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Incapacitation Data Registry Evolution

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16. Abstract Background. Before 1996, information regarding U.S. pilot medical incapacitations was scarce. Because these types of events were rare, they were not systematically tracked. The National Transportation Safety Board seldom investigated these events unless there was a pilot fatality; however, if the pilot was identified and the information provided, the medical status of the pilot would be evaluated by the Federal Aviation Administration. The purpose of this paper is to describe the development of the Civil Aerospace Medical Institute (CAMI) Incapacitation Data Registry (IDR) from initial concept through final design, including modifications and its use in applied research. Methods. This paper describes the development and employment of the IDR as a valuable research tool. The CAMI IDR cases include only inflight medical incapacitations and impairments of pilots. Inflight medical incapacitation was defined as a condition in which a flight crew member could not perform any flight duties, and impairment was defined as a condition in which a crewmember could perform limited flight duties, even though performance may have been degraded. The IDR is uniquely capable of capturing the operational and medical details of flight deck crew events in real-time, making it exceptionally suited for the FAA to use in its mission of improving aviation safety. Discussion. The IDR currently contains over 1,100 events with related medical and operational details. Individual cases are numbered sequentially, irrespective of the event date, for the protection of personally identifiable information. They are classified by medical category, pilot certification, medical certification, type of operation, safety-of-flight impact, cockpit sequence-of-event information, and Aerospace Medical Certification Division outcome. The IDR is intended to be used for research to investigate similarities and differences in pilot incapacitation events, to assist in devising strategies to reduce their likelihood of occurrence.			
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LIST OF ACRONYMS

AMCD.....	Aerospace Medical Certification Division
AME.....	Aviation Medical Examiner
ATC.....	Air Traffic Control
CAMI.....	Civil Aerospace Medical Institute
CFR.....	Code of Federal Regulations
CMO.....	Certificate Management Office
DIWS.....	Document Imaging Workflow System
EON.....	Emergency Operations Network
FAA.....	Federal Aviation Administration
GA.....	General Aviation
HIPAA.....	Privacy Act and Health Insurance Portability and Accountability
ICD-10-CM.....	International Classification of Diseases, Tenth Revision, Clinical Modification
IDR.....	Incapacitation Data Registry
MANTRA.....	Medical Analysis and Tracking System
MCA.....	Medical Case Alert
MRT.....	Medical Research Team
NTSB.....	National Transportation Safety Board
POI.....	Principal Operating Inspectors
RFS.....	Regional Flight Surgeon
ROC.....	Regional Operation Center
SOF.....	Safety-of-Flight
SPAS.....	Safety Performance Analysis System

Incapacitation Data Registry Evolution

Introduction

In general, aviation in the U.S. is safe, and commercial aviation is a very safe means of travel (Preske, 2017). In the case of airlines, pilots are subject to the Federal Aviation Administration's (FAA's) required protocol for periodic examinations and recurring flight performance testing. However, no matter how stringent the required medical evaluations are for airline pilots, the pilots occasionally suffer from health issues inflight.

The degradation of a pilot's ability to perform at peak efficiency can result in various safety-of-flight (SOF) issues ranging from minor to severe. Significant degradation can affect pilot performance enough to cause catastrophic consequences, including fatal accidents. All U.S. major airlines are required to have two qualified pilots in the cockpit for safety reasons. In those cases where a pilot has a major medical event and cannot perform his or her duties, the other pilot must be able to take over the aircraft and bring it to a safe landing. The FAA's Aerospace Medical Certification Division (AMCD) is tasked with ensuring each pilot's "fitness to fly." The Incapacitation Data Registry (IDR) has, thus, proven valuable to AMCD in achieving that goal.

The ultimate goal of any database is to provide accurate information for data-driven decisions and strategies. The purpose of the IDR is to collect, classify, and analyze pilot inflight medical event data, airman information, along with toxicological and autopsy findings, then correlate those details with the actions taken by the AMCD as a consequence of the inflight medical event. Certification actions include a return to duty clearance determination, a time-limited medical special issuance certificate, or continuance of the pilot's current medical without restrictions.

Evans and Radcliffe (2012) noted a lack of data when studying commercial pilot incapacitation rates. Research is often limited in scope due to the lack of comprehensive pilot medical data and is not confined to inflight events. Other studies rely on simulated flight data (Harper et al., 1970). The FAA's IDR combines accurate airman medical data with comprehensive inflight event information and has been used in previous research projects dealing with all types of flight operations (DeJohn et al., 2006).

Regulations Governing Operation of Aircraft During a Medical Incapacitation or Impairment

The FAA's Code of Federal Regulations (CFR) Title 14 Part 61(a) (2018) refers to the certification of pilots, flight instructors, and ground instructors. The FAA's Title 14 CFR § 61.53 (2016) relates to the prohibition of operations during medical deficiency and governs reporting requirements for pilots who have taken certain medications, used alcohol, or have other reasons that they are not fit to fly. In addition, CFR 61.53(a) prohibits a person from acting as the pilot of an aircraft if that person "knows or has reason to know of any medical condition that would make the person unable to meet certification requirements. This includes taking medication or receiving other treatment for a medical condition that results in the person being unable to meet those requirements for issuance of a medical certificate. Title 14 CFR 61.53(a) also states that "a person shall not act as pilot in command, or in any other capacity as a required pilot flight crewmember, while that person knows or has reason to know of any medical condition that would make the person unable to operate the aircraft in a safe manner."

