

**Technical Report Documentation Page**

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16. Abstract <b>INTRODUCTION.</b> Identification of pilot incapacitation is essential for aviation safety. Multiple databases of diverse origins house varying quality levels of pilot incapacitation information. Evaluating these data sources is imperative to compile a trustworthy and precise list of pilot incapacitation events. <b>METHODS.</b> The study assessed four primary databases: National Transportation Safety Board (NTSB), Accident Incident Data System (AIDS), Emergency Operation Network (EON), and Aviation Safety Reporting System (ASRS). This evaluation examined data sources, contents, origin, flow, regulations, and parameters such as availability, accessibility, and quality specific to pilot incapacitation information. Utilizing SQL and natural language processing (NLP) algorithms, we implemented screening, identification, and collection processes for pilot incapacitation events from these data sources on the Federal Aviation Administration (FAA) enterprise information management (EIM) platform. <b>RESULTS.</b> Diagrams show the intricacies of data sources, contents, origin, flow, and relative quality of evaluated databases. A list of pilot incapacitation events was identified and collected. A Venn diagram depicts the intersection of event sets originating from each data source. A road-map is proposed to use these data sources for monitoring pilot incapacitation. <b>DISCUSSION.</b> The study faces limitations arising from database availability and completeness. Future enhancements may be made via dedicated data fields for pilot incapacitation and implementing advanced NLP techniques aimed at identifying events by narrative descriptions. A major discovery of this project was the existence of separate NTSB databases for reported/not investigated events and reported/investigated events, with only the latter being shared with the FAA. On further inquiry with NTSB, we learned that reportable pilot incapacitation events not resulting in a serious incident or accident are not investigated and are not part of the data currently shared with the FAA. The FAA and NTSB are currently working on a MOU to allow sharing of these non-investigated reports.			
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# Pilot Incapacitation - Assessment of Data Sources

Presented to:

By: Haibiao Ding and  
Stacey Zinke

Date:



Federal Aviation  
Administration



Federal Aviation  
Administration

## Introduction – Pilot Incapacitation

- **Over time flight operations and the numbers of pilots in the US have increased**
- **AVS/AAM need a Safety Assurance Program (SAP), per FAA Order VS 8000.367**
- **Past monitoring was ad-hoc**
- **To have an SAP, our processes need to adapt & pilot incapacitation is a key safety metric**



In the past, monitoring of pilot incapacitations in aerospace medicine was done sporadically, on an ad-hoc basis, as permitted by availability of time and resources. CAMI created an Incapacitation Data Registry in roughly 1996 to track pilot incapacitations, which was converted into an MS Access Database in 1997. While this system did provide some limited capabilities for tracking pilot incapacitations the processes used created an incomplete dataset for this safety hazard, which could not be used to determine its' severity and likelihood. Data was gathered in a manual process which required extensive time resources and tracked only a limited number of the reported cases. Data on pilot incapacitations when time permitted was stored in a MS Access Database. Preference was given to include pilot incapacitations from part 121 operations. When a case was chosen for additional processing by CAMI's Medical Research Team, the medical technician would contact the pilot and the pilot's family, requesting additional information over time and log updates into the MS Access database to determine the progression and/or resolution of the pathology that likely caused the logged incapacitation. As described, this process appeared to be focused more on the logic to determine the recertification of the incapacitated pilot. It did not appear to be assessing the cause of the incapacitating event to judge the efficacy of the implemented risk control strategies of aeromedical certification policies to adequately mitigate the risks of pilot incapacitations from the system, and to fine-tune these policies based upon the derived versus acceptable level of this risk, as is required by FAA Order VS 8000.367. The information collected also did not appear to be timely enough to be immediately actionable for a case of pilot incapacitation to assist in the decision of whether or not we should aeromedically recertify the pilot following an incapacitating event. It would take a minimum of six months to several years to gather data on each case. This manual and sporadic collection of data provided some information to populate the MS Access database, but did not appear to be used for anything actionable beyond the inclusion of it in an occasional study, which again would have to be performed on the incomplete and limited data, which would likely not be suitable for use to draw meaningful conclusions.

Due to these noted inefficiencies, this system was shut down, documented in an OAM Technical Report (publicly available at [https://www.faa.gov/sites/faa.gov/files/data\\_research/research/med\\_humanfacs/oamtechreports/202128.pdf](https://www.faa.gov/sites/faa.gov/files/data_research/research/med_humanfacs/oamtechreports/202128.pdf)), and archived in 2021.

## Data Sources, Event Time Frames, Data Repositories, and Accessing Options

<b>NTSB</b>	Current - 2008	2007 - 1982	Pre 1982 (to 1960s)
	EIM: Privacera: eimprod1-ntsb/ntsb/safety Hue/rdsfeeds-aurora: database: ntsb_nonrestrict	<a href="https://data.ntsb.gov/avdata">https://data.ntsb.gov/avdata</a>	
<b>AIDS</b>	Current - 1970s		
	EIM: Hue/rdsfeeds-aurora: database: aids_nonrestrict table: aid_data database: aids_restrict	<a href="https://www.asias.faa.gov/apcx/f?p=100:12:::NO::">https://www.asias.faa.gov/apcx/f?p=100:12:::NO::</a>	
<b>EON</b>	Current - 2008		
	EIM: Privacera: eimprod1-safety/eon/safety Hue/Presto: database: Safety table: v_eon_json	<a href="https://c3.eon.faa.gov/eon/SitePages/Home.aspx">https://c3.eon.faa.gov/eon/SitePages/Home.aspx</a>	
<b>ASRS</b>	Current - 1987		
	EIM: Hue/rdsfeeds-aurora: database: asrs_nonrestrict	<a href="https://asrs.arc.nasa.gov/search/database.html">https://asrs.arc.nasa.gov/search/database.html</a>	

NTSB: National Transportation Safety Board  
 AIDS: Accident Incident Data System  
 ASRS: Aviation Safety Reporting System

EIM: Enterprise Information Management platform of FAA  
 EON: Emergency Operation Network

