Chinook ultralight aircraft, Chinook WT 11 ultralight aircraft, single place Chinook ultralight aircraft troubleshooting report.

Troubleshooting the Chinook WT - 11

These reports on the Chinook WT - 11 should not be confused with the Chinook Plus 2. They are two different aircraft, produced by two different manufacturers!

The Chinook WT - 11 was a single place aircraft with a wing warping system for roll control and was produced up until 1988, by Birdman Enterprises.

The Chinook Plus 2 is a two place ultralight aircraft, first produced in 1992 by A.S.A.P. - Aircraft Sales and Parts.

Troubleshooting the Chinook single place ultralight aircraft

WT - 11

The original Chinook WT -11 was introduced in 1984. It available then only in a single place configuration. The Chinook WT-11 is a pusher, in a taildragger configuration. The main construction uses aluminium tube bolt and rivet together construction. The pilot 's seat is located at the front of the main boom. Controls are standard stick and rudder with a left mounted throttle. While the plane was "three axis control" it used a wing warping system for aileron control. The design featured doors which could be removed for summer operation. Originally power was supplied by a Rotax 277 engine with a belt drive which sat inverted at the trailing edge of the wing.

With it being one of the first "three axis" aircraft on the market, and building times coming in at around 200 hours, demand for the craft was good, with some 800 kits reported to have been sold worldwide. In the automotive industry when there is a problem with a vehicle, manufacturers are made to do recalls and updates. We are not as fortunate in the ultralight industry, especially when there is no longer a manufacturer. Thus we have to rely on information from reliable sources, such as other pilots, magazines, government reports, dealers, aircraft owners etc.

The following report on the Chinook is broken down into these problem areas.

Engine
Airframe
Landing Gear
Wing

Engine :

ROTAX 277 CC ENGINE

The 277 Rotax engine is probably the most trouble free engine, in the Rotax family. Problems have been reported however with motor mounts, on such planes as the Falcon, Skyseeker, and Challenger, Chinook WT 11, and should be an area of regular inspection.

These mounts are similar in most cases to those used on the 185 cc Rotax and have been reported to shear, careful preflight inspections recommended of this area by all pilots using single cylinder Rotax engines.

Another problem that has occurred is in the use of a belt drive system with the 277. The 277 engines use a plastic bearing liner to support the crankshaft bearings in the crankcase.

Over tightening of the belts on a belt reduction system can cause this plastic liner to compress, allowing the bearing and crankshaft to move inside the crankcase halves.

This can permit the magneto to come in contact with the lighting coils and stator plate, located on the mag end of the crankshaft.

For the proper way to adjust a drive belt system when used on the 277 cc Rotax engine contact the REDUCTION DRIVE MANUFACTURER, the ultralight manufacturer, or write/call/email

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Another reported problem is in the exhaust system supplied by manufacturers of some ultralight aircraft. The exhaust system supplied by Rotax is specially tuned, to provide the best performance and reliability possible, some manufacturers in adapting this exhaust system to their design have changed the tuning length of the exhaust to better fit the cosmetics of their design.

An example of this is the early model Chinook aircraft in Canada. The manufacturer in redesigning the exhaust to fit his design changed the tuning, and performance on the engine to such an extent that in some cases only 65 % of the available thrust was obtained. You should check to see whether your aircraft is equipped with this exhaust.

Another commonly reported problem is with the wrist pin bearings on the 277. These bearings have been reported to wear out causing considerable damage to the engine when they do.

Many owners have updated the engine on their craft to a 377/447 Rotax using a gear drive system. This requires a new engine mount and prop. While the 377/447 provide better climb performance it also can provide speeds in excess of the manufacturers VNE.

ALSO NOTE THAT YOU CAN NOT PUT A 503 ROTAX ON A SINGLE PLACE CHINOOK

THE EXTRA WEIGHT IS TO FAR AFT OF THE C OF G LIMITS!

Airframe:

Several problems have been reported with the Chinook WT 11's airframe the first main boom failure is covered a little later in this report. Other updates include a second aileron horn on the outboard section of each wing. This helps stiffen up the "aileron".