Similarly, Title 14 CFR § 91.17 (2012) subpart A states, “[n]o person may act or attempt to act as a pilot...of a civil aircraft...while using any drug that affects the person’s faculties in any way contrary to safety.”

Regulations Supporting the Collection of Airman Inflight Medical Data

FAA Order 8025.1D, Medical Responsibilities in Aerospace Incidents and Accidents, states that “the Civil Aerospace Institute (CAMI) shall obtain, store, and analyze incident, accident, autopsy and toxicology reports, medical certification information, aircraft occupant injury data, inflight aircrew incapacitation data and human performance information on airmen involved in aerospace incidents and accidents.” The Order also states that “CAMI shall establish aerospace medical research databases and registries that comply with current Privacy Act and Health Insurance Portability and Accountability (HIPAA) requirements” (FAA, 2015).

In 1996, in response to FAA Order 8025.1D, CAMI’s Medical Research Team (MRT) began to receive Medical Case Alert (MCA) forms (Figure 1). The MCAs were locally created and generated by CAMI in consultation with participating FAA Regional Flight Surgeons (RFSs) after receiving notification from various FAA sources, law enforcement, or, in the case of fatal accidents, the National Transportation Safety Board (NTSB). The MCAs were developed to collect accident, incident, medical, and autopsy data to enable documentation of events and to record pilot and passenger conditions and injuries; however, they were used sporadically and never widely accepted.

Figure 1.

