



# The Weatherman & the Millionaire:

How Carl-Gustaf Rossby and Harry E. Guggenheim  
Revolutionized Aviation and Meteorology in America

by David Laskin

**A** brilliant powder blue sky fills the screen. A beat of silence then a distant mosquito-like whine quickly amplifies into the unmistakable drone of an old propeller plane. Out of nowhere, an enormous rectangular wing slices across the screen. There is just time enough for a glimpse of the thin-faced, grinning, handsome man in the cockpit and, on the side of the plane, right behind the propeller, in big bold letters: *The Spirit of St. Louis*.

Charles A. Lindbergh with  
Harry Guggenheim, 1927



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## Rossby Waves

In 1939 and 1940, Carl-Gustaf Rossby published a pair of papers describing the immense loops or meanders that buckle the east-to-west flow of the circumpolar jet. Rossby waves, as these meanders in the atmosphere and oceans came to be known, are not only long in size, commonly spanning 3,000 miles, but long-lived as they hover in pretty much the same place for weeks or even months at a time. They do, however, eventually shift position, and Rossby devised the equation to compute the speed with which they move.

Since weather tends to get exciting along the peaks and valleys of Rossby waves, forecasters are intensely interested in their position and movement. In fact, it was immediately after the publication of Rossby's seminal papers that his colleagues at MIT began to use his circulation model to issue the first regular five-day forecasts for the Northern hemisphere. In 1941, Rossby's protégé Jerome Namias was appointed chief of the newly formed Extended Forecast Division at Weather Bureau headquarters, where he remained for the next 30 years. Namias later told an interviewer that Rossby "triggered a whole new chain of thinking" through his work on Rossby waves. "They formed the basis for the advance in extended forecasting."

Cut to the dusty, wintry library of the old Weather Bureau headquarters building on 24th and M Streets in Washington, D.C. A round-faced, elfin young man—a kind of Nordic Mickey Rooney—is making scrawls on a weather map with great concentration and excitement, when in strides a much older man, as gray as the winter

"Young man, your insubordination is intolerable," Marvin splutters as Rossby brandishes the map in his face. "As far as I'm concerned, your days at the Bureau are over!" As the library door slams, a dust cloud rises from the ancient leather-bound tomes.

## A Dynamic Team

No, this is not a treatment for a meteorologically themed screenplay, but an only slightly fanciful rendering of an actual event—indeed, an historic event that led directly to the emergence of two endeavors that define our time: commercial aviation and scientifically grounded weather forecasting. The fact that the incident lends itself so readily to a big screen scenario is a tribute to the charisma and genius of the leading man, Rossby himself.

Best known today for identifying the long waves that bear his name, the Swedish-born Rossby was a major force in American meteorology for 25 years. Legendary for his charm, his powers of persuasion, his headlong enthusiasms, and his readiness to have a good time no matter what it cost, Rossby was irresistible. His many friends and colleagues spoke of him as a force of nature—chaotic, restless, awe-inspiring, and extremely entertaining.

Luck and the right connections brought the Swedish dynamo to the attention of philanthropist Harry F. Guggenheim just as the millionaire was throwing his energy and a sizable sum of

