List of Documents Submitted by Alan Singleton at the March 14, 2013, Public Hearing

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7. Safety Summary (see Attachment B(2) of the August 11, 2011, Supplemental Memo for Cases 687-11-AM & 688-S-11)
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Bell OH-58 Kiowa

From Wikipedia, the free encyclopedia

The **Bell OH-58 Kiowa** is a family of single-engine, single-rotor, military helicopters used for observation, utility, and direct fire support. Bell Helicopter manufactured the OH-58 for the United States Army based on its Model 206A JetRanger helicopter. The OH-58 has been in continuous use by the U.S. Army since 1969.

The latest model, the *OH-58D Kiowa Warrior*, is primarily operated in an armed reconnaissance role in support of ground troops. The OH-58 has been exported to Austria, Canada, the Dominican Republic, Taiwan, and Saudi Arabia. It has also been produced under license in Australia.

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OH-58 Kiowa

An OH-58D Kiowa Warrior in action during the Iraq War, taking off from FOB MacKenzie in October 2004.

Role	Observation/scout helicopter
National origin	United States
Manufacturer	Bell Helicopter
First flight	Bell 206A: 10 January 1966[1] OH-58D: 6 October 1983[2]
Introduction	May 1969
Status	In service
Primary users	United States Army Australian Army Republic of China Army Royal Saudi Land Forces
Produced	1966–1989[note 1]
Number built	2,200
Unit cost	OH-58D: US$4.9 million (1990)[2] OH-58D KW: US$6.7 million (1990)[2] KW retrofit: US$1.3 million (1990)[2]
Developed from	Bell 206

- 5.1 Former operators
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Development

On 14 October 1960, the United States Navy asked 25 helicopter manufacturers on behalf of the Army for proposals for a Light Observation Helicopter (LOH). Bell Helicopter entered the competition along with 12 other manufacturers, including Hiller Aircraft and Hughes Tool Co., Aircraft Division.[3] Bell submitted the *D-250* design, which would be designated as the *YHO-4*.[4] On 19 May 1961, Bell and Hiller were announced as winners of the design competition.[5][6]

Light Observation Helicopter (LOH)

Bell developed the D-250 design into the *Model 206* aircraft, redesignated as *YOH-4A* in 1962, and produced five prototype aircraft for the Army's test and evaluation phase. The first prototype flew on 8 December 1962.[7] The YOH-4A also became known as the *Ugly Duckling* in comparison to the other contending aircraft.[7] Following a flyoff of the Bell, Hughes and Fairchild-Hiller prototypes, the Hughes OH-6 Cayuse was selected in May 1965.[8]

When the YOH-4A was rejected by the Army, Bell went about solving the problem of marketing the aircraft. In addition to the image problem, the helicopter lacked cargo space and only provided cramped quarters for the planned three passengers in the back. The solution was a fuselage redesigned to be more sleek and aesthetic, adding 16 cubic feet (0.45 m^3) of cargo space in the process.[9] The redesigned aircraft was designated as the *Model 206A*, and Bell President Edwin J. Ducayet named it the *JetRanger* denoting an evolution from the popular Model 47J *Ranger*.

In 1967, the Army reopened the LOH competition for bids because Hughes Tool Co. Aircraft Division could not meet the contractual production demands.[10] Bell resubmitted for the program using the Bell 206A.[4] Fairchild-Hiller failed to resubmit their bid with the YOH-5A, which they had successfully marketed as the FH-1100.[11] In the end, Bell underbid Hughes to win the contract and the Bell 206A was designated as the OH-58A. Following the U.S. Army's naming convention for helicopters, the OH-58A was named Kiowa in honor of the Native American tribe.[12]

YOH-4A LOH in flight.

Advanced Scout Helicopter

In the 1970s, the U.S. Army began evaluating the need to improve the capabilities of their scout aircraft. The OH-58A lacked the power for operations in areas that exposed the aircraft to high altitude and hot temperatures, areas where the ability to acquire targets was a critical deficiency in the tactical warfare capabilities of Army aviation.[13]

The power shortcoming caused other issues as the Army anticipated the AH-64A's replacement of the venerable AH-1 in the Attack battalions of the Army. The Army began shopping the idea of an Aerial Scout Program to industry as a prototype exercise to stimulate the development of advanced technological capabilities for night vision and precision navigation equipment.[13] The stated goals of the program included prototypes that would:

> ...possess an extended target acquisition range capability by means of a long-range stabilized optical subsystem for the observer, improved position location through use of a computerized navigation system, improved survivability by reducing aural, visual, radar, and infrared signatures, and an improved flight performance capability derived from a larger engine to provide compatibility with attack helicopters.[13]

In early March 1974, the Army created a special task force at Fort Knox to develop the system requirements for the Aerial Scout Helicopter program,[14] and in 1975 the task force had formulated the requirements for the Advanced Scout Helicopter (ASH) program. The requirements were formulated around an aircraft capable of performing in day, night, and adverse weather and compatible with all the advanced weapons systems planned for development and fielding into the 1980s. The program was approved by the System Acquisition Review Council and the Army prepared for competitive development to begin the next year.[15] However, as the Army tried to get the program off the ground, Congress declined to provide funding for it in the fiscal year 1977 budget and the ASH Project Manager's Office (PM-ASH) was closed on 30 September 1976.[16]

While no development occurred during the next few years, the program survived as a requirement without funding. On 30 November 1979, the decision was made to defer development of an advanced scout helicopter in favor of pursuing modification of existing airframes in the inventory as a near term scout helicopter (NTSH) option. The development of a mast-mounted sight would be the primary focus to improve the aircraft's ability to perform reconnaissance, surveillance, and target acquisition missions while remaining hidden behind trees and terrain. Both the UH-1 and the OH-58 were evaluated as NTSH candidates, but the UH-1 was dropped from consideration due to its larger size and ease of detection. The OH-58, on the other hand demonstrated a dramatic reduction in detectability with an MMS.

On 10 July 1980, the Army decided that the NTSH would be a competitive modification program based on developments in the commercial helicopter industry, particularly Hughes Helicopters development of the Hughes 500D which provided significant improvements over the OH-6.[17]

Army Helicopter Improvement Program (AHIP)

The Army's decision to acquire the NTSH resulted in the "Army Helicopter Improvement Program (AHIP)". Both Bell Helicopter and Hughes Helicopters redesigned their scout aircraft to compete for the contract. Bell offered a more robust version of the OH-58 in their model 406 aircraft,[18] and Hughes

offered an upgraded version of the OH-6. On 21 September 1981, Bell Helicopter Textron was awarded a development contract.[19][20] The first prototype flew on 6 October 1983,[2] and the aircraft entered service in 1985 as the OH-58D.[21]

Initially intended to be used in attack, cavalry and artillery roles, the Army only approved a low initial production level and confined the role of the OH-58D to field artillery observation. The Army also directed that a follow-on test be conducted to further evaluate the aircraft due to perceived deficiencies. On 1 April 1986, the Army formed a task force at Fort Rucker, Alabama, to remedy deficiencies in the AHIP.[21] As a result of those deliberations, the Army had planned to discontinue the OH-58D in 1988 and focus on the LHX, but Congress approved $138 million for expanding the program, calling for the AHIP to operate with the Apache as a hunter/killer team; the AHIP would locate the targets, and the Apache would destroy them in a throwback to the traditional OH-58/AH-1 relationship.[22]

The Secretary of the Army directed instead that the aircraft's armament systems be upgraded, based on experience with Task Force 118's performance operating armed OH-58D helicopters in the Persian Gulf in support of Operation Prime Chance, and that the aircraft be used primarily for scouting and armed reconnaissance.[23] The armed aircraft would be known as the OH-58D Kiowa Warrior, denoting its new armed configuration. Beginning with the production of the 202nd aircraft (s/n 89-0112) in May 1991, all remaining OH-58D aircraft were produced in the Kiowa Warrior configuration. In January 1992, Bell Helicopter received its first retrofit contract to convert all remaining OH-58D Kiowa helicopters to the Kiowa Warrior configuration.[2]

Design

Mast mounted sight

The OH-58D introduced the most distinctive feature of the Kiowa family — the Mast Mounted Sight (MMS), which resembles a beach ball perched above the rotor system. The MMS by Ball Aerospace & Technologies has a gyro-stabilized platform containing a TeleVision System (TVS), a Thermal Imaging System (TIS), and a Laser Range Finder/Designator (LRF/D). These new features gave the aircraft the additional mission capability of target acquisition and laser designation in both day or night, and in limited-visibility and adverse weather.[*citation needed*]