Medical Case Alert Form

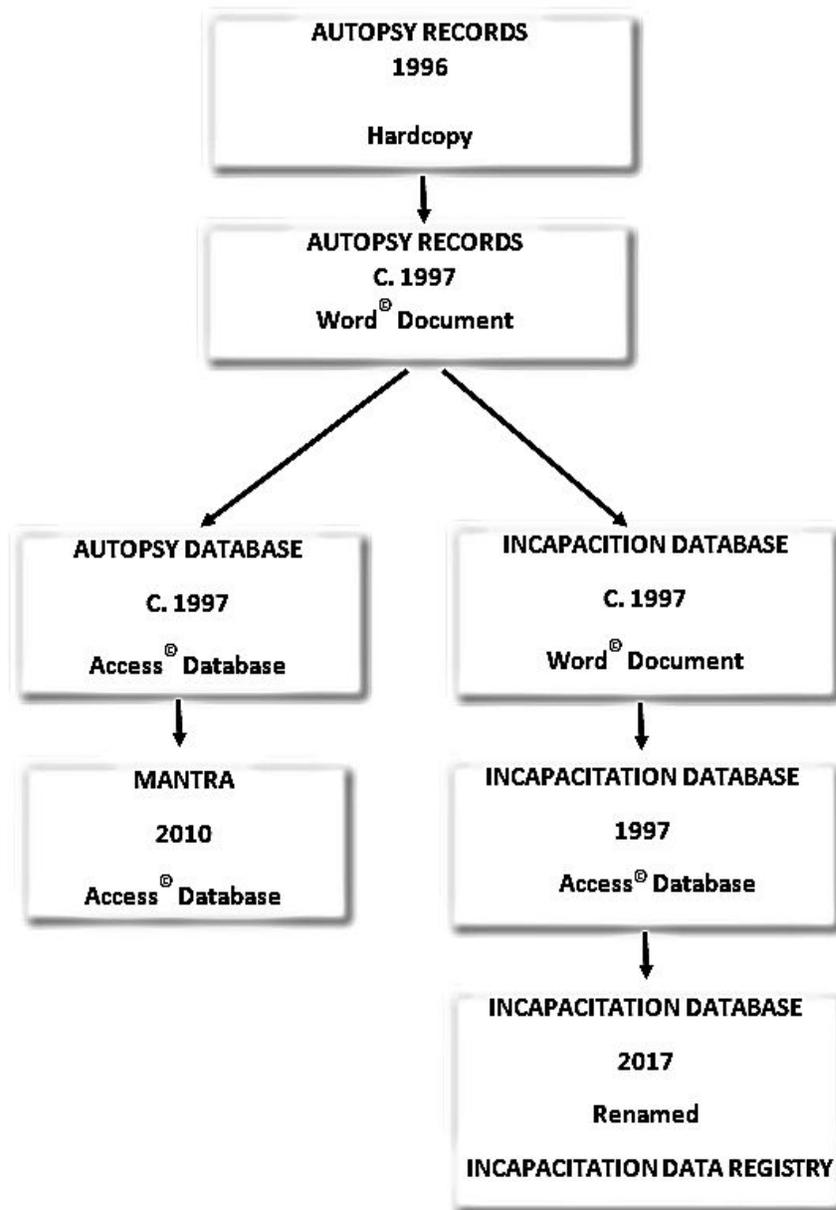
MEDICAL CASE ALERT				
(Including incapacitations, special medical circumstances, etc.)				
1. AIRCRAFT ACCIDENT/INCIDENT	1A. DATE 4/6/97	1B. TIME 1511	1C. LOCATION Atlanta, GA (inflight)	1D. N-NUMBER
1E. NUMBER OF PERSONS ON BOARD 2		1F. PILOT FATALITY <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		1G. COPILOT FATALITY <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO
2A. OCCUPANT STATUS	<input checked="" type="checkbox"/> Pilot <input type="checkbox"/> Cabin Crew <input type="checkbox"/> CoPilot <input type="checkbox"/> Passenger	28. FULL NAME		2C. SEX <input checked="" type="checkbox"/> Male <input type="checkbox"/> Female
3. MEDICAL CLASS <input type="checkbox"/> I <input type="checkbox"/> II <input checked="" type="checkbox"/> III	3A. SOCIAL SECURITY NUMBER (Airmen Only)			
3B. ANY KNOWN MEDICAL CONDITIONS (ex: SODA, SI, Undisclosed medication or condition, Path Codes) 04 - Must wear glasses for distant vision U - Admission to hospital Waiver 1OD 48425				
4. INJURY STATUS None				
5. ESTIMATED ROLE OF INCAPACITATION <input type="checkbox"/> NONE <input type="checkbox"/> POSSIBLE <input checked="" type="checkbox"/> CERTAIN				
6. POSSIBLE FACTORS INVOLVED IN THE MISHAP		6a. <input type="checkbox"/> Medical condition 6b. <input type="checkbox"/> Medication 6c. <input type="checkbox"/> Alcohol 6d. <input type="checkbox"/> Marijuana/illicit drug 6e. <input type="checkbox"/> Carbon Monoxide 6f. <input type="checkbox"/> Pesticide 6g. <input checked="" type="checkbox"/> Hypoxia 6h. <input type="checkbox"/> Spatial disorientation 6i. <input type="checkbox"/> Fatigue 6j. <input type="checkbox"/> Emotional Stress 6k. <input type="checkbox"/> Other (specify)		
7. TOXICOLOGICAL DATA	PERFORMED BY: Address 1: Address 2: City: State: Zip Code: Phone:		FINDINGS:	
8. AUTOPSY DATA	PERFORMED BY: Address 1: Address 2: City: State: Zip Code: Phone:		COMMENTS:	
9. FAA/NTSB IIC FEEDBACK	PROVIDED BY: Address 1: SO FSDO 13 Address 2: City: State: Zip Code: Phone:		COMMENTS:	
10. NARRATIVE COMMENTS: (Elaborate on any of the above, or other significant factors. Use a separate sheet if additional space is needed.) Enroute from Huntington WV to Columbia, SC at FL 270 pilot's oxygen hose/mask became disconnected and he lost consciousness. Passenger declared emergency (student pilot) and took controls of aircraft during a right dive and descending to 1600 feet, he was talked through by ATC. Pilot regained consciousness and took control. Pilot was advised to land at Atlanta, but elected to continue to Columbia, South Carolina, where aircraft landed without further incident. Pilot stated he would replace oxygen hose.				
Medical person completing form: (Name) (Phone) DATE: 5/6/97				
DOCUMENTATION CHECK:				
FEEDBACK TO AAM-1 <input type="checkbox"/> INITIAL <input type="checkbox"/> INTERIM <input type="checkbox"/> FINAL				
INTEGRATION INTO RESEARCH DATA BASE <input type="checkbox"/> Hard Copy <input type="checkbox"/> Disk <input type="checkbox"/> CDB				

Development of Autopsy and Incapacitation Databases

Figure 2 outlines the development of the CAMI IDR and Autopsy Databases.

Figure 2.

Development of the IDR and Autopsy Database



Note. IDR = Incapacitation Data Registry; MANTRA = Medical Analysis and Tracking System.

Autopsy Database History and Development

In 1997, the Autopsy database was converted from a Microsoft Word document into a Microsoft Access database to improve data storage and retrieval. At the same time, the collection of autopsies was centralized within CAMI.

Once the conversion of the Autopsy database was completed, case inclusion criteria standards and data entry processes were established. Inclusion criteria were initially based on standards that had been collected previously using the Word document. However, more medical conditions were included, and procedures were modified with input from MRT and AMCD physicians.

During this time, autopsy reports were submitted to CAMI from RFS offices or requested from coroners or medical examiners by the MRT. Often, autopsy photographs were included in the package, which was helpful in noting major injuries and incidental medical findings using a preestablished list of keywords. These injury keywords, associated descriptions, and a more in-depth description of the injury were manually transcribed into the database. In addition, the pilot's demographic information, along with the accident details from National Transportation Safety Board (NTSB) reports, were also manually entered.