**"His far-reaching ideas and high-flying plans often took our breath away"**

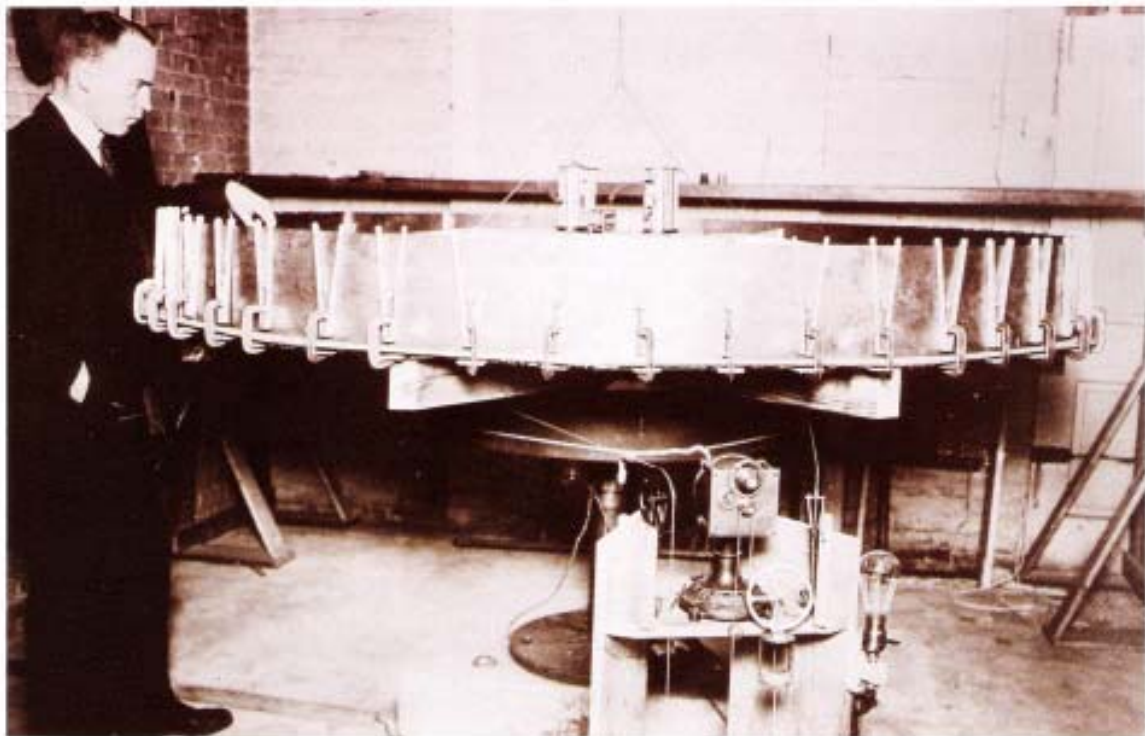
sky and yet blazing red with anger. In the heated exchange that follows, these facts rapidly emerge: The older man is Charles Marvin, the fossilized martinet who for long dreary years has kept the U.S. Weather Bureau in the meteorological stone age; the Nordic elf is the brilliant young Swedish meteorologist Carl-Gustaf Rossby, who has emigrated to the United States to try to nudge American forecasting into the modern world, only to find himself thwarted at every turn by the Neanderthal Marvin.

Rossby has just gone behind Marvin's back to do the forecast for Charles Lindbergh's nonstop 27-hour flight from Washington, D.C. to Mexico City on December 13–14, 1927—a forecast that Rossby absolutely nailed.

his father's money into a campaign to make the United States the world's leader in aviation. Working together for a few feverish months, Rossby and Guggenheim launched a joint experiment in flight and forecasting that literally propelled both enterprises into the modern world.

## Early Years

Born in Stockholm in 1898, Rossby was 20 when he relocated to Bergen, Norway, to study under pioneering atmospheric scientist Vilhelm Bjerknes at the Geophysical Institute. This was the heady period when Bjerknes and his so-called Bergen School were blasting meteorology out of its theoretical doldrums with their breakthroughs in the polar front theory and air mass analysis.



HISTORIC WMS COLLECTION

Carl-Gustaf Rossby with a rotating tank, used for studies of atmospheric motion

The young Swede was totally in his element. "His far-reaching ideas and high-flying plans often took our breath away," recalled a colleague. Under Bjerknes's tutelage, Rossby, who had previously studied mathematics and astronomy, committed himself to meteorology.

In 1926, when he secured a fellowship to export the innovations of the polar front theory to the U.S. Weather Bureau, Rossby jumped at the chance, only to incur the ire of Chief Marvin and his doddering staff—"half-educated practitioners," as one Rossby ally called them, "who had risen through the ranks because of some practical knowledge and ability to out-guess the weather."