Another update was the engine support tube, this runs from the main boom up to the root tube. The diameter and wall thickness of this tube was increased. The reason that it was increased was that on hard landings the tube would bend causing an improper angle between the wing and tail section. This was almost impossible to detect, since the tube is covered in fabric, and even out in the open the pilot has to look at it from the side or use a square.

The main root tube was also updated from a round tube to a larger square tube with an inner round sleeve.

The tail section was updated. The reason for the updates were, wear on the fabric hinge, looseness in the tail section, wear in the rudder post, and loose fitting fabric on the horizontal stabilizer, vertical fin, rudder and elevator The update uses a rectangular stabilizer with an increased) rather than the original smaller triangular design, and has a true hinged rudder and elevator. The tail section is also cable braced for more strength and rigidity.

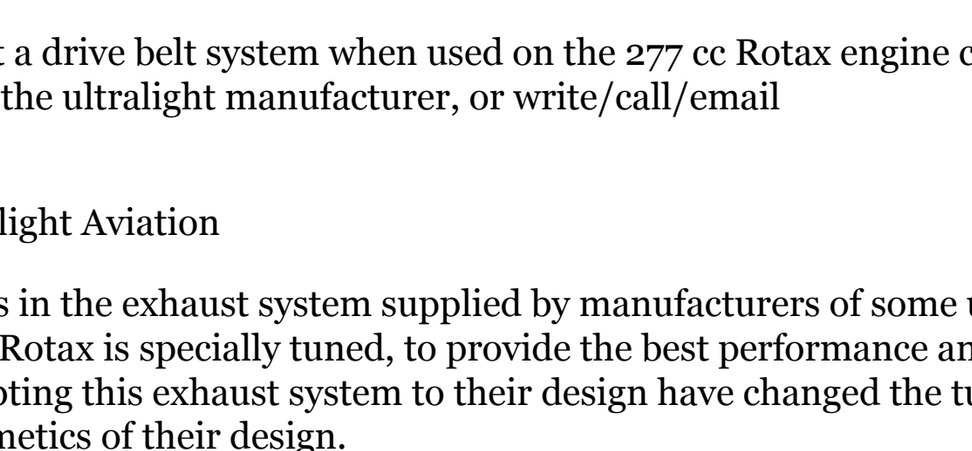
Aircraft: Chinook WT-11

Incident Report: An accident involving a Birdman Chinook WT-11 aircraft resulted from fatigue failure of the body tube supporting the tail assembly aft of the doubler as sown in diagram A.

The aircraft had logged 495 hours while two other aircraft had signs of similar fatigue cracks at 355 and 500 hours of operation.

Suggestions:

If you own a WT-11 Chinook it is suggested that this be an area of regular inspection. An update put out by the manufacturer installed an outer sleeve from the area just behind the engine mount to the tail assembly.



Aircraft: Chinook WT-11

Incident Report:

The ultralight had just become airborne and was climbing over some trees when a roll to the right developed. The pilot applied full correcting rudder and aileron but was unable to regain control. The ultralight continued into a spiral and hit the ground at about a 45 degree angle and right wing low in the field from which the takeoff occurred. The pilot was seriously injured.

The aircraft was a Chinook Model WT 11 and the subsequent investigation revealed a possible material deficiency in the aileron assembly that could have caused loss of control. The preliminary accident report also indicated that it was possible that a crosswind over the trees caused the upset. Thus there may have been insufficient aileron control available for timely correction of the unusual attitude of the aircraft. This was a early-model Chinook, and there have been reports of a connecting bolt to an aileron bracket on top of the fuselage that, in certain circumstances or if installed upside down tends to jam, thereby preventing aileron control. Later models specify installation of a different bolt that corrects the possibility of aileron jamming. There is evidence of score marks on the aileron bellcrank tab, indicating such a malfunction could have occurred in this case.

It is suggested that all owners of the older Chinook Models WT-1 and WT-11 ultralight look for signs of score marks on the bellcrank tab. If evidence of rubbing is found, then steps should be taken to correct the problem, prior to flight.

Picture 1

Picture 2

Pictures and source material courtesy Aviation Safety Ultralight and Balloon.

