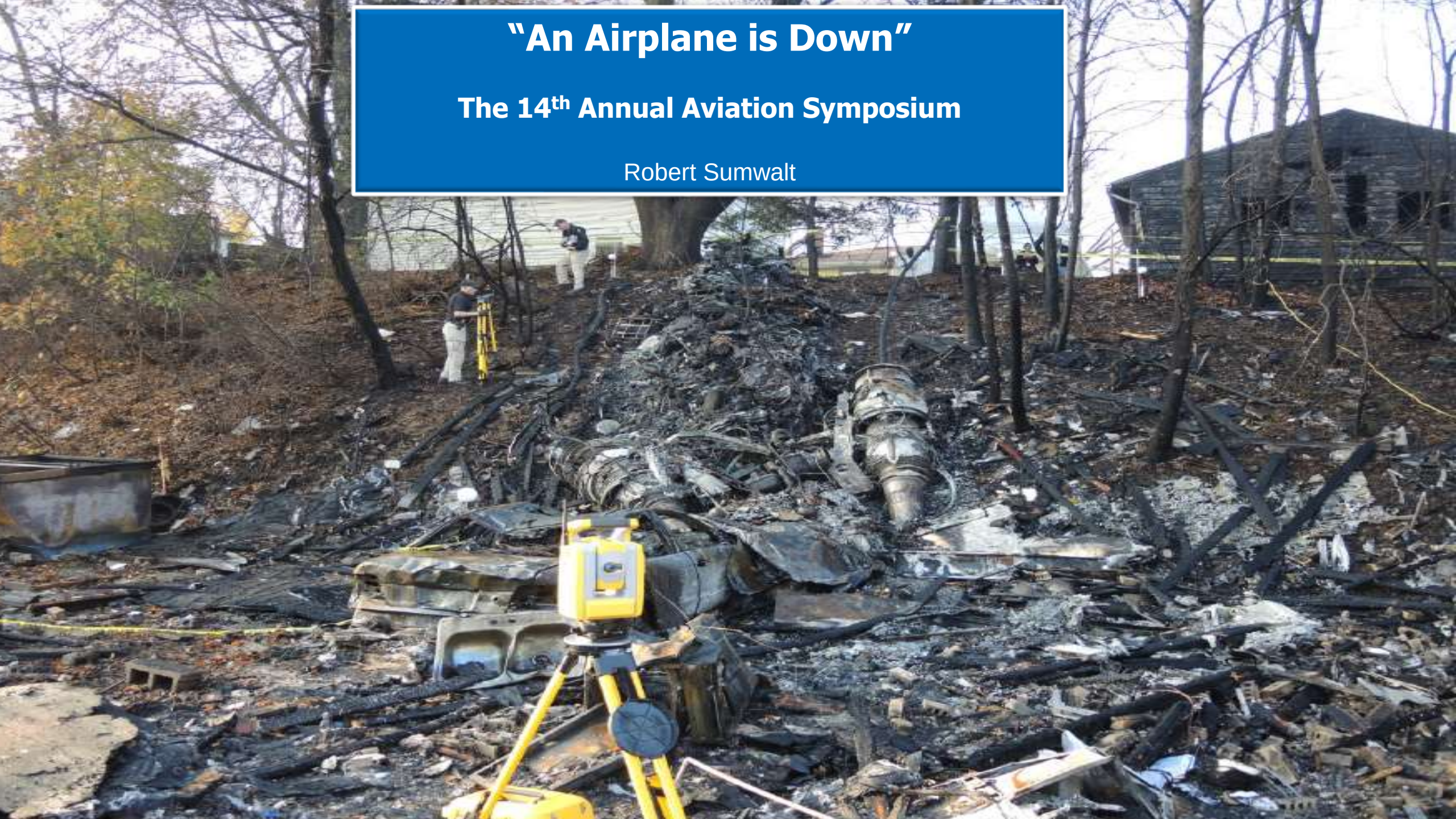

"An Airplane is Down"

