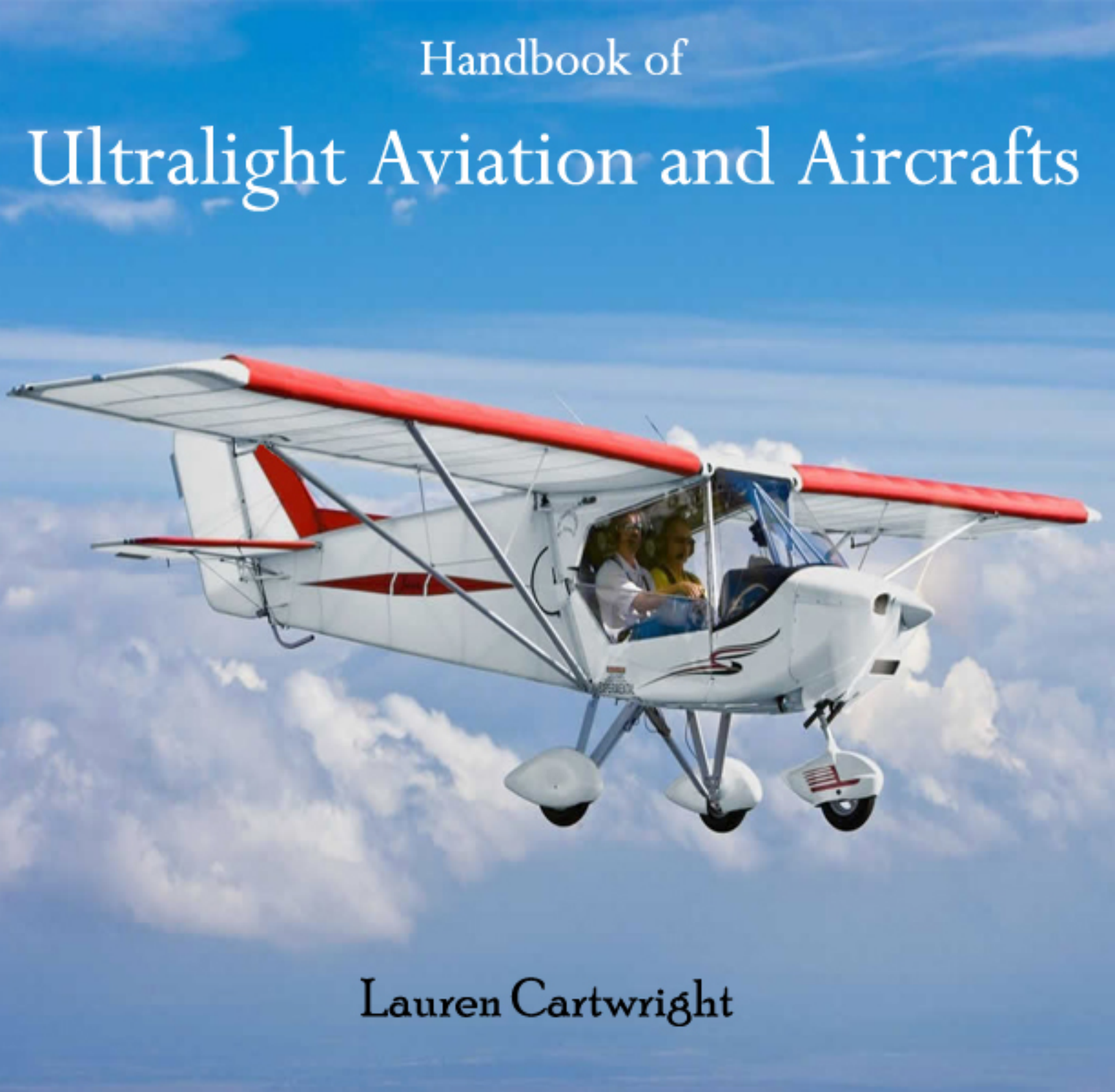
Handbook of

Ultralight Aviation and Aircrafts



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Introduction to Ultralight Aviation

Huntair Pathfinder Mark 1 ultralight.

The term "**ultralight aviation**" refers to light-weight, 1- or 2-person airplanes. During the late 1970s and early 1980s, many people sought to fly affordably. As a result, many aviation authorities set up definitions of lightweight, slow-flying aeroplanes that could be subject to minimum regulation. The resulting aeroplanes are commonly called **ultralight** or **microlight**, although the weight and speed limits differ from country to country.

There is also an allowance of another 10% on Maximum Take Off Weight for seaplanes and amphibians, and some countries (such as Germany and France) also allow another 5% for installation of a ballistic parachute.

The safety regulations used to approve microlights vary between countries, the strictest being in the United Kingdom, Italy, Sweden and Germany, while they are almost non-existent in France and the United States. The disparity between regulations can be a barrier to international trade and overflight in strict regions, as is the fact that these regulations are invariably sub-ICAO, which means that they are not internationally recognised.

In most affluent countries, microlights or ultralights now account for a significant portion of the civil aircraft fleet. For instance in Canada in October 2010, the ultralight fleet made up 19% of the total civil aircraft registered. In other countries that do not register ultralights, like the United States, it is unknown what proportion of the total fleet they make up.

In countries where there is no specific extra regulation, ultralights are considered regular aircraft and subject to certification requirements for both aircraft and pilot.

Ultralight aircraft are generally called *microlight aircraft* in the UK and New Zealand, and *ULMs* in France and Italy. Some countries differentiate between weight shift and 3-axis aircraft, calling the former *microlight* and the latter *ultralight*.

The U.S. light-sport aircraft is similar to the UK and NZ *Microlight* in definition and licensing requirement, the U.S. 'Ultralight' being in a class of its own.

Definitions

Australia

In Australia Recreational Aircraft fall under many categories, but the most common category imposes:

- a maximum take off weight (MTOW) of 544 kg or less (614 kg for a seaplane);
- a stalling speed under 45 knots in landing configuration and
- a maximum of two seats.

A new certification category for Light Sport Aircraft came into effect on 7 January 2006. This category does not replace the previous categories, but creates a new category with the following characteristics:

- A maximum takeoff weight of 600 kg or 650 kg for an aircraft intended and configured for operation on water or 560 kg for a lighter-than-air aircraft.
- A maximum stall speed in the landing configuration (Vso) of 45 knots CAS.
- Maximum of two occupants, including the pilot.
- A fixed landing gear. A glider may have retractable landing gear. (For an aircraft intended for operation on water, a fixed or repositionable landing gear)
- A single, non-turbine engine fitted with a propeller.
- A non-pressurised cabin.

- If the aircraft is a glider a maximum never exceed speed (Vne) of 135 knots CAS

In either of the above categories, there are distinctions between factory manufactured and home built aircraft.

In Australia, microlight aircraft are defined as one or two seat weight-shift aircraft, with a maximum takeoff weight of 450 kg, as set out by the Civil Aviation Safety Authority. In Australia microlights are also referred to as trikes and are distinguished from three-axis aircraft, of which the smallest are known as ultralights.

In Australia, microlight aircraft and their pilots can either be registered with the Hang Gliding Federation of Australia (HGFA) or Recreational Aviation Australia (RA Aus). In all cases, except for privately built single-place ultralight aeroplanes, microlight aircraft or trikes are regulated by the Civil Aviation Regulations.

Pegasus Quantum 145-912 ultralight trike

Flight Design CTSW

A powered paraglider

A US-made Pterodactyl Ascender ultralight on a camping flight

Canadian Lazair ultralight covered in clear Mylar

Aeroprakt A-22 Foxbat 3-axis ultralight

Ikarus C42, a German ultralight

A weight-shift ultralight, the Air Creation Tanarg

Phantom – MKI

FM250 Vampire

K-10 Swift – MKI

Quicksilver MXII

A foot-launched powered hang glider

Weight Shift Ultralight ("Trike")

P and M Aviation Quik GT450 ultralight

Pipistrel Sinus 912

Rans S-6 Coyote II, classified as ultralight aircraft in Belgium

Australian Ultralight Industries Bunyip, 3-axis ultralight

Brazil

The Brazilian Aviation Regulation (RBHA 103A) defines an ultralight plane as: "a very light manned experimental aircraft used mainly, or intended for, sports or recreation, during daylight, in visual conditions, with a maximum capacity of 2 people and with the following characteristics:

- Monomotor, with a conventional motor (internal combustion) and one propeller;
- Maximum take-off weight equal or less than 750 kg; and
- Calibrated stall speed (CAS), power off, in landing configuration (Vso) equal or less than 45 knots."

Canada

The Canadian Aviation Regulations define two types of ultralight aeroplanes: basic ultra-light aeroplanes (BULA), and advanced ultra-light aeroplanes (AULA). The US light sport aircraft is similar to, and was based upon, the Canadian AULA. AULAs may operate at a controlled airport without prior arrangement. Operating either class of ultralight in Canada requires an Ultralight Pilot Permit which requires both ground school, dual and solo supervised flights. The ultralight may be operated from land or

water, but may only carry a passenger if the pilot has an Ultralight Aeroplane Passenger Carrying Rating and the aircraft is an AULA.

Europe

The definition of a microlight according to the Joint Aviation Authorities document JAR-1 is an aeroplane having no more than two seats, maximum stall speed (V_{S0}) of 35 knots (65 km/h) CAS, and a maximum take-off mass of no more than:

- 300 kg for a landplane, single seater; or
- 450 kg for a landplane, two-seater; or
- 330 kg for an amphibian or floatplane, single seater; or
- 495 kg for an amphibian or floatplane, two-seater, provided that a microlight capable of operating as both a floatplane and a landplane falls below both MTOM limits, as appropriate.

India

In India a microlight is an aircraft that has the following characteristics:

- two seater aircraft having an all up weight of not more than 450 kg. without parachute and 472.5 kg. with parachute
- a stall speed of less than 80 km/h
- a maximum level speed of less than 220 km/h
- Allowed 1 or 2 seats
- a single engine, reciprocating, rotary or diesel
- a fixed or ground adjustable propeller
- un-pressurized cabin
- wing area more than 10 square metres
- a fixed landing gear, except for operation on water or as a glider

Indian ultralights require aircraft registration, periodic condition inspections and a current permit to fly which has to be renewed annually.

Italy

In Italy, the category for this class of aircraft is Microlight.

- Requires flying with a helmet.
- Maximum weight requirements excludes seat belts, parachute and instruments.
- Single-seat maximum weight of 300 kg, and 330 kg for amphibious, stall speed must not exceed 65 km/h.
- Two-seat maximum weight of 450 kg, and 500 kg for amphibious, stall speed must not exceed 65 km/h. Aircraft may be used for instruction or flown by pilots with a valid private license, and at least 30 hours flight time.
- Intended for use at private fields. Use at civil airports requires prior permission.

- Airspace restrictions - Must remain within 4 km from the border of another state. Sensors or any kind of cameras are prohibited.
- All aircraft must have a metal plate with the identification number issued by the AeCI (Aero Club Italia). The same number must be fixed onto the underneath of the wing with letters that measure a minimum of 30×15 cm, in contrasting colour.
- From dawn till sunset, flight must be below 500 ft (150 meters)
- On Saturday and holidays flight must be below 1000 ft (300 meters) with 5 km separation from airports not located within ATZ.
- Microlight requires a certificate exam, insurance, and a medical examination.

New Zealand

In New Zealand microlight aircraft are separated into two classes, basically single and two seat aircraft. All microlights are required to have a prescribed endurance testing period when they are first flown, and all microlights must have a minimum set of instrumentation to show airspeed (except powered parachutes), altitude and magnetic heading.

NZ Class 1
: Single seat aircraft with a design gross weight of 544 kg (1,200 lb) (landplanes) or 579 kg (1,275 lb) (seaplanes or amphibians), or less, and a stall speed in the landing configuration of 45 knots (83 km/h) or less. Requires aircraft registration, and annual condition inspections, but does not require a permit to fly.

NZ Class 2
: Two seat aircraft with a design gross weight of 544 kg (landplanes) or 614 kg (seaplanes or amphibians), or less, and a stall speed of 45 knots (83 km/h) or less in the landing configuration. Must meet minimum type acceptance standards which may be foreign standards which have been deemed acceptable, or via a temporary permit to fly and flight testing regime. Requires aircraft registration, annual condition inspections, and a current permit to fly.

Philippines

The Civil Aviation Regulations define "non-type certified aircraft", under which ultralights and microlights fall, as:

An aircraft that does not possess an aircraft type certificate issued by any country/state. It is, of simple design and constriction, either a homebuilt or a kit built variety and for recreational and sport use, day VFR condition only.

A class of non-type certificated aircraft is applicable to all classifications, including powered parachutes, gyrocopter, fixed wing aircraft and helicopters.