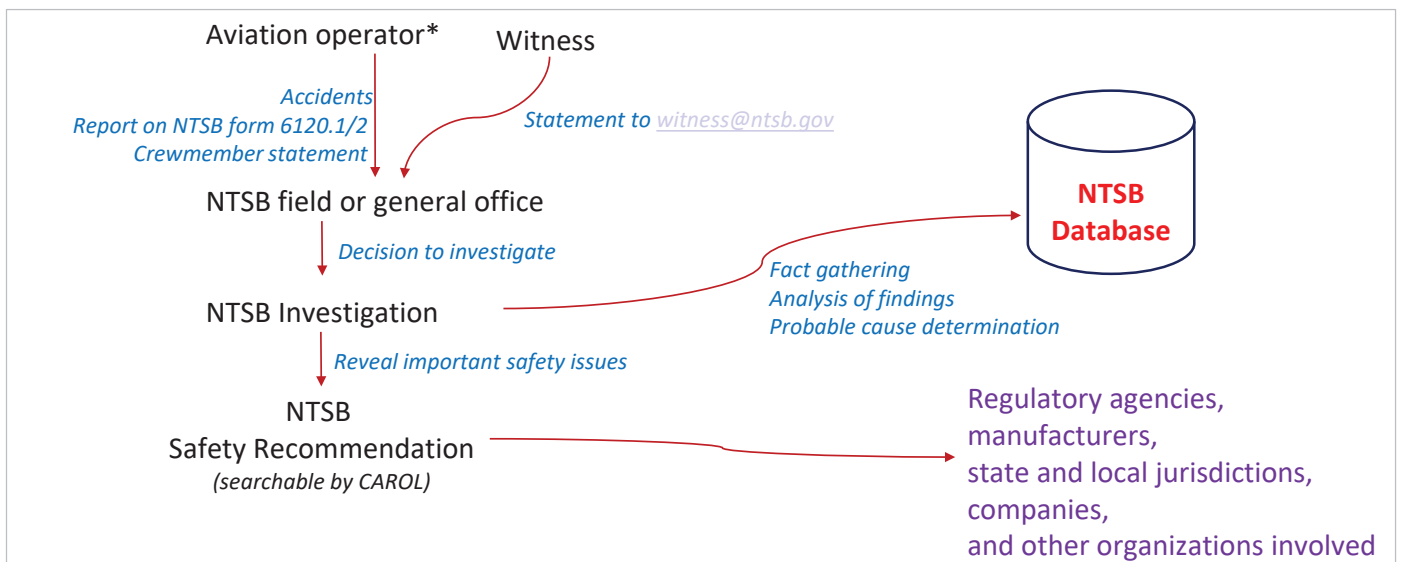


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There were four data sources investigated to assess their relative quality for use in tracking and monitoring pilot: NTSB; AIDS; EON; and ASRS. Dr. Ding has included information on database versions, coverage years, meta information, and insights into accessing the datasets. Three distinct timeframes are delineated as columns on the graph. This corresponds to three versions of databases kept and distributed by the NTSB, due to changes made to their data structure and format over time: “PRE1982” covers the timeframe from the 1960s when the data collections began through the end of 1981; “PRE2008” covers the timeframe from 1982 through the end of 2007; and the current data in its’ most recent format, covers the timeframe from 2008 through today/current. The other data sources including the AIDS, the EON, and the ASRS, do not have these structural changes, and only keep one, consolidated set of data for these events.

## Data Origin and Flow: NTSB



\*Aviation operator: any person who causes or authorizes the operation of an aircraft, such as the owner, lessee, or bailee of an aircraft.  
 CAROL: Case Analysis and Reporting Online.  
 NTSB: National Transportation Safety Board

NTSB DATA: Collected from the Pilots, Flight Crew, and Operators:

The National Transportation Safety Board (NTSB) collects safety data on accidents and incidents across all modes of transportation. Aerospace and aviation related data collected for this cause includes pilot incapacitations, among many other events, as specified in the Code of Federal Regulations (CFR). The NTSB collects information from both operators and witnesses for this purpose. The NTSB reserves the right to determine which safety related events it receives warrant further investigation to determine probable cause. This information is stored in an NTSB database. The NTSB will also make the determination of when important safety issues are identified that require action(s) on the part of regulatory agencies or others involved in the transportation industry, which need to be published as NTSB Safety Recommendations. During the process of examining and comparing the data received on pilot incapacitations from the various sources, it became evident that the data received from the NTSB Database by the FAA that includes pilot incapacitations, was either only a subset of what the NTSB receives from the CFR requirements or there was a significant and pervasive problem with compliance to the CFRs requiring the reporting of these events to the NTSB. Through a series of follow-up meetings between the NTSB and the FAA on this topic, it became clear that the FAA has only been receiving a subset of the data on pilot incapacitations that were reported to the NTSB.

**A major discovery of this project was the existence of separate databases for reported/not investigated events and reported/investigated events, with only the latter being shared with the FAA. On further inquiry with NTSB, we learned that reportable pilot incapacitation events not resulting in a serious incident or accident are not investigated and are not part of the data currently shared with the FAA. The FAA and NTSB are currently working on a MOU to allow sharing of these non-investigated reports.**

Rough description of the process by which the FAA has been ‘traditionally’ receiving and re-identifying the data that was received from the NTSB database for accidents and incidents which only included those events reported to the NTSB that they chose to investigate, is as follows:

The FAA received a copy of the NTSB’s de-identified public database on incidents and accidents in aviation on a periodic basis, every two months. The NTSB also sent a separate password-protected dataset to the FAA which included the identities of the pilots and aircrew involved in the incidents and accidents in the public dataset every two months, as per an agreement with the FAA. The file containing this data was loaded onto a location on the FAA’s ASIAS server to which the NTSB had been granted access for this purpose. The NTSB notified AVP when this file was uploaded and provided them with the password to the data. Joe Mooney of AVP had been retrieving this file and ran queries to match it with information on pilots stored in the FAA’s Airman Registry database. These queries involve attempting to match on at least 3 of the 4 entries between the identified password protected file from received from the NTSB and the information in the Airman Registry to positively identify a pilot: 1. Pilot certification ID; 2. Pilot First Name; 3. Pilot Last Name; and 4. Pilot DOB. For all entries for pilot names received from the NTSB that did not result in a good match from the queries of the Airman Registry, Joe Mooney created an exception list, which he then examined to identify any matches that could be created from them by identifying and correcting common errors in the data, such as transposing month and date information in a DOB, etc. Once he had a clean table, Joe Mooney emailed a link to the cleaned, password-protected identification file to CAMI, and would send a password for the file in a separate email, upon request to those who have a “need to know.”

\*\*\*\*NOTE\*\*\*\* This process and the agreement with the NTSB to provide this data to the FAA are currently under revision, and are subject to change, as of today 2/27/2024.



## NTSB – Reporting Requirement - 49 CFR, 830.5:

### 830.5 Immediate Notification:

- The operator of any civil aircraft, or any public aircraft not operated by the Armed Forces or an intelligence agency of the United States, or any foreign aircraft shall immediately, and by the most expeditious means available, notify the nearest NTSB office, when:
  - (a) An aircraft accident or any of the following serious incidents occur:
    - (2) Inability of any required flight crewmember to perform normal flight duties as a result of injury or illness;

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The requirement for pilots, air crew, and operators to notify the NTSB of any pilot or flight crew incapacitation during operations is codified. This is why, initially, we believed that the NTSB's collected data on pilot incapacitations would be the most comprehensive and complete set of data on these events. If this was not found to be the case, it would imply that either we had a significant non-compliance issue with 49CFR 830.5 or we were not receiving a complete set of the data that was received by the NTSB. Note also, that the CFR requirement for the operator is "Immediate Notification."

