



Pilots can use any tools at their disposal to help judge how close they get to the other aircraft, but at the end of the day, it all comes down to scanning the sky and paying attention. **Michael R. Grüninger and Capt. Carl C. Norgren** examine the deadliest aircraft disaster in California history

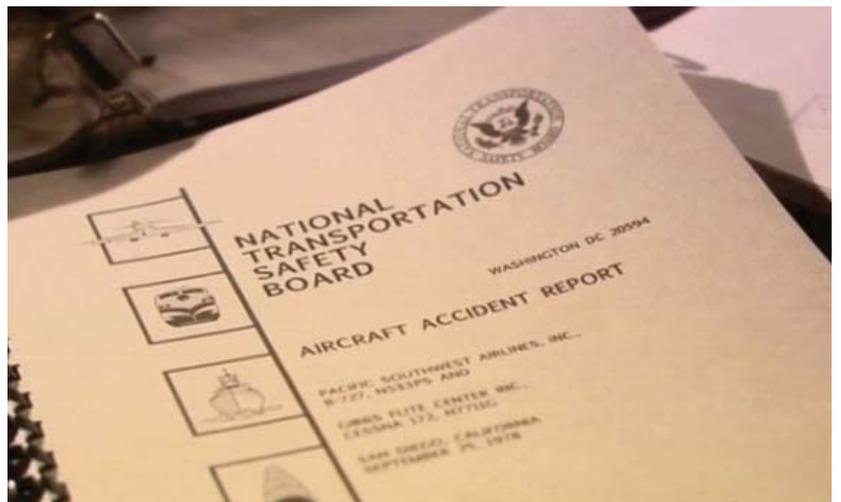
MAINTAIN VISUAL SEPARATION

The Mid-Air Collision

The 25th of September 1978 started as a hot sunny California day.

Three of the airports that are located in the San Diego area play a role in this case: Lindbergh, Miramar and Montgomery.

San Diego International Lindbergh (KSAN) is a tower-controlled IFR airport. Montgomery-Gibbs Field (KMYF) lies north of San Diego and is a VFR airport. Montgomery lies at the southern edge of the control zone of Miramar Naval Air Station. The field opened in July 1940 as “Gibbs



RESTRAINT
IFR aircraft receive ATC separation from each other, but in visual conditions pilots still must see and avoid VFR aircraft.

Field” as an all-way clay and gravel surface airfield. In 1950, it was renamed after John J. Montgomery, an aviation pioneer who made the first manned, controlled, heavier-than-air flights in the United States from Otay Mesa near San Diego, starting with a glider designed in 1883. William Gibbs (1910-2016) was the man who founded the airport in 1940, as Wikipedia informs us.

On September 25, 1978, a flight instructor of the Gibbs Flite Center and another certificated pilot took off from Montgomery with the intention of performing some instrument flight training at Lindbergh. At 08:57 PST,

the Cessna 172, N7711G, ended as the second approach to Runway 09 and began a climb-out to the north-east while being in contact with the Sand Diego approach control.

At about the same time, Lindbergh Tower instructed Pacific Southwest Airlines Flight 182, a Boeing 727, to perform a visual approach to Lindbergh's Runway 27. When the airliner was on a right downwind 27, ATC advised the airliner that there was conflicting traffic. In fact, the outbound Cessna and the inbound airliner were flying both almost in the same direction on the North side of Lindbergh. The airliner's flight crew looked out, but probably saw another Cessna and not N7711G climbing out. Both conflicting aircraft flew in parallel.

At 09:01, the Cessna pitched up in a wing level attitude, while the airliner slightly banked to the right. The Cessna collided with the right wing of Flight 182.



Losing Separation While Looking Out

Prior to the mid-air collision, ATC had issued traffic advisories to Flight 182. At the time, there were two Cessna aircraft flying in front of the airliner. The airliner flight crew



The Cessna broke up immediately and exploded. Flight 182 began a shallow right descending turn, leaving a trail of vaporlike substance from the right wing. A bright orange fire erupted in the vicinity of the right wing and increased in intensity as the aircraft descended.

Both aircraft were destroyed by the collision, in-flight and post-impact fire and ground impact. Out of the 137 persons on both aircraft, there were no survivors. Seven people on the ground were killed, and 22 houses and apartments were damaged or destroyed.

detected one of the two. But the pilots then got confused and lost visual contact. Despite all attempts to identify the conflicting traffic by looking out, the flight crew was not 100% certain whether they had cleared the traffic.

30 seconds prior to the collision, the first officer, who was pilot flying, asked: "Are we clear of that Cessna?" The flight engineer said "Supposed to be"; the captain said "I guess"; the forward jump-seat occupant said "I hope". These words seem surreal. But how many times did we say or think the same when acting as pilots?

26 seconds prior to the collision, the captain said: "Oh yeah, before we

turned downwind, I saw him about one o'clock, probably behind us now." Thereafter, the first officer ordered: "Gear down".

9 seconds prior to the collision, the first officer said: "There's one underneath," and then 1 second later, he said: "I was looking at that inbound there."

