Departure *Deviations*

Problems arise when the assigned SID differs from the one in the FMS.

BY HANS HOUTMAN AND DICK VAN ECK

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Unintended deviations from standard instrument departure (SID) procedures are an everyday threat to the aviation system. Unexpected turns or incorrect routes flown soon after takeoff create hazardous situations near airports with heavy traffic or with multiple runways in use.

At Amsterdam Schiphol Airport, for example, there have been several incidents involving pilots who flew a different SID than the one assigned to them by air traffic control (ATC) and acknowledged by the crew.

Schiphol has six runways, some of which converge. Pertinent to this discussion are Runway 24, which is the primary runway for departures, and Runway 18R, the primary runway for landings, under southerly wind conditions. In addition, there is Runway 18L, which also is used occasionally for departures (Figure 1).

The involved airlines use "operational flight plans," which provide pilots with route information, including the SIDs that likely will be followed. An operational flight plan typically is prepared by a flight dispatcher three to six hours before the scheduled departure. The flight dispatcher considers all he or she knows at the time to anticipate the departure runway that will be assigned and to determine which SID can be expected.

Schiphol, like many major airports, is subject to environmental rules and changing meteorological conditions, which sometimes lead to a change of runway configuration after an operational flight plan has been developed and given to the pilots. The pilots might already be on their way to the airport with the operational flight plan for their outbound flight in their pockets.

For aircraft departing from Schiphol's Runway 24, there are two SIDs. They are identified as Spijkerboor 1S and Andik 1S. Although they prescribe different initial turns, both lead toward the same northern airway point. The need for the two different routes is created by tactical use of the runway system. In one runway configuration, the right-turn departure from Runway 24 — Spijkerboor 1S— is preferable; in another configuration, the left-turn departure — Andik 1S — is favored.

Aircraft turning right on departure from Runway 24 can interfere with traffic arriving from the south to establish on a right downwind leg for landing on Runway 18R. Aircraft turning left on departure from Runway 24 can interfere with traffic departing from Runway 18L.

Therefore, when traffic is landing on Runway 18R, aircraft departing from Runway 24 to the north will proceed via the Andik 1S departure (left turn). When Runway 18L also is being

used for departures, aircraft departing from Runway 24 to the north will use the Spijkerboor 1S departure (right turn).

On several occasions, pilots departing Schiphol from Runway 24 have turned right after takeoff although they were cleared for the Andik 1S departure, with a left turn away from traffic arriving on right downwind for Runway 18R. On other occasions, it was the other way around: pilots were cleared for the Spijkerboor 1S departure, with the right turn to avoid traffic departing from Runway 18L, but flew the Andik 1S departure toward the traffic coming off Runway 18L.

Pilot-controller communication procedures requiring clearance readback are designed to prevent such errors. Mishearing, however, allows the errors to persist. In most of the departure deviations noted above, the pilots' readbacks of their departure clearances — which included a different SID than the one shown on their operational flight plan — to the clearance-delivery controllers were correct. And on many occasions, though not all, the tower controllers specifically mentioned the assigned SIDs in their takeoff clearances as a final check.

Investigations showed part of the problem was that, in an effort to manage their workload, the pilots had programmed their flight management systems (FMSs) with the SIDs that had been chosen by the flight dispatchers for their operational flight plans. However, no corrections to the programmed FMS routes later were made after different clearances were issued by ATC. Even inclusion of the assigned SIDs in the takeoff clearances did not alert the pilots to the errors. Apparently, the mindset of the pilots was not in line with what actually was put in the FMS.

Sometimes, the pilots' readbacks of their clearances were incorrect — the pilots "read back" the SIDs shown on their operational flight plans and not the ones assigned — and the controllers did not notice the errors. The result, however, was the same: the aircraft, on autopilot, followed the SIDs programmed in their FMSs, not the ones assigned by ATC.

The resulting wrong turns sometimes were detected at a very late stage, almost causing a loss of ATC traffic separation, and controllers had to intervene by issuing heading changes and/or level-off instructions to other aircraft in the vicinity to maintain separation. To date, the problem has not resulted in any dangerous situations at Schiphol, but it poses a very real and significant threat to aviation safety.

These incidents are not unique to Schiphol and are not a reflection of one airport's situation. They occur regularly at airports around the world. At Schiphol, the threat was reduced after one of the involved airlines stopped including the expected SIDs in its operational flight plans, instead cautioning pilots to "check SID." Following this change, none of the airline's aircraft has deviated from an assigned SID. ●

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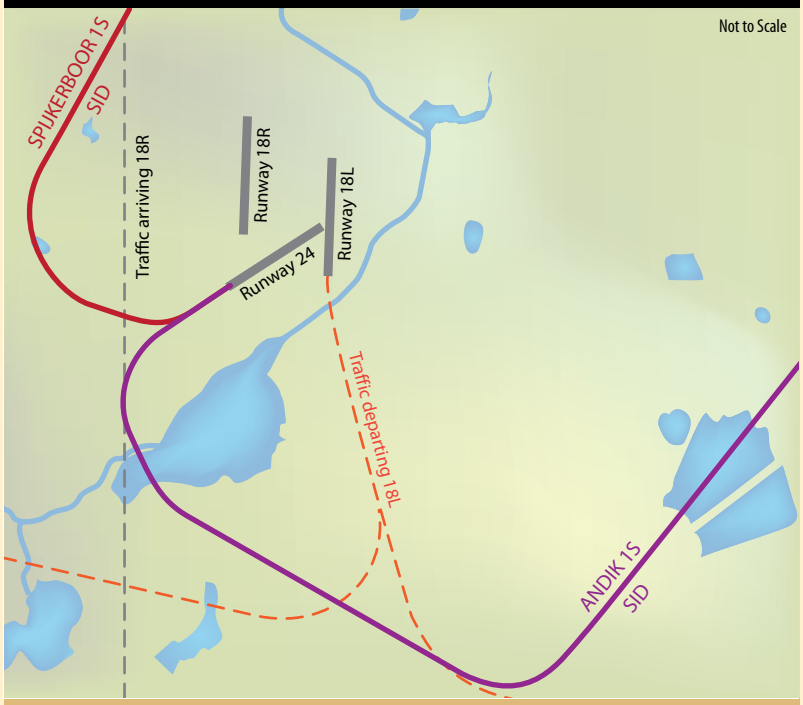
Departure/Arrival Sequences at Schiphol



SID = standard instrument departure

Source: Hans Houtman, Dick van Eck

Figure 1