



*A U.S. Navy version of the DC-4, called an R5D by the Navy. It was called the C-54 by the U.S. Air Force.*

*The airlines started carrying passengers across the ocean with seaplanes and dirigibles in the 1930s. Pan American Airlines started flying passengers on the “flying boats” to South America and across the Pacific in the late 1930’s but the first land based transport was the Douglas DC-4. It was a four-engine, 175 knot, unpressurized transport capable of hauling payloads distances of 2,000 miles or more. The military version of the DC-4 was called the C-54 by the US Air Force and the R5D by the US Navy. Douglas Aircraft started producing the DC-4 in 1942 and quantities of this transport were delivered to the military. After WWII, transoceanic airlines obtained DC-4s. It was the late 1940’s and early ‘50s that the DC-4 was replaced by DC-6s, Lockheed Constellations and Boeing Stratocruisers, all pressurized aircraft.*

*This is a story about operating the DC-4 across the North Atlantic in winter time. “DIVERTED” compares two flights, both aircraft flown by well qualified pilots The first pilot relatively inexperienced, the other pilot well experienced. The two pilots, each flying a military version of the DC-4, depart Iceland, heading for Newfoundland about the same time. This story is in four parts.*

### ***DIVERTED (Part 1 of 4):***

Ensign Walter Keys dropped his right hand to the elevator trim tab control and rotated it “nose down,” relieving the forward pressure he was applying to the control yoke. Indicated airspeed inched upward through 150 knots. Keys continued applying forward elevator pressure and nose down trim, maintaining level flight with climb power set. Even though it was nighttime and flight conditions were solid instrument conditions, Keys handled the plane as if it was a calm, sunny day. Although his flying experience was low, as compared to the average Military Air Transport Service (MATS) aircraft commander, less than 2,000 pilot hours, Keys displayed the characteristics found in the most highly skilled instrument pilots. Without conscious thought on his part, the seconds, or fractions of seconds, he spent visually checking any one flight instrument was in near perfect proportion to the time allocated to the others. Because his visual

scan and basic instrument flying was effortless, he could devote his abilities to constantly planning ahead.

Keys' ability to concentrate was so good that he could smoothly fly through a bout of vertigo without the other pilot in the cockpit becoming aware of it. In fact, he was experiencing vertigo at this very moment, while in the process of leveling off at seven thousand feet after climbing out from Keflavik, Iceland enroute to Newfoundland. Keys felt as though the airplane was in a sixty degree, diving, right bank but he had disciplined himself to ignore this type of sensation.

"RPM two thousand (revolutions per minute)," Keys ordered, while retarding the throttles to cruise power.

"Roger," replied Lieutenant junior grade(jg) Luke Swartz, the copilot, as he loosened the propeller pitch control friction lock. Swartz retarded the pitch control levers until the tachometers indicated the approximate engine RPM desired, then reset tension on the lock.

Pilot vertigo could be brought on by simple head movements. Two minutes earlier, Keys had leaned forward to adjust an instrument panel light causing his headphones to slip off and drop into the dark area below his left armrest. He had leaned forward again, looked down momentarily, found the headphones and lifted them to his head. When he next sat upright and looked at the instrument panel, he felt as though the airplane was in a sixty degree, diving, right bank. The flight instruments indicated level flight with no change of direction. Keys did not allow himself to be influenced by a strong urge to roll the airplane left. Such action would lead to fatal consequences. Instead, his instrument scan increased to several times faster than was normal for instrument conditions at night. His increased scan included the copilot's instruments to see if they agreed with the flight instruments on his own panel. He gave special attention to attitude instruments; the gyro horizon and the turn & bank (or needle-ball). It took no more than three seconds for Keys to recognize his vertigo and realize it would be dangerous only if he allowed the sensation to overcome his belief in the flight instruments.

Keys slipped the four mixture controls to automatic lean, responded to the cruise check list as Swartz read off the items, then aligned the autopilot indices and engaged the hydraulic servo controls. While occupied with these routine procedures, the vertigo disappeared. Keys couldn't say exactly when the sensation ended. He only knew that the feeling of being in a right bank and the urge to apply left aileron had mysteriously gone away. This was the second time that vertigo had happened to him over a two year period and he guessed that it probably would not be the last. Keys' ability to overcome vertigo through sheer willpower and faith in the flight instruments was typical of all highly skilled instrument pilots.