## NTSB – Reporting Requirement - 49 CFR, 830.6:

### 830.6 Information to be given in notification:

- (a) Type, nationality, & registration marks of the aircraft;
- (b) Name of owner, & operator of the aircraft;
- (c) Name of the PIC
- (d) Date & time of the accident;
- (e) Last point of departure & point of intending landing of the aircraft
- (f) Position of the aircraft w/ref to some easily defined geographic point
- (g) Number of persons aboard, number killed, & number seriously injured
- (h) Nature of the accident, the weather, & the extent of damage to the aircraft, so far as is known and;
- (i) A description of any explosives, radioactive materials, or other dangerous articles carried.

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The CFR lists the type(s) of data/information that is required to be reported to the NTSB for each accident/incident.

## NTSB – Reporting Requirement - 49 CFR, 830.15:

830.15 Reports & statements to be filed

(a) **Reports.** The operator of a civil, public ( as specified in 830.5), or foreign aircraft shall file a report on Board Form 6120.1/2 (OMB No. 3147-0001) within 10 days after an accident, or after 7 days if an overdue aircraft is still missing. A report on an incident for which immediate notification is required by 830.5(a) shall be filed only as requested by an authorized representative of the Board.

(b) **Crewmember statement.** Each crewmember, if physically able at the time the report is submitted, shall attach a statement setting forth the facts, conditions, & circumstances relating to the accident or incident as they appear to him. If the crewmember is incapacitated, he shall submit the statement as soon as he is physically able.

(c) **Where to file the reports.** The operator of an aircraft shall file any report with the field office of the Board nearest the accident or incident.

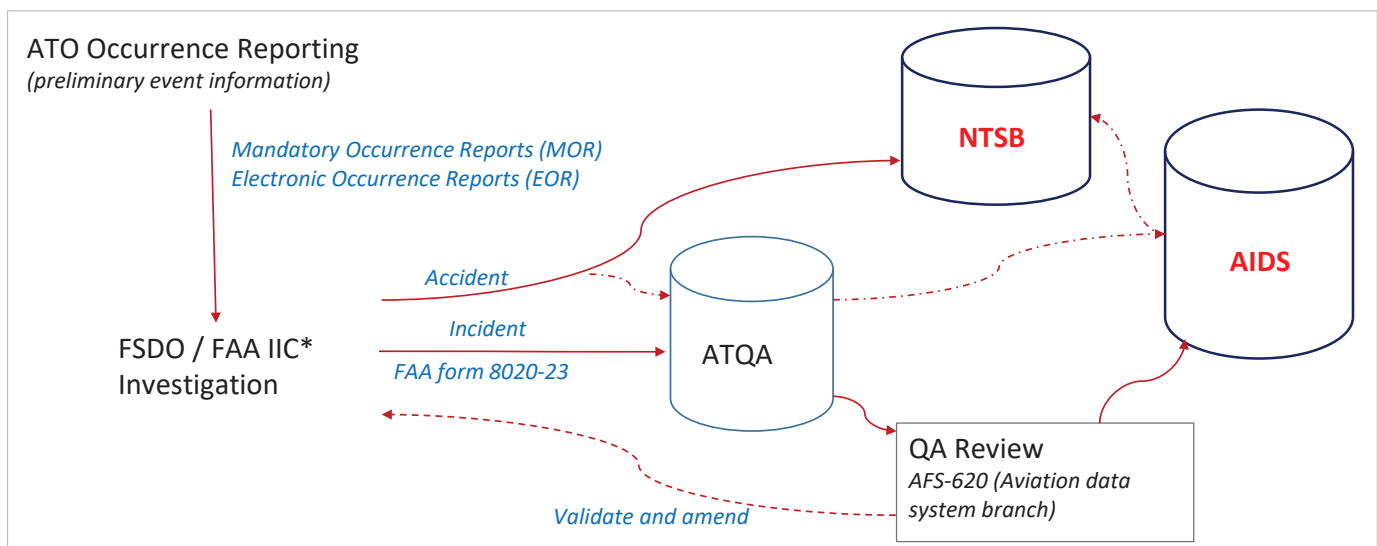


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This section in the CFR was included, since it implies that even though there is a requirement for immediate notification of the NTSB for pilot incapacitations in 49 CFR 830.5, reporting via Form 6120.1/2 is only required from the operator: 1. Within 10 days of an aircraft accident; 2. Within 7 days if an overdue aircraft is still missing, or upon request of an authorized representative of the Board. This could be a part of the reason why the NTSB public dataset with FAA's identification only contains a subset of the overall number of pilot incapacitations.

## Data Origin and Flow : AIDS



\* FAA IIC serves as the party coordinator for the FAA during an NTSB investigation, and the technical advisor to an NTSB investigator during an international investigation.

FAA: Federal Aviation Administration; IIC: Investigator-in-Charge; ATO: Air Traffic Organization; ATQA: Air Traffic Quality Assurance data system  
AFS: Flight Standards; AIDS: Accident Incident Data System; FSDO: Flight Standards District Offices; QA: Quality Assurance; SDR: Service Difficulty Reporting

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The Accident and Incident Data System (AIDS) is a database kept by and used by Flight Standards in the FAA to investigate aviation-related accidents and incidents to determine cause(s). Notification of accidents and incidents may come from Air Traffic via MORs, or it may come from operators, pilots, or family members contacting the FSDOs (data collected and input via Form 8020-30) directly. Flight Standards generally verifies information received from Air Traffic prior to storing the information in their Air Traffic Quality Assurance (ATQA) database. Flight Standards additionally reviews information placed in their ATQA system to validate the data and amend it prior to sending it to the FAA's Investigator In Charge (IIC) for further investigation and action. Solid lines and arrows stand for regular or main data flow. Broken lines and arrows represent pathways of validated or curated data flow.



## **AIDS – Reporting Requirement – FAA Order 8020.11D:**

Form 8020-23:

- FAA Form 8020-23 will be completed by the FAA IIC and entered into ATQA within 30 calendar days of notification of an accident/incident.
- Upon completion, the 8020-23 will be submitted via ATQA to AFS-620, Aviation Data Systems Branch, for a final data quality assurance (QA) review of the information collected prior to the form being moved from ATQA to the FAA Accident/Incident Database System (AIDS) Source.



