

Rediscovering the Autogiro: Cierva, Pitcairn and the Legacy of Rotary-Wing Flight

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Neither the invention in 1923 by Spain's Juan de la Cierva nor the stunning aircraft produced in America by Cierva-licensee Harold F. Pitcairn are much remembered, an ironic fate for two aeronautical pioneers and the Autogiro. It was the first successful rotary-wing aircraft, described in the March 1936 *Fortune* magazine as "the only basic contribution to the art of flight since the Wright brothers rode a biplane into the air in 1903" and when a Pitcairn Autogiro landed on the back lawn of the White House on April 22, 1931, it was the only aircraft in the world that could do so!

Juan de la Cierva was born in Murcia, Spain on September 21, 1895, the first son of a privileged family, and by 1908-9, had decided to make aviation his career, later observing that he doubted that "Juan de la Cierva Senior approved of his son's curious interest in kites and gliders, or encouraged his ambitions to build

and fly them. But boys find ways and means to satisfy their extraordinary impulses, and we spent much of our spare time and most of our spare cash in these primitive experiments in practical aeronautics."¹

In 1911 Cierva enrolled at the Civil Engineering College of Madrid (Caminos, Canales y Puertos (Roads, Canals and Ports)) and in 1912 with his friends "Pepe" Barcala and Pablo Diaz constructed the first Spanish airplane with parts from a French aircraft that had crashed. The boys, with their severely limited budget and fearing the disapproval of concerned parents, had to fabricate most of the parts that went into the rebuilding effort – including a propeller derived from a most unlikely source. Cierva reasoned that the counter of the bar had been bathed in spilled drinks for years, and that the constant action of alcohol would surely have seasoned the countertop. Of perhaps equal importance,

the countertop's price was within the remaining funds, so they purchased it and from that countertop carved a propeller. Using the first initials from each of their last names, the young builders dubbed their biplane the BCD-1, but it quickly became known as "El Cangrejo" – "the Red Crab" – because they had colored the wings and fuselage with aniline dye to a deep scarlet color.² And although it flew well, the dope on the wings softened in the rain and the first Spanish airplane eventually fell apart, but Cierva is justly remembered as the "Father of Spanish Aviation."

Cierva entered an aircraft design competition in 1919, producing a large three-engine bomber that, piloted by Captain Julio Rios Argüeso, crashed in its initial flight when the aircraft stalled. Pondering the crash, Cierva's brilliant insight was to see the wing differently – aircraft stalled when the air passing over the wing failed to generate enough lift at slow speed – Cierva reasoned that stall could be effectively eliminated if the wing itself moved. The rotor, placed on top of a fuselage, became a moving, stall-proof wing. He patented the name "Autogiro,"³ and it flew by autorotation, defined as "the process of producing lift with freely-rotating aerofoils by means of the aerodynamic forces resulting from an upward flow of air."⁴ As long as the Autogiro was propelled forward, air coming up through the rotor would generate lift, and should the Autogiro's motor fail, it would gently descend while air flowed upward through the rotor blades. Between 1920 and 1923 Cierva progressively developed autorotation in a series of models, the C.1, C.2 and C.3, but it would be his fourth model that would conquer the air.

Cierva stated⁵ that the first flight of his C.4 Autogiro was on January 9, 1923 at Getafe airfield outside Madrid when (Calvary) Lieutenant Alejandro Gómez Spencer, "a Spanish gentleman whose surname and appearance both indicate an English ancestry ... one of the best



CarterCopter CCTD in flight. Developed by Jay Carter, Jr. and his associates, the state-of-the-art Carter Copter Technology Demonstrator is the most innovative rotary aircraft flying and is advancing autogyro technology to the next level. (Photo courtesy of CarterCopters, LLC)

known Spanish fliers” guided the craft in taxi tests during which the craft became airborne. But most modern historians⁶ maintain that the first observed (and filmed) flight of C.4 took place on January 17, 1923 when Gómez Spencer flew 600 feet at a steady height of 13 feet across the field. Transferring operations to England in 1925 and forming Cierva Autogiro Ltd., he would continue to improve the Autogiro, developing a

KLM DC-2 (PH-AKL) flight, bound for Amsterdam from the airport at Croydon Aerodrome, London, delayed beyond its 10 a.m. scheduled takeoff, under the command of a Captain Hautmeyer, finally made an instrument take off, made necessary by visibility that rarely exceeded 25 yards. The pilot, though experienced, inadvertently swung subtly to the left from the white 2,100 foot takeoff guideline which proved to be a fatal

helicopter, and even though Cierva-licensed Autogiros would be used by the British, French, American and Japanese forces, the Autogiro would all but disappear by the end of WWII. Few would know or remember that it was the English Cierva Rota Autogiros that would daily calibrate the coastal radars⁷ that enabled the RAF to defeat the German *Luftwaffe* and win the Battle of Britain. The obscurity of Cierva’s Autogiro would be mirrored by