The Mast Mounted Sight system was actually developed by the McDonnell Douglas Corp. in Huntington Beach, CA. Production took place primarily at facilities in Monrovia, CA. As a result of a merger with Boeing, and a later sale of the business unit, the program is currently owned and managed by DRS Technologies, with engineering support based in Cypress, CA, and production support taking place in Melbourne, FL.[24]

Wire Strike Protection System

One distinctive feature of operational OH-58s are the knife-like extensions above and below the cockpit which is part of the passive Wire Strike Protection System. It can protect 90% of the frontal area of the helicopter from wire strikes that can be encountered at low altitudes by directing wires to the upper or lower blades before they can entangle the rotor blade or landing skids. The OH-58 was the first helicopter to test this system, after which the system was adopted by the US Army for the OH-58 and most of their

other helicopters.[25]

Operational history

Major General John Norton, commanding general of the Army Aviation Materiel Command (AMCOM),[26] received the first OH-58A Kiowa at a ceremony at Bell Helicopter's Fort Worth plant in May 1969. Two months later, on 17 August 1969, the first production *OH-58A Kiowa* helicopters were arriving in Vietnam,[27] accompanied by a New Equipment Training Team (NETT) from the Army and Bell Helicopters.[28] Although the Kiowa production contract replaced the LOH contract with Hughes, the OH-58A did not automatically replace the OH-6A in operation. Subsequently, the Kiowa and the Cayuse would continue operating in the same theater until the end of the war.

Vietnam

On 27 March 1970, an OH-58A Kiowa (s/n 68-16785) was shot down over Vietnam, one of the first OH-58A losses of the war. The pilot, Warrant Officer Ralph Quick, Jr., was flying Lieutenant Colonel Joseph Benoski, Jr. as an artillery spotter. After completing a battle damage assessment for a previous fire mission, the aircraft was damaged by .51 cal (13 mm) machine gun fire and crashed, killing both crew members. Approximately 45 OH-58A helicopters were destroyed in Vietnam due to combat and accidents.[29] One of the last combat losses was of an OH-58A (s/n 68-16888) from A Troop, 3-17th Cavalry, flown by First Lieutenant Thomas Knuckey. On 27 May 1971, Lieutenant Knuckey was also flying a battle damage assessment mission when his aircraft came under machine gun fire and exploded. Knuckey and his observer, Sergeant Philip Taylor, both died in the explosion.[30]

Operation Prime Chance

In early 1988, it was decided that armed OH-58D (AHIP) helicopters from the 118th Aviation Task Force would be phased in to replace the SEABAT (AH-6/MH-6) teams of Task Force 160th to carry out Operation Prime Chance, the escort of oil tankers during the Iran–Iraq War. On 24 February 1988, two AHIP helicopters reported to the Mobile Sea Base Wimbrown VII, and the helicopter team ("SEABAT" team after their callsign) stationed on the barge returned to the United States. For the next few months, the AHIP helicopters on the Wimbrown VII shared patrol duties with the SEABAT team on the Hercules. Coordination was difficult, but despite frequent requests from TF-160, the SEABAT team on the Hercules was not replaced by an AHIP detachment until June 1988.[31] The OH-58D helicopter crews involved in the operation received deck landing and underwater survival training from the Navy.

In November 1988, the number of OH-58D helicopters that supported Task Force 118 was reduced. However, the aircraft continued to operate from the Navy's Mobile Sea Base *Hercules*, the frigate *Underwood*, and the destroyer *Conolly*. OH-58D operations primarily entailed reconnaissance flights at night, and depending on maintenance requirements and ship scheduling, Army helicopters usually rotated from the mobile sea base and other combatant ships to a land base every seven to fourteen days. On 18 September 1989, an OH-58D crashed during night gunnery practice and sank, but with no loss of personnel. When the Mobile Sea Base Hercules was deactivated in September 1989, all but five OH-58D helicopters redeployed to the continental United States.[32]

RAID

In 1989, Congress mandated that the Army National Guard would be a player in the country's *War on Drugs*, enabling them to aid federal, state and local law enforcement agencies with "special congressional entitlements". In response, the Army National Guard Bureau created the Reconnaissance and Aerial Interdiction Detachments (RAID) in 1992, consisting of aviation units in 31 states with 76 specially modified OH-58A helicopters to assume the reconnaissance/interdiction role in the fight against illegal drugs. During 1994, 24 states conducted more than 1,200 aerial counterdrug reconnaissance and interdiction missions, conducting many of these missions at night.[33] Eventually, the program was expanded to cover 32 states and consisting of 116 aircraft, including dedicated training aircraft at the Western Army Aviation Training Site (WAATS) in Marana, Arizona.[34]

The RAID program's mission has now been expanded to include the war against terrorism and supporting U.S. Border Patrol activities in support of homeland defense. The National Guard RAID units' Area of Operation (AO) is the only one in the Department of Defense that is wholly contained within the borders of the United States.[34]

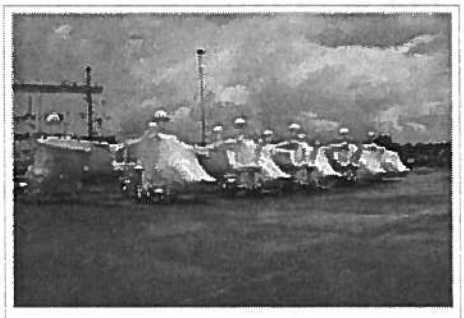
Operation Just Cause and action in the 1990s

During Operation Just Cause in 1989, a team consisting of an OH-58 and an AH-1 were part of the Aviation Task Force during the securing of Fort Amador in Panama. The OH-58 was fired upon by Panama Defense Force soldiers and crashed 100 yards (91 m) away, in the Bay of Panama. The pilot was rescued but the co-pilot died.[35]

On 17 December 1994, Army Chief Warrant Officers (CWO) David Hilemon and Bobby Hall left Camp Page, South Korea on a routine training mission along the Demilitarized Zone (DMZ). Their flight was intended to be to a point known as Checkpoint 84, south of the DMZ "no-fly zone", but the OH-58C Kiowa strayed nearly four miles (6.4 km) into the Kangwon Province, inside North Korean airspace, due to errors in navigating the snow-covered, rugged terrain. The helicopter was shot down by North Korean troops and CWO Hilemon was killed. CWO Hall was held captive and the North Korean government insisted that the crew had been spying. Five days of negotiations resulted in the North Koreans turning over Hilemon's body to U.S. authorities. The negotiations failed to secure Hall's immediate release. After 13 days in captivity, Hall was freed on 30 December, uninjured.[36][37]

Operations in Afghanistan and Iraq

The United States Army has employed the OH-58D during Operation Iraqi Freedom in Iraq and Operation Enduring Freedom in Afghanistan.[38][39] Due to combat and accidents, over 35 airframes have been lost, with 35 pilots killed.[40]



Shrink wrapped OH-58 Kiowa helicopters to be shipped to Iraq.

Future

The age of the helicopters and the loss of airframes resulted in the Armed Reconnaissance Helicopter program to procure a new aircraft, the Bell ARH-70, which was later cancelled in 2008 due to cost overruns. The current replacement for the OH-58 is the Armed Aerial Scout program.[41]

Variants

OH-58A

The *OH-58A Kiowa* is a 4-place observation helicopter. The Kiowa has two-place pilot seating, although the controls in the left seat are designed to be removed to carry a passenger up front. During its Vietnam development, it was fitted with the M134 Minigun, a 7.62 mm electrically operated machine gun. A total of 74 OH-58A helicopters were delivered to the Canadian Armed Forces as *COH-58A* and later redesignated as *CH-136 Kiowa* helicopters.[42]

An OH-58 Kiowa.

In 1978, OH-58A aircraft began to be converted to the same engine and dynamic components as the OH-58C.[43] And, in 1992, 76 OH-58A were modified with another engine upgrade, a thermal imaging system, a communications package for law enforcement, enhanced navigational equipment and high skid gear as part of the Army National Guard's (ARNG) Counter-Drug RAID program.

