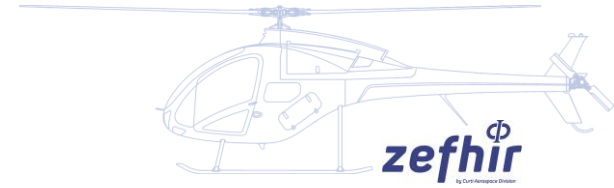




EASA ROTORCRAFT AND VTOL SYMPOSIUM 2021
Zefhir, first helicopter ever with tested parachute
Cologne, 17th November 2021

SUMMARY



- 1. WHO'S CURTI?**
- 2. WHAT'S ZEFHIR?**
- 3. WHY THE PARACHUTE?**
- 4. HOW IS THE PARACHUTE MADE?**
- 5. HOW DOES IT WORK?**
- 6. WHO CAN USE IT?**
- 7. WHEN TO USE IT?**
- 8. DOES IT AFFECT HELICOPTER PERFORMANCE?**
- 9. WHAT IS IT ABLE TO DO?**
- 10. WHY ONLY ZEFHIR HAS IT?**
- 11. IS IT SAFE?**

WHO'S CURTI - FIGURES

TURNOVER (2020)

Total Turnover:

Over 130 Million €

Established in **1955**,
CURTI Costruzioni Meccaniche
is a family run company mainly
operating in different industrial areas:
5 Business Units



HEADCOUNT (2020)

Total Employees:

Over 600

Total Employees – Mother company:

Over 420

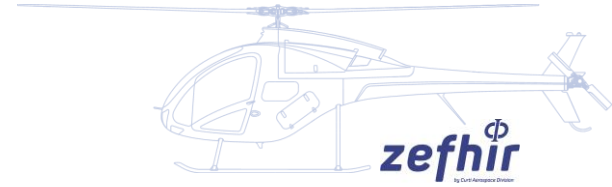


Parent Company:

9 Subsidiaries

1 USA Operating branch

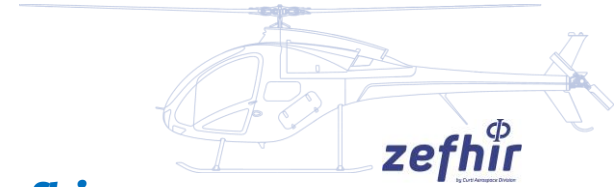
WHAT'S ZEFHIR



zefhir is the **first helicopter** in the world with an innovative **ballistic parachute system**.



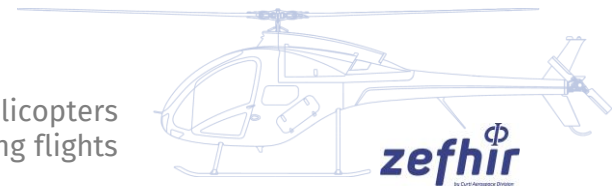
WHAT'S ZEFHIR



The **parachute** is part of the **basic configuration** of **zefhir** .
It can be activated by the pilot or by the passenger to rescue **the crew**
under specific flight conditions.



WHY THE PARACHUTE?



Over the last decade the 57% of **Accidents and Serious Incidents** in EASA Countries involved helicopters performing **non-commercial operations**. Among these, more than a half happened during training flights or pleasure flights.