United Kingdom

The UK regulations describe a microlight aeroplane as limited to two people, with a Maximum Total Weight Authorised (MTWA) not exceeding:

- 300 kg for a single seat landplane.
- 390 kg for a single seat landplane for which a UK Permit to Fly or Certificate of Airworthiness was in force prior to 1 January 2003
- 450 kg for a two seat landplane
- 330 kg for a single seat amphibian or floatplane
- 495 kg for a two seat amphibian or floatplane

A microlight must also have either a wing loading at the maximum weight authorised not exceeding 25 kg per square metre or a stalling speed at the maximum weight authorised not exceeding 35 knots calibrated speed. All UK registered aeroplanes (3-axis or flex-wing) falling within these parameters are Microlight aircraft.

A sub-category of microlights (SSDR) was introduced which allows owners more freedom to modify and experiment with their aircraft. Single Seat De-Regulated microlights must weigh less than 115kg without fuel and pilot and the wing loading must not be more than 10kg per sq m. There is no airworthiness requirement or annual inspection regime for SSDR microlights although pilots who fly them must have a normal microlight licence, and must observe the rules of the air.

A license is required to fly a microlight in the UK.

United States

The United States FAA's definition of an ultralight is significantly different from that in most other countries and can lead to some confusion when discussing the topic. The governing regulation in the United States is FAR 103 Ultralight Vehicles, which specifies a powered "ultralight" as a single seat vehicle of less than 5 US gallons (19 L) fuel capacity, empty weight of less than 254 pounds (115 kg), a top speed of 55 knots (102 km/h or 64 mph), and a maximum stall speed not exceeding 24 knots (45 km/h or 27.6 mph). Restrictions include flying only during daylight hours and over unpopulated areas. Unpowered "ultralights" (hang gliders, paragliders, etc.) are limited to a weight of 155 lb (70 kg) with extra weight allowed for amphibious landing gear and ballistic parachute systems.

In 2004 the FAA introduced the "Light-sport aircraft" category, which resembles some other countries' microlight categories.

In the United States no license or training is required by law for ultralights, but training is highly advisable. For light-sport aircraft a sport pilot certificate is required.

Ultralight aviation is represented by the United States Ultralight Association (USUA), which represents the US portion of the sport to the world through its affiliation with the FAI.

Types of aircraft

While ultralight-type planes date back to the early 1900s (such as the Santos-Dumont Demoiselle), there have been three generations of modern, fixed-wing ultralight aircraft designs, which are generally classed by the type of structure.

The first generation of modern ultralights were actually hang gliders with small engines added to them, to create powered hang gliders. The wings on these were flexible, braced by wires, and steered by shifting the pilot's weight under the wing.

The second generation ultralights began to arrive in the mid-1970s. These were designed as powered aircraft, but still used wire bracing and usually single-surface wings. Most of these have "2-Axis" control systems, operated by stick or yoke, which control the elevators (pitch) and the rudder (yaw) -- there are no ailerons, so may be no direct control of banking (roll). A few 2-Axis designs use spoilers on the top of the wings, and pedals for rudder control. Examples of 2-Axis ultralights are the "Pterodactyl" and the "Quicksilver MX".

The third generation ultralights, arriving in the early 1980s, have strut-braced wings and airframe structure. Nearly all use 3-Axis control systems, as used on standard airplanes, and these are the most popular. Third generation designs include the CGS Hawk, Kolb Ultrastar and Quad City Challenger.

There are several types of aircraft which qualify as ultralights, but which do not have fixed-wing designs. These include:

- **Weight-shift control trike** - while the first generation ultralights were also controlled by weight shift, most of the current weight shift ultralights use a hang glider-style wing, below which is suspended a three wheeled carriage which carries the engine and aviators. These aircraft are controlled by pushing against a horizontal control bar in roughly the same way as a hang glider pilot flies. Trikes generally have impressive climb rates and are ideal for rough field operation, but are slower than other types of fixed-wing ultralights.

- **Powered parachutes** - cart mounted engines with parafoil wings, which are wheeled aircraft.

- **Powered paragliding** - backpack engines with parafoil wings, which are foot-launched.

- **Powered hang glider** - motorized foot-launched hang glider harness.

- **Autogyro** - rotary wing with cart mounted engine, a gyrocopter is different from a helicopter in that the rotating wing is not powered, the engine provides forward thrust and the airflow through the rotary blades causes them to *autorotate* or "spin up" to create lift. Most of these use a design based on the Bensen B-8 gyrocopter.

- **Helicopter** - there are a number of single-seat and two-place helicopters which fall under the microlight categories in countries such as New Zealand. However, few helicopter designs fall within the more restrictive ultralight category defined in the United States of America. One example that does is the experimental Martin Jetpack.

- **Hot air balloon** - there are numerous ultralight hot air balloons in the US, and several more have been built and flown in France and Australia in recent years. Some ultralight hot air balloons are hopper balloons, while others are regular hot air balloons that carry passengers in a basket.

Electric powered ultralights

Research has been conducted in recent years to replace gasoline engines in ultralights with electric motors powered by batteries to produce electric aircraft. This has now resulted in practical production electric power systems for some ultralight applications. These developments have been motivated by cost as well as environmental concerns. In many ways ultralights are a good application for electric power as some models are capable of flying with low power, which allows longer duration flights on battery power.

In 2007 ElectraFlyer began offering engine kits to convert ultralight weight shift trikes to electric power. The 18 hp motor weighs 26 lb (12 kg) and an efficiency of 90% is claimed by designer Randall Fishman. The battery consists of a lithium-polymer battery pack of 5.6kwh which provides 1.5 hours of flying in the trike application. The power system for a trike costs USD $8285. to $11285. The company claims a flight recharge cost of 60 cents.

Safety

Historically, ultralights have had a poor safety reputation. Most of the early designs were fragile or unstable, and this resulted in a number of accidents.

As designs matured, pilot error was shown to be the cause of the vast majority of incidents involving ultralights. As a result, most countries now require an Ultralight Pilot's license/certificate, often regulated by one or more officially-delegated pilots' organizations. The United States does not require any training for ultralight pilots; however, experienced ultralighters are nearly unanimous in recommending that no one solo before receiving dual training. Instruction may be given in two-place light-sport versions of the ultralight. An instructor must be certified by the FAA to give dual instruction in a light-sport aircraft.

The build quality and airworthiness of ultralight aircraft (and homebuilt light-sport aircraft in the USA) can now equal that of Certified light aircraft. Some types satisfy both sets of requirements and are available for registration to either Ultralight or Certified status. When registered as an ultralight (or Experimental), the pilot is permitted to do more of the simple maintenance tasks, resulting in a lower cost of operation, although this comes at the cost of restrictions such as avoiding densely populated urban areas, bad weather, or night. Many older pilots are willing to trade these operational restrictions for a lower drain on their retirement incomes, and as a result many ultralights are now flown by experienced General Aviation (GA) pilots or ex-commercial pilots. One other reason for this increase in acceptance is that any pilot is "only one medical away from being an ultralight pilot" -- a reference to the requirement that most other pilots must pass periodic physical examinations, but not to fly ultralights.

The future

Ultralight/microlight aircraft were once regarded as "flying clotheslines", since early aircraft were typically completely open, wire, tube and rag aircraft – these aircraft were seldom used for anything more than local area flying.

However, ultralights are rapidly transforming into high performance aircraft, capable of very respectable speed and range. In recent years there has been a dramatic rise in the number of General Aviation pilots flying high performance ultralights due to the cost benefits.

These aircraft are now often referred to as recreational aircraft.

A rapidly growing area of the class is scale-replica "warbirds", such as the offerings from Titan Aircraft and Loehle Aircraft.

Chapter- 2

Australian Ultralight Aircrafts

Skycraft Scout

Skycraft Scout	
Role	Single seat ultralight aircraft
Manufacturer	Skycraft Pty Ltd, 152 Bellevue Road, Carton, NSW.
Designed by	Ron Wheeler
First flight	1972
Primary user	recreational flying
Produced	1976–1978
Number built	200 approx
Developed from	Tweetie hang glider

Scout displayed at the Australian Aviation Heritage Centre in Darwin

This modified and derelict Scout was spotted at Esk in Queensland in May 2008

Cec Anderson's prototype Mk1 Scout displayed at Australia's Museum of Flight, HMAS Albatross, in 2006.

Scout displayed at the Australian Aviation Museum, Bankstown.

The **Skycraft Scout** is an Australian designed and built single-seat, tail dragger, microlight airplane, used primarily for recreational aviation.

Design and development

In July 1972 a Sydney boat builder named Ron Wheeler made the first flight of a minimum aircraft which he'd designed and built himself, and which he later put into series production soon thereafter. At the time Ron was building Catamarans in Sydney's southern suburbs. Having already developed 'Tweetie', a successful hang glider, Wheeler simply modified the design of the glider to have the pilot seated instead of hanging below the wings, and of course to accommodate an engine.

Marketed as the Skycraft Scout, this was the world's first commercially produced ultra light – rigid wing rather than a Rogallo – and spawned a new Australian industry.

Ron had no experience in aircraft design and claims to have started the project on a whim in his spare time. Using sources referenced from the library at Sydney Technical College and Hurstville local Library he built up a working knowledge of aerodynamics.

The Scout was a factory-built minimum aircraft that utilised yacht fittings from his local marine shop. The early Scout was an extremely basic machine, which utilised Dacron sailcloth for the wing covering, lanyards and battens and an aluminium yacht mast as the wing spar. It was initially powered by a modified Victa lawnmower engine and, unlike a

conventional aeroplane, had only rudder and elevator controls. Nevertheless, on a good day, it usually flew.

Significantly, the Scout was the first ultralight aircraft to be covered by airworthiness regulations in the world, in this case-Australia's Air Navigation Order(ANO)95.10 issued by the Department of Transport. In 1975 Ron Wheeler approached The Department of Transport to issue an Air Navigation Order regulation for ultralight and minimum aircraft. Subsequently, the Department issued ANO 95.10 for unlicensed pilots to fly aircraft weighing less than 180 kilograms under a number of restrictive conditions, including altitude restrictions, and not to fly over sealed roads. This allowed the ultralight aircraft industry to take-off, and Wheeler went into full time production of the Scout as a leisure craft.

Specifications

General characteristics

- **Crew:** one pilot
- **Length:** ()
- **Wingspan:** 7.4 m ()
- **Height:** 1.9 m ()
- **Empty weight:** 49.4kg ()
- **Powerplant:** 1× Pixie 153 c.c. 2-stroke, single cylinder, 12 hp (9 kW)

Performance

- **Maximum speed:** 42 mph (78 km/h)
- **Range:** 40 minutes ()
- **Power/mass:** 2 ()

Australian Ultralight Industries Bunyip

Bunyip

Role	Ultralight
Manufacturer	Australian Ultralight Industries

The **Australian Ultralight Industries Bunyip** was an ultralight aircraft produced in South Australia. According to the Recreational Aviation Australia aircraft register, there are currently only two Bunyip aircraft registered in Australia as of 2007.

Specifications

General characteristics

- **Crew:** One pilot
- **Powerplant:** 1 × Rotax 503, 37 kW (53 hp)

Chapter- 3

Canadian Ultralight Aircrafts

Birdman Atlas

Atlas	
Role	Ultralight aircraft
National origin	Canada
Manufacturer	Birdman Enterprises
Designed by	Bob Lovejoy
Introduced	1980
Status	Production completed
Number built	more than 500
Developed from	Eipper Quicksilver

The **Birdman Atlas** is a single-seat, high wing, single engine in pusher configuration, ultralight aircraft that was based upon the Eipper Quicksilver design.

Development

The Atlas was introduced to the marketplace in 1980. Production was curtailed in about 1983 as the company concentrated on producing the newer Birdman WT-11 Chinook instead.

The Atlas was a development of the Quicksilver and as such incorporated many of the Quicksilver's features, such as a 6061-T6 aluminum-framed, single-surface Dacron-covered, wire-braced high wing, with the ground wires suspended from a kingpost. The fuselage structure was also built from 6061-T6 aluminum tube.

The early Atlas XC variants used weight shift for control supplemented with a rudder, whereas the later 3-A versions (for *3-Axis*) utilized a conventional control system with elevator and rudder, and spoilers for roll control.

Variants

Atlas 215 XC

Foot-launchable single place ultralight powered by a 20 hp (15 kW) 215 cc single cylinder Cuyuna 215 engine. Control system is weight shift, plus rudder. Landing gear includes a shimmy-damped, shock-absorbing tailwheel unit. Available in kit form.

Atlas 250 XC

Foot-launchable single place ultralight powered by a 25 hp (19 kW) 250 cc twin cylinder Rotax engine. Control system is weight shift, plus rudder. Landing gear includes a shimmy-damped, shock-absorbing tailwheel unit. Available in kit form.

Atlas 215 3-A

Non-foot-launchable single place ultralight powered by a 20 hp (15 kW) 215 cc single cylinder Cuyuna 215 engine. Conventional three-axis control system utilizing spoilers for roll-control. Seat is adjustable fore and aft for balance. Due to company concerns about rigging requirements it was only supplied as a completed aircraft.

