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Some voices in the aviation industry are challenging the traditional belief that the centerline of an airway is the safest position for an airplane.

BY LINDA WERFELMAN

Sidestepping

Steve Morris — AirTeamImages/airliners.net

Soon after the initial implementation of reduced vertical separation minimum (RVSM) procedures in 1997, concerns about crowded North Atlantic routes prompted development of an option designed to reduce collision risks: strategic lateral offset procedures, which allow pilots to fly parallel to and slightly to the right of an airway centerline.

In the years that followed, offset procedures also began to be viewed as a method of reducing exposure to wake turbulence within “oceanic and remote continental” RVSM airspace — airspace between Flight Level (FL) 290 (approximately 29,000 ft) and FL 410, where the standard vertical separation of aircraft was reduced from 2,000 ft to 1,000 ft.

In 2007, some in the aviation industry, especially in light of the recent midair collision in Brazil, are urging that flight crews increase their use of offset procedures and that authorities expand the airspace in which these procedures are specifically authorized. Others are discouraging wider use as unnecessary.

The discussion “goes to the roots of our assumption that the centerline of an airway is the safest place to be,” said William R. Voss, president and CEO of Flight Safety Foundation.

A thorough evaluation of the issue is needed to determine effective methods — consistent around the world — for ensuring adequate separation on the airways, he said.

“There’s an absence of clear information for pilots to act upon,” Voss said. “The question has to be examined carefully. It should be taken up by ICAO [the International Civil Aviation Organization] and worked out with pilot groups and air navigation services providers, and their decision should be communicated clearly to the aviation community.”

Previously Not an Issue

Lateral separation was not an issue in the early days of jet airliners; in 1960, the international standard for the vertical separation minimum between aircraft at and above FL 290 was set at 2,000 ft — double the previous minimum. The rationale for the 2,000-ft requirement was the recognition that barometric altimeters might not be accurate enough at the high altitudes occupied by these aircraft to allow pilots to maintain the 1,000-ft vertical separation that had been required for propeller-driven airplanes. At the same time, lateral navigation cockpit instruments were accurate enough to allow airplanes to be flown along an airway, but not so accurate

the Airway

that they could keep pilots precisely on the airway centerline.

After years of study and discussion — considering technological advances in flight deck instrumentation and autopilots — RVSM was phased in, region by region, in an eight-year program that began in 1997 in the North Atlantic and ended in 2005 in North America, South America and parts of Asia. Along with RVSM came a need for more precise aircraft altimeters and automatic altitude-control systems.

After implementation of RVSM in the North Atlantic, flight crews began reporting encounters with wake turbulence from airplanes close in front of them and 1,000 ft higher. They also expressed concerns about what might happen if an altimeter error brought one of those aircraft several hundred feet closer than the 1,000-ft vertical separation minimum.

In addition, many pilots began to question assumptions about the safety of flight on airway centerlines, recognizing that the lateral accuracy of 21st-century flight deck technology places an increasing number of airplanes exactly on the centerline.

“Where airplanes used to be spread over a mile, they are now within a few feet of the centerline,” Voss said.

Looking for Options

In response to the pilots’ concerns, the ICAO North Atlantic Systems Planning Group began reviewing options “and carried out some research to see how far the aircraft could offset from their cleared course without requesting a clearance from air traffic control (ATC) and without increasing the risk,” said Dražen Gardilčić of the ICAO Air Traffic Management Section. “The group recommended a maximum offset of 2 nm [3.7 km].”

As a result, the North Atlantic Regional Supplementary Procedures document for RVSM operations was amended to allow lateral offsets of 1 nm (1.8 km) or 2 nm to the right of the course.

“It was felt that these procedures would not only alleviate the [RVSM-related] wake turbulence issue but they would also introduce an



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additional ‘randomness’ to aircraft flight paths, and thus, the procedure would reduce the possibility of collision in the event of a vertical error,” Gardilčić said. “In other words, this would artificially degrade the accuracy of navigation systems so if there was a vertical error, aircraft would not be precisely on the centerline and possibly collide.”

After a form of the procedure was approved around 2000 for ICAO’s North Atlantic region, most other ICAO regions adopted similar procedures for lateral separation in oceanic and remote continental areas within their airspace. Much of the phrasing and reasoning in those separate documents subsequently was incorporated into ICAO’s *Procedures for Air Navigation — Air Traffic Management* manual, making the lateral offset applicable in oceanic and remote airspace worldwide.¹

The document discusses lateral offset procedures “for both the mitigation of the increasing lateral overlap probability due to increased



navigation accuracy, and wake turbulence encounters.

“The use of highly accurate navigation systems, such as the global navigation satellite system (GNSS), by an increasing proportion of the aircraft population has had the effect of reducing the magnitude of lateral deviations from the route centerline and, consequently, increasing the probability of a collision should a loss of vertical separation between aircraft on the same route occur.”