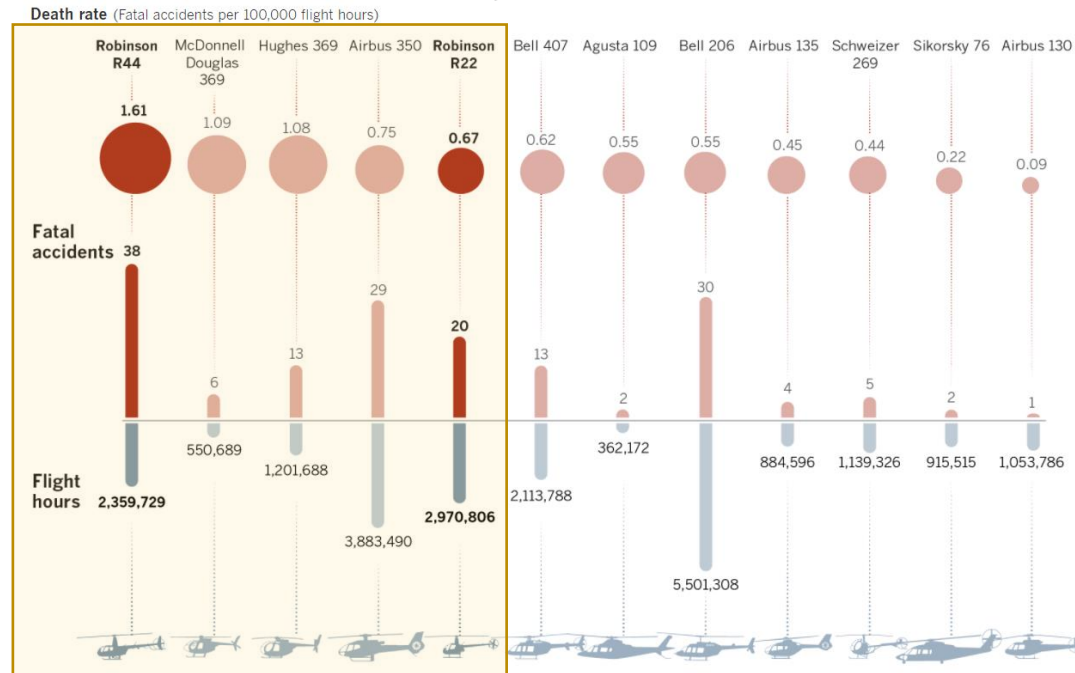
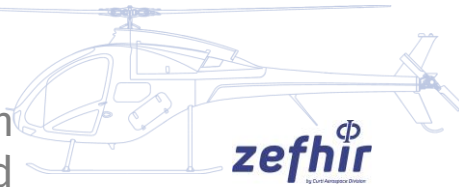
The 89% of all accidents and serious incidents involved CS27 helicopters, that is mainly relatively **small helicopters**. Small helicopters, mostly operated by non-professionals.

The conclusion that we can draw is that most accidents and incidents involving helicopters happen in the General Aviation domain. In this area, among the Priority 1 safety issues we can find **Experience, training and competence of individuals**, besides other issues related to the level of human performance of the pilots: Perception and situational awareness, Obstacle see and avoid, Flight path management.

SAFETY ISSUE	KEY RISK AREAS (ERCS)								
	AIRCRAFT UPSET	TERRAIN COLLISION	OBSTACLE COLLISION IN FLIGHT	OTHER INJURIES	RUNWAY EXCURSION /HARD LANDINGS	AIRBORNE COLLISION	FIRE, SMOKE AND PRESSURISATION	COLLISION ON RUNWAY	GROUND DAMAGE
System reliability	X	O	O	X	X		X		O
Flight path management	X	O	X	X	X	O			
Perception and situational awareness	X	O	X	O	X	O	O	O	O
Helicopter obstacle see and avoid	O	O	X			O			O
Experience, training and competence of individuals	X	O	O	X	X				

WHY THE PARACHUTE?

A journalistic investigation based on FAA and NTSB data conducted in 2018 by the Los Angeles Times [1] showed that a similar situation could be observed in the US in the 2006 to 2016 period:



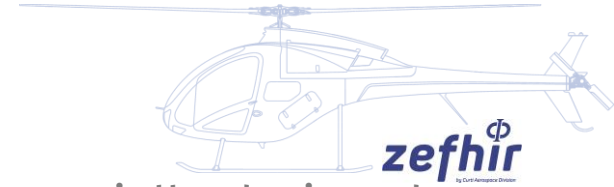
Sources: National Transportation Safety Board, Federal Aviation Administration, Times analysis

Lorena Iniguez Elebee

Note: Data exclude fatalities from 2011 because the FAA did not conduct a flight-hour survey that year.

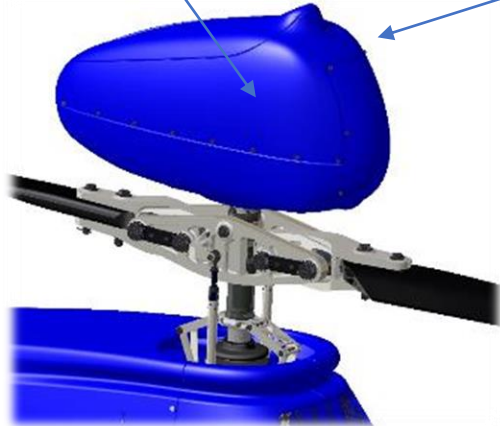
[1] Kim Christensen and Ben Welsh, "Danger spins from the sky", Los Angeles Times, Nov. 18, 2018

HOW IT'S MADE?



The **cover in composite material** contains a **housing** specially designed to include the parachute; moreover, the box also houses the **rocket**, a ballistic device with the function of **extracting** the parachute from its container, allowing it to be deployed very quickly.