Atlas 250 3-A

Non-foot-launchable single place ultralight powered by a 25 hp (19 kW) 250 cc twin cylinder Rotax engine. Conventional three-axis control system utilizing spoilers for roll-control. Due to company concerns about rigging requirements it was only supplied as a completed aircraft.

Specifications (Atlas 215 3-A)

General characteristics

- **Crew:** one
- **Length:** 14 ft 0 in (4.27 m)
- **Wingspan:** 32 ft 0 in (9.75 m)
- **Wing area:** 160 sq ft (15 m^2)
- **Aspect ratio:** 6.4
- **Empty weight:** 208 lb (94 kg)
- **Max takeoff weight:** 475 lb (215 kg)
- **Fuel capacity:** 2.8 US gallons (13 litres)
- **Powerplant:** 1 × Cuyuna 215 two stroke snowmobile engine, 20 hp (15 kW)
- **Propellers:** 2-bladed pusher propeller

Performance

- **Maximum speed:** 46 mph (74 km/h; 40 kn)
- **Cruise speed:** 41 mph (36 kn; 66 km/h)
- **Stall speed:** 20 mph (17 kn; 32 km/h)
- **Range:** 85 mi (74 nmi; 137 km)
- **Endurance:** 3 hours 6 minutes
- **Rate of climb:** 350 ft/min (1.8 m/s) at 2400 feet (732 m) with 150 lb (68 kg) pilot
- **Wing loading:** 3.1 lb/ft² (15 kg/m²)

Birdman Chinook

Chinook

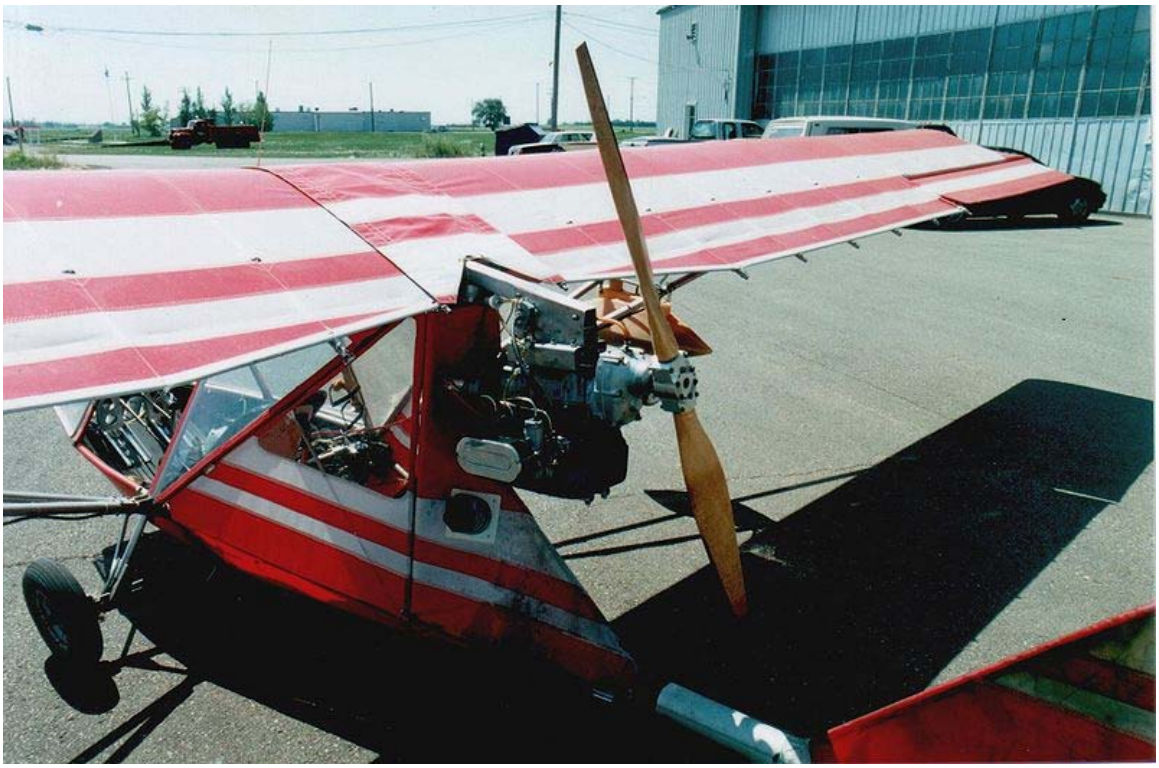
ASAP Chinook Plus 2

Role	Ultralight aircraft
National origin	Canada
Manufacturer	Aircraft Sales and Parts
Designed by	Vladimir Talanczuk
First flight	12 December 1982
Introduced	1983
Status	Kits in production
Number built	950 (2007)

Birdman Chinook 2S showing the pentagonal cockpit cross-section

Birdman Chinook 2S

Birdman Chinook 2S cockpit



Birdman Chinook 2S Rotax 503 engine installation

The **Birdman Chinook** is a family of single and two-place, pusher configuration, high-wing ultralight aircraft that was first flown on 12 December 1982 and produced by Birdman Enterprises of Edmonton, Alberta, Canada starting in 1983.

The Chinook design has evolved through several models over time and has been produced by two companies. Over 850 in total have been completed and flown and kits remain in production in the 21st century.

Design and development

Chinook WT-11

Design goals

The first Chinook model introduced was the single-seat WT-11, which entered the market in 1983. The WT-11 was the eleventh aircraft designed by Ukrainian-born aeronautical engineer Vladimir Talanczuk, a graduate of the Polish Institute for Aviation Specialists. The airfoil was developed by Dr Dave Marsden at the University of Alberta and is designated as the UA 80/1.

The company design goals for the WT-11 were:

- Good flying characteristics
- Simplicity of construction
- Maximization of aesthetics

Designer Talanczuk stated his own design intentions:

> “An Ultralight is not only a fun machine, it should also be usable for utility purposes —— training, fishing trips, crop-spraying and even for freight carrying. But an Ultralight should be affordable by many people, so it shouldn‘t become expensive. The wings, for example, can't be complicated. They should be easy to build and fix.”

The WT-11 was designed to comply with the then-new US FAR 103 *Ultralight Vehicles* category, including the maximum 254 lb (115 kg) empty weight. With the 28 hp (21 kW) Rotax 277 single cylinder, two stroke powerplant the aircraft has a factory standard empty weight of 250 lb (113 kg). The 35 hp (26 kW) Rotax 377 engine became quickly available as an option to give the aircraft more power on floats.

In 1987 the WT-11 was redesignated as the *Chinook 1S* (1 Seat) by the company to align its nomenclature with the later two-seat *Chinook 2S* model.

Construction

Talanczuk's design is a high-wing, enclosed cabin monoplane with a high aspect ratio wing of 8.75:1, giving a large wingspan of 35 feet (11 m). This gives the WT-11 a very low span-loading as well as a light wing loading. The glide ratio is 10:1 at 35 mph (56 km/h) and minimum sink is 350 fpm (1.78 m/s) at 32 mph (51 km/h). Chinooks have been soared power-off for long duration flights. The low-drag airframe and high aspect ratio wings gave remarkably good performance on the 28 hp (21 kW) Rotax 277 engine and the aircraft can cruise at 50 mph (80 km/h) burning 1.5 US gallons per hour (5.7 litres/h) of automotive fuel, giving a range of 200 miles (320 km) on 5 US gal (19 l) of fuel.

The aircraft is constructed entirely from 6061-T6 aluminium tubing, bolted together with aircraft-grade AN hardware and covered with 3.9 oz/yd² (132 g/m²) Dacron. The covering includes zippers to facilitate inspection. The structure was static load tested to +6/-3 g. The fuselage is built on a 4 in (10 cm) central "spinal" tube that supports the cockpit and the tail surfaces. The cockpit is of a unique pentagonal cross-section that provides a very wide 38 in (97 cm) cabin at hip level. The upper cockpit tubing curves down to the aircraft's nose at a ratio of 3:1 to provide a compromise between internal cockpit space and streamlining and gives the Chinook its distinctive profile.

The landing gear is of conventional configuration, with bungee suspension, giving good rough field capabilities. The enclosed cabin includes a cargo area that is located on the aircraft's center of gravity, eliminating trim changes as the load varies.

The wing is a two-spar design, supported by a "V" strut and jury struts. The wing has internal lift and drag bracing wires. The ailerons were originally designed to be "gapless", with the wing's Dacron covering extending over the ailerons. This is sometimes referred to as wing warping, but it differs from that employed on pioneer aircraft. In 1986 the company abandoned the "gapless" aileron design and moved to a more conventional separate aileron. Conversion kits for the existing aircraft fleet were made available. The WT-11's wings are removable by two people in 15 minutes. The tail surfaces use a similar sealed-gap system, utilizing seamless transitions from the fixed fin and horizontal stabilizer to the movable rudder and elevator.

The factory claimed that construction time from the assembly kit was 100 hours for a first time builder. The price for a WT-11 in 1984 was Can$7995 (US$6395).

Test flying

Test flying the WT-11 was carried out following the first flight on 12 December 1982 at Wizard Lake, Alberta, by company chief test pilot Dennis Maland.

Initial results showed that with the 28 hp (21 kW) Rotax 277 engine the aircraft would sustain level flight at low throttle settings and would cruise comfortably at 50 mph (80 km/h). The stall speed was noted as 23-25 mph (37–41 km/h). Maland rated the rudder

and elevators as "very responsive" and the ailerons as "less sensitive but good", with roll rates from 45-45 degrees of 3.5 seconds at cruise speed.

Cross wind testing showed the aircraft was controllable in winds of 20 mph (32 km/h) at 45 degrees and 15 mph (24 km/h) at 90 degrees. The aircraft was flown in 35 mph (56 km/h) surface winds safely. Take-off roll was recorded as 100–200 feet (31–62 m) and distance to clear a 50 ft (15 m) obstacle was 200–300 feet (62–93 m) at 2,500 ft (762 m) above sea level.

Extensive stall and spin testing was carried out at Wizard Lake on 28 December 1982. Straight-ahead and turning power off stalls resulted in a stable mush condition. Power-on stalls from 30 degrees nose up resulted in a +15 degree nose up stable mush, with no wing drop tendency. A near-vertical pitch resulted in a clean stall, with a smooth pitch forward and recovery to level flight with no wing drop tendency.

Spin testing entered from level flight, snap rolls and turning stalls failed to produce a spin condition as the WT-11 just mushed to level flight. These tests resulted in the company billing the aircraft as "Won't Spin".

The remaining flight testing established the service ceiling as 15,000 ft (4,572 m) and the absolute ceiling as 18,400 ft (5,608 m). Many dives to the V_{NE} of 85 mph (137 km/h) were completed without deformation, flutter or instability. Outside loops, rolls, snap rolls, stall turns, tail slides and inverted flight were all completed as test procedures, although the company recommended against customers from conducting these manoeuvres.

Floats

The WT-11 was tested on fiberglass floats, mounted close to the fuselage. Company testing showed take-off distances of about 300 feet (91 m) on the water and no need for additional vertical surfaces to be added.

Chinook 2S

Building on the success of the single-seat Chinook, Birdman introduced the two place Chinook 2S (*2 seater*) in 1984 and it quickly gained popularity as an ultralight trainer and also as a recreational aircraft. The 2S combined the WT-11's ease of handling, docile stall characteristics and spin-proofness with the reliable Rotax 447 42 hp (31 kW) and later the Rotax 503 50 hp (37 kW) engine. One flight review writer noted "The stall was the most benign that I have even seen in any airplane. At full back stick, it just mushes downward slowly with the nose level, at about 200-400 rpm. Releasing the stick returns the Chinook to flying with little altitude loss."

The construction of the 2S is similar to the WT-11, with the wingspan increased by 2.0 ft (0.6 m) and the same fuselage as the WT-11, with the second seat where the WT-11's baggage area is located. The fuel tank was relocated from the fuselage to both wing struts

as aerodynamically-shaped plastic tanks, where they are visible in flight and the fuel level can be quickly determined. Some WT-11s have had these strut tanks installed as well.

In assessing the handling of the 2S one reviewer wrote:

> “Pitch proved to be neutrally stable – it just stayed where it was put. The ailerons were the same. In a bank, the Chinook was just happy to stay at that bank angle, neither rolling itself out nor overbanking. The yaw axis was interesting – it remained slightly stable with feet on the pedals, but with feet off and the rudder removed from the fin effect as it floated, the aircraft was unstable. In this mode it slowly diverged from the direction desired, but was easy to control with the feet where they belong on the pedals. Clearly this is an aircraft that requires attention in flight, but I found that the overall effect is that it feels sprightly, not unstable.”

The two models of the Chinook built by Birdman were only in production for five years before the company went out of business in late 1987, but close to 700 aircraft were delivered in that time. The kits were made at the Canadian Ultralight Manufacturing facility in St Paul, Alberta.