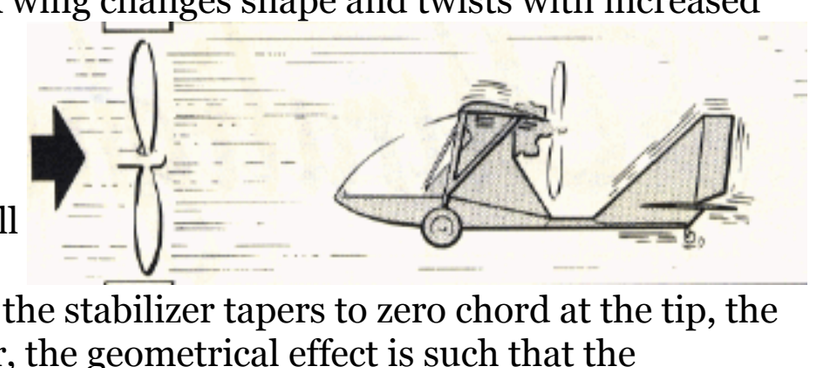
Aircraft: Chinook WT 11

Incident Report:

At the time of this report, six accidents involving fatalities and serious injuries occurred to Chinook WT 11 type ultralight aircraft. This prompted wind tunnel tests and in-depth analysis by the Canadian Aviation Safety Board, Engineering Branch.

The accident descriptions, although ambiguous, revolved around this theme. The aircraft were seen to enter a steep bank at high power and low altitude, and high speed. Suddenly the nose dropped and the aircraft was observed to strike the ground in a near vertical dive. Apparently these aircraft DID NOT STALL, but suffered loss of control for undetermined reasons.

Wind tunnel tests were set up to determine control effectiveness from stall speed to 65 mph and to compare new and used empennage assemblies. (A rip was made in the leading edge fabric of one empennage unit to simulate service damage.)



From the findings on the report, it is apparent that the Chinook wing changes shape and twists with increased air speed. Compared with conventional aircraft, the deflections of the wing with increasing dynamic pressure were very large. Also, aileron control decreases to a point where there would be near zero aileron effectiveness at the aircraft VNE of 90 mph. The manufacture stipulated a top speed of 63 mph, which is well below the unrealistic VNE. Discussions about construction of the tail section centered around shape and effectiveness. While the stabilizer tapers to zero chord at the tip, the elevator has constant chord: therefore, with a deflected elevator, the geometrical effect is such that the stabilizer's effective angle of attack at the tip is nearly equal to the elevator deflection. Thus, when maximum aircraft nose-up moment is demanded by pilot control input of full up elevator, the horizontal stabilizer may partially stall beginning at the tip and not deliver the desired effect.

Now. we already mentioned that the wings twist under air loads. As a result of this, the lift curve breaks at 8 degrees angle of attack. This appears to reflect a wing root stall. The horizontal stabilizer which operates in the downwash from the root of the wing, experiences an abrupt decrease in angle of attach when the wing root stalls. Reduced angle of attack for the stabilizer requires up elevator to balance the pitching moment of the wing. Unfortunately, too much up elevator, tip stalls the horizontal stabilizer, causing the pilot to put on still more up elevator, and the stalled area gets bigger. If the horizontal stabilizer cannot bring the pitching moment into balance a steepening dive results. This tuck-in non-recoverable dive has happened in conventional aircraft and has been resolved by moving the tail plane to a position out of the wings downwash, changing the stabilizer area and angle of incidence. None of these should be tried on the Chinook by anyone other than the manufacturer, and then only after careful engineering analysis.

The comparison of new and simulated in-service damaged empennages indicated that the new unit had a slightly higher maximum life coefficient and more violent stall characteristics.

Examination of one of the wrecked aircraft indicated fretting marks on the wing ribs. These appeared on the sides her the ribs passed through the wire loop of the wing leading edge rib strap clamp. This suggests that the ribs are able to work back and forth in the chord wise movement during flight, changing the wing contour.