Due to the requirement to record and retrieve such a large volume of data, it became apparent that creating a new database would have improved capabilities by allowing more accurate and thorough documentation and retrieval of information. Subsequently, in 2010 the Autopsy Database was converted from the Microsoft Access format and renamed the Medical Analysis and Tracking System (MANTRA). This new system can store copies of autopsies and record injury aspects of fatal accidents using the internationally recognized International Classification of Diseases, Tenth Revision, and Clinical Modification (ICD-10-CM) system. Physicians and other health care providers use ICD-10-CM to code diagnoses, symptoms, and procedures recorded in conjunction with hospital care in the United States. ICD-10-CM (n.d.) codes are important because they are more granular than ICD-10 codes and can provide more information about the severity of a patient's condition. MANTRA uses the Abbreviated Injury Scale codes and the cause of death and Incidental Medical Findings; however, MANTRA is maintained as a separate entity from the IDR.

Other details often recorded on the MCA form include pilot responses to Air Traffic Control (ATC) before the accident (e.g., read-back responses or confusion interpreting ATC commands) and pilot declarations to ATC if a pilot believed they were experiencing a serious event (e.g., a stroke or heart attack during flight). These data assisted the MRT in evaluating inflight medical events. Eventually, it became apparent that although autopsy reports could often document incapacitating events recorded on the MCA form, the information could not be electronically retrieved. Therefore, it could not be easily accessed to answer questions regarding airmen who suffered a medical event during flight or to assess the impact on SOF. The solution was to create a separate system, and the Incapacitation Database was established.

Incapacitation Data Registry History and Development

As the medical inflight event data increased, a hardcopy Word document was used alongside the Autopsy Database before establishing the Incapacitation Database. All information was collected and recorded manually, although it often duplicated information contained in the Autopsy Database. As the cases increased in number, data retrieval became an issue just as it had in the Autopsy Database.

With increasing interest and growing requests for information regarding pilots who have medical events during flight, a decision was made late in 1997 to create a Microsoft Access version of the Incapacitation Database, eventually renamed the IDR. The advantage of the registry is that it facilitates the recording of numerous operational and pilot details while

allowing flexibility to more efficiently manage data and rapidly respond to various aviation safety queries than the previous system.

Management of Incapacitation Data Registry Cases

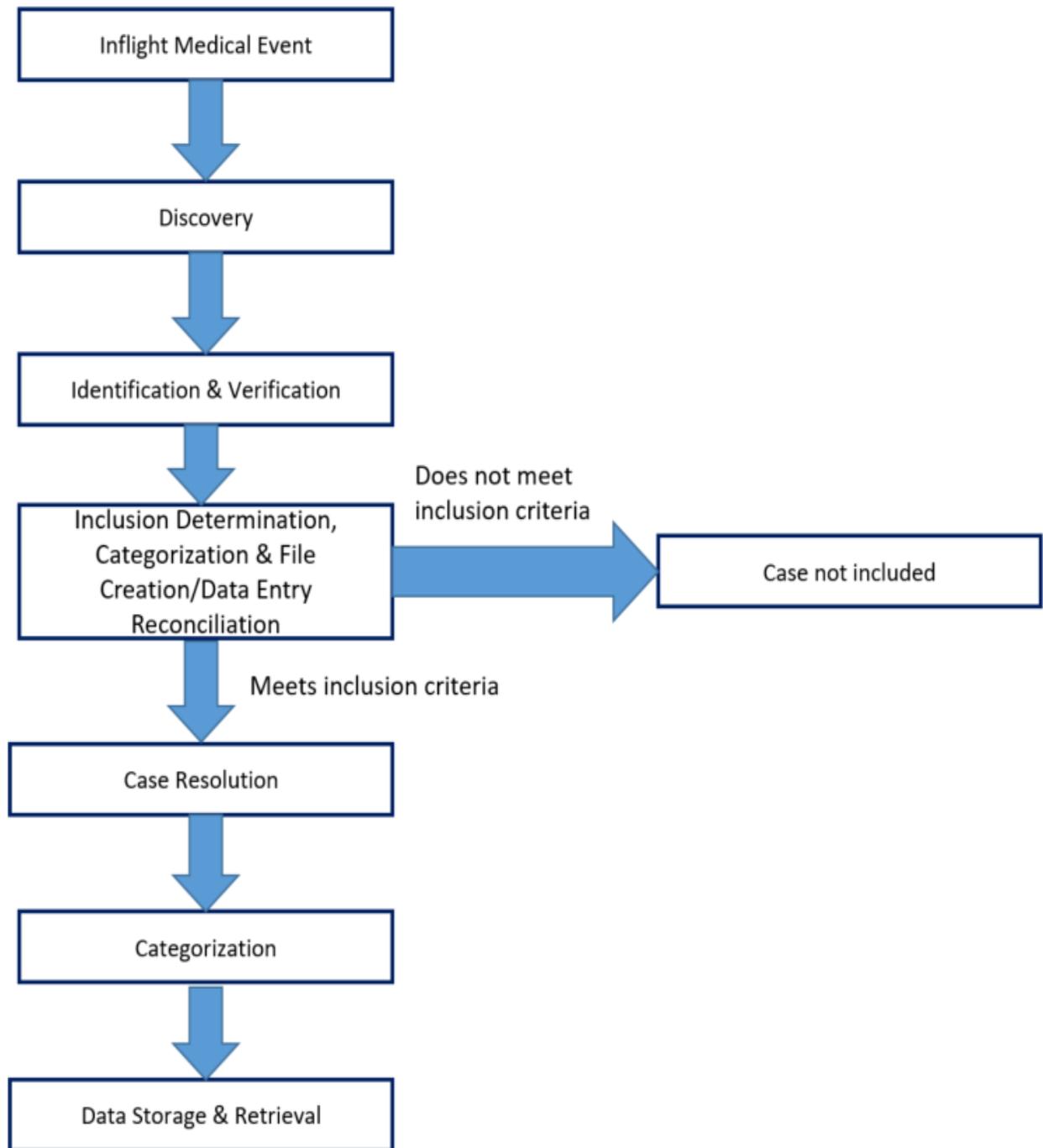
Case inclusion criteria are updated with input from MRT and AMCD physicians and experience gained from working cases in the Autopsy Database and the IDR. For example, although possession of a valid U.S. medical certificate was not originally a requirement for inclusion, it soon became apparent that sufficient medical information is not available for pilots who did not hold a U.S. medical certificate.

