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UNDERSTANDING CURRENT WAYS OF REPORTING RUNWAY INCURSION INCIDENTS AT TOWERED AIRPORTS

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Runway incursions occur when an unauthorized aircraft, vehicle or pedestrian operates on a runway. While most incursions are near-misses, they have the potential of turning into fatal accidents such as the Tenerife accident. Despite various efforts to reduce runway incursions, the number of incursions has been increasing. Learning from past incidents can help us develop effective preventive strategies but lack of in-depth investigations limits our understanding of the causes of incursions. At towered airports, the controller on duty reports the incident to the FAA using a form asking them to describe the incident in their own words. Our research question is whether the current form contributes to the lack of detail in incident reports. To answer this question, we interviewed controllers and asked how they view incident reporting and the factors they consider while doing so. In this paper, we report the results of interviews with air traffic controllers.

Nomenclature

FAA – Federal Aviation Administration
MOR – Mandatory Occurrence Report
ATSAP – Air Traffic Safety Action Program
ATO – Air Traffic Organization
ATM – Air Traffic Manager
CIC – Controller in charge
OM – Operations Manager
QAQC – Quality Assurance and Quality Control

Runway incursions are a significant threat to runway safety. The FAA defines a runway incursion as an incorrect presence of an aircraft, vehicle, or person on the protected area of the airport surface designated for the landing and takeoff of aircraft (FAA, 2016). The 1977 runway incursion involving two Boeing 747s at Tenerife that resulted in 583 fatalities (Stroeve et al., 2013) remains the deadliest accident in aviation history. An aviation accident is “an occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight until such a time as all such persons have disembarked in which: (a) a person is fatally or seriously injured; or (b) the aircraft sustains damage or sustainable failure; or (c) the aircraft is missing or completely inaccessible” (ICAO, 2001). Considering the potential that runway incursions have of resulting in an accident, the FAA’s estimate of about three runway incursions occurring each day in the U.S. is concerning (FAA, 2012a). With 1264 incidents in 2014 to 1832 incidents in 2018, runway incursion

incidents have been increasing each year over the last four years (FAA, 2019). Fortunately, most of these runway incursions are near-misses or incidents, that is, an occurrence, other than an accident, associated with the operation of an aircraft that affects or could affect the safety of the operations (ICAO, 2001).

One way to reduce runway incursions is to learn from historic accident and incident data. Runway incursion accident reports by the NTSB often help us understand the causes of accidents in detail before recommending corrective actions. Runway incursion incidents, which occur more frequently than accidents are not always investigated by the NTSB. At towered airports, they are reported by the controller on duty at the time of the incident.

When any surface event, including a runway incursion, occurs at a towered airport, the controller on duty is required to fill out a Mandatory Occurrence Report (MOR). The concerned FAA departments, such as the Air Traffic Organization (ATO), then review these reports and may contact the controller if they feel the incident needs further investigation. These reports help identify patterns in incident causation and provide a focal point for safety discussions. The controllers who fill this form out may not be trained investigators and hence may not always know how to report incidents such that we can learn from them. Some reports are extensive, stating possible underlying causes, while some reports just mention how the incursion occurred, not necessarily specifying why it occurred. Our research question is whether the current incident reporting form discourages controllers from looking further into the incident and reporting all the underlying causes. Additionally, we want to understand how controllers view incident reporting and the factors they consider while reporting the incidents. These insights can help us identify potential ways to help controllers create better reports. To answer these questions, we interviewed air traffic controllers to gain insight into the reporting process and incident reporting in general. We asked them to identify what forms they use for reporting incursions, their experiences using the form, and their opinions on it. In this paper, we first describe the interview method we used to conduct our study. We then present the results of the interviews with controllers and conclude the paper with thoughts on future work.

Interview Method

We developed a semi-structured interview with a list of 18 questions. The questions focused on three areas: (1) what kinds of forms do controllers use; (2) what happens after an incident is reported, that is, who reviews or investigates the incident; and (3) the controllers' experience using the form, and their opinions on it. The semi-structured format allowed the controllers to be more descriptive in their responses and allowed us to ask follow-up questions. The controllers' participation in the study was voluntary. We obtained approval for the research from Purdue's Institutional Review Board.

We requested permission to talk to controllers at three airports in Indiana. We received written confirmation from one of these airports and are waiting on a response from the other two. We have thus far interviewed four controllers in person. The controllers we interviewed were in positions where they were either in charge of reporting events or in managerial positions where they reviewed the reporting of events or assisted in the investigation of events. In the next section, we present a summary of the discussions we had with the controllers.