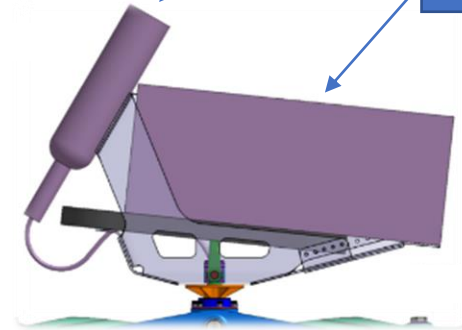
PARACHUTE HOUSING



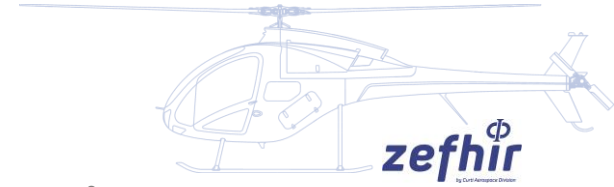
COMPOSITE COVER

ROCKET

PARACHUTE

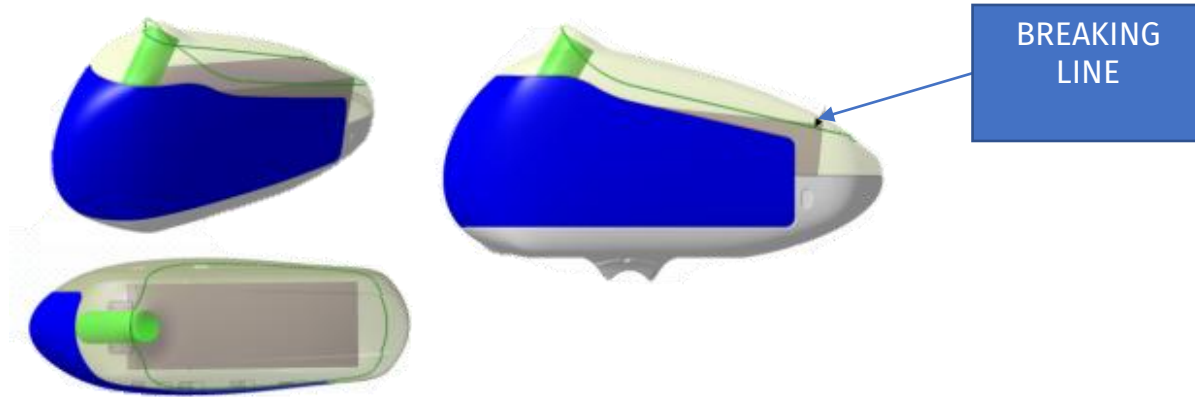


HOW IT'S MADE?

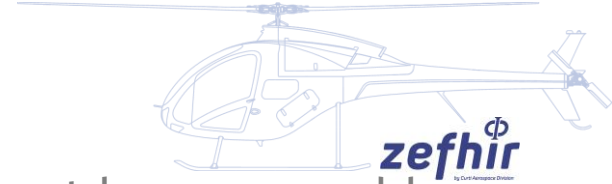


The composite cover was designed in such a way that **it breaks along a predetermined breaking line after the rocket activation** and allows the canopy to deploy out of the box.

To **prevent sharp edges** at the breaking line that could damage the canopy during the deployment, a **special technology** was used.



HOW DOES IT WORK?



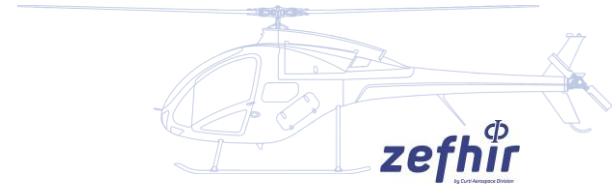
In the remote event of a **failure**, if the helicopter cannot be recovered by autorotation, the pilot **turns off the engine** and **operate the special lever** located in the cabin.

Through this simple maneuver the system starts an **automatic sequence** that **brakes the rotors** and **deploys the parachute**.

The helicopter glides down to the ground **safely** and at a **limited speed**.



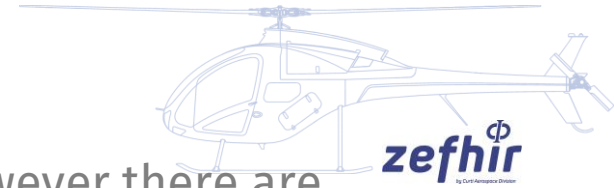
WHO CAN USE IT?