Chinook Plus 2

ASAP Chinook Plus 2

ASAP Chinook Plus 2

One of the owners of a Chinook 2S at the time Birdman Enterprises went out of business was Brent Holomis. Seeing the opportunity to step in and provide parts for the fleet he founded Aircraft Sales and Parts (ASAP) in 1988, in Vernon, British Columbia. Initially ASAP concentrated on supplying parts, but with assistance from the University of Alberta Holomis redesigned the aircraft. The new model, a two-seater introduced in 1989 was designated the *Chinook Plus 2* and incorporated an all new wing of reduced span (32 ft (10 m) versus the 2S's 37 ft (11 m)) and lower aspect ratio with a greater number of ribs and covered with Ceconite in place of untreated Dacron. The wing features flaperons. The new model has a completely new landing gear and many other improvements over the 2S and is built by Canadian Ultralight Manufacturing, which ASAP acquired. The Plus 2 retains the strut-mounted fuel tanks introduced on the 2S.

The Chinook Plus 2 is available in kit form with a large number of engine options, including the 50 hp (37 kW) Rotax 503, the four-stroke 60 hp (45 kW) HKS 700E, the 64 hp (48 kW) Rotax 582 and the 80 hp (60 kW) Rotax 912. The heavier engines, particularly the Rotax 912, have been noted as changing the aircraft's handling characteristics and making the aircraft less stable in pitch and yaw.

> The Chinook Plus 2 [with the 912 engine] is definitely not a beginner's airplane and [ASAP factory demonstration pilot] Larry [Williams] reports that students take quite a bit of extra time to adapt to its handling. The plane is very responsive to control inputs and exhibits close to neutral static stability in roll. The pitch and yaw axes both exhibit notable negative static stability and the aircraft likes to diverge from straight and level flight in both pitch and yaw. It isn't hard to control, and many aerobatic planes are similarly unstable, but it is an airplane that needs to be flown positively at all times and so would make a less than ideal trainer or plane for a low time pilot.

With the four-stroke HKS 700E engine the Plus 2 has a top speed af 90 mph (145 km/h) and a high cruise of 80 mph (129 km/h), with a 65 mph (105 km/h) economy cruise, burning only about 2 US gal (8 l) per hour, giving a five hour endurance with standard tanks. Solo power off stalls are 35 mph (56 km/h) and are "mild and uneventful". The aircraft has a very low power off sink rate of about 350 fpm (1.78 m/s).

The Plus 2 initially had a gross weight of 900 lb (408 kg), but this was progressively increased to its present 1,050 lb (476 kg).

Reviewer Dan Johnson writing in *EAA Sport Pilot & Light Sport Aircraft Magazine* in January 2008, described the Chinook Plus 2 with the HKS 700E engine:

> Though the Chinook's wide cockpit gives it a pudgy appearance from some vantage points, the design slips through the air quite well. It has light and powerful ailerons, which makes it easy to guide through the air. In general, the plane's handling is quite pleasant despite, or perhaps because of, its unorthodox shape.

The factory claims that a first time builder can complete the Chinook Plus 2 in 220 hours of labour.

Operational history

The Chinook WT-11 design won Reserve Grand Champion at AirVenture in 1983 and again in 1984.

In August 1983 test pilot Dennis Maland flew a WT-11 with the standard Rotax 277 engine to a height of 18,500 ft (5,639 m).

In November 1984 Jack Hughes flew a WT-11 across the width of Australia from Orange, New South Wales to Perth, Western Australia, in 14 days and 49 flying hours, a distance of 2,050 nmi (3,797 km).

In 1993 a 64 hp (48 kW) Rotax 582-powered Chinook Plus 2 on skis and Full Lotus Floats was used by the National Geographic Society in filming a television special about marine mammals in the Canadian Arctic.

Variants

Chinook WT-11-277
: Single seat, powered by a 28 hp (21 kW) Rotax 277, produced by Birdman Enterprises 1983-1986.

Chinook WT-11-377
: Single seat, powered by a 35 hp (26 kW) Rotax 377, produced by Birdman Enterprises 1984-1986.

Chinook 1S
: Later designation for the WT-11, to align is nomenclature with the *2S*. Single seat, powered by a 28 hp (21 kW) Rotax 277 or optionally a 35 hp (26 kW) Rotax 377, produced by Birdman Enterprises 1987.

Chinook 2S
: Two seat, powered by a 42 hp (31 kW) Rotax 447 or 50 hp (37 kW) Rotax 503, produced by Birdman Enterprises 1984-1987.

Chinook Plus 2
: Two seat, powered by a 50 hp (37 kW) Rotax 503, 60 hp (45 kW) HKS 700E, 64 hp (48 kW) Rotax 582 or 80 hp (60 kW) Rotax 912, produced by ASAP 1989-present.

Specifications (Chinook WT-11)

General characteristics

- **Crew:** One
- **Length:** 17 ft 6 in (5.34 m)
- **Wingspan:** 35 ft 0 in (10.68 m)
- **Height:** 5 ft 10 in (1.78 m)
- **Wing area:** 140 sq ft (13.0 sq m)
- **Airfoil:** University of Alberta UA 80/1
- **Empty weight:** 250 lb (113 kg)
- **Useful load:** 375 lb (170 kg)
- **Max takeoff weight:** 625 lb (283 kg)
- **Powerplant:** 1× Rotax 277, 28 hp (21 kW)
- **Propeller diameter:** 54 inch (1.37 m)

Performance

- **Never exceed speed:** 85 mph (138 km/h)
- **Maximum speed:** 60 mph (97 km/h)
- **Cruise speed:** 50 mph (81 km/h)
- **Stall speed:** 24 mph (39 km/h)
- **Range:** 200 sm (324 km)

- **Service ceiling:** 15,000 ft (4575 m)
- **Rate of climb:** 700 fpm (3.6 m/s)
- **Wing loading:** 4.5 lb/sq ft (21.8 kg/sq m)
- **Power/mass:** 22.3 lb/hp (0.07 kW/kg)
- **Load factors:** +6/-3 g

Canaero Toucan

Toucan

Role	Ultralight aircraft
National origin	Canada
Manufacturer	Canaero Dynamics Aircraft
Designed by	Peter Corley
First flight	September 1983
Introduction	January 1986
Primary user	private owners

The **Canaero Toucan** is a Canadian high-wing, two seats in tandem, twin engine push-pull configuration, twin-boom ultralight kit aircraft that was produced from 1983 to the late 1980s by Canaero Dynamics Aircraft of Rexdale, Ontario.

The Toucan greatly resembles an ultralight Cessna Skymaster.

Development

The Toucan design work started in January 1983 and was completed in April of the same year, with the first flight of the prototype in September 1983. Construction of the first pre-production aircraft was started in July 1985 with the first production aircraft flying in January 1986.

Four prototypes/pre-production aircraft were completed, which were followed by a run of twelve Toucans, all completed by June 1986. A second batch of 25 aircraft were planned to have been completed by November 1986 as well.

The Toucan design features a strut-braced high wing built from aluminum covered with aircraft fabric. The wing's leading edge is of "D" cell construction and has fiberglass wing tips. Flight controls are conventional three-axis with full-span flaperons and twin rudders. The fuselage is constructed from welded 4130 steel tube. When originally delivered an airframe parachute was standard.

The landing gear is of tricycle gear configuration with the main gear legs of sprung steel and brakes are standard equipment. Wheel pants, skis and pontoons were optional.

The original engines were 28 hp (21 kW) Rotax 277s with 35 hp (26 kW) Rotax 377 engines as optional, although some aircraft have been modified with larger engines.

Operational history

In Canada Toucans are registered as basic ultralights which prohibits passenger-carrying. Both seats can only be occupied by a student and instructor or two licensed pilots.

In November 2009 there were still five Toucans registered in Canada.

Specifications (Toucan T-IV)

General characteristics

- **Crew:** one
- **Capacity:** one passenger
- **Length:** 18 ft 11.75 in (5.7848 m)
- **Wingspan:** 38 ft 6 in (11.73 m)
- **Height:** 9 ft 4 in (2.84 m)
- **Wing area:** 182 sq ft (16.9 m^2)
- **Empty weight:** 393 lb (178 kg)
- **Gross weight:** 900 lb (408 kg)
- **Powerplant:** 2 × Rotax 277 single cylinder two-stroke aircraft engine, 28 hp (21 kW) each

Performance

- **Maximum speed:** 75 mph (121 km/h; 65 kn)
- **Cruise speed:** 65 mph (56 kn; 105 km/h)
- **Stall speed:** 24 mph (21 kn; 39 km/h)
- **Range:** 170 mi (148 nmi; 274 km)
- **Service ceiling:** 10,000 ft (3,048 m)
- **G limits:** +6/-3
- **Rate of climb:** 1,150 ft/min (5.8 m/s) solo, 165 lb pilot
- **Wing loading:** 4.95 lb/ft² (24.2 kg/m²)

Fisher FP-202 Koala

FP-202 Koala & Super Koala

FP-202 Koala

Role	Kit aircraft
National origin	Canada
Manufacturer	Fisher Flying Products
First flight	FP-202: 1981 Super Koala: 1982
Number built	FP-202: 325 (2004) Super Koala: 100 (2004)
Developed from	Piper J-3

Detail of FP-202 internal structure

The **Fisher FP-202 Koala** and **Super Koala** are a family of Canadian single and two seat high wing, conventional landing gear, single engined light kit aircraft designed for construction by amateur builders. Both aircraft were inspired by the design of the Piper J-3 Cub and strongly resemble that design.

Fisher Flying Products was originally based in Edgeley, North Dakota, USA but the company is now located in Woodbridge, Ontario, Canada.

Development

The FP-202 was designed by Fisher Aircraft in the United States in 1981 and was intended to meet the requirements of the US FAR 103 *Ultralight Vehicles* category, including that category's maximum 254 lb (115 kg) empty weight. The design goal was to provide ultralight pilots with an aircraft that looked like and flew like the classic Piper Cub, without the regulation that goes with owning a type certified aircraft. The FP-202 can achieve an empty weight of 250 lb (113 kg) when equipped with a light weight, two-stroke engine.

The Super Koala was first flown in 1983 and has two side by side seats arrangement. With its 400 lb (181 kg) empty weight and 830 lb (376 kg) maximum gross weight, the Super Koala was intended for the US Homebuilt aircraft category.

The construction of the FP-202 and Super Koala are unusual for aircraft in their class. The aircraft's structure is entirely made from wood, with the wooden fuselage built from wood strips arranged in a geodesic form, resulting in a very strong and light aircraft with redundant load paths. Like the Cub, both the wings and fuselage on the Koalas are covered with doped aircraft fabric. The wings are strut-braced and utilize jury struts. The landing gear is bungee suspended and the tail wheel is steerable. The Super Koala has flaps and brakes are optional on both designs. The company claims it would take the amateur constructor between 250-500 hours to build the FP-202 and 500 hours for the Super Koala.

Variants

FP-202 quarter front view

FP-202 Koala

Single seat, high wing ultralight aircraft, standard empty weight 250 lb (113 kg) with 28 hp (21 kW) Rotax 277 engine

Super Koala

Two seat side by side, high wing homebuilt aircraft, standard empty weight 400 lb (181 kg). Engine options are the 50 hp (37 kW) Rotax 503 and the 64 hp (48 kW) Rotax 582 engine. With the Rotax 503 the gross weight is 740 lb (336 kg) and with the Rotax 582 is 830 lb (376 kg).

Specifications (Super Koala)

FP-202 instrument panel

General characteristics

- **Crew:** one
- **Capacity:** one passenger
- **Length:** 18 ft 1 in (5.52 m)
- **Wingspan:** 31 ft 0 in (9.46 m)
- **Height:** 5 ft 7 in (1.70 m)
- **Wing area:** 140 sq ft (13.02 sq m)
- **Empty weight:** 400 lbs (181 kg)
- **Useful load:** 430 lb (195 kg)
- **Max takeoff weight:** 830 lbs (376 kg)
- **Powerplant:** 1× Rotax 582 two cylinder, two-stroke piston engine, 64 hp (48 kW)

Performance

- **Never exceed speed:** 95 mph (154 km/h)
- **Cruise speed:** 75 mph (122 km/h)

- **Stall speed:** 32 mph (52 km/h)
- **Rate of climb:** 1100 fpm (5.6 m/s)
- **Wing loading:** 5.92 lb/sq ft (28.88 kg/sq m)
- **Power/mass:** 12.96 lb/hp (0.13 kW/kg)

Murphy Renegade

Renegade

Renegade II

Role	Kit aircraft
National origin	Canada
Manufacturer	Murphy Aircraft
Designed by	Darryl Murphy
Produced	1984-present

Renegade Spirit with Rotax 618 engine

The **Murphy Renegade** is a family of Canadian two-seats-in-tandem, single engine, conventional landing gear, biplanes, produced by Murphy Aircraft and intended for amateur construction.

