40–70 M programme

Two things dominate the number. The first is the fly-by-wire conversion of a 1960s-design hydraulic control system, which is an airworthiness problem before it is a software problem. The second is certification: an OPV STC for a Part 27/29 helicopter has no complete civil precedent yet, which is why the Skyryse special conditions and the Rotor 44807 exemption matter so much as templates. Everything else — sensors, compute, autonomy software — is comparatively cheap and getting cheaper.

06

The certification picture

- Piloted, hands-off (pilot-assist / OPV with pilot aboard): an STC on a certified airframe. The Skyryse R66 special conditions (FAA-2025-2303, effective June 2026) are the first civil template for a full fly-by-wire conversion. This is the realistic first operational configuration for FireCopter.
- Remotely piloted, nobody aboard, VLOS: today done under Section 44807 exemptions (Rotor) with a remote pilot and observer; restrictive but available now, and sufficient for a demonstration over a controlled burn.
- Fully autonomous over a fire, BVLOS, in a shared fire traffic area: no civil pathway yet. The Rain/Sikorsky work and the CAL FIRE programme are building the operational evidence; public-agency aircraft can fly under public-use rules that a contractor cannot. Plan on this being a 2029–2031 outcome, in line with Airbus's own MQ-72C date.
- Practical sequencing: fly piloted with the autonomy in the loop first (the pilot is the certification argument), accumulate hours and drop data, then remove the pilot for specific mission segments (night re-drops over an already-worked fire, dip cycles) as the evidence and the rules allow.

07

Implications for a Bell 205 / UH-1H fleet

- The airframe is proven as an autonomy host. Aurora flew a fully autonomous UH-1H in 2017 with a kit intended for existing aircraft. The engineering risk is in re-doing that work to a civil standard, not in discovering whether it can be done.
- Buy the aircraft layer, own the mission layer. Fly-by-wire, flight control and perception are commodity-ish and certification-bound; partner with an Aurora- or Near-Earth-class integrator. Mission autonomy and command (CCR, the fire state model, the Commander interface) are where FireCopter differentiates and should stay in-house.
- Optionally piloted is the product, not a stepping stone. Sikorsky's “commander chooses the level of autonomy per mission” is what agencies are being shown; a fleet that can be piloted, supervised or unmanned by the hour is more saleable than one that is only unmanned.
- Lead with the data and decision layer. Every big programme above has an airframe and a flight-autonomy stack; none has a published, reviewable decision architecture with two planners and a referee. The March 2027 demonstration can show that layer on drones while the airframe work proceeds.
- Budget honestly. US$ 2–3.5 M per aircraft including an amortised STC is the number to carry; a vendor quoting a fraction of that is quoting the software only.

Sources: Lockheed Martin / Sikorsky releases (MATRIX on UH-60MX, Mar 2026; Rain live-fire demonstration, May 2025; CAL FIRE five-year collaboration, Sep 2025); Rain.aero updates; Aurora Flight Sciences (AACUS 2017; test & evaluation, May 2026); Aviation Week (Kaman / Near Earth); Federal Register FAA-2025-2303 (May 2026); The Aviationist (Robinson–Skyryse, Jun 2026); Flying Magazine (Skyryse autoland; Rotor Sprayhawk); Aviacionline (Rotor R550 pricing, Nov 2024); FlightGlobal (Airbus H145 / Hivemind); AIN (Airbus firefighting system, Apr 2026); Ars Technica (XPRIZE Wildfire, Sep 2026); Bloomberg (Firehawk pricing, Aug 2026). Prices are indicative and vary by configuration.