Pitcairn PCA-2 (foreground) and PCA-1B (background) Autogiros flying past the Statue of Liberty in a certification flight in October 1930. (Photo courtesy of Stephen Pitcairn, Pitcairn Aircraft Company)

means to tilt the rotor head and altering the pitch (angle) of each individual rotor blade, called collective and cyclic control, eventually achieve a direct control that eliminated the need for wings, effectively perfecting the control systems necessary for the coming helicopter. But this ended on the fog-shrouded morning of December 9, 1936.

mistake to all but two of the 16 people on board when the plane crashed – at the time, the worst air disaster in British history. Thus did Juan de la Cierva die – an ironic end to a man so passionately committed to developing a safe means of air travel. Stripped of his passion, the company he founded in England would shift the focus of its efforts towards developing a

that of Harold Frederick Pitcairn and his aircraft in America.

The youngest son of John Pitcairn, co-founder of Pittsburgh Plate Glass Company, Harold was born in 1897 and took an early, if not entirely approved of, interest in aviation. Inspired by the first flight of the Wright brothers in 1903, he began flight training as an air cadet in the



Pitcairn chief pilot James G. Ray with Thomas A. Edison standing in front of the Pitcairn PCA-2 Autogiro in 1930. Edison, who had unsuccessfully attempted to develop a rotary-wing aircraft, is reported to have proclaimed, upon seeing the Autogiro fly, "That's the answer, that's the answer." (Photo courtesy of Stephen Pitcairn, Pitcairn Aircraft Company)

last days of WWI, and would eventually earn a pilot's license signed by Orville Wright. During his flight training he had met a talented engineer, Agnew Larsen. They had combined talents to produce the Mailwing series, a mainstay of the emerging government-subsidized mail route system, one of which is included in the Smithsonian's National Air and Space Museum and for which Pitcairn is justly famous. But it was the Autogiro that fired his passion, and to which he would devote his efforts. He had followed Cierva's achievements and visited England and Spain to meet with the inventor, and in 1928 ordered a Cierva C.8W (the W was because Pitcairn requested it with an American Wright Whirlwind engine). That aircraft arrived at Pitcairn Field, Willow Grove, PA and on December 18, 1928, made the first rotary-wing flight in America.

After negotiations in early 1929, Cierva and Pitcairn agreed that the Pitcairn-Cierva Autogiro Company (PCA) would be formed in America with the rights to license Cierva's patents, and that Pitcairn would join the English company's board. The price was \$300,000, paid for by the sale of Pitcairn's airmail company Eastern Air Transport to a group headed by Chandler Keys and Glenn Curtiss. The purchase of Eastern Air Transport for \$2.5 million was completed just weeks before the stock market crash, and Pitcairn's

airline would eventually become Eastern Airlines.

Pitcairn threw himself into the development and promotion of the Autogiro – and the results of the next 16 months would earn him and his associates the Collier Trophy⁸, the most prestigious award for the greatest aviation achievement for 1930. Pitcairn had refined Autogiro development, first learning from the C.8W (which was presented to the Smithsonian on July 22, 1931), but then with a series of developmental aircraft, the PCA-1, 1A and 1B. (The PCA-1A survives as the oldest American-built rotary-wing craft and is currently exhibited at the American Helicopter Museum & Education Center at the Brandywine Airport, West Chester, PA on loan from the Smithsonian). But it was the next aircraft, the PCA-2, that captivated America. An original design (many of the Cierva and earlier Pitcairn models had been based on existing aircraft), the PCA-2 was seen over major American cities in late 1930 through early 1931 in its certification flights to much publicity and acclaim.

April 1931 was the best of times for Pitcairn and the Autogiro – on April 2, the PCA-2 became the first certified Autogiro in America receiving ATC 410; just six days later, Amelia Earhart set a new Autogiro altitude record at Pitcairn Field, Willow Grove of 18,415 feet; and by month's end, Pitcairn was presented the Robert J. Collier Trophy by President Hoover at the White House where James G. "Jim" Ray landed the PCA-2 in a much chronicled spectacular demonstration of its abilities. Shortly thereafter, in June Earhart completed a transcontinental Autogiro flight, landing in Glendale, CA only to discover that Poughkeepsie native John M. "Johnny" Miller had arrived a few weeks earlier! But despite such success, later technological developments and publicity, the Depression and lack of military interest on the part of senior officers mesmerized by helicopter development by Focke-Achgelis GmbH in Germany effectively doomed the Autogiro and Pitcairn would be out of the business by early 1942. A similar fate soon befell the Kellett Autogiro Company of Philadelphia.