In Canada all Renegade variants are eligible to be registered as amateur-builts, basic ultralights or advanced ultralights. In the USA the Renegade is not on the list of Special light-sport aircraft, but is eligible for the Experimental - Amateur-built category.

Development

The Renegade was designed as the result of an accident. Darryl Murphy is a mechanical engineering technologist who designed and built a rigid wing hang glider in 1978 as a school project while attending the Saskatchewan Institute of Applied Science and Technology in Saskatoon, Saskatchewan. In 1984 Murphy was in a non-aviation accident that left him hospitalized for four months. During his recovery time he decided to design a biplane to fit into the then-new Canadian ultralight category. The resulting aircraft, C-IDJY, is a single-seat model and was intended as a one-off aircraft for his own use, with no production intentions. Murphy named it the *Renegade*.

After taking the aircraft to a number of fly-ins and other aviation events, Murphy was encouraged by the large number of people who wanted him to build one for them. In 1985 he quit his job and started *Murphy Aviation* (later renamed Murphy Aircraft Manufacturing), with his brother Bryan and located the company in Chilliwack, British

Columbia. The original Renegade design was turned into a two-seater by relocating the fuel tank from the centre fuselage to the upper wing, installing a second seat and designating it *Renegade II*. Initial sales were disappointing as only one kit was sold in the first six months. Sales improved greatly once the aviation press began reviewing the aircraft. By 1986 the company had a backlog of orders, including many from outside North America. Murphy displayed the Renegade at the EAA Convention, Oshkosh and returned to Chilliwack with a substantial order book. During 1989 sales totalled 129 Renegade IIs.

The Renegade two was initially offered to buyers in six different configurations:

- Plans only
- Partial materials kits
- Full materials kit
- Complete kit, unassembled
- Quick-build kit
- Fully assembled aircraft

In May 1987 a new version of the basic Renegade design first flew. Named the *Renegade Spirit* it added a radial engine-style round cowling and additional fuselage stringers to give the aircraft a rounded look. The standard engine was the 64 hp (48 kW) Rotax 532 and later the Rotax 582 of the same output, with the 80 hp (60 kW) four-stroke Rotax 912UL added as a later option. Fibreglass wheel pants are also an option.

Design

The Renegade fuselage is constructed of aluminium square tubing extrusions and fittings, fastened with Avex rivets. The turtle deck and engine cowling are made from fibreglass. The fin, rudder, horizontal stabilizer and elevators are built from aluminum tubing and channel sections. The tail is wire-braced. A manual trim tab mounted on the elevator is an option. The landing gear is of conventional configuration and incorporates bungee suspension. The welded engine mount is 4130 steel.

The Renegades's wings have a positive stagger and incorporate a single faired interplane strut and cabane struts as well as wire-bracing. The top wing has a span of 21 ft (6.4 m) and incorporates a 10 degree sweep to improve visibility from the pilot's back seat, accessibility for the front seat passenger and reduces adverse yaw. The lower wing has 3 degrees of dihedral. Ailerons are of the Friese type, with two ailerons on the lower wing standard and four ailerons optional. The front wing spar was initially a 3 in (7.6 cm) aluminum tube and the rear spar is "C" channel. Starting 1 January 1989 the front spar was changed to a rectangular spar and an outboard drag brace was added, increasing wing rigidity. The ribs are stamped aluminum and mate with an aluminium sheet leading edge. All surfaces are covered with aircraft fabric. Controls are via torque tubes.

The Renegade II wing design was sand-bag tested on 16 February 1988 to 4,050 lb (1,837 kg), or +7.2 g working load, with a +10 and -6 gs ultimate load.

The company indicates that construction time varies between 300-500 hours, depending on builder experience.

Operational history

Renegades have been equipped with floats for operations from water.

Variants

Renegade Spirit

Renegade
: Single seat prototype, one built, powered by a 40 hp (30 kW) Rotax 447 powerplant.

Renegade II
: Two seat biplane, powered by a 50 hp (37 kW) Rotax 503 or 64 hp (48 kW) Rotax 532.

Renegade Spirit
: Two seat biplane with round cowling, powered by a 64 hp (48 kW) Rotax 532 or Rotax 582 or 80 hp (60 kW) four-stroke Rotax 912UL

Aircraft on display

- Kalamazoo Aviation History Museum - Renegade Spirit

Specifications (Renegade II)

General characteristics

- **Crew:** one
- **Capacity:** one passenger
- **Length:** 18 ft 5 in (5.61 m)
- **Upper wingspan:** 21 ft 0 in (6.40 m)
- **Lower wingspan:** 19 ft 8 in (5.99 m)
- **Height:** 6 ft 5 in (1.96 m)
- **Wing area:** 153 sq ft (14.2 m^2) (168 sq feet with optional rounded wing tips)
- **Empty weight:** 375 lb (170 kg)
- **Gross weight:** 850 lb (386 kg)
- **Fuel capacity:** 14 US gallons (53 litres)
- **Powerplant:** 1 × Rotax 503 two cylinder, two-stroke aircraft engine, 50 hp (37 kW)
- **Propellers:** 2-bladed ground adjustable

Performance

- **Maximum speed:** 85 mph (137 km/h; 74 kn)
- **Cruise speed:** 75 mph (65 kn; 121 km/h)
- **Stall speed:** 36 mph (31 kn; 58 km/h)
- **Never exceed speed:** 120 mph (100 kn; 190 km/h)
- **Range:** 282 mi; 454 km (245 nmi)
- **G limits:** +10/-6 (ultimate)
- **Rate of climb:** 700 ft/min (3.6 m/s)

Blue Yonder EZ Harvard

EZ Harvard

The prototype EZ Harvard

Role	Kit plane
National origin	Canada
Manufacturer	Blue Yonder Aviation
Designed by	Wayne Winters
First flight	2002
Introduced	2002
Primary user	Private owners
Number built	1
Developed from	EZ King Cobra

The EZ Harvard prototype

The **Blue Yonder EZ Harvard** is a Canadian designed and built, single-engined, single-seat aircraft provided as a completed aircraft or in kit form by Blue Yonder Aviation. The aircraft is a 75% scale replica of the North American Harvard trainer of the Second World War.

The aircraft can be constructed in Canada as a basic ultra-light, or amateur-built aircraft, but is not currently available as an advanced ultra-light.

Development

The EZ Harvard was designed by Wayne Winters of Indus, Alberta and based on the earlier EZ King Cobra. The project was started as a customer request for a scale Harvard replica and was later offered as a commercially available kit aircraft.

Winters created the EZ Harvard by using the cantilever wing design from the EZ King Cobra and added 4 feet (1.2 m) additional span, to increase the wingspan to 31 feet (9.4 m) and the wing area to 176 sq ft (16.4 m^2). The fuselage was redesigned to give the round cross section, glazed canopy and distinctive fin shape of the original Harvard. The aircraft retained the Junkers ailerons of the original Merlin wing along with the Clark "Y" airfoil and construction featuring a leading edge "D" cell and foam ribs. The fuselage is

constructed of welded 4130 steel tube. Even though the Harvard was originally a two-seat aircraft the EZ Harvard is a single seater with the prototype powered by a Rotax 582 two stroke engine of 64 hp (48 kW).

The prototype of the new design flew in 2002. In the basic ultralight version gross weight is limited to the category maximum of 1,200 lb (544 kg).

The EZ Harvard has a large round cowling that can accommodate a variety of powerplants:

- Rotax 503 50 hp (37 kW)
- Rotax 582 64 hp (48 kW)
- Rotax 912 80 hp (60 kW)

Operational history

Despite being widely demonstrated no further orders have been received for the type and the prototype remains the sole flying example.

Specifications (Rotax 582)

General characteristics

- **Crew:** one
- **Length:** 21 ft (6.4 m)
- **Wingspan:** 31 ft (9.5 m)
- **Height:** 7 ft (2.1 m)
- **Wing area:** 176 sq ft (16.4 sq m)
- **Airfoil:** Clark Y
- **Empty weight:** 495 lb (224 kg)
- **Loaded weight:** 1200 lb (544 kg)
- **Useful load:** 705 lb (320 kg)
- **Powerplant:** 1× Rotax 582 fixed pitch, 64 hp (48 kW)
- **Propellers:** 1 propeller, 1 per engine

Performance

- **Maximum speed:** 100 mph (162 km/h)
- **Cruise speed:** 90 mph (146 km/h)
- **Stall speed:** 40 mph (65 km/h)
- **Range:** 380 sm (615 km)
- **Service ceiling:** 12,000 ft (3660 m)
- **Power/mass:** 18.75 lb/hp (0.09 kW/kg)

Chapter- 4

Czech Republic Ultralight Aircrafts

InterPlane Griffon

Griffon	
Role	Ultralight aircraft
National origin	Czech Republic
Manufacturer	InterPlane Aircraft
Introduced	1992
Status	Production completed

The **InterPlane Griffon** is a single seat, high wing, single engine, pusher configuration, tricycle gear ultralight aircraft, that was produced in kit form from InterPlane Aircraft of Zbraslavice, Czech Republic.

Development

The Griffon was the first design produced by InterPlane when they opened for business in 1992. The Griffon was designed for the requirements of the US FAR 103 *Ultralight Vehicles* category, including that category's maximum 254 lb (115 kg) empty weight.

The Griffon airframe is constructed from aluminum tubing, with the wings and tail covered with doped aircraft fabric. The wing is supported by a "V" strut and utilizes jury struts. It features a three tube tail that allows the pusher propeller to be located in between the tail booms. Standard features supplied included brakes, electric starting, wheel pants, elevator trim system and a plastic cockpit pod fairing with a windshield. The wings and tail surfaces can be folded for trailering or storage.

Available engines included the 40 hp (30 kW) Rotax 447 and the 50 hp (37 kW) Rotax 503.

Variants

Griffon

Basic version equipped with 40 hp (30 kW) Rotax 447, empty weight 254 lb (115 kg).

Griffon EX

Deluxe version equipped with 50 hp (37 kW) Rotax 503, empty weight 342 lb (155 kg).

Specifications (Griffon EX)

General characteristics

- **Crew:** one
- **Length:** 18 ft 9 in (5.72 m)
- **Wingspan:** 32 ft 11 in (10.03 m)
- **Height:** 7 ft 2 in (2.18 m)
- **Wing area:** 150.3 sq ft (13.96 m^2)
- **Empty weight:** 342 lb (155 kg)
- **Gross weight:** 606 lb (275 kg)
- **Fuel capacity:** 5 US gallons (19 litres)
- **Powerplant:** 1 × Rotax 503 twin cylinder two-stroke aircraft engine, 50 hp (37 kW)

Performance

- **Maximum speed:** 87 mph (140 km/h; 76 kn)
- **Cruise speed:** 59 mph (51 kn; 95 km/h)
- **Stall speed:** 30 mph (26 kn; 48 km/h)
- **Never exceed speed:** 90 mph (78 kn; 140 km/h)
- **Range:** 124 mi (108 nmi; 200 km)
- **Rate of climb:** 1,181 ft/min (6.00 m/s)
- **Wing loading:** 4.0 lb/ft² (20 kg/m²)

InterPlane Skyboy

Skyboy

Role	Ultralight aircraft & Light-sport aircraft
National origin	Czech Republic
Manufacturer	InterPlane Aviation
First flight	1992
Introduced	1992
Status	In production

The **InterPlane Skyboy** is a two seat, side-by-side, high wing, single engine, pusher configuration ultralight aircraft that is manufactured as a completed aircraft by InterPlane Aircraft of Zbraslavice, Czech Republic.

Development

Interplane Skyboy - front view showing the unusual main landing gear

Interplane Skyboy - showing doors and interior accommodation

The Skyboy was designed in 1992 specifically for the German market as a trainer. It was adapted for the US FAR 103 *Ultralight Vehicles* category for use as a two-seat trainer under the FAR 103 trainer exemption. It later became available as a US Light-sport aircraft. The aircraft is available in Canada as an Advanced Ultralight Aeroplane.

The Skyboy wing is built from aluminum extrusions for the spars and wing ribs and covered with doped aircraft fabric. The wing's leading edge is Mylar covered in fabric, to increase stiffness. The wing is supported by "V" struts and utilizes jury struts. The fuselage is built upon an aluminum main tube that runs from the tail right to the rudder pedals. The wings and horizontal tail surfaces can be folded for trailering or storage. The cabin is constructed from two fibreglass shells, joined together. The rear of the cabin is covered in aircraft fabric. The optional cabin doors open upwards.

Controls are conventional three-axis. The control stick is a centrally mounted "Y" stick, between the two seats that can be used from either seat.

The Skyboy has a distinctive main landing gear, consisting of a trailing idler link, with suspension consisting of a coil spring mounted over a shock absorber. The company describes the main landing gear: "one of the best landing gears in the market (makes bad landings look good)".

The available engines include the 64 hp (48 kW) Rotax 582, 80 hp (60 kW) Rotax 912, 100 hp (75 kW) Rotax 912S and the 85 hp (63 kW) Jabiru 2200. The 50 hp (37 kW) Rotax 503 was available at the beginning of production, but did not provide adequate performance.