Luke Swartz aimed an Aldis lamp out the copilot's side window at engines three and four. His right arm encircled the portable electric lamp, preventing its extremely bright light from blinding Keys or himself. With his left hand he manipulated the propeller controls for the right engines to synchronize them, using the shadow caused by the light striking the overlapping propeller arcs. A mixture of light rain and wet snow was illuminated by the light. The precipitation appeared to be streaming at them horizontally and opposite their direction of flight, always the illusion in an aircraft. He observed a trace of rime ice on the wing's leading edge, the nacelles, oil cooler air inlets, prop domes and any other forward facing surfaces. The rate of accumulation was slow.

Ensign Bob Jernigan, the navigator, parted the night curtains. "Okay Walt, we're a hundred miles out at 2210 Zulu (Greenwich time). Make your heading 270 magnetic."

"Two-seventy mag. I got'cha Bob."

Keys rotated the autopilot rudder control, skidding the R5D two degrees right, then adjusted the altimeter to 29.92 inches of mercury, the appropriate setting for aircraft crossing into oceanic controlled airspace. Keys had leveled at 7,000 but when he finished adjusting the altimeter it indicated the aircraft was at 8,100, more than 1,000 feet different. Ordinarily this large difference would have caused him concern but not this time. More than two hours before, when he first boarded the plane, he had noticed that the altimeters all indicated approximately one thousand feet above Keflavik's elevation. This was because, three days prior, when the aircraft had arrived, the altimeter setting had been close to the standard of 29.92. While the aircraft underwent a 72 hour delay due to mechanical problems, the Icelandic Low had deepened and the altimeters, acting as barometers, had reflected the dramatic drop in pressure. The control tower had given them a setting of 28.84 for their departure, a number which Keys had always thought could only exist in the middle of a hurricane. Climbing out, with a planned cruising altitude of 8,000 enroute, Keys reasoned that a climb to seven thousand feet would suffice. Within a few minutes after level off, the altimeter adjustment back to 29.92 had placed them at their assigned enroute altitude.

"That was as easy a climb of 1,000 feet as an R5D can do," he joked as Swartz followed his example and reset the copilot's altimeter to 29.92.

"I wish this was an R6D" commented Swartz, "we could fly non stop to Westover if it were."

Keys was grateful, in a way, that it was not one of the factory new aircraft. If the R5Ds had been completely phased out, he wouldn't be the aircraft commander. While the old timers were lining up to fly the military version of the new Douglas DC-6, he had managed to be one of the last pilots to check out as aircraft commander (AC) in the R5Ds. He wouldn't forget how Sam Reagan, who'd been transferred out a few months back, had gone to bat for him when the XO wanted to hold him back because of inexperience and rank. After Reagan was transferred, the Chief Pilot, Lloyd Parkhill, took him under his wing and scheduled him for a line check. Now Parkhill was gone but here he was on his second flight in an R5D as the AC. By the end of this month of February, 1953, the R5Ds would have all been phased out and he'd be "riding shotgun" again and sweating out the transition to AC in the new airplanes. Maybe he could squeeze one more trip as AC before the trusty old Skymasters made their last flights - to the airplane boneyard in Arizona.

This flight had worked out to be lengthier than most. He wasn't complaining because of their eastbound delay at Orly Airport, however. The unscheduled overnight there had allowed him to spend the night in Paris, something he'd wanted to do since checking into the squadron. Luke and Bob had gone into town with him. They had one hell of a night and still managed to get back out to Orly in time for the two hour flight to Rhein-Main next morning. They'd staged for two days at Rhein-Main before crewing a westbound flight to Prestwick and Keflavik. Then came the big holdup in Iceland. His crew had been sitting in Keflavik for three days waiting for parts to arrive and work to be done on BUNO

90414, the airplane that Zeke Lang would be flying tonight. For a time this morning, it looked like he'd be taking that airplane. Then, another scheduled westbound flight showed up just as maintenance was finishing work on 414. Since his stage crew was first in they were scheduled to be first out. Not that it made that much difference because both airplanes were ready to go at nearly the same time.

Swartz held a flashlight aimed at a corner of the windshield. He cupped one hand around it so that light did not reflect back into the cockpit. Flakes of wet snow could be seen striking the glass. Some wedged against the wiper blades and began to build small patches of rime ice there.