The 14th Annual Aviation Symposium

Robert Sumwalt


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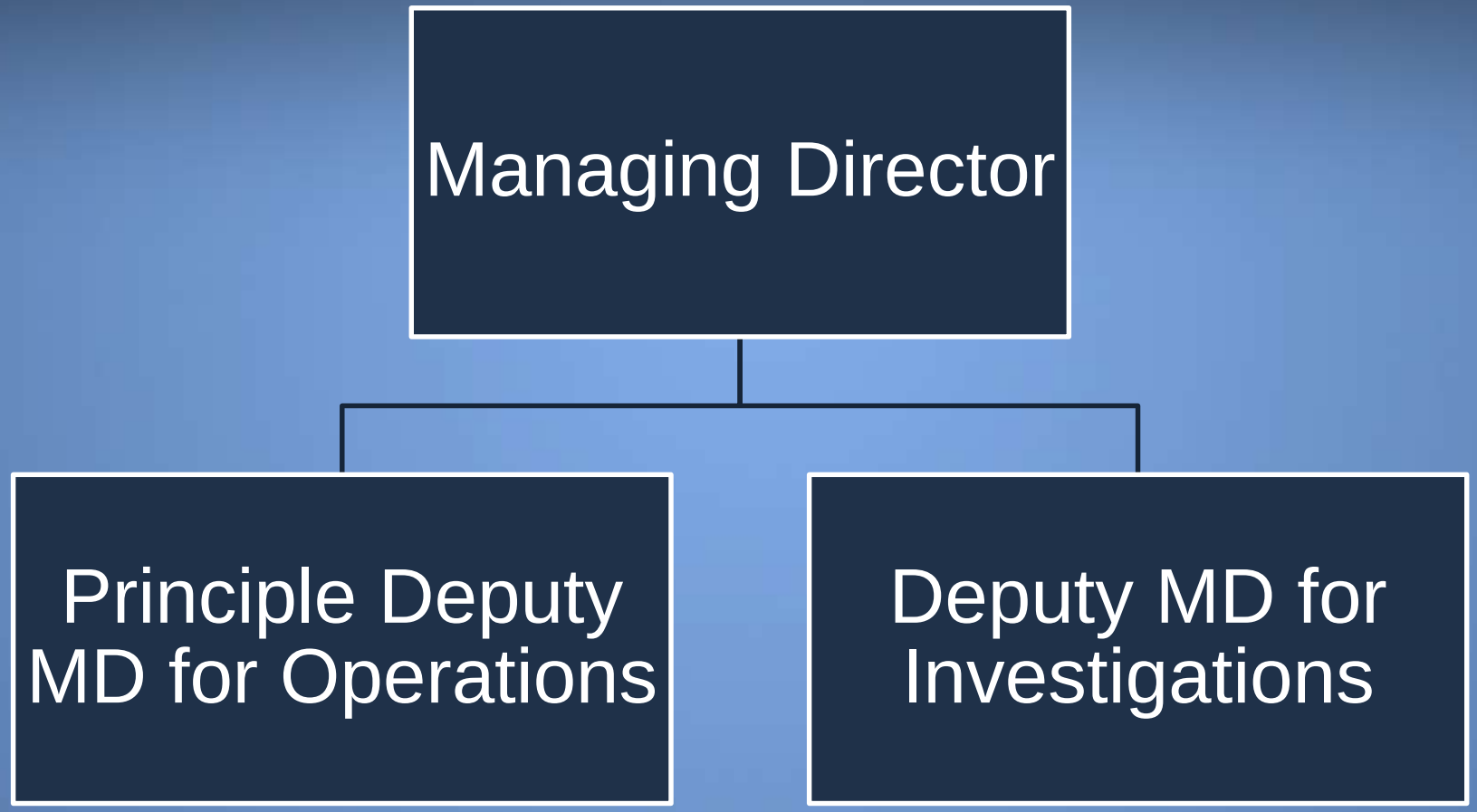
Sharon Bryson
Managing Director