Results

We categorize the controllers' responses into four broad categories. First, we discuss their views on incident reporting, then give an overview of the reporting process, details of the reporting forms controllers use to report incidents, and finally their views on the forms.

Controllers' Views on Incident Reporting

The controllers all agreed that incident reporting is important. They believe that for smaller airports without equipment to track and record surface movements, reporting of incidents is the only way to become aware of unsafe events occurring at that airport. In their opinion, the change in aviation's safety culture with an emphasis on fixing systemic issues rather than punishing the culprit has motivated them to report incidents. They feel that reporting incidents will help reduce the likelihood of future similar incidents.

The Reporting Process

In this paper, we focus on reporting incidents. The controller in charge (CIC) and the Air Traffic Manager (ATM) at one of our airports gave us an insight into the incident reporting process. Overall the details that the controllers provided on the reporting process conform to FAA guidelines. Controllers fill out a Mandatory Occurrence Report (MOR) using an online tool called CEDAR to provide details of the incident. The FAA's guidelines mention that if controllers do not have access to CEDAR, they can fill out and submit Form 7210-13 instead (FAA, 2012b).

When an incident occurs, the first step is to determine whether it was a significant event or not. The FAA gives a list of potentially significant events, such as security incidents, or when the separation between aircraft is less than 33% of the FAA separation standard. This list of events is not all-inclusive and the FAA guidelines suggest that each situation should be considered based on individual circumstances. In case of a significant event, the CIC indicated that they must report the incident using an MOR within an hour of the event. The person filling out the form must indicate that it is a significant event by checking 'Yes' on Question 4 shown in Figure 1.

SECTION A Complete for ALL MORs	1. Reporting FAC ID	2. Date UTC (dd/mm/yyyy)	3. Time UTC	4. Significant Occurrence? <input type="radio"/> Yes <input type="radio"/> No
	5. MOR reported by (select one): <input type="radio"/> Controller providing services <input type="radio"/> FLM <input type="radio"/> Internal Facility Review <input type="radio"/> CIC <input type="radio"/> Aircraft Owner/Operator <input type="radio"/> Electronically Detected <input type="radio"/> External Facility Referral <input type="radio"/> Hotline (Describe in summary) <input type="radio"/> Other (Describe in summary)			

Figure 1. An excerpt of Form 7210-13 that controllers may use to report an incident. The online form has a similar question pertaining to the significance of the event.

The controller on duty must notify at least the supervisor or the CIC. The CIC will get in touch with the ATM, who informs the Regional Operations Center (ROC). The CIC told us that in case of a significant event, they would be calling a lot of people in managerial positions to notify them of the incident, and answering a lot of questions related to the incident.

If the controller selects non-significant on the form, they must complete the MOR before the end of their current shift. This timeline conforms to the FAA guidelines on MORs. One of the controllers provided us with a flow chart that shows the steps involved in submitting an MOR. Figure 2 shows a modified version of the flow chart. The type of MOR controllers fill out depends on the occurrence. As Figure 2 shows, MORs include surface separation, airport environment, and terrain/obstruction. In the case of runway incursions, controllers need to consider whether it was a possible pilot or vehicle deviation. If that were the case, the controller must specify whether a Brasher Warning was issued to the pilot. A Brasher warning is issued to the flight crew instructing them to make a note of the occurrence and collect their thoughts for future coordination with Flight Standards regarding enforcement actions or operator training (FAA, 2012b). If the warning was not issued, the controller needs to explain why not.

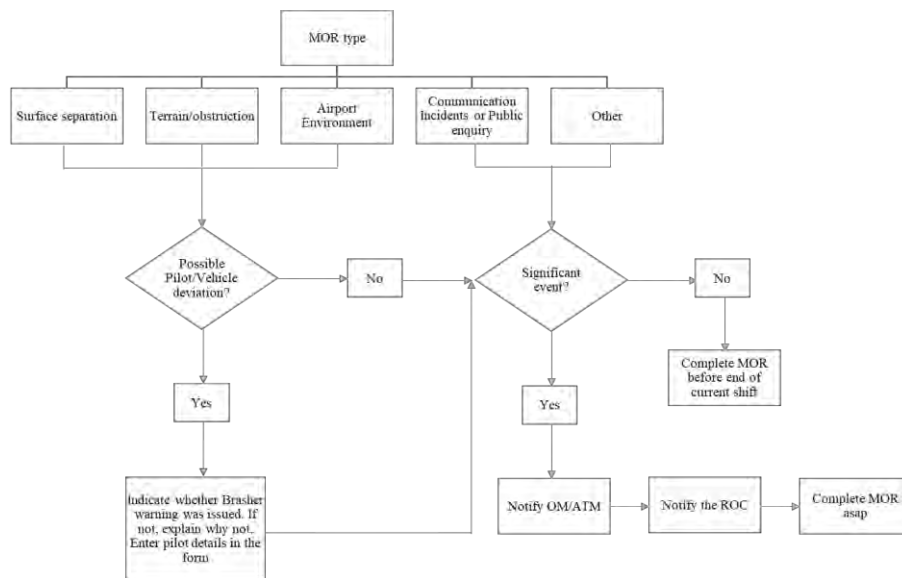


Figure 2. A modified version of the Event Reporting Flow Chart. One of the controllers printed out the original chart for us.