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Zeke Lang and his copilot and navigator stepped from the vehicle which had transported them from the transient quarters at Keflavik, Iceland, and entered the Flight Operations office.

"Lieutenant Lang, we've diverted Lieutenant Keys to Harmon AFB and that's the plan for you also."

"What's the problem with Goose Bay, Labrador, Major?" Lang ignored the MATS Transport Control Officer's error in referring to Keys as a lieutenant.

"Goose is clobbered and forecast to stay that way for a while. When they do come up, they'll have snow removal problems," replied the Transport Control Officer (TCO).

"Okay Major, when did Keys get airborne?"

"About twenty minutes ago - uh - you scheduled for a 2330 Zulu departure but the passengers are on the way and you can leave early if you wish."

"We'll try to do that Major."

Lang picked up a sheaf of forms from an open file atop the counter.

Zeke Lang listened while the U.S. Air Force meteorologist told a familiar story. Low pressure was centered between the southern tip of Greenland and Iceland. A trailing cold front stretched south-southwestward toward Newfoundland merging with another area of low pressure located near the Gaspé Peninsula. Both systems were moving northeast. In another twelve hours, the flight's approximate arrival time at Harmon, the low pressure area over Gaspé was predicted to have moved to a position along the Labrador coast near the Strait of Belle Isle.

Lang didn't like what the forecaster had to say even though experience had taught him that bad weather was to be expected this time of year in the North Atlantic. He wasn't afraid of the weather. He just knew it was going to be a lot more work as compared to a flight where conditions were favorable. Both the enroute and the destination forecast weather was poor. The forecast for Goose was for high winds and driving snow with ceiling and visibility at or below GCA minimums (ground controlled approach). Lang agreed that Harmon would be better than Goose but not much better. Forecast surface winds there would be somewhat lighter with ceiling and visibility predicted to be eight hundred and two. At least more than one alternate airport was available with Harmon as the destination - either NAS Argentia

or Moncton, New Brunswick. Another possibility was Gander, a non-military base but usable in a pinch. The forecast for the Newfoundland alternates was borderline but it was unlikely that the weather at both would go sour simultaneously. He noted that Moncton would be more difficult to reach if fuel were a problem because of its direction from Harmon. Winds aloft over the Canadian Maritimes would be strong from the west requiring a minimum of two hours to reach Moncton from Harmon. The enroute weather forecast was unfavorable. Light to moderate icing could be encountered in the frontal zone and the front would be difficult to traverse because it lay nearly parallel to their intended track for much of the route. Winds aloft were strong from the southwest becoming west to northwest for the latter portion. The flight to Harmon was 1500 miles or 150 miles farther than Goose. It would be slow and they'd definitely need extra fuel for icing conditions. Lang always investigated possible alternatives.

"What's the temperature at 8,000 feet?"

"Uh - I'd say - let's see - uh - its pretty warm ahead of the front. Keflavik is warmer than Savannah, Georgia right now. We're running forty-five degrees Fahrenheit here on the surface - uh - I'd say about freezing at eight. It won't stay that way of course. The closer you get to the front, the colder it will get."

"How about two thousand feet?"

"Two thousand? Nobody files for two thousand." The forecaster made no attempt to answer.

Lang waited.

"Uh - about 40 degrees Fahrenheit - say plus 5 degrees Centigrade," the forecaster replied skeptically.

"You got any idea how far out I can go at two thousand before running into below freezing temperatures?" Lang brushed aside the forecaster's attitude.

"It all depends on how fast that front is moving. Probably a few hundred miles. You have a good chance of staying in warm air as long as you're that low on the east side of the front. As soon as you cross through, the temperature will drop in a hurry. Surface temps west of the front are well below freezing."

"What about winds at two thousand?"

"We don't work 'em up at that low altitude but I can give you winds off the 850 milibar chart - that's roughly five thousand. Its as low as we go." The forecaster continued the skeptical tone of voice. He tried to convey the impression that a flight at 2,000 feet should never be attempted.

"Give us the lowest winds you have out to about - say - 40 degrees west longitude, then we'll take the 8,000 foot winds for the rest of it."