Paul Sledzik
Deputy Managing Director

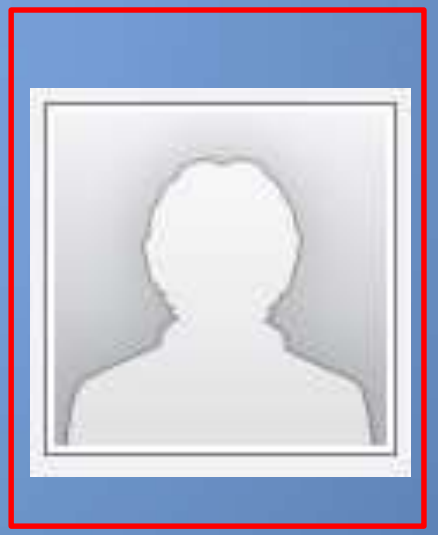
Managing Director

Deputy MD


Managing Director
Principle Deputy MD for Operations
Deputy MD for Investigations

Dana Schulze
Director, Office of Aviation Safety

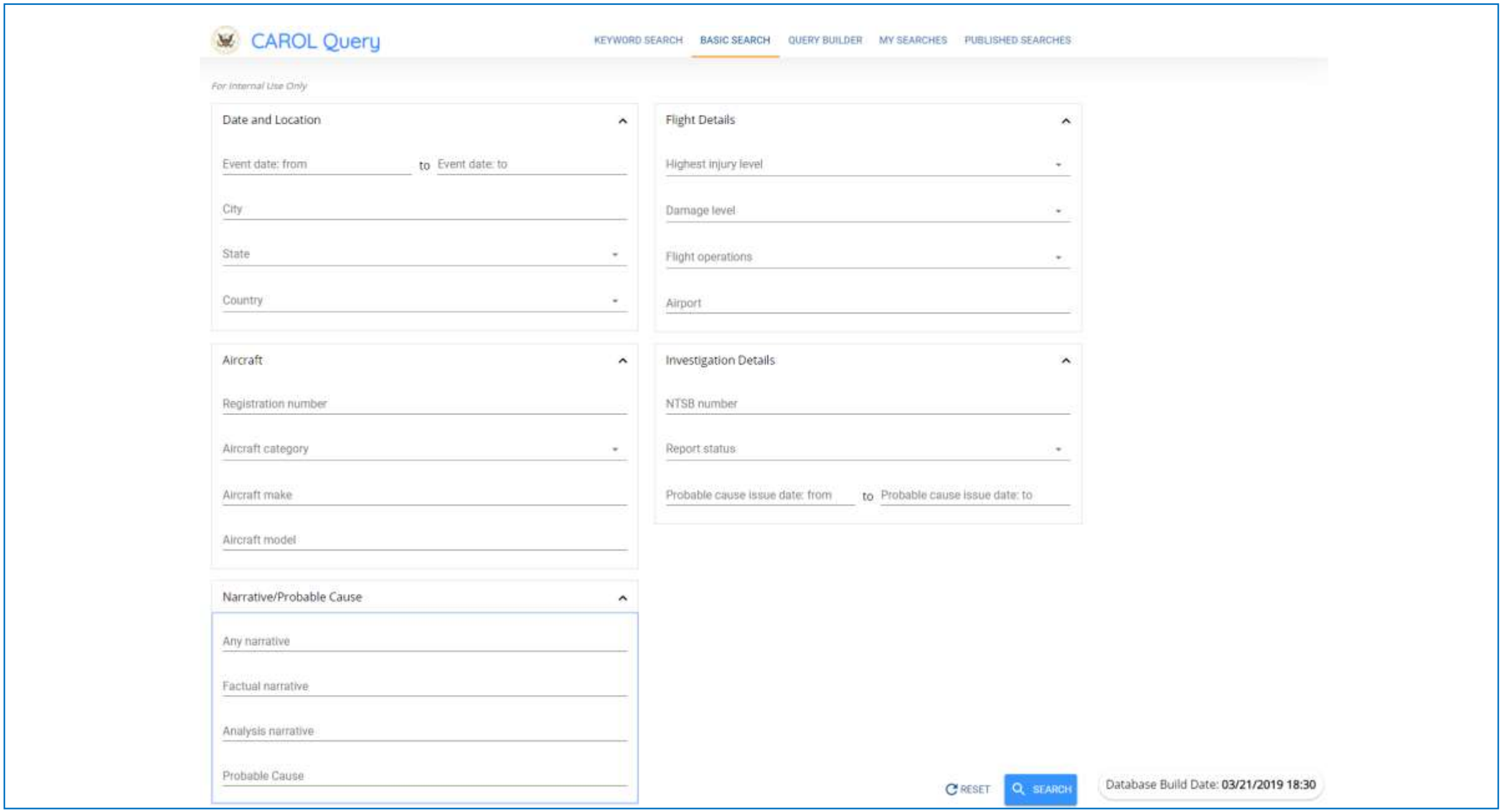
Tim LeBaron
Deputy Director, Regional Operations