MRT discovery of an inflight medical event usually comes via the FAA's Emergency Operations Network (EON) or online newspaper searches; however, AMCD often alerts the MRT when working on a case involving inflight medical incapacitation. Conversely, the Medical Team can also bring a case to the attention of AMCD if certification issues are involved. Following crewmember identification and verification, a determination is made if the incident meets IDR inclusion criteria.

To qualify for inclusion, an event must occur while preparing for flight, during preflight, while taxiing, airborne, on approach or landing, or just after completing a flight. In addition, all cases where pilots have tested positive on a random or reasonable suspicion drug and/or alcohol test are included, provided the airman is either preparing for or had just completed a flight. Figure 3 shows the flow of reporting, collection, review, entry, and inflight medical event data analysis.

Figure 3.

Procedure for Collecting and Recording Inflight Medical Events



Once established that the event meets the criteria for inclusion, a case file is opened in the IDR, a corresponding sequential case number is assigned, and a corresponding hardcopy is created. When the sequence of events, pertinent medical details, and preliminary demographics

are confirmed, the event is entered into the IDR. An airman may have more than one case number assigned if they have multiple inflight events.

Information relevant to the event is integrated from the FAA's Medical Certification Documenting Imaging Workflow System (DIWS), the Safety Performance Analysis System (SPAS), the CAMI Forensic Toxicology database, the FAA's EON, Regional Operation Center (ROC) reports, and Aircraft/Incident Preliminary Notices. Additional information relevant to the event ATC data includes facts provided by the FAA's Certificate Management Office (CMO), FAA Principal Operating Inspectors (POIs), FAA Aviation Safety Inspectors, airline representatives, crew statements, flight operational information (e.g., flight diversions), aircraft details, reports of any cockpit entry, and assistance rendered by onboard health care providers. Media accounts may also be included. In the case of student pilots, the flight school's chief flight instructor is usually contacted. The airman's medical history is reviewed in DIWS, and pertinent details are recorded along with the follow-up action taken by the applicable RFS and the AMCD.

Close interaction between the Medical Team research physician and the Incapacitation Registry administrator is imperative. The Medical Team physician reviews the description of the inflight event, the pilot's medical history, and treatment facility records to characterize the event accurately and independently for inclusion in the Registry. In addition, the Medical Team research physician is frequently consulted when questions arise concerning the interpretation of clinical information or the disposition or categorization of cases.

Commercial pilots are under constant scrutiny and are required to be part of the FAA's drug and alcohol testing program, including random testing. The FAA's 49 CFR § 40.1 Subpart A (2019) requires that personnel in safety-sensitive positions submit to preemployment, reasonable suspicion, random, return to duty, follow-up, and post accident drug and alcohol testing.

For pilots who test positive for drug and alcohol use while on duty, it is sometimes necessary for the NTSB to obtain the airman's 24-hour history, including bar and restaurant receipts, coworkers' recollections, and hotel and restaurant workers' statements to verify the airman's activities before an event. Treatment facility records and pertinent information obtained from personal statements are also collected during an NTSB or CAMI Incapacitation investigation. In addition, the FAA's Drug Abatement Division provides the MRT with detailed records of all random, reasonable suspicion alcohol and drug cases, including breath-alcohol levels and drug levels. The CAMI toxicologist is consulted in most cases to determine the level of impairment or incapacitation, which can vary depending on the airman's drug or alcohol history. Further details are often obtained from the media in high-profile cases.

The increasing use of over-the-counter, prescription, and illicit drugs in the U.S. population has raised concern about the possible safety implications of increased drug use in aviation, especially in air transport operations. Although drug and alcohol testing is mandatory in the transportation industry, according to Title 49 CFR § 40.85 (2018) Procedure for Transportation Workplace Drug and Alcohol Testing Programs, testing is limited to opiates, marijuana, amphetamines, cocaine, and phencyclidine. The FAA Drug and Alcohol Abatement Division, in conjunction with the AMCD, record the legal and medical consequences of drug and alcohol-related cases in DIWS.