Canadian CH-136 Kiowa with 408 Tactical Helicopter Squadron, 1984

The *OH-58B* was an export version for the Austrian Air Force.[44] The Australian Government also procured the OH-58A for the Australian Army and Royal Australian Navy as the *CAC CA-32*. Produced under contract in Australia by Commonwealth Aircraft Corporation, the CA-32 was the equivalent of the 206B-1 (upgraded engine and longer rotor blades). The first twelve of 56 were built in the U.S. then partially disassembled and shipped to Australia where they were reassembled.[45] Helicopters in the naval fleet were retired in 2000.[45]

OH-58C

Equipped with a more robust engine, the *OH-58C* was supposed to solve many issues and concerns regarding the Kiowa's power. In addition to the upgraded engine, the OH-58C had unique IR suppression systems mounted on its turbine exhaust. Early "C" models featured flat-panel windscreens as an attempt to reduce glint from the sun, which could give away the aircraft's location to an enemy. The windscreens had a negative effect of limiting the forward view of the crew, a previous strength of the original design.

OH-58C operated by the National Test Pilot School at the Mojave Airport. The flat windscreen and the IR suppressors on the exhaust can be clearly seen

The aircraft was also equipped with a larger instrument panel, roughly a third bigger than the OH-58A panel, which held larger flight instruments. The panel was also equipped with Night Vision Goggle (NVG) compatible cockpit lighting. The lights inside the aircraft are modified to prevent them from interfering with the aircrews' use of NVGs.[46] OH-58C aircraft were also the first U.S.

OH-58D Kiowa. Note the lack of

Army scout helicopter to be equipped with the AN/APR-39 radar detector, a system which allowed the crew to know when there were anti-aircraft radar systems in proximity to the aircraft.[47]

Some OH-58C aircraft were armed with two AIM-92 Stingers. These aircraft are sometimes referred to as OH-58C/S, the "S" referring to the Stinger installation.[48] Called Air-To-Air Stinger (ATAS), the weapon system was intended to provide an air defense capability.

weapons pylons.

OH-58X Kiowa. Modified OH-58D prototype. Note nose, pitch link cover and engine cowl area.

OH-58D

The *OH-58D* (Bell Model 406) was the result of the Army Helicopter Improvement Program (AHIP). An upgraded transmission and engine gave the aircraft the power it needed for nap-of-the-earth flight profiles, and a four-bladed main rotor made it much quieter than the two-bladed OH-58C. The OH-58D introduced the distinctive Mast-Mounted Sight (MMS) above the rotor system, and a mixed glass cockpit, with traditional instruments identified as "standby" for emergency use.

The *Bell 406CS* "Combat Scout" was based on the OH-58D (sometimes referred to as the *MH-58D*). Fifteen aircraft[7][49] were sold to Saudi Arabia.[50] A roof-mounted Saab HeliTOW sight system was opted for in place of the MMS.[51] The 406CS also had detachable weapon hardpoints on each side.

The *AH-58D* was an OH-58D version operated by Task Force 118 (4th Squadron, 17th Cavalry) and modified with armament in support of Operation Prime Chance. The weapons and fire control systems would become the basis for the Kiowa Warrior. AH-58D is not an official DOD aircraft designation, but is used by the Army in reference to these aircraft.[52][53][54]

The *Kiowa Warrior*, sometimes referred to by its acronym *KW*, is the armed version of the OH-58D Kiowa. The main difference that distinguishes the Kiowa Warrior from the original AHIP aircraft is a universal weapons pylon found mounted on both sides of the aircraft. These pylons are capable of carrying combinations of AGM-114 Hellfire missiles, air-to-air Stinger (ATAS) missiles, 7-shot 2.75 in (70 mm) Hydra-70 rocket pods,[55] and an M296 .50 caliber machine gun. The standard of performance for aerial gunnery from an OH-58D is to achieve at least one hit out of 70 shots fired at a wheeled vehicle 800 – 1200m away.[56][57] The Kiowa Warrior upgrade also includes improvements in available power, navigation, communication and survivability, as well as modifications to improve the aircraft's deployability.[58]

OH-58F

The *OH-58F* is the designation for planned upgrade of the OH-58D Kiowa Warrior to extend the design's service until 2025. The planned Cockpit and Sensor Upgrade Program (CASUP)[59] features a nose-mounted targeting and surveillance system for use to look downward over mountains and deserts, rather than the mast-mounted sensor used on the OH-58D, used to look over trees and down-range.[60] The AAS-53 Common Sensor Payload includes an advanced infrared camera, color Electro-Optical camera, and image intensifier. Additional enhancements include a Force Battle Command Brigade and Below

(FBCB2) display screen and dual-channel, full-authority digital engine-controller.[59] The new model will have Level 2 Manned-Unmanned teaming, increased armor protection, common missile warning system, dual-independent advanced moving maps, improved cockpit control hardware and software for enhanced situational awareness, three full color multi-function displays, digital inter-cockpit communications, digital HELLFIRE future upgrades, Aircraft Survivability Equipment (ASE) upgrades, a redesigned aircraft wiring harness, and enhanced weapons functionality via 1760 digital interface.[61]

In October 2012, the Army finished building the first OH-58F Kiowa. Its first flight test is expected in April 2013. Unlike most other military projects, the Army designed and built the new variant itself, which lowered developmental costs. The Army designed model weighs 3,590 lb, which was 53 lb below the target weight and about 200 lb lighter than the OH-58D. The weight savings are attributed to fewer wires routed more efficiently and a lighter sensor. The Army is to build two more aircraft with the first delivered in March 2013. The first production aircraft will start being built in January 2013 and will be handed over to the Army by the end of the year. Low rate production is to start in March 2015, with the first operational squadron being fully equipped by 2016. The Army is to buy 368 OH-58Fs, with D-models being converted into F-models. Older A and C-model OH-58s, which are currently being remanufactured into D-models, will instead be remanufactured into F-models.[62]

OH-58 Block II

On April 14, 2011, Bell performed the successful first flight of their OH-58 Block II variant. The Block II is Bell's entry in the Armed Aerial Scout program.[63] It builds on the improvements of the F-model, and adds features including the Honeywell HTS900 turboshaft engine, the transmission and main rotors of the Bell 407, and the tail and tail rotor of the Bell 427. Bell started voluntary flight demonstrations in October 2012, and the Army had to decide by December if it would even proceed with the AAS program.[64] Bell hoped for the Army to go with their service life extension models instead of the program. Bell sees the F-model Kiowa as an "obsolescence upgrade," while the Block II is seen as the performance upgrade. This gives the Army flexibility in times of shrinking budgets, as they have the option of upgrading the Kiowa to the F-model and then continuing to the Block II later when there are sufficient funds.[65] Shortly before December 2012, the Army decided they would recommend proceeding with the AAS program.[41]

Others

The OH-58X was a modification of the fourth development OH-58D (s/n 69-16322) with partial stealth features and a chin-mounted McDonnell-Douglas Electronics Systems turret as a night piloting system; including a Kodak FLIR system with a 30-degree field of view. Avionics systems were consolidated and moved to the nose, making room for a passenger seat in the rear. No aircraft were produced.[2]

Operators

Australia

- Australian Army [66]
  - 161 Recce Squadron[67]

Austria

- Austrian Armed Forces (OH-58B)[68]

Republic of China (Taiwan)

- Republic of China Army (OH-58D)[69]
  - 601st Air Cavalry Brigade
  - 602nd Air Cavalry Brigade

Dominican Republic

- Dominican Air Force[70]

Saudi Arabia

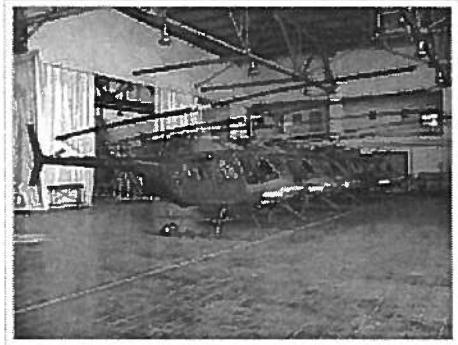
- Royal Saudi Land Forces[71]

United States

- United States Army [72]

OH-58 Kiowa Operators (former operators in red)

Australian Army Kiowa



Bundesheer OH-58

Former operators

Australia

- Royal Australian Navy [73]