All pilots who choose **zefhir** are trained on the correct use of the parachute system. They will be provided with the information necessary to **maximize the effectiveness** of the device in an emergency.



WHEN TO USE IT?



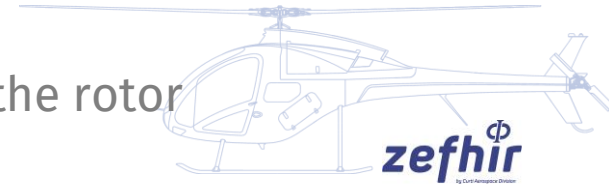
zefhir has **very good autorotation performances**, however there are situations when this manoeuvre is not possible, such as:

- **Flight controls failure**
- **Loss of maneuverability**
- Flight conditions that do **not allow to restore rotor speed**
- Flying over an area where emergency landing cannot be performed safely
- **Pilot illness**



WHEN TO USE IT?

In this UK accident the main rotor blades separated from the rotor head. In this circumstance it is not possible to perform autorotation and the parachute system could have helped to save a life.



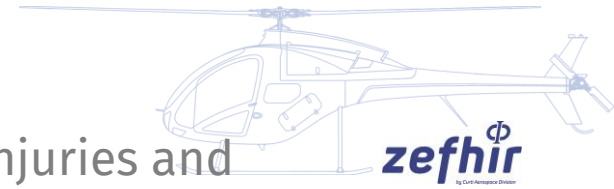
AAIB Bulletin: 2/2013		G-CHZN	EW/C2012/01/01
ACCIDENT			
Aircraft Type and Registration:	Robinson R22 Beta, G-CHZN		
No & Type of Engines:	1 Lycoming O-320-B2C piston engine		
Year of Manufacture:	1988 (Serial no: 884)		
Date & Time (UTC):	6 January 2012 at 1126 hrs		
Location:	Ely, Cambridgeshire		
Type of Flight:	Private		
Persons on Board:	Crew - 1	Passengers - None	
Injuries:	Crew - 1 (Fatal)	Passengers - N/A	
Nature of Damage:	Aircraft destroyed		
Commander's Licence:	Private Pilot's Licence (Helicopters)		
Commander's Age:	50 years		
Commander's Flying Experience:	59 hours (of which 59 were on type) – Helicopters 4,960 hours – Aeroplanes Last 90 days - 18 hours Last 28 days - 12 hours		
Information Source:	AAIB Field Investigation		

Synopsis

The Robinson R22 helicopter was flying from Manston to Fenland. Near Ely, witnesses on the ground saw it pitch and roll rapidly, the two main rotor blades separated from the rotor head and the aircraft fell to the ground. The pilot was fatally injured.

The accident was caused by main rotor divergence resulting in mast bumping, the rotor blades striking the airframe and rotor blade separation. The report includes Safety Recommendations, to the EASA and the FAA, that refer to the certification requirements for future light helicopters, to reduce the risk of 'loss of main rotor control' accidents.

WHEN TO USE IT?



A parachute system installed could have prevented these injuries and fatal outcome [1]:

'Nothing in my training prepared me'

Larry Wells, a pilot for the FAA, was practicing hovering, landing and liftoff maneuvers near Jackson, Miss., on Sept. 1, 2009, when his Robinson R44 began to shudder violently.

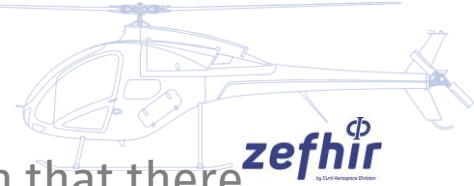
“When the vibration started, I looked in to check the gauges, but by that time the vibration was so bad I could not read them,” Wells recalled.

At 1,000 feet above the ground, everything was a blur as he fought to regain control. Seconds later, the helicopter tore through the treetops and slammed into a house, killing his passenger, Charles Farmer, a 59-year-old co-worker.

Wells, then 57, broke more than 60 bones and spent six weeks in a coma. His left arm was partly paralyzed and he now walks with a limp.

[1] Kim Christensen and Ben Welsh, “Danger spins from the sky”, Los Angeles Times, Nov. 18, 2018

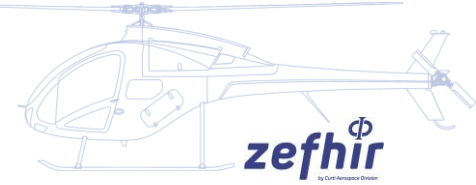
DOES IT AFFECT HELICOPTER PERFORMANCE?