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One hour and thirty minutes later, Lieutenant(jg) Whitey Hunt, Lang's copilot, leveled R5D BUNO 90414 at 2,000 feet and called for cruise power.

"That'll be two thousand turns and thirty-two inches," Lang said, as he adjusted both sets of controls.

"Since we're not in controlled airspace, what'a'ya want'a do about the altimeter setting Zeke?" Hunt asked, after engaging the hydraulic autopilot and completing the cruise check off list.

"Put your radio altimeter on high range Whitey."

Hunt extracted a small penlike flashlight from his shirt pocket and aimed it at the lower left portion of his poorly lighted instrument panel. He leaned forward and rotated the radio altimeter's range switch from "Lo" to "Hi." The instrument's thin white needle fluctuated for a moment, then settled approximately half way around a circular scale which was numbered from zero to 4,000 feet.

"That'll help," remarked Hunt.

Lang twisted in his seat, parted the night curtains and spoke to the navigator: "Say Alex, what'cha readin' on the high range radar altimeter right now?"

Lieutenant Alex Leighton arose from the navigator's stool and adjusted a scale on the small CRT located above the radio operator. He also looked at the instrument panel above the navigator's table.

"The radar altimeter says 2,100 but my pressure altimeter shows about 3,000. Can that be right?"

"You got'cher pressure altimeter set to 29.92?" Lang asked.

Leighton checked both instruments again before replying: "Yes I do, 29.92 is set."

"Okay Alex, that's right."

Lang aimed a flashlight at the windshield then at a small outside air temperature gage located just above it on the electrical panel. Streamers of rain flowed across the glass and past the side windows. The gage read plus six degrees Centigrade.

"Whitey, let's just keep the Keflavik altimeter setting while we're low but check the radio altimeters also."

"I thought the TCO back there was going to call MATS Headquarters for instructions when you filed for two thousand feet cruising altitude," said Hunt, chuckling.

"He did call the air traffic control center Whitey. I think the guy felt a little better when they told him that we'd get cleared for a block of altitude from the surface to six thousand. What bothered him the most was that we'd be starting out in uncontrolled airspace - below 5,000 feet that is."

"Yeah - like maybe we'll run into another airplane in the middle of the Atlantic Ocean at two thousand feet in the middle of the night in February?"

"Fat chance." Both pilots laughed.

Hunt's tone of voice became serious. "Do you think Keys climbed out to eight thousand Zeke?"

"The TCO said he filed for eight. I'm thinking he's going to run into problems a lot sooner than we will. I'll bet he'll have twenty-five to thirty knots more on the nose than we have down here at two."

"Ice too," commented Hunt, "I hope he has bouquet gas. He's going to need it."

"I'm afraid it won't do much good to worry about him Whitey. Taking care of ourselves is going to keep us busy

enough. We'll stay low long as we can. When we get into the front and the temp drops, we'll climb up to eight or maybe ten. We might be able to get on top on the other side of the front. At least it might be cold enough so icing won't be that much of a problem."

"Once we climb, we'll just haf'ta take whatever winds they want'a serve up."