The Skyboy has never been available as a kit aircraft, but only as a factory-complete, ready-to-fly product. Labour wage levels in the Czech Republic have meant that its price has been generally similar to buying unassembled kits for North American buyers. In 2008 the completed Skyboy base model sold for about US$60,000.

Operational history

Aside from its flight training and recreational aircraft roles, the Skyboy has been employed in South Africa for surveillance duties, in Australia for professional aerial photography and in Mexico for tourist sightseeing flights.

Variants

Skyboy UL
: To stay below the exemption's 496 lb (225 kg) empty weight limit the aircraft was marketed without cabin doors, wheel pants and hydraulic brakes, using mechanical brakes instead and with a 904 lb (410 kg) gross weight. The initial engine was the 50 hp (37 kW) Rotax 503 and later the 64 hp (48 kW) Rotax 582.

Skyboy S
: Higher 1,232 lb (559 kg) gross weight version for Europe and Canada, with the 64 hp (48 kW) Rotax 582 or larger engines.

Skyboy ZK
: 1,000 lb (454 kg) gross weight version, with the 64 hp (48 kW) Rotax 582 engine.

Specifications (Skyboy S)

General characteristics

- **Crew:** one
- **Capacity:** one passenger
- **Length:** 20 ft 0 in (6.10 m)
- **Wingspan:** 34 ft 5 in (10.49 m)
- **Wing area:** 163.6 sq ft (15.20 m^2)
- **Empty weight:** 490 lb (222 kg)
- **Gross weight:** 1,000 lb (454 kg)
- **Fuel capacity:** 10 US gallons (38 litres)
- **Powerplant:** 1 × Rotax 582 twin cylinder two-stroke aircraft engine, 64 hp (48 kW)

Performance

- **Maximum speed:** 90 mph (140 km/h; 78 kn)

- **Cruise speed:** 68 mph (59 kn; 109 km/h)
- **Stall speed:** 40 mph (35 kn; 64 km/h)
- **Never exceed speed:** 128 mph (111 kn; 206 km/h)
- **Range:** 200 mi (174 nmi; 322 km)
- **Service ceiling:** 9,000 ft (2,743 m)
- **Maximum glide ratio:** 7:1
- **Rate of climb:** 630 ft/min (3.2 m/s)

Chapter- 5

French Ultralight Aircrafts

Croses Pouplume

Pouplume	
Role	Ultralight
Manufacturer	homebuilt
Designed by	Emilien Croses
First flight	1960

The **Croses *Pouplume*** ("lousefeather") was an unusual ultralight aircraft developed in France in the 1960s. Inspired by Henri Mignet's Pou-du-Ciel design with its distinctive tandem wing layout, Croses set out to develop a similar aircraft to be powered by a single-cylinder motorcycle engine of around 6 kW (8 hp). The resulting machine, designated the **EC-1** weighed only 108 kg (238 lb) empty, and flew around 1960. Like the Pou-du-Ciel, the Pouplume dispensed with traditional ailerons and elevators and pivoted the entire forward wing to provide pitch control.

The **EC-1** was followed by the **EC-2**, a two-seat version powered by a conventional aero-engine, and the **EC-3**, the definitive version marketed for homebuilding, again powered by a motorcycle engine. At least twelve examples of the latter had flown by 1977. A further development, the **Pouplume Sport** was intended to be powered by a 1500 cc Volkswagen air-cooled engine, and featured wings of reduced span. About 55 of this version were known to be under construction in 1977.

Specifications (typical EC-3)

General characteristics

- **Crew:** One pilot
- **Length:** 4.70 m (15 ft 3 in)
- **Wingspan:** 7.8 m (25 ft 7 in)
- **Height:** 1.80 m (5 ft 11 in)
- **Wing area:** 16.0 m² (172 ft²)

- **Empty weight:** 110 kg (243 lb)
- **Gross weight:** 220 kg (485 lb)
- **Powerplant:** 1 × Monet-Goyon motorcycle engine, 6 kW (8 hp)

Performance

- **Maximum speed:** 70 km/h (44 mph)

Aviasud Mistral

Mistral

Role	Ultralight biplane
National origin	France
Manufacturer	Aviasud Engineering
First flight	1985
Introduced	1986
Number built	250+ (1999)

The **Aviasud Mistral** is a French two-seat ultralight biplane built by Aviasud Engineering. This plane is notable as it has forward swept wings and side-by-side seating. The lower wings are movable and are used as the roll control (wing leveler).

The aeroplane (along with the Sirocco) was taken over, and is still supported by, by Aériane in 1989.

Design and development

The Aviasud Mistral was designed by two Belgian engineers, Francois Goethals and Bernard d'Otreppe.

The prototype first flew in May 1985, and the aircraft entered production with AviaSud engineering in Fréjus, with the first production model having its maiden flight in February 1986. Aviasud has built more than 200 Mistrals, it has also been built by Ultraleger Industria Aeronáutica Ltda in Brasil.

The Mistral is a biplane of mixed wooden and composite construction, with forward swept wings, with the all-moving lower wings used as large ailerons, and a conventional, all-moving tailplane. It has a fixed tricycle landing gear and a nose-mounted Rotax piston engine. The Mistral has an enclosed cockpit with two side-by-side seats forward of the wings.

Variants

Cockpit of the Aviasud Mistral

Mistral

Original version with 47 kW Rotax 532 engine.

Mistral 503

Low powered, economy version with 37 kW (50 hp) Rotax 503 engine.

AE 206 Mistral

Basic version, powered by 48 kW (64 hp) Rotax 582 engine.

AE 206 US

"Ultra Silent" version with larger, lower geared propeller.

AE 207 Mistral Twin

Twin engined version for advertising and surveillance work, with additional, pusher Rotax 503 engine above wing. 30 built by 1999.

Specifications (AE 206)

General characteristics

- **Crew:** 2
- **Length:** 5.66 m (18 ft 6¾ in)
- **Wingspan:** 9.40 m (30 ft 10 in)
- **Height:** 2.25 m (7 ft 4½ in)
- **Wing area:** 16.39 m² (176.4 sq ft)
- **Airfoil:** NACA 23012
- **Empty weight:** 205 kg (452 lb)
- **Max takeoff weight:** 390 kg (860 lb)
- **Powerplant:** 1× Rotax 582 two-stoke, two-cylinder water-cooled piston engine, 47.7 kW (64 hp)

Performance

- **Never exceed speed:** 165 km/h (89 knots, 103 mph)
- **Maximum speed:** 155 km/h (84 knots, 96 mph)
- **Cruise speed:** 90 km/h (49 knots, 56 mph) (econ cruise)
- **Stall speed:** 60 km/h (33 knots, 38 mph)
- **Range:** 530 km (286 nmi, 329 miles) (no reserves)
- **Service ceiling:** 4,575+ m (15,000+ ft)

Best Off Skyranger

Skyranger

Best Off Aviation **Skyranger** on skis at Montebello, Quebec 2005

Role	ultralight aircraft
Manufacturer	Best Off Aviation
Number built	about 900

Best Off Aviation **Skyranger** being tied down at Sun n Fun 2006

Skyranger cockpit with optional extended panel

The **Best Off Skyranger** is a French-designed two-seat ultralight utility aircraft. It is a high-wing conventional monoplane with tricycle undercarriage, and of fabric-covered tubular construction.

The Skyranger is also manufactured under licence by Aero Bravo in Brazil, SkyRanger Aircraft in the United States (as a kit), and Aeros in Ukraine.

Some 900 are flying throughout the world.

Specifications (Skyranger)

General characteristics

- **Crew:** one pilot
- **Capacity:** one passenger
- **Length:** 5.50 m (18 ft 0½ in)
- **Wingspan:** 9.50 m (31 ft 2 in)
- **Height:** 2.00 m (6 ft 6¾ in)
- **Wing area:** 14.10 m² (151.8 ft²)
- **Empty weight:** 250 kg (551 lb)
- **Max takeoff weight:** 560 kg (1,234 lb)
- **Powerplant:** 1× Rotax 912UL flat-four, 60 kW (80 hp)

Performance

- **Never exceed speed:** 195 km/h (105 knots, 121 mph)
- **Cruise speed:** 150 km/h (81 knots, 93 mph) (max cruise)
- **Stall speed:** 64 km/h (35 knots, 40 mph) (flaps down)
- **Rate of climb:** 4.6 m/s (900 ft/min)

Chapter- 6

New Zealand Ultralight Aircrafts

Micro Aviation Bantam

Bantam

Role	Microlight
Manufacturer	Micro Aviation
Designed by	Max Clear
First flight	1983
Number built	275+

The **Micro Aviation Bantam** is a high wing two-seat microlight aircraft built in New Zealand by Micro Aviation. The first Bantam was a Rotax 503 powered single seater derived from the Phantom ultralight by Max Clear in 1983, and known as the B10 (B for Bantam, 10 for the number of people who helped build it).

The Bantam was a success, and Max Clear decided to build the type for others. He founded MicroAviation at Te Kowhai to build a further improved version, the B-20, which had pull on sailcloth wings, conventional 3 axis controls, and some structural improvements.

In 1986 production switched to the B22, which had a two-seat body and a Rotax 582 engine. Although the B-22 name has been retained, further large redesigns have seen a new wing with Clark Y section aerofoil, wider chord and shorter span adopted, and additional bracing added to the tail.

Current production models are the B22S with the new wing and the B22J (with an Australian Jabiru 85 hp 4-stroke engine). Variants have been made with amphibious float undercarriage, crop-spraying equipment, for coastal and game park patrol and with controls adapted for use by paraplegic pilots. As with many New Zealand aircraft, the Bantam is effectively a STOL type (stated ground roll is 30 metres), although the short undercarriage travel limits rough field capabilities.

As of 2006, 275 Bantams had been produced. They can be found throughout the world, but are most common in Australasia and Africa.

In October 2007 the first flight of the B22UL model took place. This version is powered by a ULPower UL260i. This engine features a FADEC system and produces 71 kW (95 hp). The first Bantam to fly with this new powerplant was airframe number 300.

Specifications

General characteristics

- **Crew:** 2
- **Length:** 5.544 m (18 ft 2.28in)
- **Wingspan:** 9.031 m (29 ft 7.56in)
- **Height:** ()
- **Empty weight:** 176 kg (388 lb)
- **Max takeoff weight:** 430 kg (948 lb)

Performance

- **Cruise speed:** 104 km/h (64 mph)

Martin Jetpack

Martin Jetpack

The Martin Jetpack flying at AirVenture 2008.

Role	Ultralight aircraft
National origin	New Zealand
Manufacturer	Martin Aircraft Co.
Designed by	Glenn Martin

Introduced	2008
Status	Prototype
Unit cost	USD $100,000

The **Martin Jetpack** is a experimental aircraft. Its tradename calls it a "jet pack", but is not jet- or rocket-powered. It has been developed by the Martin Aircraft Company of New Zealand, and was unveiled on July 29, 2008 at the Experimental Aircraft Association's 2008 AirVenture in Oshkosh, Wisconsin, USA. It is classified by the Federal Aviation Administration as an experimental ultralight airplane.

Unlike earlier devices called "jetpacks", the Martin Jetpack is the first to be considered a practical device. It has been under development for over 27 years and uses a gasoline (premium) engine with two ducted fans to provide lift. Theoretically it can reach a speed of 60 miles per hour, an altitude of 8,000 feet, and fly for about 30 minutes on a full fuel tank. The consumer price is expected to be $100,000. Martin Aircraft planned to deliver the first jetpacks to ten customers in early 2010.

Description

The Jetpack is a small VTOL device, with two ducted fans that provide lift. It is powered by a 2.0 litre V-4 piston 200-horsepower gasoline (premium) engine. The pilot straps him/herself onto it, and does not sit. It is much too big for him/her to walk about wearing it, so it cannot be classed as a backpack device. It does not have a jet turbine or rocket motor, however the Jet in Jetpack refers to the production of two jets of air from its ducted fans. The Martin Jetpack meets the Federal Aviation Administration's classification of an ultralight aircraft. It uses the same gasoline used in cars, is relatively easy to fly, and is cheaper to maintain and operate than other ultralight aircraft. Most helicopters require a tail rotor to counteract the rotor torque; this and the articulated head complicate flying, construction and maintenance enormously. The Jetpack is designed to be torque neutral – there is no tail rotor, no collective, no articulating or foot pedals – and this simplifies flying dramatically. Pitch and roll are controlled by one hand, yaw and the throttle by the other.

Safety features

In order to enhance safety, the finished product will feature a ballistic parachute and a fly by wire system whereby the pilot sends instructions to a computer which then interprets them and flies the craft smoothly. It can also be programmed to only fly a few meters above the ground and/or fly within certain limits.