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FAA Order 8020.11D describes the timeframes allowed for Flight Standards' validation of the data. The timeframes given in the process of 30 days or greater, would likely be too delayed for aeromedical needs for recertification decisions for pilots who were previously incapacitated. It needs to be determined if this much delay is acceptable for overall summary monitoring and reporting of pilot incapacitations for the executive level. 8000 series orders are owned by AFX – Flight Standards. 7000 series orders are owned by ATO – Air Traffic.

# Form 8020-23

FAA ACCIDENT / INCIDENT REPORT		AMENDED DATE		MO		DA		YR	
1. ACCIDENT / INCIDENT									
2. DATE OF EVENT									
3. FAA OFFICE									
4. STAB ID									
5. OPERATOR NAME									
6. AIRPORT									
7. LOCAL TIME									
8. LATITUDE									
9. LONGITUDE									
10. AIRCRAFT DAMAGE									
11. COLLISION - BETWEEN TWO AIRCRAFT									
12. AIRCRAFT REGISTRATION									
13. FACTORS - IDENTIFY PRIMARY FACTOR AS A BIDENTY (SECONDARY FACTORS, IF ANY, AS X)									
14. TECHNICAL FACTORS									
15. OPERATIONAL FACTORS									
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17. WEATHER FACTORS									
18. ACTUAL WEATHER									
19. RUNWAY CONDITIONS									

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2. PILOT INFORMATION									
3. EVALUATION OVERVIEW									
4. CORRECTIVE ACTIONS									
5. NARRATIVE (ATTACH ADDITIONAL SHEETS AS NECESSARY)									
6. CONDUCT OF INVESTIGATION									
7. FAA INITIAL NOTIFICATION									
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INSTRUCTIONS FOR FAA FORM 8020-23 ACCIDENT/INCIDENT REPORT	
1. OCCURRENCE INFORMATION	2. AMENDED DATE
3. DATE OF EVENT	4. FAA INVESTIGATING OFFICE
5. OPERATOR NAME	6. AIRPORT
7. LOCAL TIME	8. LATITUDE
9. LONGITUDE	10. AIRCRAFT DAMAGE
11. COLLISION - BETWEEN TWO AIRCRAFT	12. AIRCRAFT REGISTRATION
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Pilot Incapacitation - Assessment of Data Sources



A copy of the FAA's Form 8020-23 is included here for illustration and to show that the Flight Standards Investigator will, for every accident and incident that they select for further investigation, be making a determination as to which, if any, of the FAA's listed 9 areas of responsibility may have contributed to the accident or incident, along with a brief explanation of how and why each selected area may have been involved or contributed to the event. The 9 contributing FAA responsibilities/factors are: 1. FAA Facilities; 2. Non-FAA Facilities; 3. Airworthiness; 4. Airman/Air Agency Incompetence; 5. FAR Change Needed; 6. Airport Certification; 7. Security; 8. Airman Medical Qualif.; and 9. FAR Violation.

## JO 7210.632A: Appendix A

### Mandatory Occurrence Reporting (MOR) & Voluntary Safety Reporting (VSRP)

10. **Emergency or In-Flight Hazard.** The following are provided as examples and are not intended to be all-inclusive.

*NOTE – Emergency or in-flight hazards may be declared by ATC, flight crew, facility personnel, or officials responsible for the operation of the aircraft.*

- a. Medical emergency
- b. Inflight equipment malfunction requiring special handling
- c. Passenger/flight crew injury due to turbulence other than wake
- d. Fuel quantity
- e. Pilot disorientation
- f. VFR pilot in or trapped on top of clouds
- g. Laser light illumination
- h. Hijack
- i. Bomb threat
- j. Bird strike
- k. Other

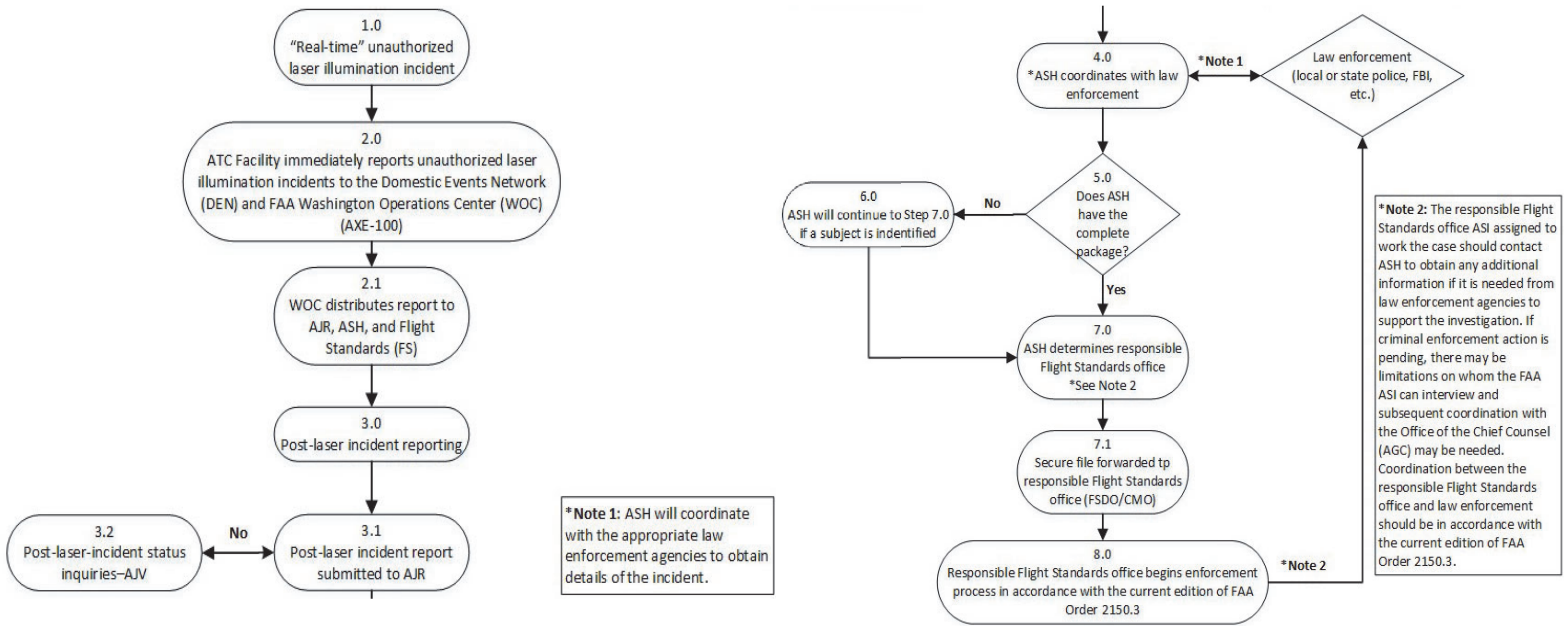


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This shows the types of Emergencies or In-flight Hazard events for which ATCs are required to file an MOR, which will become one of the inputs into the AFX AIDS system and will also feed into the upward reporting for the FAA's Emergency Operations Network (EON).