Verification of information is a major part of the IDR process due to the potential for unreliability in preliminary information. Every attempt must be made to verify information received from third-party sources, news media, or the Internet from at least one other source and

if possible, from two credible sources. Erroneous medical information and disposition of cases can adversely impact an airman's career, reputation, potential recertification, and subsequent return to flight duty (Masters, April 1995). After verification of the identity of the airman involved in an inflight medical event, the RFS from the airman's home region is alerted, allowing them to conduct an independent review. The information gained from the RFS investigation is then included in DIWS.

In most general aviation (GA) medically related events, the verification process is extensive and time-consuming. While GA accident and incident investigation notification may identify the aircraft, the pilot's identity is not commonly provided. However, in fatal cases, the NTSB will typically identify the pilot as part of their investigation. When local law enforcement is called to the scene, a police report is generally filed and can be obtained to identify the airman. Information from other sources such as MANTRA, media outlets, other aircrew, the RFS, the airman's Aviation Medical Examiner (AME), flight schools, employers, and FAA ATC are obtained where possible. Interaction and information exchange with the appropriate RFS and/or the AMCD typically follow the identification and verification process.

In all cases, the final resolution is a process that requires the assembly of the most complete and accurate data available. As previously stated, gathering inflight medical event information is time-consuming and involves several sources (Figure 3). Due to the extensive amount of information that must be documented, it may take years before all the facts are known, the case is completed, and the final disposition of a case becomes available. An incapacitating event can require an airman to submit many medical test results, requiring the information to be continually reassessed as additional details become available before a final disposition is reached.

If an airman's medical certificate is denied because of an inflight medical event, the airman may be either reaffirmed, recertified, provided a special issuance medical certificate, or remain in a denied status. The AMCD's postflight evaluation, medical diagnosis, and final disposition are crucial to assigning the correct category for the event and assuring any studies using data from the IDR are complete and accurate.

Timely identification of events is essential to ensure the RFS is made aware of an incident to prevent the possibility of an airman flying with an undiagnosed medical condition. It is incumbent on every pilot who has a medical event inflight to report this to their AME at the time of the event or at their subsequent medical evaluation, whichever occurs first before they can exercise the privileges of their medical certificate. Unfortunately, not all pilots report inflight medical events to the FAA promptly, and many never follow up or notify their AME that they have experienced a medical event, especially if the pilot feels it is insignificant. However, once the MRT becomes aware of an event, every attempt is made to identify the pilot and gather all pertinent information to determine if the pilot meets the criteria for inflight medical incapacitation.

While professional pilots are generally required to report inflight events to their company and their AME immediately, pilots who do not fly professionally may not report incapacitations until their subsequent examination, which could be years after the event. This can be a problem since details of each event must be captured before crucial information is overwritten in the DIWS by subsequent AMCD updates. This also applies to data acquired from the SPAS and the CAMI Toxicology database.

Most commercial inflight events are reported to the FAA via regular EON reports, the Daily Alert Report, or directly from airline representatives. Reports generally contain basic information, such as flight number, date, time, and reporting facility, along with a brief narrative of the event. Other resources include direct communication with the applicable RFS, the Drug and Alcohol Abatement Division, weekly notification of laser strikes from the ROCs, FAA POIs and CMOs, the NTSB, the FAA's AMCD, FAA Flight Standard District Offices, ATC towers, Air Route Traffic Control Centers, Air Traffic Control Terminal Radar Control, local law enforcement, or other reporting facilities. In addition, internet searches, online newspapers, and local and national news sites also provide helpful information on the event.

Most GA aviation incapacitation events are more difficult to reconstruct than airline events, as they often involve an individual who may not survive the event, leaving no one to provide information. In those cases, relevant data are often obtained via ATC transcripts as tracking and voice information is recorded, third-party observations, autopsy reports, NTSB reports, local onsite police reports, and FAA medical reviews in MANTRA.

Categorization of Inflight Medical Events

The difference between incapacitation and impairment depends on the severity of the medical event, the impact on the airman's performance, and the impact on SOF. Each category is determined from a combination of inflight observations, aircrew interviews, medical records, and, when appropriate, AMCD DIWS information and NTSB reports. Examples of incapacitations include myocardial infarction, stroke, loss of consciousness, or an epileptic seizure. An impairment is an event that significantly degrades the airman's performance but does not entirely prevent them from exercising some of their aircrew duties. Examples of impairment include gastrointestinal upset, nausea, headache, or muscle cramps. In the case of unwitnessed fatalities (usually GA events), some assumptions must be made to ascertain the event category and level of incapacitation or impairment.

Precise categorization of each inflight medical event is crucial, as research results rely on the accuracy of the information contained in the IDR. Therefore, the category assigned must accurately reflect the cause of the event. Figure 4 uses the Vascular category as an example of where categories are entered into the IDR.

Figure 4.

Category Entry Into the Inflight Incapacitation Data Registry

Medical Information

Medical Class: I Medical Classification: 12 TOX ID: AME Code:

History Codes	Restriction Codes	EKG Codes	Medications	Incidental Autopsy Findings
Path Codes	SODA/Waiver Codes	SI Codes	Category	Cause of Death

LOC

Incap/Impairment: Incapacitation Possibility: Certain

Rank	Category	Drug Origin	D
1	VASCULAR		
*			

Record: 1 of 1 No Filter Search

Category Comments
Cerebral vascular accident.
FAA neurological consultant:
Temporoparietal cerebral
infarction secondary to chronic
atrial fibrillation.