Specifications

General characteristics

- **Crew:** 1

- **Capacity:** 1 passenger
- **Length:** 5 ft ()
- **Wingspan:** (width) 5.5 ft ()
- **Height:** 5 ft ()
- **Wing area:** ² ()
- **Empty weight:** 250 lb ()
- **Useful load:** 280 lb ()
- **Powerplant:** 2× Martin Aircraft 2.0L V4. 2 stroke, 200 hp (150 kw) Max 6000 rpm each
- **Propeller diameter:** 1 ft 7 in ()

Performance

- **Range:** 366 nm (31.5 mi)
- **Service ceiling:** 8,000 ft ()
- **lift-to-drag:** 7
- **Fuel consumption:** 10 US gal/h Mogas
- **Minimum power/mass:** 600 lb thrust ()

Chapter- 7

Polish Ultralight Aircrafts

3Xtrim 3X55 Trener

3Xtrim 3X55 Trener

Role	Ultralight civil utility aircraft
Manufacturer	3Xtrim Aircraft Factory
Designed by	Adam Kurbiel
First flight	1996
Number built	60 (to Sept 2006)
Unit cost	base price US$99,900

The **3X55 Trener** (Trainer) and **3X47 Ultra** are a family of ultralight civil aircraft produced in Poland by the 3Xtrim Aircraft Factory. Both are two-seat, high-wing, strut-braced monoplanes with fixed tricycle undercarriage and available only as completed aircraft. There are also 450 Ultra and 495 Ultra Plus sub-variants of the 3X47 Ultra, with gross weights adjusted for national ultralight regulations.

The US light sport aircraft version of the 3X55 is known as the Navigator 600 and has a 1320 pound maximum gross take-off weight

3Xtrim take their company name from a double entendre, as they refer to their designs being "triple trimmed" (or more exactly “triple-tested”) during the design, prototype and production stages and also that the aircraft is designed for “extreme conditions”. In English the company name is pronounced “Three-Extreme”.

Design History

Former SZD sailplane engineer Adam Kurbiel designed the predecessor of 3X55, the EOL-VLA, to conform to European JAR-VLA rules. That plane was modified through the years to meet Canadian Advanced Ultralight and US Light Sport Aircraft rules. The 3X47 version is specifically for the European market to meet those standards.

The designation 3X55 means “3Xtrim Aircraft - 550 kg gross weight” while the 3X47 refers to its 470 kg gross weight.

The European versions feature extensive structural use of carbon fibre to achieve lightness, while the 3X55 is predominantly of fibreglass construction. Otherwise the two aircraft are similar in appearance and performance.

The 3X55 first flew in 1996 and by the summer of 2006 about 60 aircraft of both types had been produced.

3Xtrim **3X55** showing its Rotax 912ULS engine installation

3Xtrim **3X55** showing its cockpit accommodation for two crew side-by-side with vertically hinged doors

3Xtrim **3X55** taxiing, showing front view of the aircraft

3Xtrim **3X55** with 30 degrees of flap deflection, showing the centre-section flap

3Xtrim **3X55** instrument panel

Construction

The fuselage and vertical tail of the 3X55 is a one-piece structure made from fibreglass. The firewall is a Fiberfrax ceramic/aluminium sandwich.

The cockpit is 47.5 inches (1.21 m) wide at the elbows. Crew access is via a door on each side of the cockpit that hinges upwards and is supported by a gas strut.

The control sticks are located conventionally in front of each seat. The standard throttle arrangement is one panel-mounted centre throttle, but a second throttle located on the left side of the panel is optional, allowing the left-seat pilot to fly with either hand on the throttle or stick.

The wings are strut-braced with a single spar and are made from fibreglass and foam with a 15.5% CAGI.R3 airfoil. The wing has a span of 31 .5 feet and an area of 127.4 sq ft (11.84 m^2), which gives it a wing loading of 9.5 lbs/sq ft at gross weight. The aircraft has removable wings, with single locking pins and quick-disconnect controls which can be easily hooked up and inspected from inside the cockpit.

The wings have conventional Frise ailerons and slotted flaps. The elevator and rudder are also conventional. Ailerons and elevator are controlled by dual centre-mounted sticks through push-pull tubes, while the rudder is controlled by cables. The rudder cables attach to the rudder by wrapping around the wide bottom diameter of the rudder itself. The pitot tube is mounted in the left-hand strut.

The flaps are operated by a ceiling-mounted flap handle with detents for 0, 15 and 30 degrees of deflection. The flaps are controlled directly with the handle attached to a flap centre-section behind the fuselage and the wing flaps plug into the flap centre-section. Flaps are normally set to 15 degrees for take-off and 30 degrees for landing.

The plane comes in one colour – white, but owners can add their own vinyl decals to finish the plane as desired.

Fuel capacity

The fuel tank is located behind the right-hand seat. The quantity can be read directly through a sight gauge behind the seat. The standard tank is 70 litres (18 US gallons) with 87 litres (23 US gallons) optional. Behind the left-hand seat is a small baggage compartment, with additional baggage space above and behind both seats.

Powerplant

The 3X55 powerplant options are the 80 hp (60 kW) Rotax 912UL or the 100 hp (75 kW) 912ULS. The standard fuel is premium auto fuel, but it can run on 100LL as well.

The 3X55 can be equipped with either a three-bladed, fixed pitch Czech-made Woodcomp wood/fibreglass SR 200 propeller or an electrically adjustable Woodcomp SR 2000 propeller, with an optional constant speed unit.

Landing gear

The main landing gear consists of sprung fibreglass gear legs with 5X5.00 tires as standard on graphite wheel rims. Larger 6X6.00 tires are optional.

The nose gear is a single-fork design also made from fibreglass. Nose gear suspension is a compressed rubber donut system.

Competition history

Krzysztof Wieczorek won the 16th FAI World Precision Flying Championship in 2004 and took the 3rd place in the 14th FAI World Rally Flying Championship in 2004 flying 3Xtrim aircraft. In the 17th FAI World Precision Flying Championship in 2006, 3Xtrim took the 1st (Krzysztof Wieczorek) and 3rd (Krzysztof Skrętowicz) places.

Specifications (550 Trener)

General characteristics

- **Crew:** 1
- **Capacity:** 1 passenger
- **Length:** 6.87 m (22 ft 6½ in)
- **Wingspan:** 10.03 m (32 ft 11 in)
- **Height:** 2.40 m (7 ft 10¾ in)
- **Wing area:** 12.40 m² (133.5 ft²)
- **Empty weight:** 325 kg (717 lb)
- **Max takeoff weight:** 550 kg (1,212 lb)
- **Powerplant:** 1× Rotax 912 flat-four, 73.4 kW (98.6 hp)

Performance

- **Never exceed speed:** 220 km/h (118 knots, 136 mph)
- **Cruise speed:** 170 km/h (91 knots, 106 mph)
- **Stall speed:** 70 km/h (38 knots, 44 mph)
- **Range:** 750 km (405 nmi, 466 mi)
- **Service ceiling:** 4,000 m (13,120 ft)
- **Rate of climb:** 4.5 m/s (886 ft/min)

Skopiński Panda

Panda

Role	ultralight
Manufacturer	Aero-service Jacek Skopiński
Designed by	Jan Fiala
Produced	2010-

The **Skopiński Panda** is a two-seater ultralight manufactured by Aero-service Jacek Skopiński.

Design

The Puma is a two-seater, high-wing ultralight with T-tail and fixed tricycle landing gear. It is an all-metal aircraft with a semi-monocoque structure. The rectangular strut-braced wing has one main and one secondary spar. The aircraft can be fitted with the Rotax 912 or Rotax 914 engine.

Specifications

Technical data:

- Wingspan: 8,91 m
- Length: 6,62 m
- Height: 2,32 m
- Cabin width: 1,2m
- Wing area: 10,6 m^2
- Horizontal tail area: 1,47 m^2
- Vertical tail area: 0,92 m^2
- Wing Airfoil: NACA 633618 modificated
- Tail airfoil: NACA 64015

Weight and Performance:

- Empty Weight: 270 kg
- Max. Takeoff Weight: 472,5 kg
- Payload: 202,5 kg
- Max. Fuel Capacity: 2x50 l
- Max. Load Factors: +4 / -2
- Stall Speed (without flaps): 79 km/h
- Stall Speed (with flaps): 62 km/h
- Never Exceed Speed: 260 km/h
- Max. Speed in horizontal flight: 220 km/h
- Cruising speed: 190 km/h
- Rate of climb: 6 m/s
- Ceiling: 3650 m
- Range (45 min. reserves): 1200 km

Chapter- 8

United States Ultralight Aircrafts

Aero Adventure Aventura

Aventura

Aero Adventure Aventura II

Role	Ultralight aircraft
National origin	United States
Manufacturer	Aero Adventure Aviation
First flight	1995
Introduced	1995
Developed from	Advanced Aeromarine Buccaneer

An Aventura II at Sun 'n Fun 2004

The **Aero Adventure Aventura** is a family of ultralight amphibian marketed as a kit aircraft by Aero Adventure Aviation of Rockledge, Florida.

The aircraft are high-wing flying boats of pusher configuration available in both single and two-seat models. Its design heritage stretches back to the Advanced Aeromarine Buccaneer amphibian ultralights.

Design

Introduced in 1995, the single-seat Aventura has repositionable main landing gear, down for runways and up for landing on water. The steerable tail wheel is retractable in concert with the repositioning of the main gear. There is no water rudder. The wing is an aluminium frame covered with pre-sewn Dacron envelopes. The hull is constructed from fibreglass and the wingtip floats are polyethylene. The remainder of the structure is anodized aluminium tubing, bolted together. Controls are conventional three-axis, with full span ailerons and no flaps. The company claims that the fast-build kit can be constructed in 90 hours.

The two-seat Aventura II was introduced in 1996 and is similar to the single seater, but with a wider cabin and hull for two occupants in side-by-side configuration. The two-seater also features flaps to reduce landing speeds. The company claims 130 hours to build the two-seater from the kit.

Variants

Aventura UL
: Single seater optimised for the US FAR 103 Ultralight Vehicle category, with an empty weight of 328 lb (149 kg). Engines include the original 28 hp (21 kW) Rotax 277 in early models and the 40 hp (30 kW) Rotax 447 currently.

Aventura HP
: Single seater intended to be registered as an amateur-built aircraft. Standard engines are the 50 hp (37 kW) Rotax 503 64 hp (48 kW) Rotax 582.

Aventura Sport
: Two-seater marketed as the simplest and lightest model in the line-up. Standard engine is the 64 hp (48 kW) Rotax 582.

Aventura II
: Two-seater with some options included as standard features. Standard engine is the 100 hp (75 kW) four-stroke Rotax 912ULS.

Aventura XLR
: Limited edition two-seater with many extras as standard features, including a new style engine cowling, custom graphics package, redesigned instrument panel including GPS, vertical speed indicator and a mode-C transponder, electric landing gear retraction, gear indicator lights, differential hydraulic brakes, carpeting and a headliner. The standard engine is the 100 hp (75 kW) four-stroke Rotax 912ULS.

Specifications (Aventura HP)

General characteristics

- **Crew:** one pilot
- **Length:** 20 ft 6 in (6.25 m)
- **Wingspan:** 27 ft 9 in (8.48 m)
- **Height:** 6 ft 0 in (1.83 m)
- **Wing area:** 156 ft² (14.5 m²)
- **Empty weight:** 325 lb (147 kg)
- **Max takeoff weight:** 650 lb (296 kg)
- **Powerplant:** 1× Rotax 447 piston engine, 40 hp (30 kW)

Performance

- **Maximum speed:** 85 mph (136 km/h)
- **Service ceiling:** 13,500 ft (4,116 m)

Aero-Works Aerolite 103

Aero-Works Aerolite 103

An Aerolite 103 at Oshkosh 2001

Role	Ultralight aircraft
National origin	United States
Manufacturer	Aero-Works Inc.
First flight	October 1996
Introduced	1997
Number built	150 (December 2004)

The **Aero-Works Aerolite 103** is an American single seat, high-wing, pusher configuration ultralight aircraft that was introduced by Aero-Works, Inc, of Millersburg, Ohio in 1997. The aircraft's model number indicates that it was designed to comply with the Federal Aviation Administration FAR 103 ultralight rules.

Development

The aircraft was designed to meet the requirements of FAR 103 *Ultralight Vehicles*, including maximum 254 lb (115 kg) empty weight.

The company reports that builder-achieved empty weights vary from 252 lb (114 kg) to 300 lb (136 kg), with 275 lb (125 kg) being typical. To remain under the FAR 103 empty weight requires the use of a light-weight engine, such as the 35 hp (26 kW) 2si 460-F35.

Design

The Aerolite 103 features a high wing with half-span flaps that are extended by use of an overhead bellcrank to a maximum of 40 degrees. The flight controls are three-axis and

are actuated by a wheel mounted on a control column via flexible push-pull cables and conventional rudder pedals connected to the rudder by cables. The engine throttle is a twist-grip type and incorporates a brake lever to operate the non-differential mechanical drum brakes installed on the main wheels of the tricycle landing gear.