The following conclusions summarize the phenomena of uncontrolled dive accidents.
*Loss of wing downwash coupled with a horizontal stabilizer design deficiency makes this component prone to stalling at large up-elevator angles. A stalled horizontal stabilizer may be unable to rotate the aircraft sufficiently to effect dive recovery.
*The aircraft has a disproportionately high rate of sink and steep glide angle at higher air speeds with power off or set to idle.
*insufficient torsional rigidity of wings exist to a point where aileron effectiveness decreases with high air speed.
*Stabilizer horizontal plan form is aerodynamically unsuitable (as determined in the course of the Chinook tail plane testing).
*Deterioration of performance (in the case of the Chinook's empennage) with service is not significant, but damage such as fabric tears must be repaired before flight.
*Finally: Low torsional stiffness in the wings is a problem-don't push the speed limits or pull "g's"

Accession Number : ADA168978

Title : Wind Tunnel Evaluation of Chinook WT-11 Ultra Light (Essais en Soufflerie de l'Avion Ultra-Leger Chinook WT-11).

Descriptive Note : Aeronautical note,

Corporate Author : NATIONAL AERONAUTICAL ESTABLISHMENT OTTAWA (ONTARIO)

Personal Author(s) : Roderick,W. E.

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Abstract : Full scale wind tunnel tests were carried out on the wing and empennage of WT-11 Chinook ultra light aircraft in the NAE 9m X 9m Low Speed Wind Tunnel. This test program was initiated in response to a request from the Canadian Aviation Safety Board, Ottawa, Ont., to determine the aerodynamics of the vehicle and measure the gross structural airloads. The purpose of the program was to establish if there were any unusual characteristics that might have contributed to several accidents involving this design. Aside from considerable distortion of the wing at high dynamic pressures, corresponding to 50 to 60 mph, and considerable aeroelastic effects on lift curve slope and maximum lift coefficient, at these higher dynamic pressures the basic wind does not appear to possess any inherently dangerous characteristics. However, the empennage exhibits some non-linear characteristics that could possibly cause handling qualities problems. The combination of wing stalling characteristics with horizontal tail characteristics could result in large amplitude pitch down at the stall. Keywords: Ultralight aircraft, Private aircraft, Aerodynamic characteristics, and Wing tail configurations.

Descriptors : *WIND TUNNEL TESTS, *UTILITY AIRCRAFT, TEST AND EVALUATION, PITCH(MOTION), TAIL ASSEMBLIES, CANADA, WIND, AEROELASTICITY, STALLING, NONLINEAR SYSTEMS, AERODYNAMIC LOADING, AERODYNAMIC CHARACTERISTICS, SLOPE, AVIATION SAFETY, WINGS, LIFT, DISTORTION, WING BODY CONFIGURATIONS, DYNAMIC PRESSURE, AERODYNAMICS, HORIZONTAL STABILIZERS, CURVES(GEOMETRY), ACCIDENTS.

Subject Categories : AERODYNAMICS
TRANSPORT AIRCRAFT

Distribution Statement : APPROVED FOR PUBLIC RELEASE

Aircraft: Chinook WT 11

Incident Report:

A fatal accident involving a Birdman WT 11 Chinook type ultralight raised load distribution as an ultralight safety concern.

This particular ultralight porpoises several times on final approach before striking the ground at high speed in a nose- down attitude. The instructor had previously mentioned that he had difficulty controlling this craft when flying with a lightweights student.

As in all aircraft, there is a centre of gravity envelope (C of G) which determines the placement of the load for safe operation, these must be adhered to.

Aircraft: Chinook WT11,

Incident Report:

The year is 1984, an individual has recently completed construction of a Chinook single seat ultralight aircraft. The craft is powered by a 277 fan cooled Rotax engine using a belt drive and spinning a 48 inch wooden propeller. This kit took over a year to obtain, as the local dealer, for the craft had gone out of business, and the owner had to settle for parts and pieces from several kits in order to finish his off.

The craft was finally assembled, the Ontario Distributor was called, he came checked the plane out, and after a careful preflight, test flew the aircraft. Other than a little back pressure required to fly the craft, it was reported to be flying quite well. The backpressure, it was explained could be taken out simply by putting a trim tab on the elevator. The owner at this point in time had no flight experience, as his flight training was to be included as part of the original deal for his aircraft.

He contacted another dealer, on the Airfield By Appt Only for training, explained his problem, the dealer new all about the problems this pilot, plus 15 other pilots and students were having. In an effort to promote the sport offered to train, the now defunct schools students as a group, for whatever it cost in fuel, for his aircraft. The deal was struck the pilots began their training.