Canada

- Canadian Forces
  - 400 Tactical Helicopter Squadron[74]
  - 3 Canadian Forces Flying Training School[75]
  - 401 Tactical and Training Helicopter Squadron[76]
  - 403 (Helicopter) Operational Training Squadron[77]
  - 408 Tactical Helicopter Squadron[78]
  - 411 Tactical Helicopter Squadron[79]
  - 422 Tactical Helicopter Squadron[80]
  - 427 Tactical Helicopter Squadron[81]
  - 430 Tactical Helicopter Squadron[82]
  - 438 Tactical Helicopter Squadron[83]
  - 444 Tactical Helicopter Squadron[84]
  - Aerospace Engineering Test Establishment[85]

Specifications

OH-58A

Data from U.S. Army Aircraft Since 1947[86]

General characteristics

- **Crew:** 1 pilot, 2 pilots, or 1 pilot and 1 observer
- **Length:** 32 ft 2 in (9.80 m)
- **Rotor diameter:** 35 ft 4 in (10.77 m)
- **Height:** 9 ft 7 in (2.92 m)
- **Empty weight:** 1,583 lb (718 kg)
- **Max. takeoff weight:** 3,000 lb (1,360 kg)
- **Powerplant:** 1 × Allison T63-A-700 turboshaft, 317 shp (236 kW)
- **Fuselage length:** 34 ft 4.5 in (10.48 m)

Performance

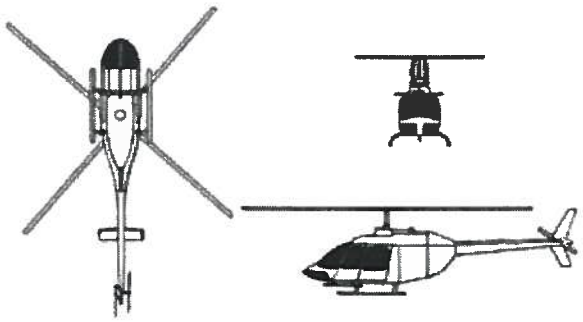
- **Maximum speed:** 120 knots (222 km/h, 138 mph)
- **Cruise speed:** 102 knots (188 km/h, 117 mph)
- **Range:** 299 mi (481 km, 260 nmi)
- **Service ceiling:** 19,000 ft (5,800 m)

Armament

- **Guns:** **One M134 7.62 mm Minigun mounted on the M27 Armament Subsystem, *or*
  - One M129 40 mm Grenade Launcher mounted on the XM8 Armament Subsystem

OH-58D Kiowa Warrior

Data from Jane's,[2] U.S. Army Aircraft Since 1947[86]



General characteristics

- **Crew:** 2 pilots
- **Length:** 42 ft 2 in (12.85 m)
- **Main rotor diameter:** 35 ft 0 in (10.67 m)
- **Height:** 12 ft $10\frac{5}{8}$ in (3.93 m)
- **Main rotor area:** 14.83 ft^2 (1.38 m^2)
- **Empty weight:** 3,829 lb (1,737 kg)
- **Gross weight:** 5,500 lb (2,495 kg)
- **Powerplant:** 1 × Rolls-Royce T703-AD-700A or 250-C30R/3 turboshaft, 650 hp (485 kW) each

Performance

- **Maximum speed:** 149 mph (241 km/h)
- **Cruise speed:** 127 mph (204 km/h)
- **Range:** 345 miles (555 km)

- **Service ceiling:** 15,000 ft (4,575 m)

Armament

- AGM-114 Hellfire anti-tank missiles
- Hydra 70 rockets
- M296 or M3P .50 cal (12.7 mm) machine gun.
- AIM-92 Stinger air-to-air missiles (no longer used)[*citation needed*]

See also

- Kimberly Hampton, an OH-58D pilot who was the first US female military pilot to be shot down and killed as a result of hostile fire.

Related development

- Bell YOH-4
- Bell 206
- Bell 400
- Bell 407
- Bell ARH-70

Aircraft of comparable role, configuration and era

- OH-6 Cayuse
- MBB Bo 105
- Cicaré CH-14
- Mil Mi-36
- Changhe Z-11
- Aérospatiale Gazelle

Related lists

- List of active United States military aircraft

References

Footnotes

1. ^ The last new build aircraft were delivered to the U.S. Army in 1989. The subsequent arming of the AHIP and the System Safety Enhancement Program (SSEP) caused aircraft to be steadily refitted until 1999.

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- World Aircraft information files Brightstar publishing London File 424 sheet 2

External links

- OH-58 Kiowa Warrior (http://www.army.mil/factfiles/equipment/aircraft/kiowa.html) and OH-58D fact sheets on Army.mil (http://www.aviation.army.mil/factsheets/OH58.html)
- OH-58D armament systems page on Army.mil (http://tri.army.mil/LC/CS/csa/kppoints.htm)
- Kiowa Warrior Mast-Mounted Sight (MMS) Sensor Suite on northropgrumman.com (http://www.es.northropgrumman.com/solutions/mms/index.html)

Bell OH-58A 'Kiowa'

Description

Notes: Single rotor, light observation vehicle (2 CREW, 2 PASSENGERS, OR 40 LBS CARGO) .	
Manufacturer:	Bell
Base model:	H-58
Designation:	OH-58
Version:	A
Nickname:	Kiowa
Designation System:	U.S. Air Force
Designation Period:	1948-Present
Basic role:	Helicopter
Modified Mission:	Observation
Crew:	Pilot Co-pilot/Observer

Specifications

Length:	32' 7"	9.9 m
Wingspan:	35' 4"	10.7 m
Wingarea:	978.8 sq ft	90.9 sq m
Empty Weight:	1,464 lb	663 kg
Gross Weight:	2,313 lb	1,048 kg
Max Weight:	3,000 lb	1,360 kg

Propulsion

No. of Engines:	1
Powerplant:	Allison T63-A-700 turboshaft
Horsepower (each):	317

Performance

Range:	299 miles	481 km	
Cruise Speed:	117 mph	188 km/h	101 kt
Max Speed:	138 mph	222 km/h	120 kt
Climb:	1,780 ft/min	542 m/min	
Ceiling:	18,900 ft	5,760 m	

Known serial numbers

68-16687 / 68-16986, 69-16080 / 69-16379, 70-15050 / 70-15649, 71-20340 / 71-20865, 72-21061 / 72-21460 , 73-21861 / 73-21934 , 89-0082 / 89-0117 , 221252 / 221253 , 701523 , 701553 , 710388 , 710554 , 710799 , 721193 , 816695 , 816797

Examples of this type may be found at

Museum	City	State
Air Mobility Command Museum	Dover AFB	Delaware
United States Army Aviation Museum	Ozark	Alabama

OH-58A on display


Air Mobility Command Museum

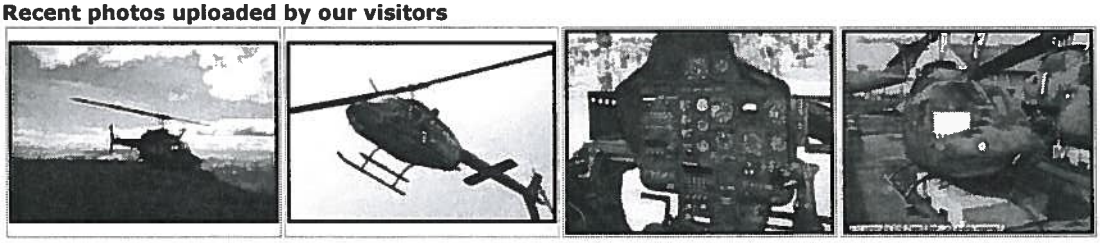

United States Army Aviation Museum

Recent comments by our visitors

Mike Hardin , TX	I enlisted in 1977 and after the 67V school was assigned as a OH-58 crewchief/observer at Ft Bragg in early 1978 with B Troop 1/17 Cav. I was assigned to OH-58A #68-16937 which is close to two of the birds assigned to the United States Army Aviation Museum at Ft Rucker. It was a great bird and I treated it like it was my own personal "ride". In 1981 my platoon was the first in the 82nd to receive an upgraded to the "C" model 58's and we flew our 58's to Corpus Christi Army Depot for rebuild. From Corpus we flew to the Bell plant in Amarillo, Texas and signed for our C model 58's. It took a week to work off the red X's and so our first test flight. There must have been about 30 pages of red X's on each bird (15 in all) after down grading most to circle red X's we were cleared to ferry the birds back to Bragg were they spent the next month in intermediate maintenance at the 82 Aviation BDE. The bird I got was a Vietnam vet with bullet holes in the floor and roof thru the co-pilots/observer seat area, I always thought about that but it was a good bird and flew well. 03/18/2011 @ 15:10 [ref: 36883]
Robert Enterprise, AL	Back in the '70s when the Army was doing all it could to get troops to re-enlist my father reupped in a flying OH-58. 09/27/2007 @ 13:37 [ref: 18034]
Craig Clary , CA	Great Helicopter, I have about 8 flights in one of these birds and i enjoyed every one of them. 03/20/2007 @ 05:19 [ref: 15969]