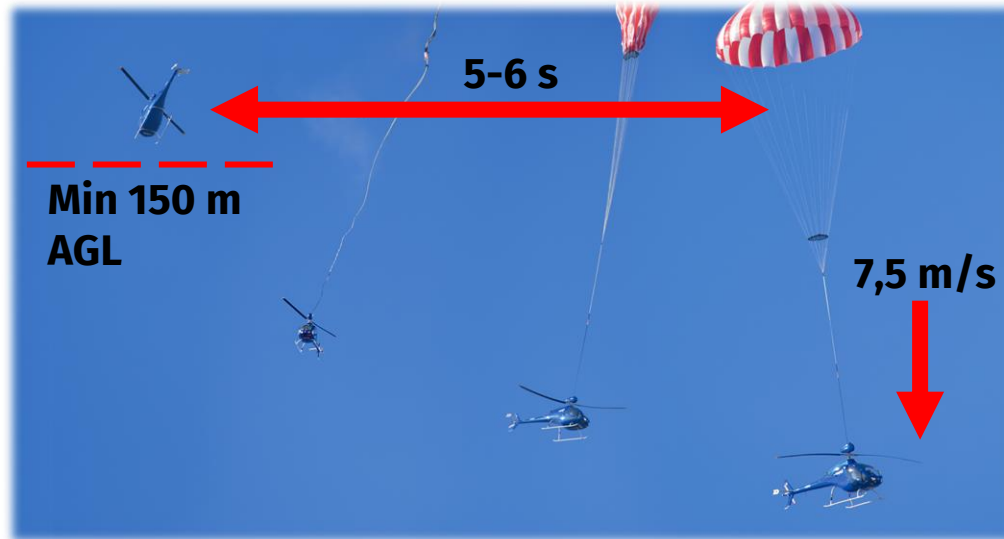
Flight tests conducted with the system installed have shown that there are **no appreciable variations** on the overall **dynamic and aerodynamic performances** of the helicopter (airspeed, handling qualities, stability, autorotation, loads).



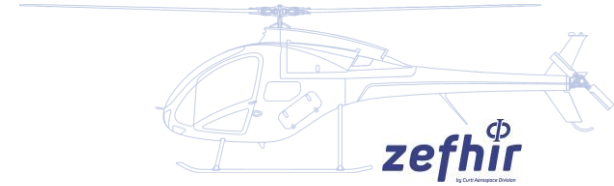
WHAT IS IT ABLE TO DO?



- Minimum altitude for activation: **150 m AGL**
- Deployment time: **5 to 6 s**
- Stabilized vertical speed: **7,5 m/s**
- **Minor damage to the helicopter**
- **Save the life of the crew** by limiting decelerations due to impact



WHY ONLY ZEFHIR HAS IT?

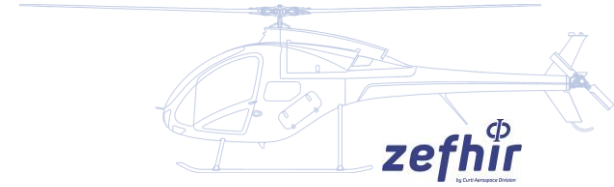


The parachute system is born in harmony with **zefhir**, being **fully integrated** into it from a **structural** and **aerodynamic** point of view.

This was possible thanks to the **reduced weight** of the helicopter, the availability of **state-of-the-art** ballistic **parachutes** and the **huge investments** in the project, especially in the testing procedures.



IS IT SAFE?



Yes! An intense and expensive **test campaign** was conducted to verify that the parachute system was fully reliable from all points of view.



STATIC SHOOT TEST

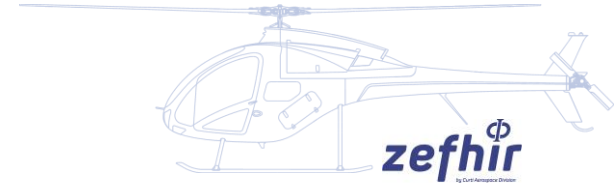


DYNAMIC SHOOT TEST



STRUCTURE FATIGUE TEST

IS IT SAFE?



For the **first time in aviation history**, a **full-scale test of the rescue system for helicopters** was also performed, transforming the helicopter into a RPAS. Thanks to this test, it was possible to **validate the parachute system** and verify its effectiveness in a simulated emergency situation.





ANY QUESTION?
PLEASE VISIT US AT A010 BOOTH!
THANK YOU FOR THE ATTENTION!

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