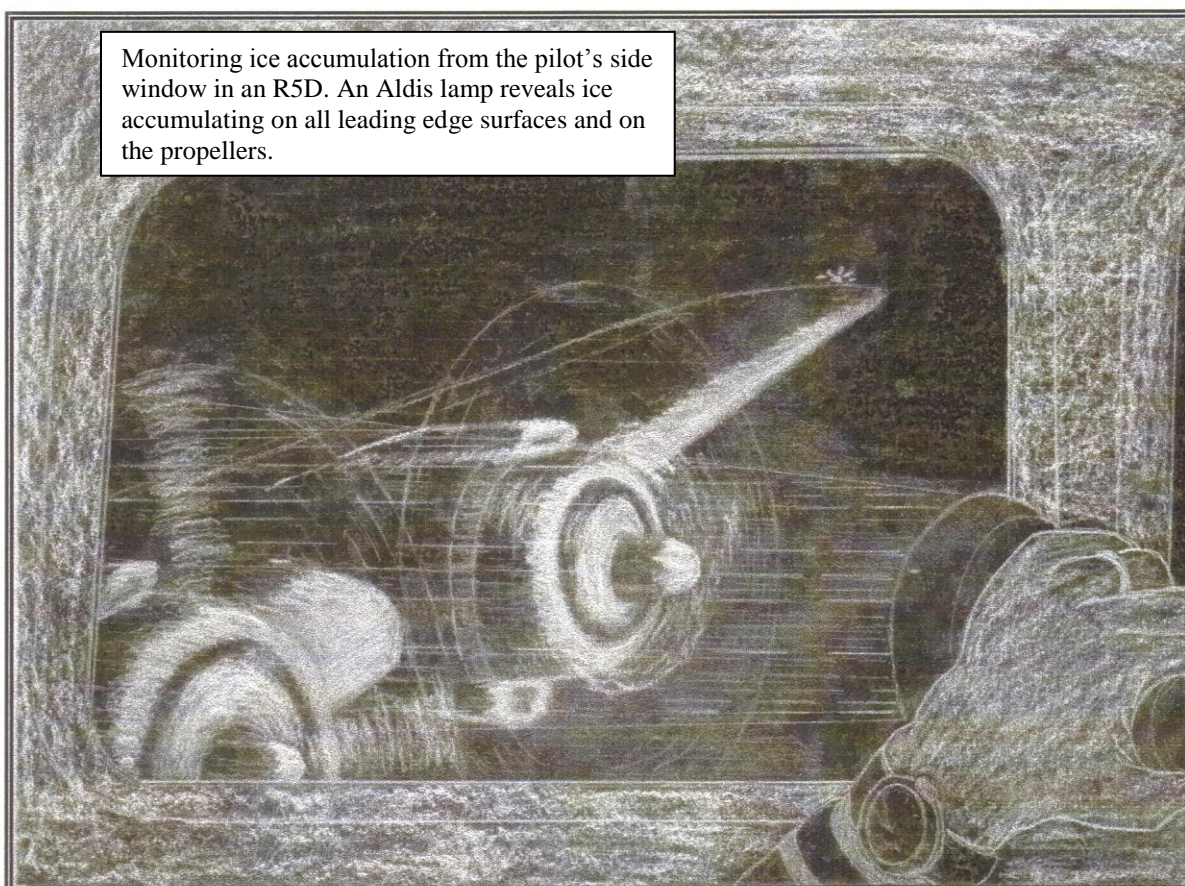
Lang aimed the flashlight at the windshield and the temperature gage again. Steady rain, noisier now, streamed across the glass. The temperature had dropped one degree to plus five degrees Centigrade.

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Walter Keys returned from the crew's head, eased back into the pilot's seat and donned his headset. What had just happened to him was distracting to say the least - the burning sensation he felt when he urinated. He buckled his lap belt and tried to get comfortable but couldn't. He tried to remember those old movies about venereal disease that they'd shown aviation cadets when he was in training more than three years ago. How long had it been since his layover in Paris? He counted up the days and came to six. Damn! Could he have contracted a case of gonorrhoea? He couldn't afford to dwell on the unpleasant distraction. There was nothing that he could do about it now. There were more pressing items to think about - like getting this airplane to Newfoundland.

Keys tuned both radio automatic direction finders (ADFs) to the Prince Christian nondirectional radio beacon located at the southern tip of Greenland. Precipitation static was heavy and he could discern the station's Morse code identifier only with difficulty. The ADF bearing appeared unreliable although the needles did seem to spend more time pointing between the nose and the right wing than anywhere else on the circular dial. Keys checked the panel clock - 0100 Zulu. According to flight plan, they should pass 130 miles southeast of Greenland's southern tip at 0150 Zulu - another fifty minutes. Navigation had been easy for the first three and a half hours of this flight. Weather prevented celestial but LORAN coverage was superb for speed. Jernigan was also using altimetry, backed up with more LORAN, to produce excellent course information. Headwinds were stronger than forecast. They should have averaged 150 knots groundspeed but GS was down to 130.

Keys blamed ice accumulation as well as headwinds for their slow progress. They were carrying high power settings but still hadn't been able to maintain their planned 175 knots true airspeed. Indicated airspeed of 145 knots with a minus 5 degrees at 8,000 feet calculated to be 162 knots true, or 13 knots below planned. Fuel usage had been twenty percent too high for about the last hour and thirty minutes ever since the temperature dropped and icing began.



Monitoring ice accumulation from the pilot's side window in an R5D. An Aldis lamp reveals ice accumulating on all leading edge surfaces and on the propellers.