# Example: Laser Illumination Incident Reporting and Civil Investigation Process Flowchart



Excerpted from 8900.1 Vol. 7 Ch. 7, available at <https://drs.faa.gov>



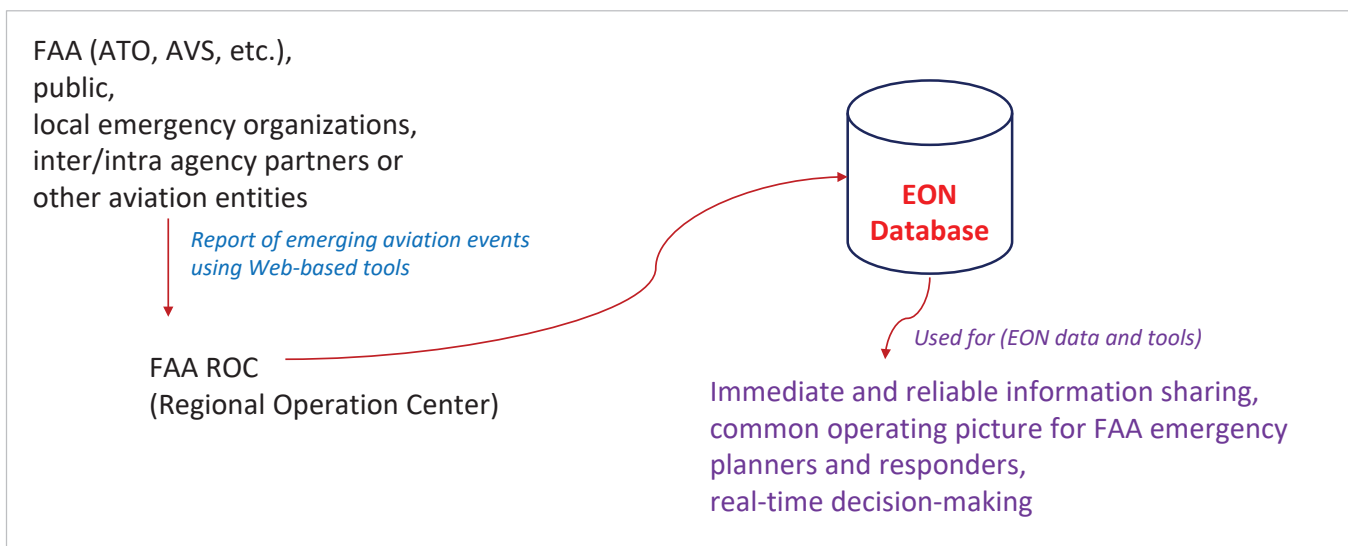
## Slide: 12

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An example where AAM is listed in FAA Order 2150.3C on compliance and enforcement processes, but the outlined responsibilities never go to the specifics as far as coordination, roles, responsibilities, and actions/follow-up for pilot incapacitations.



## Data Origin and Flow : EON



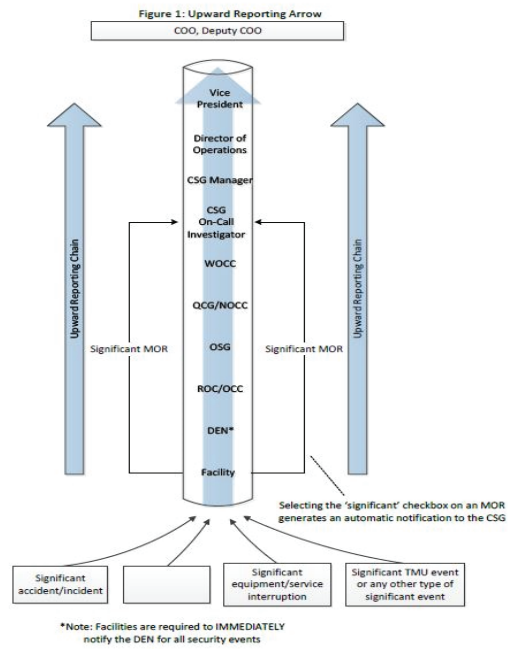
EON: Emergency Operations Network; ATO: Air Traffic Organization; AVS: Office of Aviation Safety

The FAA's Emergency Operations Network (EON) collects data from a variety of sources, including, Air Traffic Controllers and AVS on emerging aviation events which are used for upward reporting, to inform FAA emergency planners and responders, and to use in real-time decision-making.

# FAA Joint Order 1030.3B – Initial Event Reporting (EON)

01/06/14

JO 1030.3B



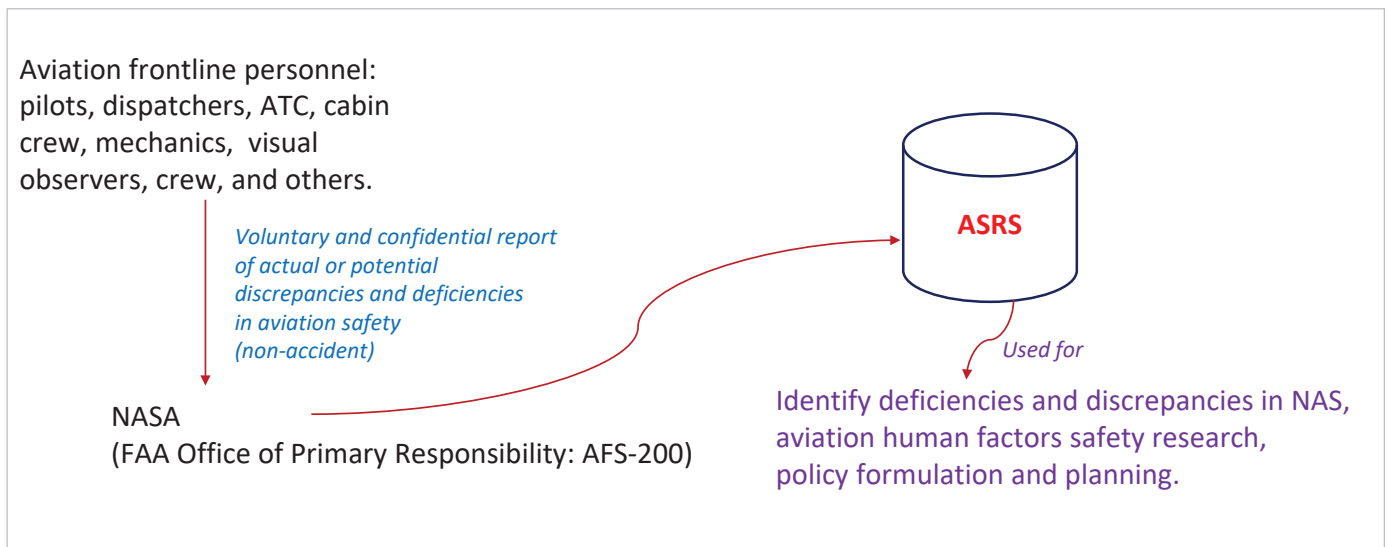
## Slide: 14

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Figure showing FAA's upward reporting chain for FAA's Initial Event response. These events begin with notification, which in many cases may be a "Significant" Mandatory Occurrence Report (MOR) from ATC, and they will feed upward through the Regional Operation Control Centers (ROCs) and the Operational Control Centers (OCCs) to become part of the Emergency Operations Network (EON).