Two months later the pilot was soloed, on the dealers aircraft, and had about 5 hours of flying in his plane, but because winter had arrived he decided to put the craft away for the winter.

The wings were removed and the craft put into a garage for storage. Winter, turned to spring, spring to summer, and the pilot decided to get his plane out of storage. Thinking perhaps he could take the plane off from the road in front of his house he assembled it at home rather than take it to the flying field. After the plane was assembled he decided better, and contacted the dealer who had given him his flight training, asking if he could come over and take the craft off from the road.

The dealer arrived looked at the situation, considered it a little tight but since it was a country road, with little or no traffic he would give it a shot. The dealer was told that the plane had been thoroughly preflighted and was ready to fly. The dealer decided to do a preflight anyway, and found that the bolts holding the leading and trailing edge spars to the main root tube had NO LOCKING NUTS, or for that matter no nuts at all. Nuts were found for these bolts, and no other problems could be visually seen.

The dealer brought the craft out onto the road. With someone positioned at both ends of his "runway" he took off. Proceeding to a sod field he used for training, he arrived, did some touch and goes, some deadsticks, practiced sideslips, in all flew the plane for about 45 minutes.

The owner then arrived, gassed the plane up and flew for about 3 hours in total that day. The craft now had about 11 hours of logged flight time. The dealer was approached to fly the craft back to the Airfield By Appt Only, since it was fairly narrow, located on the top of a hill, had several obstructions on the sides, and could be very turbulent in windy conditions. The weather all day had been very calm, but in the last 35 minutes had picked up considerably, it was also blowing 90 degrees across the runway that the dealer would be landing on.

He took the aircraft off from the sod field, flew around for a bit then flew over to home base, and set up for a circuit. The plane was about 1500 feet in the air, coming in on final (a little village was just off the end of the runway and had to be cleared before a lower circuit height), the dealer set up for a power off approach, the wind was about 20 mph directly from his left, he positioned the craft so that he would land about 1/3 of the way down the runway, dropped the nose, and started in. Due to the cross wind and turbulence associated with this field the dealer decided, an approached speed of 55 mph, would not be unreasonable.

At an altitude of about 800 feet, the pilot noted that there was no "feel" on the stick, no pressure, and the plane was picking up speed, moving the stick back and forth, nothing happened, the crafts speed was now over 75 mph, no matter what the dealer did with rudders, or joystick, the plane would not respond.

The craft was now about 150 feet in the air and headed for the very end of the runway, (in fact later the pilot indicated he didn't think he would make the end of the runway, rather he would fly into the side of the hill,) when the plane experienced a sudden lifting action, the plane actually started to climb with nose down, along with the lift came a fair amount of turbulence, and all of a sudden pressure returned to the joystick.

The pilot landed the plane, several onlookers rushed to the craft, including the owner.

The dealer sat in the plane for several minutes, gathered his thoughts, then climbed out.

A check of all control systems, found no problem. The elevator worked, the ailerons worked, no cables were broken frayed or, disconnected.

A check of the washout on the wings revealed, a slight deviation from factory specs but only a very slight difference. This plane has not been flown since, in fact the owner has sold off most of it in parts and pieces. The dealer can not explain what happened, he had no control over the craft for nearly 1,000 feet. In fact the only reason he was able to regain control was the thermal activity, and turbulence off the end of the runway.

The pilot indicates he does not believe he was caught in a thermal, or shear, or anything of that nature. He had no control of the aircraft, on any control system.

From: Tom Robeson
Dave:
I have something you may want to add to your alert #007 concerning the Haegar re-drive. I found on my Chinook WT-11 w/277 that the prop thrust would crush the fibers of the prop hub against the aluminium adapter (shown in your photo) causing the prop bolts to loosen. I machined a "washer" the O.D. of the prop hub with a 1"hole and corresponding bolt pattern and placed this between prop and hub.

The reason I was here in the first place was I suffered the exact failure you describe with the adjusting bolt snapping. No harm to me or the plane I landed in a "chisel plowed" field, the Chinook has pretty good gear, eh?).
Tom Robeson

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