According to the document, the use of strategic lateral offsets in a particular airspace must be authorized by the appropriate air traffic services (ATS) authority, and, with that authorization, the offsets may be flown in en route oceanic or remote continental airspace on uni-directional and bi-directional routes and on parallel route systems whose centerlines are separated by at least 55.5 km (30 nm).

“The decision to apply a strategic lateral offset shall be the responsibility of the flight

crew,” the document says. “The flight crew shall only apply strategic lateral offsets in airspace where such offsets have been authorized by the appropriate ATS authority and when the aircraft is equipped with automatic offset tracking capability.”

When offset procedures are flown to mitigate the effects of wake turbulence, pilots may contact the flight crews of other aircraft on the inter-pilot air-to-air frequency of 123.45 MHz to coordinate the offsets, the document says.

Although ATC is made aware of the airspace in which offset procedures are authorized, controllers do not issue clearances to flight crews to fly the procedures — and crews that fly them are not required to inform ATC.

‘I Feel Relieved’

Although offset procedures have been recommended for North Atlantic operations for several years, “too few pilots actually use them,” said Capt. Heinz Frühwirth of Austrian Airlines, vice chairman of the International Federation of Air Line Pilots’ Associations (IFALPA) ATS Committee and a member of the ICAO Separation and Airspace Safety Panel that developed the offset procedures.

Frühwirth, who regularly flies North Atlantic routes in Airbus A330s and A340s, said that he regularly uses offset procedures.

“In the North Atlantic, it’s recommended to use offsets whenever you can, and it’s straightforward enough — program it into flight management,” he said. “I feel relieved to see all those other airplanes off to the side.”

Gardilčić said, however, that ICAO’s North Atlantic Systems Planning Group has recently expressed concern that not enough aircraft appear to be flying the offset procedure in the North Atlantic, “thus negating, in part, the safety benefits that could be obtained with greater participation.”

Data collected by U.K. National Air Traffic Services (NATS), which provides ATC services for aircraft in the eastern portion of the North Atlantic, show a “disappointing” frequency of offset use by airliners — less than 10 percent,

“There is a lot of operational wisdom that could easily be used to increase safety at little cost.”

compared with the hoped-for 67 percent, NATS senior press officer Richard Wright said.

“In trying to understand why, we have been talking to the airlines, and it seems that pilots are reluctant to stray from company procedures,” Wright said. “The best performers are the airlines who have incorporated [offset procedures] into their standard operating procedures.”

Airlines are now being encouraged to do just that, said Wright and Ron Singer, communications adviser for Nav Canada, which provides ATC services for the western North Atlantic.

“We believe offsets are an effective procedure and add a layer of defense” against wake turbulence and midair collisions, Singer said, adding that Nav Canada is encouraging wider use of offsets on North Atlantic routes.

Wright said that, in addition, NATS and Nav Canada are examining the possibility of issuing lateral offsets along with oceanic clearances. Such a change would require approval from civil aviation authorities and ICAO, in addition to detailed discussions with airline officials.

IFALPA has repeatedly encouraged pilots and operators to use offset procedures.

“Strategic lateral offset procedures should be a [standard operating procedure], not a contingency, and operators should be endorsing the use of lateral offsets for safety reasons on all oceanic and remote airspace flights,” IFALPA said in a June 15, 2006, *Safety Bulletin*. “Operators are reminded that the current [offset procedure] is designed to mitigate the effects of wake turbulence, as well as to enhance flight safety.”²

Fatal Midair Collision

Calls for increased use of lateral offsets intensified after the Sept. 29, 2006, midair collision over the Brazilian Amazon jungle of a Gol Airlines Boeing 737-800 and an Embraer Legacy 600 business jet owned and operated by ExcelAire, a jet charter firm with headquarters in Ronkonkoma, New York, U.S. The crash occurred while the two airplanes, which were

being flown in opposite directions, were on the same airway and at the same altitude.

The 737 was destroyed and all 154 occupants were killed. The seven occupants of the business jet were uninjured. The airplane’s left wing and left horizontal stabilizer were damaged, but the crew was able to conduct an emergency landing at Cachimbo Air Base.

“The accident over Brazil confirmed our worst fears — that the only two airplanes in that part of the sky could collide,” Voss said.

The investigation was continuing, but some in the aviation industry have cited the accident in their calls for expanded use of lateral offsets in areas where they already are authorized, as well as expansion of the areas of authorization.

“While the strategic lateral offset procedure that is in use in other areas of the world does not yet exist in South America, some member associations are actively debating the benefits of this concept and may soon put forth positions encouraging the use of this procedure,” IFALPA said in a January 2007 *Safety Bulletin*.³

Frühwirth said that IFALPA would “try to push the issue wherever we can in the immediate future.”