Write a note about the Bell OH-58A

Recent photos uploaded by our visitors



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Aircraft Performance Data for CESSNA 210F CENTURION '66

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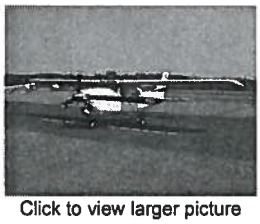
Click to view larger picture

Aircraft Performance Data

Cruise Speed (knots): 165
Stall Speed (knots): 50
Range in Nautical Miles: 656
Service Ceiling (feet): 19900
Rate of Climb (feet per minute): 1115
Take over 50 foot obstacle (feet): 1275
Landing over 50 foot obstacle (feet): 1340
Take Off Normal (feet): 675
Landing Normal (feet): 735

Dimensions

Average Empty Wt (pounds): 1865
Gross Wt (pounds): 3300
Fuel Regular (Gallons): 65
Fuel Max (Gallons): 84

CESSNA 210F CENTURION '66 Performance, CESSNA Performance Data, CESSNA 210F CENTURION '66, Performance Specs, CESSNA 210F CENTURION '66 Operating Costs, CESSNA 210F CENTURION '66, Compare CESSNA 210F CENTURION '66, CESSNA 210F CENTURION '66 performance specs, compare the CESSNA 210F CENTURION '66 to other aircraft, fuel burn for the CESSNA 210F CENTURION '66, Cruise Speed for the CESSNA 210F CENTURION '66, Range for the CESSNA 210F CENTURION '66, Useful load for the CESSNA 210F CENTURION '66, Stall Speed for the CESSNA 210F CENTURION '66, Service Ceiling for the CESSNA 210F CENTURION '66, payload for the CESSNA 210F CENTURION '66, Gross weight for the CESSNA 210F CENTURION '66

AIRCRAFT PERFORMANCE DATA

Cessna 210 F Centurion - Performance Data

Horsepower: 285
Top Speed: 172 kts
Cruise Speed: 165 kts
Stall Speed (dirty): 54 kts

Gross Weight: 3300 lbs
Empty Weight: 1865 lbs
Fuel Capacity: 65 gal
Range: 640 nm

Takeoff
Ground Roll: 675 ft
Over 50 ft obstacle: 1265 ft

Landing
Ground Roll 735 ft
Over 50 ft obstacle: 1340 ft

Rate Of Climb: 1115 fpm
Ceiling: 19900 ft

Related Specs:

- P210R pressurized
- P210N II pressurized ('81 has less performance)
- T210R Turbo Centurion
- T210N, Turbo Centurion
- T 210 M Turbo
- T 210 L Turbo
- T 210 G,H & J Turbo Centurion
- T 210 F Turbo Centurion
- 210R Centurion
- 210 M,NII
- 210 G, H & J, K, L Centurion
- 210 D & E Centurion
- 210 B,C Two Ten
- 210 A Two Ten
- 210 M,NII (prior to 1978)
- T 210 K Turbo

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Cessna 210

From Wikipedia, the free encyclopedia

The **Cessna 210 Centurion** is a six-seat, high-performance, retractable-gear single-engine general aviation aircraft which was first flown in January 1957 and produced by Cessna until 1985.

Contents

- 1 Design and development
  - 1.1 Succession
  - 1.2 Modifications
- 2 Variants
- 3 Operators
  - 3.1 Civil
  - 3.2 Military
- 4 Accidents and incidents
- 5 Specifications (T210N Turbo Centurion II)
- 6 See also
- 7 References
  - 7.1 Notes
  - 7.2 Bibliography
- 8 External links

Model 210 Centurion

A Cessna 210 Centurion

Role	light aircraft
National origin	United States
Manufacturer	Cessna
First flight	January 1957[1]
Introduction	1957
Produced	1957-1986
Number built	9,240
Variants	Cessna 206

Design and development

The early Cessna 210 (210 and 210A) had 4 seats with a Continental IO-470 engine of 260 hp (190 kW). It was essentially a Cessna 182B to which was added a retractable landing gear, swept tail, and a new wing.[2] In 1961 the fuselage and wing were completely redesigned - the fuselage was made wider and deeper, and a third side window was added. The wing planform remained the same (constant 64" chord from centerline to 100 inches (2,500 mm) out, then straight taper to 44" chord at 208 inches from centerline), but the semi-Fowler flaps (slotted, rear-moving) were extended outboard, from Wing Station 100 to Wing Station 122, which allowed a lower landing speed (FAA certification regulations state that a single-engine aircraft must have a flaps-down, power-off stall speed no greater than 70 miles/hour). To compensate for the reduced aileron span, the aileron profile was changed and its chord enlarged. The 1964 model 210D introduced a 285 hp (213 kW) engine and 2 small child seats, set into the cavity which contained the mainwheels aft of the passengers.

1960 model Cessna 210, showing the strut-braced wing used on the early model 210.

In 1967 the model 210G introduced a cantilever wing replacing the strut-braced wing. Its planform changed to a constant taper from root chord to tip chord. In 1970 the 210K became the first full 6-seat model. This was achieved by replacing the flat leaf-springs used for the retractable main landing gear struts (undercarriage) with tapered tubular steel struts of greater length. This allowed the tires to be nested farther to the rear of the fuselage, making room for the full size rear seats. In 1979 the 210N model eliminated the folding doors which previously covered the two retracted main wheels. The tubular spring struts retract into shallow channels along the bottom of the fuselage and the wheels fit snugly in closed depressions on the underside of the fuselage. Some models featured de-icing boots as an option.

A Cessna T210L shows the later models' strutless cantilever wing

The aircraft was offered in a normally aspirated version, designated the model **210**, as well as the turbocharged **T210** and the pressurized **P210** versions. The **Centurion II** was an option introduced in 1970 with improved avionics, and was available in both normally aspirated and turbocharged versions (**Turbo Centurion II**)[1]

Cessna T210L

On 21 May 2012 the airworthiness authority responsible for the design, the US Federal Aviation Administration, issued an emergency Airworthiness Directive requiring 3,665 of the cantilever wing Cessna 210s to be inspected for cracks in the spar cap, wing spar and wing. Aircraft with more than 10,000 hours of airframe time were grounded immediately pending a visual inspection.[3]

A Cessna P210N Pressurized Centurion with its distinctive small windows

Succession

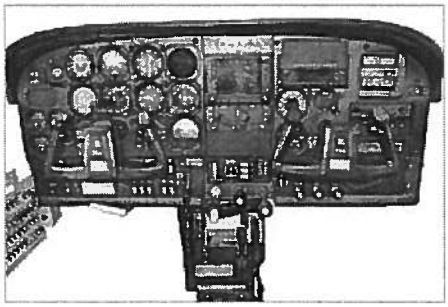
In November, 2007, Cessna acquired the assets of Columbia Aircraft Company. The Columbia 350 and 400 models were integrated into the Cessna single engine range and redesignated as the Cessna 350 and Cessna 400. These aircraft replaced the Cessna 210 at the top end of the Cessna single-engine model line.[4]

Modifications

There are a wide range of modifications available for the Cessna 210, including:

- Aeronautical Engineers Australia has developed a life extension package for 210s suffering from wing spar carry-through beam corrosion.[5]
- Aerospace Systems and Technologies offers a TKS technology weeping fluid ice protection system for the Cessna 210, models L, M and N.[6]

- Crownair Aviation developed a "Centurion Edition" T210, which is a remanufactured aircraft introduced in November 2008 that features a glass cockpit and new engine along with other minor refinements.[7]
- O&N Aircraft offers a Rolls-Royce Model 250 turboprop conversion of the Pressurized Cessna P210N known as the "Silver Eagle".[8]
- Vitatoe Aviation offers the TN550 conversion which uses a Continental IO-550P engine with an IO-520 turbocharger with dual intercoolers and a larger alternator.[9]



An updated Cessna T210 instrument panel.