The aircraft has conventional nose wheel steering connected to the rudder pedals. The main landing gear utilizes sprung-tubes for suspension and absorbing landing loads. There is a fourth small caster-wheel under the tail, because when the pilot's seat is unoccupied the aircraft rests on its tail, due to the aircraft's empty center of gravity.

The Aerolite 103 is sold as an assembly kit aircraft. The kit includes an illustrated assembly manual and pre-built fuselage, wings, control surfaces, jury struts and struts. The wings are covered by the builder with pre-sewn Dacron envelopes. The company estimates the time to complete the airframe at 60–80 hours. The kit does not include powerplant, propeller or instruments.

When the aircraft was first introduced the standard engine was the 35 hp (26 kW) 2si 460-F35, with the 40 hp (30 kW) Rotax 447 optional. In 2009 the standard recommended engine was the Rotax 447, with the 46 hp (34 kW) Rotax 503 single carburettor engine optional.

Aerobatics and spins are prohibited.

Operational history

Since its introduction the Aerolite 103 has won many awards, including:

- AirVenture 1997 - Grand Champion Ultralight
- Sun 'n Fun 1998 - Best Commercial Design
- AirVenture 1998 - Reserve Grand Champion Ultralight
- Sun 'n Fun 1999 - Grand Champion Ultralight
- AirVenture 1999 - Grand Champion Ultralight

In December 2004 the company reported that 150 aircraft were flying, the majority as US unregistered ultralights. In July 2009 there were 12 Aerolite 103s registered as experimental amateur-builts in the USA.

Specifications (Aerolite 103 with Rotax 447)

General characteristics

- **Crew:** one
- **Capacity:** no passengers
- **Length:** 17 ft (5.19 m)
- **Wingspan:** 26 ft 10 in (8.18 m)
- **Height:** 6 ft 5 in (1.96 m)

- **Wing area:** 124 sq ft (11.54 sq m)
- **Empty weight:** 275 lb (125 kg)
- **Useful load:** 325 lb (147 kg)
- **Max takeoff weight:** 600 lb (272 kg)
- **Powerplant:** 1× Rotax 447 fixed pitch, 40 hp (30 kW)
- **Propellers:** 1 propeller, 1 per engine

Performance

- **Never exceed speed:** 75 mph (122 km/h)
- **Maximum speed:** 70 mph (113 km/h)
- **Cruise speed:** 63 mph (102 km/h)
- **Stall speed:** 35 mph (57 km/h)
- **Range:** 120 statute miles (194 km)
- **Rate of climb:** 800 ft/min (4.1 m/s)
- **Wing loading:** 4.83 lb/sq ft (23.6 kg/sq m)
- **Power/mass:** 15 lb/hp (0.11 kW/kg)

Airdrome Dream Classic

Dream Classic	
Role	Ultralight aircraft
National origin	United States
Manufacturer	Airdrome Aeroplanes
Designed by	Robert Baslee
Number built	49 (fall 2007)
Developed from	Santos-Dumont Demoiselle

The **Airdrome Dream Classic** is a minimalist, high wing, single seat, single engine ultralight aircraft inspired by the 1908 Santos-Dumont Demoiselle and produced in kit form by Airdrome Aeroplanes of Holden, Missouri.

The aircraft is intended for the US FAR 103 *Ultralight Vehicles* category.

Development

The Dream Classic was designed as a low-cost and very basic ultralight. The fuselage is open and constructed from pop-riveted aluminum tubing. The wing is covered with aircraft fabric and is wire-braced utilizing a kingpost to support the ground loads or optionally strut-braced. The wings can be removed in 20 minutes for trailering. Controls are conventional three-axis, with the elevator and ailerons operated by a side stick.

Two different wings are available, a *standard* wing of 30.5 ft (9.3 m) span and 122 sq ft (11.35 sq m) area and a *speed* wing of 21.5 ft (6.6 m) span and 86 sq ft (8.00 sq m) area. The *speed* wing restricts the aircraft's useful load to 170 lb (77 kg), while the *standard* wing allows 250 lb (113 kg).

The standard engine is the 40 hp (30 kW) Rotax 447, although engines of 28 to 52 hp (21 to 39 kW) can be used. The manufacturer estimates that a builder will take 100–120 hours to complete this aircraft from the kit. In 2009 the airframe-only kit for the wire-braced version cost US$3495 and US$3995 for the strut-braced version. A completed airframe is also available for an additional US$2000.

By the fall of 2007 48 wired braced and one strut-braced Dream Classics were flying.

Variants

Dream Classic Standard
: Single seat ultralight with 21.5 ft (6.6 m) wingspan and 86 sq ft (8.00 sq m) wing area, standard engine 40 hp (30 kW) Rotax 447

Dream Classic Speed
: Single seat ultralight with 30.5 ft (9.3 m) wingspan and 122 sq ft (11.35 sq m) wing area, standard engine 40 hp (30 kW) Rotax 447

Specifications (Dream Classic Speed)

General characteristics

- **Crew:** one
- **Capacity:** no passengers
- **Length:** 14 ft 0 in (4.27 m)
- **Wingspan:** 21 ft 6 in (6.6 m)
- **Height:** 6 ft 0 in (1.83 m)
- **Wing area:** 86 sq ft (8.00 sq m)
- **Empty weight:** 223 lb (101 kg)
- **Useful load:** 170 lb (77 kg)
- **Max takeoff weight:** 393 lb (178 kg)
- **Powerplant:** 1× Rotax 447 fixed pitch, 40 hp (30 kW)

Performance

- **Maximum speed:** 76 mph (123 km/h)
- **Cruise speed:** 68 mph (110 km/h)
- **Stall speed:** 31 mph (50 km/h)
- **Rate of climb:** 670 fpm (3.4 m/s)
- **Wing loading:** 4.57 lb/sq ft (22.25 kg/sq m)
- **Power/mass:** 9.3 lb/hp (0.16 kW/kg)

Kolb Kolbra

Kolb Kolbra & King Kolbra

Role	Ultralight aircraft
National origin	United States
Manufacturer	New Kolb Aircraft
First flight	2000
Introduced	2000
Status	Production completed
Number built	King Kolbra - 2 (2003) Kolbra - 2 (2003)
Unit cost	US$16.964 (Kolbra, 2003 base price)
Developed from	Kolb Firefly, Kolb Slingshot

The **Kolb Kolbra** and **King Kolbra** are a family of American tandem two seater, high wing, strut-braced, pusher configuration, conventional landing gear-equipped ultralight aircraft that were produced in kit form by New Kolb Aircraft of London, Kentucky and intended for amateur construction.

Neither the Kolbra nor the King Kolbra are in production.

Design and development

The Kolbra was intended as a dual control, ultralight trainer and was created by combining the front half of a Firefly fuselage with the rear fuselage cage of the Slingshot. The front fuselage was then widened by 10.5 in (27 cm) to allow more room for the pilot's feet. The King Kolbra has a wide fuselage front, similar to the Mark III whereas the Kolbra has a pointed nose.

The Kolbra's factory standard engine was the 64 hp (48 kW) Rotax 582 engine, placing it in the Ultralight Trainer category, but it could be equipped with the 80 hp (60 kW) Rotax 912UL or the 80 hp (60 kW) Jabiru 2200 in the *Experimental - Amateur-built* category. The King Kolbra's standard engine was the Jabiru 2200.

Both aircraft feature a forward fuselage of welded 4130 steel tubing, mated to an aluminum tailboom. The horizontal stabilizer, tail fin and wings are also constructed of riveted aluminum tubing and feature full-span flaperons. All flying surfaces are covered in doped aircraft fabric. The wings and horizontal tail are quick-folding for storage and ground transport. The landing gear is sprung tubing for the main gear, with a steerable sprung tailwheel.

Variants

Kolbra
: Two seats in tandem configuration, high wing ultralight, powered by a 64 hp (48 kW) Rotax 582, 80 hp (60 kW) Jabiru 2200 or 80 hp (60 kW) Rotax 912UL engine. Aircraft has a highly pointed nose.

King Kolbra
: Two seats in tandem configuration, high wing ultralight, powered by a 80 hp (60 kW) Jabiru 2200 engine. Aircraft has a broad nose.

Specifications (Kolbra)

General characteristics

- **Crew:** one
- **Capacity:** one passenger
- **Length:** 24 ft 0 in (7.32 m)
- **Wingspan:** 29 ft 0 in (8.84 m)
- **Height:** 6 ft 10 in (2.08 m)
- **Wing area:** 156 sq ft (14.5 m^2)
- **Empty weight:** 496 lb (225 kg)
- **Gross weight:** 1,000 lb (454 kg)
- **Fuel capacity:** 10 US gallons (38 litres)
- **Powerplant:** 1 × Rotax 582 twin cylinder, two-stroke aircraft engine, 64 hp (48 kW)

Performance

- **Maximum speed:** 100 mph (160 km/h; 87 kn)
- **Cruise speed:** 75 mph (65 kn; 121 km/h)
- **Stall speed:** 35 mph (30 kn; 56 km/h)
- **Never exceed speed:** 110 mph (96 kn; 180 km/h)
- **Range:** 184 mi; 296 km (160 nmi)
- **G limits:** +4/-2
- **Rate of climb:** 1,000 ft/min (5.1 m/s)

Avionics

- none

Rocky Mountain Wings Ridge Runner

Rocky Mountain Wings Ridge Runner

Role	Ultralight aircraft
National origin	United States
Manufacturer	Rocky Mountain Wings
Designed by	Stace Schrader
Introduced	2000
Status	Kits in production
Produced	2000-present
Number built	63 (Ridge Runner 1, 2007) 56 (Ridge Runner 3, 2007)
Unit cost	US$10,900 (Base price, Ridge Runner 1 less engine, 2010)
Developed from	Denney Kitfox

The **Rocky Mountain Wings Ridge Runner** is a family of American high wing, strut-braced, single engine, conventional landing gear aircraft that were designed by Stace Schrader and are produced by Rocky Mountain Wings of Nampa, Idaho for amateur construction.

Design and development

Introduced at Airventure, Oshkosh, Wisconsin in July 2000, the first Ridge Runner was a single seater designed as an FAR 103 Ultralight Vehicles compliant aircraft that would have an empty weight within that category's 254 lb (115 kg) empty weight limit.

The designer, Stace Schrader was formerly involved with Avid Aircraft, the Denney Kitfox and Sky Raider LLC designs, all similar aircraft. The resulting aircraft was described by reviewer Andre Cliche as "a clone identical to its predecessors except for a few details like, for example the type of ailerons and balloon tires for rough terrain operations."

The aircraft has an optional powder coated 4130 steel tube frame fuselage covered in doped fabric. The wing is constructed with aluminium tube spars and is also fabric-covered. The kit includes many pre-fabricated parts, including the wing ribs, seat belts and shoulder harnesses, wheels and tires. The manufacturer estimates the construction time as 250-600 hours, depending on the options selected and builder experience.

The Ridge Runner 1 requires a very light engine to remain under 254 lb (115 kg) empty weight and the specified engine remains the out-of-production 28 hp (21 kW) Rotax 277.

Variants

Ridge Runner Model 1 *Ultralight*

Original model, a single seat, FAR 103 compliant aircraft, with a 247 lb (112 kg) empty weight when equipped with the out-of-production 28 hp (21 kW) Rotax 277 engine, or alternatively an experimental light sport aircraft. Acceptable power range 20 to 80 hp (15 to 60 kW).

Ridge Runner Model 2

Light sport or amateur-built version, similar to the Model 1, but with a jump seat added, though without dual controls, and an empty weight increased to 350 lb (159 kg), gross weight 950 lb (431 kg). Acceptable power range 28 to 52 hp (21 to 39 kW). The manufacturer says of this model: "Ridge Runner II is not a full two place. It has a small jump seat or cargo area"

Ridge Runner Model 3

Light sport or amateur-built version, with two seats in tandem with dual controls. Standard engine is the Rotax 503 of 52 hp (39 kW). Acceptable power range 40 to 100 hp (30 to 75 kW).

Specifications (Ridge Runner 1 Ultralight)

General characteristics

- **Crew:** one
- **Length:** 17 ft 0 in (5.18 m)
- **Wingspan:** 26 ft 2 in (7.98 m)
- **Height:** 5 ft 3 in (1.60 m)
- **Wing area:** 99.4 sq ft (9.23 m^2)
- **Empty weight:** 247 lb (112 kg)
- **Gross weight:** 900 lb (408 kg)
- **Fuel capacity:** 5 US gallons (19 litres)
- **Powerplant:** 1 × Rotax 277, 28 hp (21 kW)
- **Propellers:** 2-bladed wooden

Performance

- **Cruise speed:** 55 mph (48 kn; 89 km/h)
- **Stall speed:** 23 mph (20 kn; 37 km/h)
- **Range:** 140 mi (122 nmi; 225 km)
- **Rate of climb:** 700 ft/min (3.6 m/s)