Pitcairn would successfully sue the United States government to enforce his personal company and Cierva-licensed rotary-wing patents in 1951 as every helicopter which the military purchased was based on Autogiro control technology. The



John M. "Johnny" Miller, age 97, with Hofstra University's Dr. Bruce Charnov, at the Experimental Aircraft Association (EAA) AirVenture Fly-In at Oshkosh, WI in July 2002. Johnny Miller made the first Autogiro transcontinental flight in May 1931, arriving in California 10 days before Amelia Earhart. (Photo courtesy of Dr. Bruce Charnov)

government would be found liable by the Trial Examiner on March 5, 1966 in a 232-page decision where it was concluded that “Harold Pitcairn had been the key person in the development of the rotary-wing industry in the United States, a true pioneer.”⁹ Damages in the amount of \$31.4 million dollars were awarded on July 12, 1977, affirmed by the Supreme Court on July 23, 1977 with an additional award of \$600,000 for delay – a total of \$32,048,738, but it came too late for Harold Pitcairn.

On Friday, July 22, 1960, Harold Pitcairn was preparing for a gala occasion, the celebration of his brother Raymond’s 75th birthday, undoubtedly thinking of the festive evening for more than 450 guests, the remarks he would make as master-of-ceremonies and the honors and celebratory telegrams that had arrived from dignitaries including former president

Eisenhower, industry and civic leaders. But it is not unlikely that Pitcairn also thought of that day 29 years earlier when *he* stood next to another president and received the Collier Trophy on the White House lawn. By all accounts Raymond’s birthday was a glittering occasion on Saturday evening and Harold appeared in particularly jovial mood. After returning home Pitcairn went into his study which was located on the ground floor. Ever since the Lindbergh kidnapping on February, 1932, it had been Pitcairn’s nightly practice to check all the accessible windows and doors with a loaded Savage .32-caliber semi-automatic pistol to ensure security for his family. His wife Clara assumed he would come to bed after making those rounds, but soon was drawn back to the study by the sound of a gunshot. Rushing down the stairs she found her husband dead at his desk from a gunshot wound to the head.

The circumstances of Harold Pitcairn’s death remain unclear even after four decades. The death was immediately reported as a suicide by the media, but as asserted by Pitcairn admirers Frank Kingston Smith¹⁰ and Frank Anders, Jr.¹¹ “police investigation disclosed that two shots had been fired; one had penetrated the ceiling directly over the desk in the ground floor study, another had struck Pitcairn in the eye.”¹² Pitcairn’s widow Clara requested that the inquiry be ended, and she claimed that she never wished to speak of it again. Harold Pitcairn became, in the words of Frank Anders, the “Forgotten Rotorcraft Pioneer” – the only remaining part of his legacy being the check from the United States Treasury, and that was for contributions made to helicopter development.

Hofstra University will hold the first-ever international conference dealing with



Fairey Rotodyne “Y” convertiplane, which could take off and land as a helicopter and fly as an autogyro, in a test flight during 1957-1962. It could carry 40 passengers and a crew of two and cruise at 200 miles per hour. (Photo courtesy of Westland Helicopters, Ltd.)

the autogiro, entitled *From Autogiro to Gyroplane: The Past, Present and Future of an Aviation Industry* on April 25 and 26, 2003. The conference will commence with the conferring of an honorary degree for lifetime achievement on England's Wing Commander Kenneth H. Wallis renowned autogyro engineer, pilot (he flew the "Little Nellie" autogyro in the 1967 James Bond film *You Only Live Twice*), designer and holder of every autogyro record between 1968 and 1990) with the Friday afternoon session devoted to the Pitcairn/Cierva era. The invited keynote address will be delivered by Pitcairn Aircraft Company archivist/historian Carl Günter. Entitled "Rediscovering Harold F. Pitcairn," Juan de la Cierva, nephew of the Spanish inventor, will speak on a comparison of the lives of these two forgotten aviation pioneers.