A 1967 Cessna 210G modified with a leading edge cuff and flaperons for improved low speed performance characteristics

A Vitatoe Cessna 210N conversion

Variants

The Cessna 210 was manufactured in 26 model variants, The C210, C210A-D, the Centurion C210E-H&J, Turbo Centurion T210F-H&J, the Centurion II C210K-N&R, the Turbo Centurion II T210K-N&R and the P210N&R. The 210N, T210N (turbocharged), and P210N (pressurized) versions were produced in the greatest quantity. The rarest and most expensive models were the T210R and P210R, which were produced only in small quantities in 1985-86.

Several modifications and optional fittings are also available including different engine installations, wing tip tanks, speed brakes, STOL kits and gear door modifications.

The early strut-winged Cessna 210B was developed into a fixed-gear aircraft known as the Cessna 205. This spawned an entirely new family of Cessna aircraft including the 206 and the eight seat 207.[10]

210
: Four-seat production variant with a Continental IO-470-E engine, 40 degrees hydraulic flap, gear doors, introduced in 1960.,[11] first flown in 1957, 575 built.[2]

210A
: A 210 with a third cabin window on each side, introduced in 1961, 265 built.[2]

210B
: A 210A with a cut-down rear fuselage, a rear vision window and a Continental IO-470-S engine, introduced in 1962, 245 built.[2]

210C
: A 210B with some minor changes, introduced in 1963, 135 built.[2]

210D Centurion
: A 210C fitted with a 285 hp (213 kW) Continental IO-520-A engine and increased take-off weight to

3,100 lb (1,406 kg),[11] introduced in 1964, 290 built.[2]

210E Centurion

A 210D with some minor changes, introduced in 1965, 205 built.[2]

210F Centurion / Turbo Centurion

A 210E with some minor changes and optional 285 hp (213 kW) turbocharged Continental TSIO-520-C engine, introduced in 1966, 300 built.[2]

210G Centurion / Turbo Centurion

A 210F with a strutless cantilever wing and modified rear window, increased take-off weight to 3,300 lb (1,497 kg),[11] introduced in 1967, 228 built.[2]

210H Centurion / Turbo Centurion

A 210G with a new flap system and instrument panel, 210 built.[2] Flap range decreased to 30 degrees, fuel capacity increased from 65 to 90 US gal (246 to 341 l). Introduced in 1968.[11]

210J Centurion / Turbo Centurion

A 210H with reduced wing dihederal, different nose profile and a Continental IO-520-J (or TSIO-520H) engine, introduced in 1969, 200 built.[2]

210K Centurion / Turbo Centurion

A 210J with rear changed to full seat to provide six seats, a IO-520-L engine with 300 hp (224 kW) limited to 5 minutes, landing gear changed, enlarged cabin with a single rear side window, weight increased to 3,800 lb (1,724 kg), produced 1970-71, 303 built.[2][11]

210L Centurion / Turbo Centurion

A 210K with nose-mounted landing lights, the electrical system changed to 24 volt, the engine driven hydraulic pump replaced with an electrical pump and a three bladed prop fitted. Improved aerodynamics led to an increase in approximately 8 kn (15 km/h) in cruise speed.[11] Produced 1972-76, 2070 built.[2]

210M Centurion / Turbo Centurion

A 210L with an optional 310 hp (231 kW) TSIO-520-R engine and minor changes, produced 1977-80, 1381 built.[2]

210N Centurion / Turbo Centurion

A 210M with open wheel wells for main landing gear and minor changes.[2] Although this change appeared only on the C210N, most early models have had gear doors removed due to extensive maintenance and handling problems, leaving them similar to the "N".[11] Produced 1981-84, 1943 built.

210R Centurion / Turbo Centurion

A 210N with longer span stabiliser and minor changes, produced 1985-86, 112 built.[2]

P210N Pressurized Centurion

A Turbo 210N with pressurized cabin, four windows each side, with a 310 hp (231 kW) Continental TSIO-520-AF engine, produced 1978-83, 834 built.[2]

P210R Pressurized Centurion

A P210N with longer span stabilizer increased take-off weight and a 325 hp (242 kW) Continental TSIO-520-CE engine, produced 1985-86, 40 built.[2][10]

Riley Turbine P-210

Conversion of pressurized Cessna 210P Centurion aircraft, fitted with a Pratt & Whitney Canada PT6A-112, flat rated at 500 shp (373 kW).[12]

Operators

Civil

The Cessna 210 is widely used by flight training schools, private operators, air taxi and commercial charter, and companies.

Military

Bolivia
Dominican Republic
El Salvador
Honduras

- Honduran Air Force

Jamaica

- Jamaica Defence Force

Mexico
Philippines
Panama
Paraguay

- Paraguayan Air Force - 2 210N
- Paraguayan Naval Aviation - 2 210N

Accidents and incidents

- While flying N6579X, an early model 210A, famed test pilot Scott Crossfield crashed and died in the woods of Ludville, Georgia on April 19, 2006. The National Transportation Safety Board established the probable cause as "The pilot's failure to obtain updated en route weather information, which resulted in his continued instrument flight into a widespread area of severe convective activity, and the air traffic controller's failure to provide adverse weather avoidance assistance, as required by Federal Aviation Administration directives, both of which led to the airplane's encounter with a severe thunderstorm and subsequent loss of control."[13]

Specifications (T210N Turbo Centurion II)

Data from Janes' All The World's Aircraft 1982-83[1]

General characteristics

- **Crew:** One
- **Capacity:** Five passengers

- **Length:** 28 ft 2 in (8.59 m)
- **Wingspan:** 36 ft 9 in (11.20 m)
- **Height:** 9 ft 8 in (2.95 m)
- **Wing area:** 175 ft² (16.23 m²)
- **Empty weight:** 2,303 lb (1,045 kg)
- **Max. takeoff weight:** 4,000 lb (1,814 kg)
- **Powerplant:** 1 × Continental Motors TSIO-520-R air-cooled turbocharged flat-six, 310 hp (231 kW)

Performance

- **Maximum speed:** 204 knots (235 mph, 378 km/h) at 17,000 ft (5,200 m)
- **Cruise speed:** 193 knots (222 mph, 358 km/h) at 20,000 ft (6,100 m)
- **Stall speed:** 58 knots (67 mph, 108 km/h) CAS, flaps down, power off
- **Range:** 900 nmi (1,036 mi, 1,668 km) econ cruise at 10,000 ft (3,050 m)
- **Service ceiling:** 27,000 ft (8,230 m)
- **Rate of climb:** 930 ft/min (4.7 m/s)
- **Wing loading:** 22.9 lb/ft² (111.8 kg/m²)
- **Power/mass:** 0.078 hp/lb (0.13 kW/kg)

See also

Related development

- Cessna 182
- Cessna 206

Aircraft of comparable role, configuration and era

- Beechcraft Bonanza
- Cessna 206
- Piper Saratoga
- Piper Malibu

References

Notes

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11. ^ *a b c d e f g* Danielle Bruckert and Oleg Roud (2008). *Cessna 210 Training Manual*. ISBN 978-0-557-01418-7.
12. ^ Taylor 1982, p. 453
13. ^ NTSB (September 2007). "NTSB Probable Cause, Report CHI06MA115[2007 (http://www.ntsb.gov/ntsb/brief.asp?ev_id=20060501X00494&key=1) "]. http://www.ntsb.gov/ntsb/brief.asp?ev_id=20060501X00494&key=1. Retrieved 2008-06-02.

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- Simpson, R.W. (1991). *Airlife's General Aviation*. England: Airlife Publishing. ISBN 1-85310-194-X.

External links

- FAA Type Certificate Data Sheet 3A21 (http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgMakeModel.nsf/0/8d6fe1c9ed78bbdd862572430063b139/$FILE/3A21.pdf) Type Certificate Data Sheet for Cessna 210 models.