Note. AME = aviation medical examiner; EKG = electrocardiogram; FAA = Federal Aviation Administration; SI = Special Issuance; SODA = Statement of Demonstrated Ability.

The category list is based on clinical expertise and experience gained from previously reported events. The list is fluid and may be altered to reflect information acquired by reviewing subsequent inflight medical events. The current list consists of 49 categories, including medical conditions, drug and alcohol events, laser strikes, and suicides. Cases are assigned to the miscellaneous category when only one or two events of a similar nature have occurred. When several events of the same type are categorized as miscellaneous, a new category is added, and cases previously assigned to the miscellaneous category are recategorized.

More than one category can be assigned to an individual event if applicable (Figure 4). The category that precipitated the event receives the highest priority, and subsequent categories are ranked according to their contribution to the event. Categories are subject to change with each review of the case as new details are discovered or reported.

Data Storage and Protection of Personally Identifiable Information

IDR data are stored in a password-protected Microsoft Access data registry located at CAMI, with full access to the registry available to the administrator and read-only access available to approved individuals. Hardcopy case files are permanently stored in locked file cabinets housed within a secure room with limited access in compliance with FAA procedures for personally identifiable information secure storage.

Discussion

The CAMI IDR was developed in 1997 at the request of the Federal Air Surgeon to track pilot inflight medical incapacitations and impairments. The data, which are compiled on individual airmen holding a U.S. FAA medical certificate involved in inflight medical events,

provide the FAA with a unique resource for aviation safety studies of inflight medical events. The IDR currently contains over 1,100 cases and reflects data in real-time as new cases are received daily.

While inflight medical incapacitations of airline pilots have been the subject of several reports in the literature, these studies have been limited to airline pilots regardless of whether the pilots were actively conducting inflight operations. The CAMI IDR is unique in that it is the only known data registry that provides the capability to evaluate inflight medical incapacitation events.

Over the years, arguments have been made for and against the dual-pilot airline requirement and its effect upon SOF concerns (Rice, 2019; Pilot Incapacitation, 2021). IDR data suggest that the two-pilot scenario has been effective. In all cases where one pilot was incapacitated, the other pilot could execute a safe landing with no loss of life; consequently, IDR accident data are limited. IDR has recorded only five accidents between 1996 and 2013 in which pilot degradation was a causal factor and only two of those resulted in pilot fatalities.

A wide variety of data are available in the IDR, including operational and medical details of events, determining whether SOF was significantly affected, and certification actions taken by the FAA because of the event. Data from the IDR have been used to answer important questions, including categories of inflight medical events, the impact of events on flight safety, the necessity of cockpit entry during a pilot inflight event, and the level of medical care delivered to the flight crew. Appendix A presents a brief summary of questions answered and manuscripts published using incapacitation data.

Research conducted using the IDR supports CAMI researchers and the greater scientific community, can assist in assessing the aeromedical certification decision-making processes, and directly impact various areas of operational aviation safety. The review of inflight medical incapacitation cases provided by the IDR process can result in recommendations directly to FAA AMCD.

IDR information is used in aeromedical publications and presentations by FAA officials to educate and inform diverse groups within the aeromedical community (DeJohn et al., 2004; DeJohn et al., 2006). The documentation of inflight medical event data is a valuable resource for questions asked by the FAA's Office of Aviation Medicine relating to airman inflight medical events. It provides data for publications in medical journals and presentations to aerospace medical organizations.

REFERENCES

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APPENDIX A: RESPONSES TO QUESTIONS AND MANUSCRIPTS PUBLISHED USING INCAPACITATION DATA

The following is a partial list of responses to questions and manuscripts that have been published that relied on data from the CAMI IDR. The responses were generally not part of planned CAMI research projects but answered questions primarily posed by FAA operational organizations, particularly the Office of Aviation Medicine. There were additional questions beyond 2016; however, detailed responses were not documented beyond that date.

Responses to Questions Using Incapacitation Data:

8/7/2013 – 8/13/2013, Dr. Antunano, AAM-3, requested a Comparison of IDR by Medical Class Issued and CFR Part.

This required extracting relevant events from the IDR database, obtaining denominator data of the size of pilot groups, and statistically comparing the resulting calculated rates. This required approximately two days' full-time effort by one medical research officer.

1/7/2014 – 2/3/2014, Dr. Tilton, AAM-1, requested a study addressing rates of inflight medical events in Part 121 operations over time and across airline companies.

A working group was formed by Dr. Chidester, AAM-3A, but required the equivalent research support of two full-time employees for three weeks from the Medical Research Team. The project was completed on 2/3/2014.

This required extraction of relevant events from the IDR. Denominator data for calculating rates to compare over time and across airline companies required a time-consuming extraction of information from Bureau of Transportation Statistics data.