End Notes

1. Cierva, Juan de la, and Don Rose. *Wings of Tomorrow: The Story of the Autogiro*. New York: Brewer, Warren & Putnam, 1931, p. 26.
2. For a rare photograph of the BCD-1, see Capon, P.T. "Cierva's First Autogiros – Part 1" *Aeroplane Monthly*. Vol. 7, No. 4, April 1979, pp. 200 – 205:201.
3. Cierva and Cierva-licensed machines are thus Autogiros. The machines of others are autogyro, Gyrocopter (patented by American Igor Bensen which ceased as a trademarked term in 1988), or the generic gyroplane.
4. Fay, John. *The Helicopter*. New York: Hippocrene Books, 4th ed., 1987, p. 80.
5. Cierva, Juan de la, and Don Rose. *Wings of Tomorrow: The Story of the Autogiro*. p. 104; see also Capon, P. T. "Cierva's First Autogiros – Part 1," *Aeroplane Monthly*; Capon, P. T. "Cierva's First Autogiros – Part 2," *Aeroplane Monthly*, Vol. 7 No. 4, May 1979, pp. 234 – 240.
6. See e.g., Brooks, Peter W. *Cierva Autogiros: The Development of Rotary-Wing Flight*. Washington, D. C.: Smithsonian Institution Press, 1988, p. 43; Gablehouse, Charles. *Helicopters and Autogiros: A History of Rotating-Wing and V/STOL Aviation*. Rev. ed. Philadelphia: Lippincott, 1969.

Previous edition published as *Helicopters and Autogiros: A Chronicle of Rotating-Wing Aircraft*. Philadelphia: Lippincott, 1967, p. 38.

7. Hill, Norman (Flying Officer) "Wingless Combat" *Royal Air Force Flying Review*. Vol. XVIII, No. 4, January 1963, pp. 24 – 25, 57.
8. For photographs of Harold F. Pitcairn posing with the Collier Trophy in front of the PCA-2 at the White House, see Smith, Frank Kingston "Mr. Pitcairn's Autogiros," March, 1983, *Airpower*, Vol. 12 No. 2, March 1982, pp. 28 – 49 p. 36.
9. Smith, Frank Kingston. *Legacy of Wings: The Story of Harold F. Pitcairn*. New York: Jason Aronson, 1981, pp. 334 – 335.
10. Smith, Frank Kingston. *Legacy of Wings: The Story of Harold F. Pitcairn*, 1981, p. 334.
11. Anders, Frank "The Forgotten Rotorcraft Pioneer: Harold F. Pitcairn." *Rotor & Wing International*, May 1990, pp. 34 – 37: 37.
12. Frank Kingston Smith adds, neatly accounting for all the circumstances: "The next morning it was discovered that the semi-automatic pistol was defective; when cocked, it had a supersensitive "hair trigger, and it had a faulty disconnecter so that it would fire more than one shot at a time, a condition known as "doubling." None of this information ever came out." Smith, Frank Kingston. *Legacy of Wings: The Story of Harold F. Pitcairn*, p. 334; but see Smith, Frank Kingston "Mr. Pitcairn's Autogiros" *Airpower*, Vol. 12 No. 2, March, 1983, p. 49, where the author asserts that "At age 75 Harold Pitcairn died . . ." obviously confusing Harold with his older brother Raymond.



Bruce Charnov's genuine interest in rotorcraft technology began in 1999 when he decided he wanted to learn how to fly. The question as to "what to fly" prompted him to search the Internet since he somehow remembered gyrocopter advertisements in *Popular Science* during his teenage years. To his surprise, he encountered more than 2,200 references relating to the gyrocopter and he was inspired to begin his research.

Since then Professor Charnov has published more than 20 articles on the history of the autogiro/gyroplane and he is widely consulted by museums and aviation historians on this technology. His book, *From Autogiro to Gyroplane: The Amazing Survival of An Aviation Technology*, will be published by Praeger Publishers in 2003.

Professor Charnov earned a B.A. from the University of Michigan, an M.A. and rabbinical ordination from the Graduate School of the Jewish Theological Seminary, an M.B.A. from Fairleigh Dickinson University, and a Ph.D. from the United States International University. He is a graduate of the Hofstra University School of Law, having received a J.D. with distinction and an award for excellence in labor law, and was associate editor of the *Hofstra Law Review*. He has authored and co-authored articles in the areas of labor law and trends in arbitration.

Professor Charnov has co-authored several books, including three editions of *Management* (Barrons Educational Press, 1987, 1993, 2000); Greek and Portuguese translations, 1995 and 1997), *Managing People in Today's Law Firm*, (Quorum Press, 1995), *Global Corporate Intelligence* (Quorum Press, 1990), and *Ethical Dilemmas of the Academic Profession* (Charles C. Thomas Press, 1987). He teaches courses in human resources management, collective bargaining and alternative dispute resolution, strategic policy and planning, non-profit management, and business ethics/social responsibility.

In 1998 Professor Charnov retired as Captain in the Naval Reserve and received the Meritorious Service Medal from the President of the United States. -SK