Keys picked up the Aldis lamp and aimed it at the left wing. The bright light revealed moderate snow streaming past, some was sticking to leading edges to form rime ice. Keys decided to wait to operate the pneumatic wing deicer boots. He had enough experience to know that premature operation would result in only partial removal and might start a dangerous cycle - the pieces remaining would serve as a basis for even faster ice accumulation. He aimed the lamp at number one engine then at number two which was just visible if he pressed his face against the cockpit side window. Both propeller hubs were covered with rime and small white discs expanding outward from the hubs could be seen. The fuzzy white discs were about two feet in diameter and were caused by rime ice beginning to build at the hub end of each blade of the three bladed props and extending outward. Keys extinguished the lamp, reached to the overhead electrical panel and adjusted the alcohol flow for each propeller to a higher rate. If allowed to accumulate, the ice would gradually deform the accurately shaped blades resulting in an even greater loss of airspeed. The alcohol deicing system was only mildly effective in combating propeller ice. If conditions deteriorated, no amount of alcohol could prevent serious accumulation on the blades. The plane began to bounce in light turbulence. The turbulence increased to the point that Keys disengaged the autopilot. Cockpit noise levels increased as the moderate snow, which had made no sound contacting the aircraft, changed to a mixture of sleet and snow. Airspeed dropped even more and Keys called for climb power in order to maintain 135 knots indicated. Ice was forming on the windshields. In a brief period of relatively smooth air, Keys reset his directional gyro with the magnetic compass then corrected heading. Luke Swartz checked his wing

with the Aldis lamp. Ice was building faster and had extended back to nearly the full width of the deicer boots. There was a layer at least an inch thick on engine cowls, oil cooler airscoops and engine air intake leading edges. The white discs around the prop hubs had increased in diameter.

The pilots cycled the deicer boots twice. The Aldis revealed long strips of ice dislodged and being carried away in the slipstream but there was no noticeable improvement in indicated airspeed. As usual, the boots had been partially effective. Small pieces of rime remained on the boots and ice could be seen on the tips beyond the boots and in the areas near the nacelles which the boots did not reach. Ice covered the engines' magneto housings. Oil cooler air scoops were rimmed with ice more than an inch thick and were partially choked off. An eerie sound, like that made by someone blowing across a tube, was gradually getting louder. It was caused by ice forming on antenna posts and antennae atop the fuselage just aft of the cockpit.

Keys now faced the westbound transport pilot's dilemma. He wanted to climb to ten thousand but decided against it because any improvement in icing conditions would probably be offset by stronger headwinds at that altitude. Another solution might be a more westerly heading to get them through the front sooner but that wasn't a good idea just yet because of Greenland's ten thousand foot plus elevation. Once abeam Prince Christian, they could change course but he respected the lofty Greenland Icecap too much to do it this soon.

Flight conditions had deteriorated sooner and lasted longer than Keys had expected. The forecaster had predicted periods of light to moderate icing for early portions of the flight, improvement midway and chance of more icing near destination. If this situation continued, they would use far more fuel than planned. Keys gave brief consideration to turning back for Iceland but dismissed the idea. What kind of North Atlantic pilot was he? Thinking about turning around this early in the flight? Hang in there Keys you'll be through the front shortly and conditions will improve. Once thoughts of a turnaround were dismissed, his mind functioned more clearly.

The intervals of light turbulence combined with icing increased in frequency and airspeed continued to decline - to 125 knots. Keys grasped the prop controls, retarded them to 2,000 RPM then pushed them quickly forward - not quite all the way. This caused the RPM to surge to near 2700 and loud sounds like bricks hitting the fuselage could be heard. Ice chunks were being thrown against the aluminum skin from the inboard propellers by increased centrifugal force. He repeated the action then asked Swartz to reset climb power. Airspeed increased to 135 knots. It was time to cycle the wing boots again. The accumulation had occurred faster this time. Both pilots noticed that engine oil and cylinder head temperatures were running hot even though cowl flaps had been set to "trail" position and outside air temperature had dropped to minus ten Centigrade. Keys found himself hoping for even colder temperatures. Their present conditions, in cloud with a minus ten degrees combined with turbulence, was ideal for icing.

*To be continued . . . . .*



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**Revised Sept, 2010**