But it was not in Rossby's nature to sit around and mope. Instead he befriended the one enlightened colleague he met in Washington—a young Navy lieutenant named Francis W. Reichelderfer (Reich to his buddies) who had completed a crash course in meteorology at Harvard's Blue Hill Observatory, flown as a bombardier, and taught himself the basics of the Bergen approach to forecasting. Reich was delighted to find someone who had acquired the Bergen wisdom at the source, and he helped Rossby in any way he could, which included

introducing him to important people like Harry Guggenheim. Reich and Guggenheim, both Navy pilots (Guggenheim had flown overseas during World War I), shared a conviction that the United States lagged woefully behind Europe in aviation and desperately needed to catch up. Guggenheim was in a position to do something about it.

### Funding the Future

Around the time that Rossby and Marvin were locking horns, Harry Guggenheim was pitching a scheme to his father Daniel to foster the development of aviation in the United States. It was an easy pitch. Though Daniel had never flown and never would, he grasped his son's vision and readily agreed to put up the money, eventually \$3 million in all, for the foundation named in his honor, the Daniel Guggenheim Fund for the Promotion of Aeronautics. Harry, as president, spent his father's money on anything he believed would improve American aviation, from experimental flights to university programs in aeronautical engineering to improving aviation weather forecasts.

Soon after the fund was up and running, Reich told Harry Guggenheim that if he wanted someone to forecast the weather for pilots, Rossby was



his man. Rossby's first Guggenheim-sponsored mission was to help draw the weather maps for Richard E. Byrd's transatlantic flight. Rossby did such a fine job that Charles Lindbergh, another Guggenheim connection, signed him up to do the forecasting for his Washington to Mexico City hop. When Lindy let it be known that Rossby's forecasts were the best he had ever had—far superior to the Weather Bureau's—Chief Marvin hit the roof. Marvin may not have slammed the door in Rossby's face, but he made it clear that the effervescent Swede was no longer welcome at headquarters.

No worries. Thanks to his new friends, Rossby had a new position in commercial aviation ready and waiting. Guggenheim was especially interested in promoting passenger flights because the United States had such an abysmal record in this area. When the fund began doling out money in 1926, only about 5,700 Americans a year trav-

timely observations. Standard procedure at the time was for pilots to phone their destination airport before take-off to get the latest weather, and then confirm or change the flight plan depending on the weather conditions up ahead. But Rossby astutely pointed out that this approach had limited usefulness since weather often comes in "sideways." It was essential, Rossby wrote, to establish "dense strings of stations on and surrounding the airway."

He came up with a novel way to get those "strings" in place. Borrowing an Army Air Corps pilot for the day, Rossby would choose a strategically placed town along the airway and ask the pilot to buzz the place. When they landed in a field on the outskirts of town, there was usually a sizable crowd of gawkers. Rossby then deployed his legendary charm to get himself a ride to the mayor's office, where he proceeded to sweet-talk town officials into helping him enlist local

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eled as passengers on commercial flights—small wonder given what they had to endure. Virtually the only commercial flights available were mail carriers, so passengers—typically one per plane—were crammed in on top of the mailbags. If they arrived in one piece they counted themselves lucky. As one historian of aviation put it, "The airmail pilot faced a series of dangers fully as deadly as any confronted by the military pilot in combat. The chief foe was weather." Of the nation's 40 original airmail pilots, 31 died in crashes, most of which were weather related. Guggenheim, with Rossby's help, was determined to turn this around.

### New Heights in Travel

With about half a million dollars from the fund, Guggenheim inaugurated an experimental Model Airway offering passenger service between Los Angeles and San Francisco. To ensure that the planes flew as safely as possible, he launched a companion Model Weather Service. Guggenheim chose Western Air Express (the forerunner of TWA) to run the flights along their existing airmail route, and he tapped Rossby to head up the Model Weather Service.

The 29-year-old Rossby rose admirably to the challenge. The first task was getting reliable and

residents as volunteer weather observers. Anyone with a phone who stayed put all day was pressed into service. By the time he was done barnstorming around California, Rossby had assembled a small army of gas station attendants, hotel managers, and clerks to report at regular intervals on local visibility, ceiling, fog, rain, or snow. Eventually, Rossby had forty observation posts between Los Angeles and San Francisco, with observers phoning in data six times a day. An additional six balloon stations reported on winds at cruising altitudes.