“It is very unfortunate that it took an accident that cost many lives to make people aware that there is a lot of operational wisdom that could easily be used to increase safety at little cost,” he said. “Of course, even though we are convinced that the use of offset procedures enhances safety, we remind pilots that they should adhere to published, authorized procedures.”

Capt. Rick Valdes of United Airlines, a member of numerous safety committees within IFALPA and the Air Line Pilots Association, International (ALPA), said that — authorized or not — some pilots have begun using offset procedures on South American routes.

“Offsets are very advantageous when you happen to have traffic coming in the opposite direction, and in South America, you come nose to nose [with other airplanes] every flight,” Valdes said. “You want to have that extra margin of safety.”

If the pilots of either airplane involved in the Amazon midair collision had been using offset procedures, he said, the crash wouldn't have occurred.

Valdes, who flies Boeing 767s from the United States to South America and Europe, said that the offset procedures, as implemented over the North Atlantic, are "awesome. I wish we had more people participating."

Not all carriers have authorized their pilots to use the procedures, perhaps because of a lack of understanding of their safety benefits, he said.

Offset procedures should become a standard practice in the regions where they are already authorized and should be expanded to other airspace, he said.

Capt. Erik Reed Mohn of Scandinavian Airlines System (SAS) agreed that offset procedures should be "expanded to any airspace that can accommodate them." Reed Mohn said that he usually flies Airbus A330s and A340s on North Atlantic routes that are so far north that they are outside the region where offset procedures have been authorized. As a result, his flights are on "random" routes determined by the airline's planning staff, he said.

Nevertheless, he added, "We're invariably meeting other airplanes absolutely head-on" — although the safety provided by vertical separation has prevailed.

"It's actually amazing to see the extreme accuracy of modern navigation equipment demonstrated every time you meet an aircraft going in the opposite direction," he said.

'Systems Seem to Work'

Some air navigation services providers say that equipment accuracy and current ICAO policies on offset procedures are major factors in the general

safety of the current systems of aircraft separation.

"These systems seem to work with no problem and are consistent with ICAO ... standards for their use," said Phil Peguero, safety director at Airways New Zealand.

"The reality is that, while ATC systems are generally extremely reliable, there are the odd errors, and the issue of offsets is raised to mitigate the possibility of such errors," Peguero said. "The irony of the situation is ... that the greater the accuracy of navigation without an offset strategy, the greater the chance is these days of a collision if ATC gets it wrong. The offset achieves a controlled degrade of the navigation accuracy so that a small degree of horizontal distancing is created in case vertical application by the ANSP [air navigation services provider] has failed."

Although ANSPs should never rely on offset procedures or airborne collision avoidance systems (traffic-alert and collision avoidance systems), pilots should implement these and other safety strategies that "mitigate the risk of failure in the ANSP," he said. For that reason, the Civil Air Navigation Services Organisation (CANSO), which represents ANSPs, "could take a view that the issue is one to be decided by the pilot fraternity, according to their own perception of the risk they face being exposed to a failure in an ANSP," he said.

Wright, of U.K. NATS, said that NATS officials were beginning to review the possibility of using lateral offsets in domestic airspace.

"We will need to consider the risk reduction and whether any new risks might be introduced, especially in busy Terminal Area airspace," he said. "We will need to have detailed

technical discussions with airlines before putting any proposals to our regulator."

Despite differing opinions on how to proceed, Voss said that uniform, well-defined procedures are essential worldwide. Without a coordinated means of handling offsets, individual operators and, in some cases, individual pilots, will develop their own methods, he warned.

"What you don't want is pilots doing random offsets," he said. "This is a global problem and should be dealt with globally." ●

Notes

1. International Civil Aviation Organization (ICAO). *Procedures for Air Navigation Services — Air Traffic Management*. Document 4444, 15.2, "Special Procedures for In-Flight Contingencies in Oceanic Airspace," 15.2.4 "Procedures for strategic lateral offsets in oceanic and remote continental airspace." ICAO does not specifically define "remote" airspace, but it often is considered to be airspace where surveillance by air traffic control is not available.
2. International Federation of Air Line Pilots' Associations (IFALPA). "Navigation Errors on the North Atlantic." *IFALPA Safety Bulletin*, no. 07SAB02. June 15, 2006.
3. IFALPA. "ATC Operations in Brazilian Airspace." *IFALPA Safety Bulletin*, no. 07SAB14. Jan. 29, 2007.

Further Reading From FSF Publications

FSF Editorial Staff. "RVSM Heightens Need for Precision in Altitude Measurement." *Flight Safety Digest* Volume 23 (November 2004).

FSF Editorial Staff. "Global Implementation of RVSM Nears Completion." *Flight Safety Digest* Volume 23 (October 2004).

FSF Editorial Staff. "Bracing the Last Line of Defense Against Midair Collisions." *Flight Safety Digest* Volume 23 (March 2004).