While he spoke these words, the conflict alert warning began in the San Diego Approach control facility, indicating to the controllers that the predicted flightpaths of Flight 182 and the Cessna would enter the computer's prescribed warning parameters. At the time of the collision, the

IMPACT
Cessna 172 N7711G (top). Both aircraft crashed into North Park, a San Diego neighborhood.

SAFETY SENSE

approach controller advised the Cessna pilot of “traffic in your vicinity, a PSA jet has you in sight, he’s descending for Lindbergh.” This transmission was not acknowledged.

Unexpected to Stakeholders

The stakeholders were unsuspecting of the high risk they were exposed to.

ATC believed the airliner had the Cessna in sight. The crew had reported a traffic ‘in sight’. In fact the traffic in-sight was not the conflicting Cessna. In addition, the complex airspace in San Diego is segmented in various traffic zones for the many airports in the vicinity. The various ATC facilities had agreed on certain air traffic management procedures to streamline traffic and avoid misunderstandings. Contrary to Miramar Order NKY 206G, the approach controller at San Diego approach control did not direct Flight 182 to maintain 4,000 ft or below until clear of the Montgomery Field airport traffic area. However, the controller argued that neither of the two aircraft was within the Montgomery Field airport traffic area.

The flight crew of the airliner believed they had overtaken the Cessna. And yet, the flight crew of Flight 182 had received three traffic advisories and was on a visual approach in VMC under an IFR flight plan. Regulations and airmanship require the crew to “see and avoid” other aircraft. The crew’s initial response to the advisories indicated that they did not see the aircraft and were looking for it. When advised of additional traffic, one minute prior to the collision, the captain told the controller traffic in sight. Now the approach controller cleared Flight 182 to maintain visual separation and to contact the Lindbergh Tower.

“Maintain-visual-separation” requires that the pilot separates his aircraft from the traffic that has been pointed out to him. The question arises as to whether the flight crew was referring to the Cessna pointed out by the controller when they called “traffic in sight”. The Cessna had not received any traffic advisories apart from the one when it was already too late.



The victims on the ground had no idea of the drama unfolding in the skies, until it was too late for them.

Confusion and Cockpit Visibility

While ATC had pointed out two other aircraft to Flight 182, there was more traffic in the area. The traffic situation was complex at the time. In addition, cockpit visibility was limited. A cockpit visibility study showed that the Cessna might have been masked by the B-727’s cockpit structure. The pilots could not see it unless they either leaned forward or raised their seats, or both.

Even had they done this, it would have been almost impossible to spot the Cessna. The Cessna was now on virtually the same course as Flight 182 and with little or no relative motion, the target would have been almost impossible to detect and to maintain visual contact with.

The NTSB report concludes: “In retrospect, there is little doubt that the controllers were misled by their belief that Flight 182’s flight crew were visually separating their aircraft from the Cessna and by their previous experiences with similar conflict alerts where in no action on their part was necessary.”

Ensuring Separation

Loss of separation is clearly a major hazard. Any safety management system will have picked it up. Two main mitigating actions have been set-up: Air traffic control and the See-and-Avoid policy assisted by modern technology, such as a TCAS.

Controllers will advise pilots on conflicting traffic and provide course corrections to ensure no collision occurs. In VMC, controllers might require the pilots to maintain visual separation. Traffic advisories will alert the pilots on where to look for potentially conflicting traffic.

Alert Fatigue

Pilots get traffic advisories frequently and almost never need to change course or take any other action based

on such an advisory. This leads to alert fatigue. Although an alert is received, the action triggers no urgency. How many times did the alert disappear even without any action by the flight crew?

However, the alert should have caused the pilots to take swift action. The first action should have been to look out. If the other traffic is not in sight, any maintain-visual-separation instruction cannot be accepted.

Visual Detection

Tracking one small, fast moving target is a very demanding task. When there is little relative motion, it becomes even harder. The glare from the sun and hazy visibility conditions can add further challenges. When multiple targets are added, the task quickly becomes too demanding for a pilot to accomplish in addition to his duty of controlling the aircraft.

The advent of drones has added a further layer of complexity. Their size makes drones almost impossible to detect visually at a distance and to allow effective evasive action to be taken. The see-and-avoid principle did not prove sufficiently reliable in 1978 and is even less so in the increasingly crowded airspace of 2018.

“Maintain visual separation” might just not be a viable mitigating procedure any longer.



Michael R. Grüninger is managing director of Great Circle Services (GCS) Safety Solutions and Capt. Carl C. Norgren is a freelance contributor to Safety Sense. GCS assists in the whole range of planning and management issues, offering customized solutions to strengthen the position of a business in the aviation market. Its services include training and auditing (IS-BAO, IOSA), consultancy, manual development and process engineering. GCS can be reached at www.gcs-safety.com and +41-41 460 46 60. The column Safety Sense appears regularly in BART International since 2007.

SIGHLESS
Both the Boeing and the Cessna were in the worst possible position to be seen from the cockpit of the other.