**\*\*NOTE\*\*** The blank box is also blank on the source for this figure in the FAA JO 1030.3B.

## Data Origin and Flow : ASRS



ASRS: Aviation Safety Reporting System  
ATC: Air Traffic Controller  
NASA: National Aeronautics and Space Administration

AFS: Flight Standards  
NAS: National Airspace System

Although the data flow for the confidential, voluntary reporting system is shown and was examined for comparison and use to look into pilot incapacitation events, it is unlikely to yield much new information to the effort, since the data is de-identified by NASA, and FAA is not allowed access to information that might re-identify or match the cases to other data collected, and the data provided to NASA is reportedly modified by NASA prior to input into the system for better categorization and standardization.

## FAA Order 2150.3C – FAA Compliance & Enforcement Program ASRP

### **d. Aviation Safety Reporting Program.**

(1) General. The ASRP is a program under which an individual may report any information they believe discloses an unsafe condition in the national airspace system. The reports are made to National Aeronautics and Space Administration (NASA), which will not release to the FAA any report that might reveal the identity of any individual involved in an occurrence or incident.

*NASA reportedly modifies these reports to standardize them & categorize them upon receipt of information.*

The details of the ASRS, voluntary reporting aviation safety program managed and maintained by NASA.



## FAA Order 2150.3C – FAA Compliance & Enforcement Program FAA Employee Responsibilities

**6. Compliance and Enforcement Responsibilities of All FAA Employees.** All FAA employees have important compliance and enforcement-related responsibilities.

**a. Duty to Report Apparent Violations.** Any FAA employee who becomes aware of an apparent violation by, or apparent lack of qualification of, any regulated person reports such information to the FAA program office with oversight for the matter or the FAA Hotline. All FAA employees also must promptly, fully, and truthfully cooperate with any further inquiry or investigation, including providing statements, testimony, documents, or other information as requested.



Outlining the responsibilities for FAA employees with respect to reporting violations or lack of qualifications for a regulated person.

## Elements of Data Requirements per Pilot Incapacitation

Elements of data requirements	NTSB	AIDS	EON	ASRS
To determine pilot incapacitation				
<i>Dedicated data fields</i>				
Incapacitation indicator	✓	✓		
Physical causes/factors	✓			
Involved subject	✓	✓		
<i>Narrative description</i>	✓	✓	✓	✓
To identify a pilot	1			
<i>Names</i>	✓	✓		
<i>Date of birth</i>	✓	✓		
To remove duplicates				
<i>Date and time</i>	✓	✓	✓	✓ <sup>2</sup>
<i>Location</i>	✓	✓	✓	✓

<sup>1</sup> Pilot identification information releases only to organizations with an agreement.

<sup>2</sup> Date truncated to year and month only, time provided in four segments: 0001-0600, 0601-1200, 1201-1800, and 1801-2400.

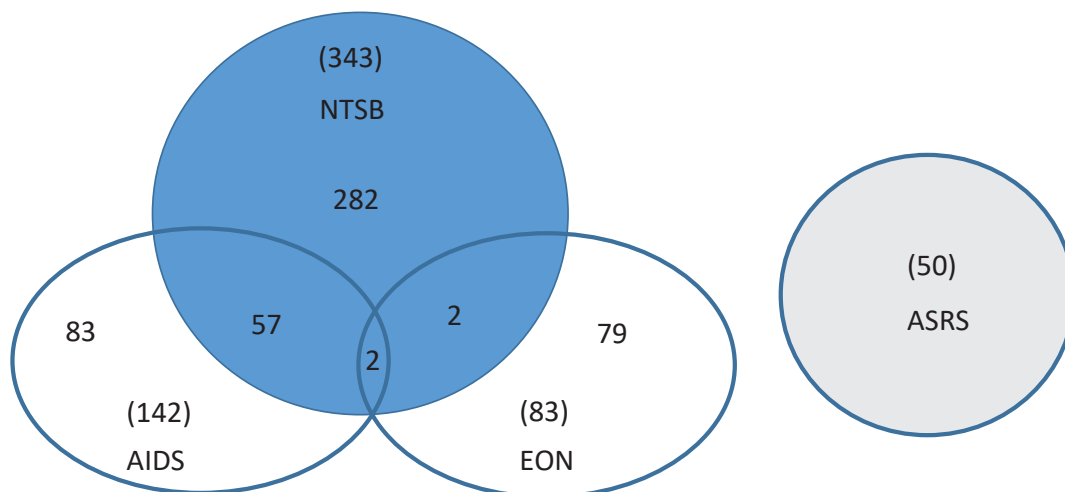
These are the elements (data contents) from each listed data source required to identify an event of pilot incapacitation and the incapacitated pilots in the databases, and to mark the duplicate events across the disparate databases.

## Data Format, Content, and Record Count on EIM

Data source	EIM data format	Contents	Approximate total record count on EIM
NTSB	Raw - .mdb Convert - csv	Information about aviation accidents (and some incidents) including: Aircraft, pilot, location, date and time, weather, damage and casualty, narrative description, and investigation results.	26,000 (2008 - 2023)
AIDS	Raw - relational	Information of incidents (and some accidents) including: Aircraft, location, operator and pilot, weather and environment, narrative description, findings.	40,000 (2008-2023)  227,000 (1970s - 2023)
EON	Raw - json Convert - json	Emerging air or ground related incidents, such as aviation security incident/threat, air carrier accident/incident, pilot deviation, laser event, medical emergency, unmanned aircraft systems (UAS) incident.	520,000 (2008 - 2023)
ASRS	Convert-relational	Actual or potential discrepancies and deficiencies in aviation safety, including narratives submitted by reporters and coded information by expert analysts.	81,000 (2008 – 2023)  224,000 (1987 – 2023)

Additional information about each of the datasets assessed for tracking and monitoring pilot incapacitations, with respect to accessing these datasets on EIM.