The ATM explained that controllers submit the MOR to the service center (East, West, or Central) under which the airport falls. The department of Quality Assurance and Quality Control (QAQC) reviews the MORs and may contact the ATM for more details. They may ask for recordings of the communication between the pilot and the ATC, interview the CIC, speak to the pilot, or ask the NTSB or third parties to get involved in the investigation. QAQC analyzes the reports to find trends or common contributing factors to events. They may issue an Internal Compliance Validation (ICV) to the ATM, recommending steps to reduce the frequency of unsafe events. The department of QAQC also does random checks to ensure that events are reported. For example, they may review ATSAP reports or pilot-submitted reports to check if a specific event is missing an MOR. In such cases, the controller may lose their job for not reporting the event.

The Reporting Form

The online form has a drop-down menu with types of MOR. The controllers said that the list is quite extensive in terms of types of occurrences, and that the terminology used in the form is easy to understand. The time taken to fill out the MOR depends on how busy they are and the event's significance. Controllers must immediately reports significant events to their manager (OM or ATM). If the event is not significant, the controller may decide to wait till the airport is not too busy. In case they are busy, they may make a note of the event and fill out the form later or call another controller to take over while they fill out the form. One of the controllers stated that non significant events are quick and easy to report. Sometimes, the controller may talk to the pilots involved to find out their side of the story. In case of a pilot deviation, the controllers must give pilot details such as name and licence number for further investigation.

Controllers' Views on The Form

One of the controllers stated that the MORs often help identify *what* happened, while the Air Traffic Safety Action Program (ATSAP) reports help to identify *why* it happened. ATSAP is a non-punitive program that encourages controllers to report incidents. The controllers felt that ATSAP has helped develop a strong safety culture among controllers. One of them said that ATSAP reports are often more detailed than MORs—one of the reasons being that the ATSAP form probes the controllers by asking additional related questions. By referring to the ATSAP reports, the personnel investigating the incident not only understand the incident better but can also identify any cases of under-reporting. For example, if the report submitted by the pilots is vague or the pilot's account contradicts the controller's, the investigators can contact the involved personnel to get more clarity on the event and raise awareness of such issues. The controllers mentioned that they receive training on how to report incidents.

The controllers had varied opinions on the online MOR form. One said that the online form was better than the previously used paper form because it asks only those questions that pertain to the specific type of MOR selected. Another controller said that the form was user friendly and easy to fill out. While these two controllers said that they do not dislike anything about the form in particular, another controller said that the questions the form asks are too basic. They pointed out that the form lacks objectivity as it asks the controller to describe the incident in their own words. The controller said that with an open-ended question, the person filling out the form uses their discretion in reporting the details of the incident. This person may choose to not report certain facts if they think they are not significant enough. Additionally, the controllers filling out the form may be under time pressure, or busy at work, and hence may only report the bare minimum.

Conclusion and Future Work

Our first reseach question was whether the current reporting form discourages controllers from looking further into the incident and reporting all the underlying causes. Two controllers, including a supervisor, explained that they mostly viewed the MOR as a means of reporting *what* happened and not necessarily *why*. The FAA guidelines simply mention that the MOR must be complete enough to describe *what* happened. They said that they tend to provide more details in

ATSAP reports than MORs because the ATSAP questions encourage them to look deeper into the incidents' causes. The simple format of the MOR form may not necessarily encourage controllers to look deeper into the causes—something they are willing to do when asked more detailed questions. Our next research question was to understand how controllers view incident reporting and the factors they consider while reporting incidents. All four controllers we interviewed advocated incident reporting and believe that effective reporting can improve safety. The controllers in managerial positions always supported the FAA in further investigations of an incident and followed the procedures. The biggest factor they consider in reporting is the significance of the event. Not surprisingly, they are more invested if the incident is significant and will look deeper into the underlying causes. The controllers we interviewed did not have conflicting opinions on any of the questions we asked. The reporting process they described agrees with the FAA guidelines. In current work, we are creating an alternative reporting tool that is still quick and easy to fill out, but will encourage deeper consideration of the causes.

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