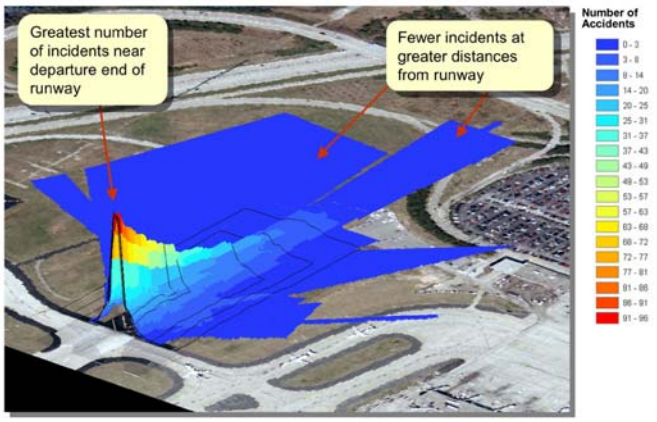
End-Around Taxiways

Why "End-Around Taxiways". In response to increased air traffic, airports are constructing additional parallel runways to expedite the flow of landing and departing aircraft. In a typical parallel runway configuration, departing aircraft use the inboard runways and arriving aircraft use outboard runways. Arriving aircraft need to cross the inboard departure runways which can result in delays and risks of runway incursions. To reduce both the delays and risk of incursions, airports are proposing construction of taxiways that go around the end of the runway often referred to as "End-Around Taxiways" (EATs). These EATs are intended to allow aircraft to taxi around the end of the runway without interfering with operations on the runway (as would be required when crossing the runway). Because most cases involve EATs that would allow arrivals to taxi beyond the end of a departure runway, the initial focus was issues associated with allowing aircraft to depart over those taxiing aircraft.



Verifying the Safety of EATs Under Departures. A key concern that needed to be resolved before the Federal Aviation Administration (FAA) could approve the use of EATs beyond the departure end of the runway was verifying that the EATs could be operated safely. The Federal Aviation Administration (FAA) requested that The MITRE Corporation's Center for Advanced Aviation System Development (MITRE/CAASD) conduct a study to determine whether EAT operations met safety criteria as established in FAA's Safety Management System (SMS). The study mined FAA and National Transportation Safety Board (NTSB) records of accidents and incidents over a 24-year period, identifying incidents that could pose a risk to an aircraft if it were on a taxiway beyond the end of the runway. The overall risk was estimated on a per departure basis, and showed that risk varies significantly according to the operator type of the departing aircraft and the distance to the end-around taxiway. MITRE/CAASD derived a risk formula that was used to demonstrate that the risk would remain within SMS guidelines if the FAA applied an appropriate risk management process that limited the number of implementations NAS-wide. Based on the results of this study, as well as an assessment of the human factors associated with EAT operations, FAA approved use of EATs under departures and issued design guidelines for EATs beyond the departure ends of runways.

Additional Cases. Several airport operators have also requested that FAA approve EATs that pass under arriving aircraft. MITRE/CAASD is performing a similar analysis to estimate the risk associated with these operations in support of such approval and to provide design guidance to airport operators.

Human Factors Issues with EATs. MITRE/CAASD provided human factors and experimental design expertise over the course of several simulations conducted at airline training centers and NASA Ames. During these evaluations, it became clear that pilots were having difficulty distinguishing between EAT aircraft and Runway Incursion (RI) aircraft. One study found 25% of the pilots could not correctly identify if an aircraft was crossing the departure runway, or was on the departure-end EAT, resulting in unnecessary rejected take-offs with EAT aircraft and failures to abort with runway incursion aircraft. Two mitigation strategies were examined in the final simulation. The first was a depression, where the EAT was depressed at varying depths below the runway threshold, and the second was a visual screen of varying heights placed between the end of the runway and the EAT. The depression and screen both provide an effective mitigation to help pilots distinguish between aircraft that are crossing the runway (causing an incursion) and those that are safely on the EAT. The arrival case is being evaluated to determine if there are additional human factors issues associated with arrivals over-flying aircraft on the EAT.

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