The first flights of the Model Airway—Fokker F-10 trimotors purchased with a \$155,000 Guggenheim loan—took off simultaneously from Los Angeles's Vail Field and the Oakland Municipal Airport at 9 a.m. on May 26, 1928. Passengers, 12 per plane, paid \$50 for the three-hour, 365-mile, one-way flight. "It has ... been noted that passengers enjoy eating while they are in the air," wrote a contemporary chronicler of the project with some astonishment, and so a "luncheon" was served halfway into the trip. Passengers were also provided newspapers, stock market reports (of great interest in those final months before the market crash), and in-flight radio. The planes themselves were equipped with two-way radios, a hugely important recent innovation, so the two

pilots were kept constantly abreast of changing weather conditions.

Not a single weather-related accident occurred during the year that the Model Airway ran. In fact, Rossby's service was deemed so important that when the experiment had run its course, California legislators secured federal funding for the U.S. Weather Bureau to continue the service. "I believe that it is simply lack of knowledge as to what can be done in this respect that has kept industrial and commercial enterprises from making vigorous demands for meteorological services of this type," Rossby declared. Once he demonstrated what could be done, there was no going back. In time, the Weather Bureau adopted the Rossby model nationwide.

### A Lasting Legacy

"The so-called Model Airway experiment never really ended," wrote Robert J. Serling in his book *The Only Way to Fly*. Instead, its lessons and procedures were incorporated into the normal daily operations of Western Air Express and eventually into airlines operating around the country. The program conclusively proved to the American public that passenger flights could be not only dependable and comfortable but safe—safe above all from the vagaries of weather—and the response was huge. In 1930, some 385,000 Americans traveled as passengers on commercial flights; that figure jumped to 800,000 by 1935.



Carl-Gustaf Rossby

friend Reich, the bureau's newly appointed head. In 1941, Rossby moved on, yet again, to the University of Chicago. In 1950, he returned to his native Sweden, though he made frequent return trips to the United States. On December 17, 1956, Rossby made the cover of *Time* magazine

## Harry, as president, spent his father's money on anything he believed would improve American aviation

By then, Rossby himself had long since moved on. Notoriously restless ("a problem solved is a dead problem," he was fond of saying), he left California in September 1928, months before the Model Airway experiment ended, to head up a new meteorology program initiated by the Daniel Guggenheim Fund at the Massachusetts Institute of Technology. It was during his tenure at MIT that Rossby made his signal breakthrough on the propagation and movement of immense semi-permanent "planetary waves," now commonly known as Rossby waves, thus opening the way to reliable five-day weather forecasts.

Rossby, who seldom stayed in one post longer than a decade, signed on as the Weather Bureau's assistant chief in 1939 at the behest of his old

in acknowledgement of his key role in raising "meteorology to its present high estate." Buried deep in the piece was reference to a theory that the world's climate might be altered by solar heat trapped in the atmosphere due to a build up of carbon dioxide. "Rossby wants to find out about this little matter too," the *Time* reporter wrote archly.

The idea that Rossby might have contributed an early study of the greenhouse effect is tantalizing, but it was not to be. Nine months after the *Time* cover story, he died of a heart attack in his Stockholm office at the age of 58. **W**

Seattle-based writer DAVID LASKIN is the author of numerous weather-related books, including *The Children's Blizzard*.

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## EPILOGUE

Norm Crabill

*Don't wait for somebody else to do it!*

If you see a need, get busy and do it yourself, as the Guggenheims so aptly did for aviation in the late 1920's. They were not the only ones; individual initiatives in aerospace technology have made many significant contributions to aviation, e.g. the Wright Brothers, the Orteg Prize that motivated Lindbergh, the National Air Races, the light plane industry that has morphed into business jets, and more recently the Burt Rutan "*StarShipOne*", the first all-civilian foray into space and the winner of the \$10 M Ansari X Prize backed by *Microsoft* cofounder Paul Allen.