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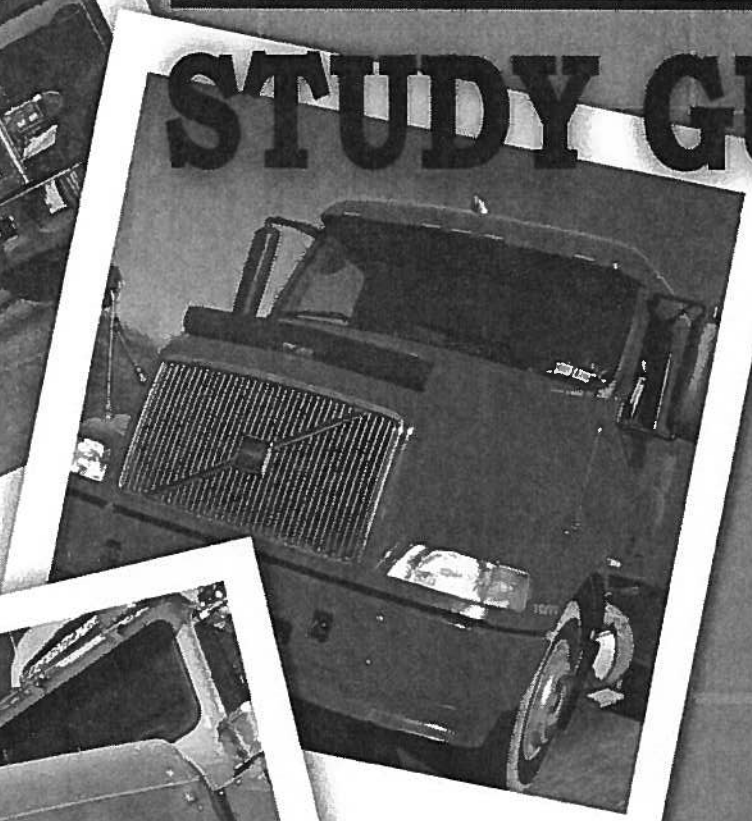
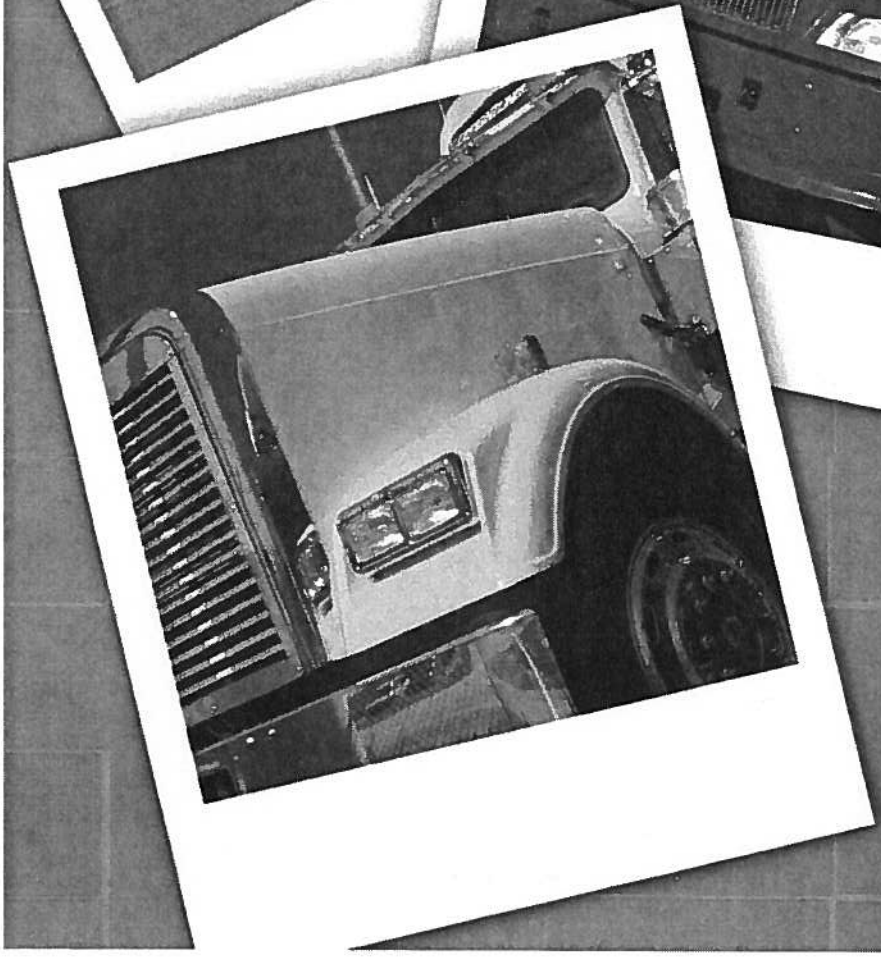
Categories: Cessna aircraft | High wing aircraft | Propeller aircraft | Single-engine aircraft | United States civil utility aircraft 1950–1959 | 1957 introductions

CDL

Commercial Driver's License

STUDY GUIDE





Jesse White
Illinois Secretary of State

Reckless Driving — Operating a CMV or non-CMV in a manner that exhibits a willful, wanton or reckless disregard of the safety of persons or property.
- Passing a vehicle stopped for a pedestrian in a crosswalk.
- Driving on a sidewalk.
- Passing a school bus receiving or discharging passengers or displaying a warning not to pass.

No Valid CDL — Operating a CMV without a valid CDL.
- Operating a CMV with an improper classification or restriction.
- Violation of an instruction permit.

Following Too Closely — Following the vehicle ahead too closely.
- Failure of a truck to leave sufficient distance for being overtaken by another vehicle.

Improper Lane Usage — Improper or erratic traffic lane changes.
- Improper lane changing, lane usage and/or center lane usage.
- Improper passing.
- Passing on a hill or curve or when prohibited.
- Passing on wrong side of the road.
- Improper passing on shoulder, left or right.
- Driving wrong way on a one-way street or highway.
- Driving on the left side of the roadway.
- Passing in a school zone.

Conviction Involving a Fatal Accident — A violation of any state law or local ordinance relating to motor vehicle traffic control (other than parking violations) arising in connection with a fatal traffic accident.

Multiple Licenses — A violation relating to a CMV driver having multiple driver's licenses.

Traffic Violations — Two serious traffic violations within a three-year period results in a two-month disqualification. Three serious traffic violations in the same period results in a four-month disqualification.

1.15 Size Limitations

Drivers must obey all posted signs regarding maximum truck width, length, height and weight limits. They must be aware that some highways prohibit truck travel entirely. Others allow truck travel on a limited basis. For example, only very small trucks may cross certain township bridges as well as the highways leading to and from these bridges. Higher limits are allowed on state highways designated by the Illinois Department of Transportation (IDOT) and on local streets and highways designated by local government officials. These heavier and larger vehicles and combinations are allowed to travel on non-designated streets or highways in the state highway system for up to five miles to gain access to a designated roadway. These vehicles are prohibited on all streets and highways under local jurisdiction unless designated by local officials. Maps showing state highways on which these vehicles may operate from are available by calling IDOT, 217-782-6271.

Width — The maximum width for most vehicles is 8 feet, except on designated Class I and Class II state highways and designated local roads, where a width of 8 feet, 6 inches is allowed. Exemptions to maximum widths are:
- Loads of farm products or implements of husbandry being transported during the period from one-half hour after sunrise to one-half hour before sunset in times of good visibility.
- Buses operating within the limits of cities and villages located in counties with populations of 500,000 or more. Maximum widths may be up to 9 feet. However, no vehicle wider than 8 feet, 8 inches, may be operated on the interstate highways in those counties.

Length — No vehicle with or without a load, other than a semitrailer, shall exceed a length of 42 feet. Semitrailers may have an overall length of 53 feet, including the load being carried. However, for semitrailers more than 48 feet in length, the maximum allowable distance from the king pin to the rear axle is 40 feet. The maximum length of either the semitrailer or trailer in a truck tractor-semitrailer-trailer (double-bottom) combination is 28 feet, 6 inches.
- On Class I designated state and local highways there is no overall length limit.
- On Class II designated state and local highways there is no overall length limit; however, the maximum allowable wheel-base is 55 feet for truck tractor-semitrailer combinations, and 65 feet for truck tractor-semitrailer-trailer (double-bottom) combinations.
- On Class III highways and the remainder of the state highway system, the maximum allowable wheelbase is 55

feet for the truck tractor-semitrailer combinations. All other types of vehicle combinations are limited to an overall length of 60 feet, including load.
- On non-designated local streets and highways, the maximum overall length is 55 feet, including loads for truck tractor-semitrailer combinations, and 60 feet for all other types of vehicle combinations.