## A Venn Diagram of Pilot Incapacitation Events (2008 – 2020)



- Pilot incapacitation events from NTSB and AIDS databases were retrieved using SQL scripts, while those from EON and ASRS databases were identified through natural language processing (NLP) techniques, along with manual verification based on individual judgement. It's worth noting that variations in results may arise when different algorithms are applied.
- Duplicates in the retrieved data were primarily identified based on date, time, and location. However, duplicates in ASRS were not marked due to truncated date and time information.

The Venn diagram is constructed using the pilot incapacitation events extracted from the databases, adhering to two inclusion criteria. A case of pilot incapacitation must meet both conditions as follows: 1. The subject is a pilot or flight crew member (excluding cabin crew), and 2. The subject is incapacitated. SQL scripts were used when the database has dedicated data fields for the inclusion criteria, otherwise NLP was utilized.

The data included were not intentionally filtered by event type, thus accidents and incidents not involving accidents may both be included, provided that both accidents and incidents were present in the original data source.



## Sample Data View (Merged) of Pilot Incapacitation Events

EventSource	EventID	EventType	DateTime	Region	Location	City	State	Longitude	Latitude	Airport	Injuries	Fatalities	Description
AIDS	20090412009189I		2009-04-12 14:32:00	SO, SO15	FORT MYER	FORT MYE	FL	08151W	02635N	SOUTHWE	0	1	(-23) N559D
NTSB	20090413X626	INC	2009-04-12 18:05:00		Fort Myers	Fort Myers	FL	-81.75527	26.536111	Name: Sou	0	1	Personnel iss
AIDS	20090930050009A		2009-09-30 12:37:00	GL, GL11	ALBANY, IN	ALBANY	IN	85 09W	40 17N		0	1	THE PILOT B
EON	45841	General Aviat	2009-09-30 16:37:00	AGL	3 MI SE ALB	None	None	-86.2947	39.7173	Departure:	0		ALBANY IND
NTSB	20090930X405	ACC	2009-09-30 16:37:00		Albany, IN	Albany	IN	-85.163887	40.288055	Name: ID:	0	1	Personnel iss
NTSB	20100728X550	ACC	2010-07-28 18:25:00		Walla Walla	Walla Wal	WA	-117.8013	46.412223	Name: ID:	1	0	Aircraft-Fluid
EON	66504	General Avia:	2010-07-28 18:50:00	ANM	WALLA WA	None	None	-118.289	46.09478	Departure:	0		WALLA WAL
AIDS	20150527010409A		2015-05-27 16:25:00	SO, SO15	MELBOURN	MELBOUR	FL	80 39W	28 6 N	MELBOUR	0	0	ON MAY 27,
EON	235037	Pilot Deviatio	2015-05-27 20:25:00	ASO	MELBOURN	None	None	-80.6453	28.10275	Departure:	0		MELBOURN
NTSB	20150528X555	ACC	2015-05-27 20:25:00		Melbourne	Melbourne	FL	-80.65972	28.106945	Name: ME	0	0	Environment
NTSB	20181124X141	INC	2018-11-24 01:33:00		Bakersfield	Bakersfield	CA	-119.0544	35.433612	Name: Me	1	0	Personnel iss
EON	550486	MEDICAL EM	2018-11-24 02:16:00	AWP	BAKERSFIEL	BAKERSFIE	CA	-119.058	35.43386	Departure:	0		BAKERSFIELD



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This is a sample data view of what merged events of pilot incapacitation look like in ascending order of event date and time in a data spreadsheet.

## Data Availability and Accessibility

Data source	Access restrictions	EIM data update frequency claimed (observed) <sup>1</sup>	Convenience to access and analyses	Note
NTSB	NTSB website: public. EIM: FAA wide <sup>2</sup> .	Monthly (2-4 weeks)	No issue to access the data in EIM and retrieve the data for analysis.	Pilot identification information provided by FAA/ASIAS.
AIDS	No public access. EIM: Non-restrict version: FAA-wide. Restrict version: extra request.	Daily (Non-restrict version: one year. Restrict version: 3-4 weeks)	No issue to access the data in EIM and retrieve the data for analysis. Extra privilege request for restrict version took about two weeks.	Pilot identification information exists in restrict version only.
EON	No public access. Website: FAA PIV card. EIM: FAA wide.	As needed (Daily)	No issue to access the data in EIM and retrieve the data for analysis	
ASRS	Website: public. EIM: extra request.	Monthly (3 months)	No issue to access the data in EIM with extra privilege request.	Actual database names are different from the documented.

**Notes:**

1. Claimed update frequency was from the data page of FAA EIM Data Governance Center. Observed update frequency was estimated by data query on EIM in July and August 2023.
2. FAA wide: When a dataset on EIM data center is intended for FAA-wide access, any user possessing a FAA email account is granted accessibility. When a dataset necessitates additional privileges for access, a FAA user has the option to submit an access request along with a justification directly on the dataset's page within the EIM Data Governance Center (DGC).

ASIAS: Aviation Safety Information Analysis and Sharing



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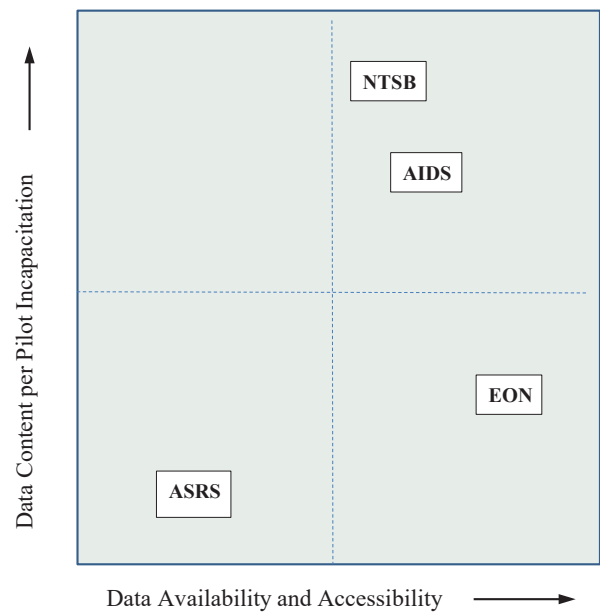
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This slide outlines the metrics used to evaluate data availability and accessibility, drawing on Dr. Ding's experience and the available information.