Deputy Director

SAFTI

System for Analysis of Federal Transportation Investigations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BOEING
737 MAX

October 29, 2018

March 10, 2019

National Transportation Safety Board
Washington, DC 20594

Safety Recommendation Report

Assumptions Used in the Safety Assessment Process and the Effects of Multiple Alerts and Indications on Pilot Performance

Accident Number:	DCA19RA017 / DCA19RA101
Operator:	PT Lion Mentari Airlines / Ethiopian Airlines
Aircraft:	Boeing 737 MAX 8 / Boeing 737 MAX 8
Location:	Java Sea, Indonesia / Ejere, Ethiopia
Date:	October 29, 2018 / March 10, 2019

The National Transportation Safety Board (NTSB) is providing the following information to urge the Federal Aviation Administration (FAA) to take action on the safety recommendations in this report. They are derived from our participation in the ongoing investigations of two fatal accidents under the provisions of Annex 13 of the International Civil Aviation Organization. As the accident investigation authority for the state of design and manufacture of the airplane in these accidents, the NTSB has been examining the US design certification process used to approve the original design of the Maneuvering Characteristics Augmentation System (MCAS) on the Boeing Company (Boeing) 737 MAX. We note that, since the PT Lion Mentari Airlines (Lion Air) accident on October 29, 2018, Boeing has developed an MCAS software update to provide additional layers of protection and is working on updated procedures and training. However, we are concerned that the process used to evaluate the original design needs improvement because that process is still in use to certify current and future aircraft and system designs.

Although the NTSB's work in this area is ongoing, based on preliminary information, we are concerned that the accident pilot responses to the unintended MCAS operation were not consistent with the underlying assumptions about pilot recognition and response that Boeing used, based on FAA guidance, for flight control system functional hazard assessments, including for MCAS, as part of the 737 MAX design.[1] We are making these recommendations to address assumptions about pilot recognition and response to failure conditions used during the design certification process as well as diagnostic tools to improve the prioritization and clarity of failure indications presented to pilots.

[1] (a) We based our preliminary findings on information from the publicly released preliminary accident reports. (b) While Boeing uses the term "uncommanded MCAS function" in its assessment documents, in this report, we are using the term "unintended MCAS operation" as it relates to our review of the accident events.

59582

ASR-19-01

- Design assumptions
- Human factors validation of assumptions
- Better cockpit diagnostic tools

If this is your aircraft …

Are you prepared to interface with this?

Three things to consider:

- Become a party member
- Make a party submission
- Meet with Board Members

NTSB

National Transportation Safety Board