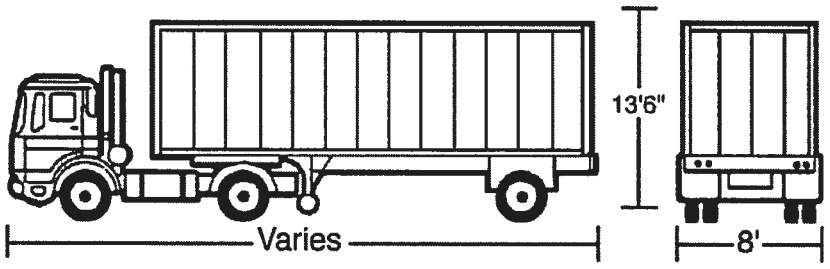
A combination of vehicles specially designed to transport motor vehicles may have an overall length of 65 feet plus a front overhang of 3 feet and a rear overhang of 4 feet on Class I and II highways. On all other highways and streets, the maximum overall length is 60 feet including load.

Exceptions to these limitations are vehicles hauling pipes, poles, machinery or other structural objects that cannot be quickly taken apart. However, the length of these objects may not exceed 80 feet, except for public utility emergency repairs or for those holding special permits. These vehicles are not allowed to operate when it is dark or on Saturdays, Sundays and legal holidays.

Height — The maximum height for all vehicles on all highways is 13 feet, 6 inches, including load from the underside of the tire to the top of the vehicle.

Weight — The maximum weight limits on both designated and non-designated state and local streets and highways are:
- 20,000 pounds on a single axle
- 34,000 pounds on a tandem, and
- up to 80,000 pounds on a 5-axle combination, depending upon axle spacings.

However, any single axle of a 2-axle motor vehicle weighing 36,000 pounds or less and not a part of a combination of vehicles may carry an axle load of up to 20,000 pounds. Exceptions for certain vehicles are allowed by the statutes and by local city ordinances.



1.16 Special Lighting Equipment

Second division or combination vehicles longer than 25 feet or wider than 80 inches (excluding mirrors, bumpers and other safety devices) must have special lighting equipment. The following lighting equipment is required on vehicles operated outside the limits of cities, towns or villages between sunset and sunrise:
- Two yellow or amber lights on the front of the vehicle. One light must be on each upper-front corner and visible for 500 feet.
- Three red lights on the rear of the vehicle in a horizontal line and visible for 500 feet.
- Two yellow or amber reflectors on the front of the vehicle. One reflector must be on each lower corner.
- Two red reflectors on the rear of the vehicle. One reflector must be not more than 12 inches from each lower corner.

Second division or combination vehicles longer than 20 feet and weighing more than 3,000 gross pounds must have special reflectors when operated outside the limits of cities, villages or towns between sunset and sunrise. The required reflectors, which must be approved by IDOT include:
- Two amber reflectors on each side of the vehicle, not more than 5 feet above the road and placed at approximately 1/3 the length of the side of the vehicle.
- One amber reflector on each side of the vehicle not more than 12 inches from the front and not more than 5 feet above the road.
- One red reflector on each side of the vehicle not more than 12 inches from the rear and not more than 5 feet above the road.

NOISE LEVELS AND PROPERTY VALUE SUMMARY

Noise levels are frequently measured in decibels (dBs). The decibel is logarithmic unit that indicates the ratio of a physical quantity (usually power or intensity) relative to a specified or implied reference level. The volume (or loudness) of a sound is measured in decibels. The general range of human hearing is from 0 dB to 120 dB. A quiet library is about 30 dB, while 120 dB is considered the threshold of pain, where the ear begins to feel pain from the volume. Normal conversation at 3-5 feet is about 60 dB and typical car interior on a highway is 75 dB. At 80 dB, noise is considered loud (garbage disposal, dishwasher, average factory, noise office or telephone dialtone). City traffic noise inside car is about 85 dB; power drill, shop tools, busy urban street, diesel truck and food blender are at 90 dB. Power mower at 3 feet is 107 dB; snowmobile and a motorcycle are at 100 dB; power saw at 3 feet is about 110 dB. Some sound levels of music are violin (82-92 dB), cello (85-111 dB), oboe (95-112), flute (92-103 dB), clarinet (85-114 dB). Finally, a semi-truck will generate noise between 90 and 100 dB, an operating tractor at 80% load – at 100 dB while at 100% load it can reach 120 dB; a rooster generates noise from 66 to 83 dB; dogs' barking exceeds 100 dB and might reach 120 dB while a single dog barking is about 75 dB; and a gunshot produces noise at about 140 dB.

According to U.S. Department of Transportation Federal Aviation Administration Advisory Circular 93-2 (AC No AC-93-2) (enclosed) the dB average (dBA) for Cessna 172M and 170P is 74.3 and for BELL Jet Ranger helicopter is 84.6. According to FAA Advisory Circular 36-3F (repealed) Cessna 170 takeoff and landing dBA is 68.0 and 61.0, respectively. According to FAA Advisory Circular 36-3H (AC No AC-36-3H), the dBA for Cessna is 170B 68.0 and 61.0 at takeoff and landing, respectively.

As we can observe from this data, the exposure to noise for the local community (most of which is located at a safe distance from the proposed RLA of more than 200 feet) would not increase in any way as both the helicopter and the airplane petitioner owns cannot generate noise at a level higher than tractors, dogs, and guns, which are widely present in the community. Furthermore, as was stated at the June 16, 2011 public hearing gunshots, are frequently heard in the vicinity of the property as gun owners regularly discharge weapons, and such gunshots produce noise at a much higher level than the model airplane and helicopter petitioner owns. Finally, to mitigate any potential noise exposure, petitioner has purposely placed the RLA in an area, which is located at a significant distance from most neighbors.

Another concern expressed at the public hearing was regarding potential decrease in property values as a result of noise and safety concerns. As explained in the Safety Summary, concerns about safety are minimal as compared to safety concern from highway traffic. Therefore, impact on property value is likely to be negligible.

As far as noise impact on property values is concerned, there is a lot of research on the impact of airport noise on property values. Although most of the findings are not applicable to restricted landing areas, some of the results are relevant to the case at bar. Aircraft noise disturbance costs are most commonly expressed as a percentage change in residential property values per decibel of noise exposure. One such study decomposed the noise effects into loudness and event frequency, and concluded that adding more flights is less noticeable than raising average loudness. Studies have shown that percent change in property value per one decibel increase in noise level for detached houses is 0.65 percent.

These results indicate that property values decrease if there is increase in noise levels. However, as indicated above, there will not be such an increase in the case at bar. The equipment owned by petitioner is unable to produce noise at higher level than the currently existing noise in the community. Property values decrease with increase in decibel levels and such increase in this case is simply not present.

SAFETY SUMMARY

Between 1976 and 1990, according to FAA and National Transportation Safety Board (NTSB), there were 333 general aviation Building and Residence (B&R) Accidents, or an average of fewer than 23 a year. Seventy of these accidents resulted in a fatality, either aboard the aircraft or in a building/residence on the ground, while 12 of these resulted in an injury to persons on the ground. On average, only about 10 general aviation B&R accidents a year result in a serious injury and/or death to individuals either in the aircraft or in a building/residence on the ground. Over the 15-year period studied, only seven general aviation B&R studied, only seven general aviation B&R accidents involved fatalities on the ground. On average, less than one general aviation accident a year results in a fatality or serious injury to persons in a building or residence on the ground. All in all, only nine individuals between 1976 and 1990 were killed when a general aviation aircraft "fell" on the building or residence in which they were located. And between 1985 and 1990, there were absolutely no fatalities or injuries to individuals on the ground as the result of a general aviation B&R accident.

To put things into perspective, during 1985 alone, more than 7,750 pedestrians were killed by motorists on the highways, more than 1,100 people lost their lives in boating accidents, and more than 900 were killed while riding on bicycles. In 1984, 11,600 were killed in falls, 4,800 by fires, and 1,800 by firearms.

During 1985, general aviation, according to FAA, conducted more than 44.3 million departures, or almost 1.5 takeoffs for every hour flown. General aviation conducted more than 500 million departure between 1976 and 1985. Therefore, only 12 of these estimated 500 million departures resulted in a fatality or serious injury to persons in a building or residence on the ground.

The more recent data by FAA is also reassuring. Thus, according to the most recent available data, in 2005, 12 persons on the ground sustained injuries as a result of general aviation accidents. Similarly, in 2004, 11 persons on the ground sustained injuries as a result of general aviation accidents and 26 in 2003. There are numerous data to show that each year less than 30 and most of the recent years, less than 20 people on the ground are killed by general aviation accidents. If we compare this to the pedestrians killed by motor vehicles each year (between 4,000 and 5,000 each year for the period 1999 – 2009), we can observe that the threat to persons on the ground is almost negligible.