## A Ranking Matrix of Source Data Quality per Pilot Incapacitation

Table of ranking scores

Elements of data quality	Weight	NTSB	AIDS	EON	ASRS
Data content per pilot incapacitation		100.00	87.50	27.50	16.25
<i>Pilot incapacitation determination</i>	50%	100	75	25	25
<i>Pilot identification</i>	35%	100	100	0	0
<i>Duplicate detection (Event identification)</i>	15%	100	100	100	25
Data availability and accessibility		82.50	85.00	90.00	70.00
<i>Available on EIM</i>	50%	75	100	100	75
<i>Access restriction on EIM</i>	20%	100	100	100	75
<i>Update frequency on EIM</i>	20%	75	75	100	50
<i>Public availability</i>	10%	100	0	0	75



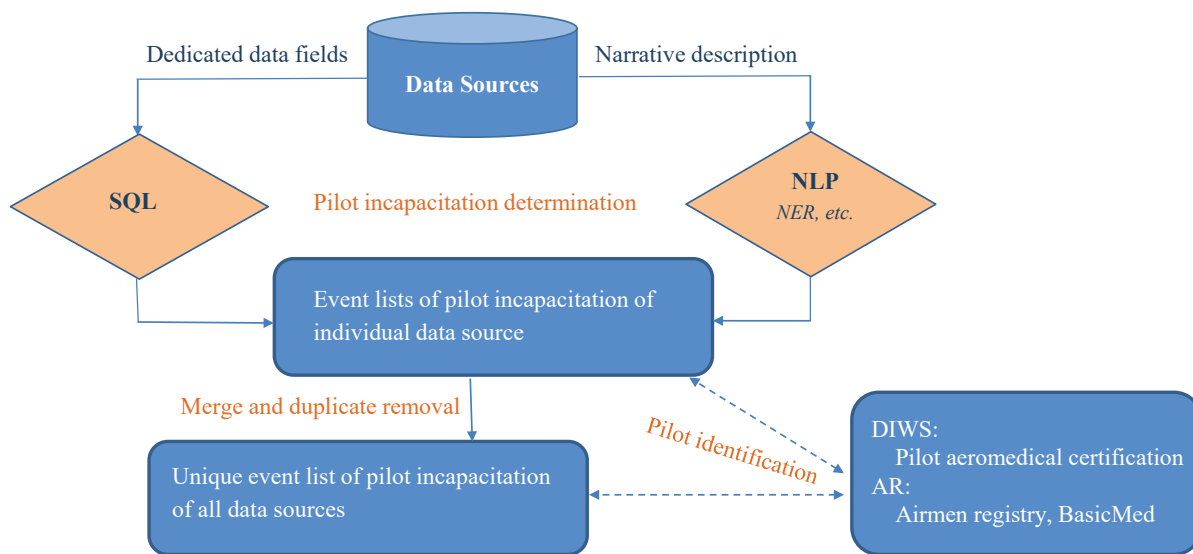
The data quality ranking is designed to establish priorities based on data preferences through a dual-dimensional assessments. Empirical scores ranging from 0 to 100 and weight percentages from 0% to 100% are presented for quantification purposes.

Firstly, the evaluation focuses on the data contents, including information associated with pilot incapacitation and ease of identifying such events, the availability and accessibility of pilot identification information, the dataset's authority and impact on aviation safety, and the thoroughness of event investigation and categorization.

Concurrently, the ranking incorporates an assessment of data availability and accessibility by examining data availability on EIM platform, ease of access (particularly when requiring additional privileges), and frequency of data updates. Additionally, it evaluates data availability at other repositories than the EIM platform, emphasizing the convenience of importing the dataset to the EIM platform for analysis.

This dual-dimensional approach provides a comprehensive evaluation by considering both the intrinsic qualities of the data and the practical aspects of accessing and utilizing the dataset effectively.

## A Sample Roadmap for Leveraging the Data Sources



SQL: Structured Query Language    NLP: Natural Language Processing  
 NER: Named Entity Recognition    DIWS: Document Imaging Workflow System  
 AR: Airmen Registry

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This slide presents a sample roadmap for leveraging the data sources in the context of a relevant study or operational application.



## Practice Suggestions

1. **NTSB**, premier data source for pilot incapacitation.
  - Accident events.
  - Dedicated data fields.
  - Identified root causes and contributing factors.
2. **AIDS**
  - Primarily focused on incident events.
  - Dedicated data fields.
  - Many accidents in AIDS are duplicates of those in NTSB
3. **EON**
  - Reliable resource for up-to-date information.
  - A wide range of services through its portal.
4. **ASRS**
  - Truncated date and time information.

Accurately identifying pilot incapacitation events based solely on narrative descriptions can be challenging, due to the diverse nature of such events and the inherent variations in cognitive interpretations among individuals. Therefore, incorporation of dedicated data fields specifically designed for pilot incapacitation is of utmost significance. These fields can provide definitive results and significantly enhance the accuracy of identification.



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This slide outlines key highlights and offers practical suggestions derived from the experience of data analysis using the pilot incapacitation data sources.

## Discussion:

- **Adequate data fields to collect for pilot incapacitation**
  - Special phrases in text description.
  - Dedicated data fields.
- **Categorization of causes and factors**
  - Inherent health/physical issue and illegal medicine.
  - Health/physical problem caused by external factors such as fire, smoke, odor, food poison, malfunctioned equipment, weather, laser strike, Sun light at low angle, strong light at airport, blocked visibility, fatigue, work overload, stress, harassment, emotion, etc.
  - Impaired judgement, negligence, work experience.

Enhancing the identification of pilot incapacitation events could be achieved through the incorporation of additional dedicated data fields or the inclusion of specific phrases within the narrative descriptions. The establishment of standardized categorizations for incapacitation causes and contributing factors would significantly contribute to the development of more robust standards for aeromedical certification.

## **Orders Referenced/Reviewed for this presentation:**

1. FAA Order 1370.121A
2. FAA Order 7210.632A
3. FAA Order 7210.633A
4. FAA Order 7200.20B
5. FAA Order 1030.3B
6. FAA Order 1370.121A
7. FAA Order 2150.3C
8. FAA Order 8000.72
9. FAA Order 8000.373C
10. FAA Order 8000.375
11. FAA Order 8020.11D
12. FAA Order 8020.16D
13. FAA Order 8900.1, Volume 7 (<https://drs.faa.gov>)



**The Office of Aerospace Medicine Report and Documentation of the previously decommissioned Incapacitation Data Registry is available at:**

**Larcher, J. & DeJohn, C. (2021) “Incapacitation Data Registry Evolution”  
FAA OAM Technical Reports**

**[https://www.faa.gov/sites/faa.gov/files/data\\_research/research/med\\_humanfa/cs/oamtechreports/202128.pdf](https://www.faa.gov/sites/faa.gov/files/data_research/research/med_humanfa/cs/oamtechreports/202128.pdf)**