We can't always depend on the government to unfailingly anticipate future directions for aerospace research and development. Case in point - the development of jet engines and swept wings was totally ignored in this country in the late 30's and early 40's. These "break-through" technologies showed up in operational German aircraft in the last year of WW II, and the US had no comparable technology, but luckily our production resources turned the tide. Again, despite the work of Robert Goddard with liquid fueled rockets in the 1920s and 1930s, the US was only the second nation to put a satellite into orbit in the 1950s after the Russian Sputnik.

In the late 30's, NACA engineer Fred Weick developed his own ideas for a safe and easy-to-fly GA aircraft. After he left NACA, his *Ercoupe* appeared just before WW II, and was in mass production after WW II. He went on to develop safer and more efficient agricultural airplanes, and improved pesticide application technology, and initiated the design of the *Piper Cherokee* series of aircraft.

The two recent government programs for improving general aviation, the Advanced General Aviation Technology Experiments and the Small Airplane Transportation System, were the result of the initiative of a single individual, NASA engineer Dr. Bruce Holmes, and were a welcome change to government policy. These programs have shown a path that has already influenced several state-of-the-art new aircraft, e.g. *Cirrus*, *Columbia*, and *Diamond*, and the *Eclipse*, *Adams*, and *Honda Jets*. The recent SATS demonstration at Danville points the way to the development of a comprehensive infrastructure to support these types of aircraft; it will be up to the GA industry to capitalize on these developments.



So, whether in the government or outside, the influence of individual initiative on the development of aviation technology has been significant, and will continue to be so, as long as we have a system that recognizes good ideas when they come along. But history shows that you can't count on the government to do it all, and the private initiative system of philanthropy and venture capitalist has and can provide a back-up. In view of the new national program for manned space flight to the moon and Mars, and the drastic redirection of funding of aeronautical programs, these private initiatives may become more important than ever for the US to maintain its lead in aeronautical technology, Philanthropists and venture capitalists – pay attention!



## **JGG – A 35 Year History**

By Sharon D. Dillon

The Williamsburg-Jamestown Airport's story is one of struggle and triumph. It all began in 1967 when Larry Waltrip first asked his parents, Dudley and Mary Waltrip, who owned a construction company, to take their bulldozers and carve a little airstrip on their 200 acres of clay off of Lake Powell Road so he could learn to fly. Larry, his father Dudley C., and his brother Dudley S. (Timmy), began to do just that – carve the runway with their bulldozers. In the middle of all this, friends told them “You have to get permits from the State and the FAA to build and operate an airport”. This they did, and on July 10, 1969 the senior Waltrips did receive permission to establish and operate the Jamestown Airport by both the State and the FAA. Ironically, Larry did get his private certificate in 1970, but he did his flying at Fort Eustis since he was a member of the Virginia Air National Guard.

As construction began and word got around, a few neighbors were up in arms. They thought the airport would not meet safety standards, especially considering the airport approach flew over their neighborhood and near the Rawls Byrd Elementary School. Some were also fearful that the Waltrips would run a substandard operation, using the airport as a business loss to decrease their tax burden.

The neighbors formed a committee and filed legal suits to prevent the construction, even going so far as the Virginia Supreme Court. When that august body found in the Waltrips' favor, construction continued and on September 20, 1970 the airport, with a new name, officially opened with a grand dedication ceremony.

Eugene Marlin, of the Peninsula Airport Commission and manager of the Patrick Henry Airport (now Newport News-Williamsburg International Airport), dedicated the airport and said the Williamsburg-Jamestown Airport had “nowhere to go but up.”

Richard Coakley, chair of the James City County Board of Supervisors and a former opponent of the project, said the airport was “one good example of the type of progress James City County has made in the past 15 years.” Then he and Miss Williamsburg, Mary Lou Bloxom, cut the ribbon to officially open the airport designated W-70, now JGG.