The February 3, 2014 response memo summarized data that indicated:

- The rate of incapacitating or impairing events has significantly increased over time, averaging 1.2 per million operating hours for 2010–2012. This is a significant linear trend ($p < .01$).
- Though some airlines replicate this significant linear trend, others do not, and the situation is best understood as a change in the industry norm.
- Though incapacitating and impairing events are most frequently gastrointestinal, the increase in industry event rate appears to be associated with urological ($p < .01$) and vasovagal ($p < .06$) events.
- The age of incapacitated pilots did not appear to differ from the population of Part 121 pilots.

9/8/2015, Judy Frazier, AAM-220, Incapacitation Database and NTSB Accident queries for the involvement of kidney stones.

Dr. Frazier referenced an article that mentioned three inflight incapacitations from kidney stones and requested further information regarding inflight issues from kidney stones. We provided results of the query on the IDR and a list of AP_IDs, which included two kidney stone-related accidents. We also provided two additional articles related to Dr. Frazier's initial article. This project required a half-day contractor time and almost half of a day of full-time employee physician time.

10/5/2015, As a result of public and media in the death of an American Airlines pilot who died in-flight on 10/5/2015 due to a possible heart attack, Dr. Fraser called to request a list of commercial pilots who died in-flight to forward to HQ FAA Media Relations Division (AOC-100), Les Dorr.

An email response was sent to Drs. Fraser and Berry explaining that a search of the IDR revealed seven Part 121 and one Part 135 in-flight deaths of U.S. pilots from 1994 through 2015, counting the event on October 5, 2015. This included only those cases where the pilot died in-flight, not in transit to or in the hospital, and assumed that the pilot in the most recent event died in-flight and not during transport to the hospital.

Later that day, a follow-up email response included cases where the pilot had an event in-flight but may have died after landing. It showed 11 Part 121 cases and one Part 135 case. This confirmed Les Dorr's (AOC-200) assertion that this was the twelfth in-flight death of an airline pilot.

10/6/2015, As a result of continued media and U.S. Senate interest in the death of an American Airlines pilot who died in-flight on 10/5/2015 due to a possible heart attack, Dr. Fraser called to request a list of all Part 121 pilots who had experienced in-flight incapacitation in the CAMI IDR.

An email response was sent providing the requested data with the original data and a summary attached. In summary:

- There were 206 categories of incapacitation among 185 Part 121 pilots from 1993 to 2015, including today's United event, which is still under review. There are more categories than pilots because many pilots had more than one incapacitation category assigned.
- There was a total of 27 different medical categories of incapacitation.
- The most common causes of in-flight incapacitation were Gastrointestinal (30%), Vasovagal (14%), and Cardiac (11%).
- There was a total of 11 deaths. (Recall that the twelfth death was a Part 135 event).
- Seven of the 11 pilots died onboard the aircraft.
- There were 102 confirmed diversions; however, in many cases, it was unknown whether there was a diversion, and it was not applicable in others because the phase of flight may have been during approach, landing, or in preflight.

8/29/2016, Dr. Chidester, AAM-3a, requested incapacitation cases where laser strikes were the cause.

Information provided to Stacey Zinke McKee and Dr. Chidester showed there were a total of 927 laser-related cases in the IDR from 1995 through 8/29/2016, 85 of which were laser Illumination Blindness cases.

10/7/2015, As a follow-up to the October 5 and 6 responses to the death of an American Airlines pilot who died in-flight on 10/5/2015, we sent Dr. Fraser incapacitation event rates based on data from a February 3, 2014, response to Dr. Tilton's request that CAMI conduct analyses of Part 121 incapacitation event rates after noticing the co-occurrence of two in-flight incapacitation events at a single airline.

An October 8, 2014 email included data from the February 2014 response indicating that for 2000 to 2012:

- The overall in-flight medical incapacitation rate was 0.61/1,000,000 flight hours.
- The cardiac in-flight incapacitation rate was 0.05/1,000,000 flight hours.
- The in-flight death rate was 0.014/1,000,000 flight hours.
- All in-flight deaths resulted from cardiac events.

5/27/2016 – 5/31/2016, On May 27 at 1334, Dr. Fraser asked if there were any problems with providing Mr. Shimizu, of the Japanese Civil Aviation Bureau working with the Japanese International Transport Institute, with de-identified incapacitation data.

On May 31 at 1634, an email with attachments containing de-identified frequency data stratified by type of operation and the cause of medical incapacitation or impairment for Part 91, 135, and 121 operations was provided to Dr. Fraser.

9/2/2016 – 9/7/2016, On September 2, 2016, the Deputy Federal Air Surgeon, Dr. Mike Berry, requested a count of in-flight medical incapacitation events by category for all types of operation not later than September 9 to answer an International Civil Aviation Organization query.

A response was sent on September 7 containing a table of 302 Part 121 incapacitations and another table of 262 Part 121 impairments from 1996 to 2015 sorted by frequency of occurrence.

9/6/2016 – 9/8/2016, On September 6, 2016, the CAMI Aeromedical Division Manager, Star Forster, requested a summary of all laser illumination cases for all types of operation in the CAMI IDR by September 9 for a presentation she was giving the following week.

An email response was sent on September 8 containing a table attachment that summarized 927 cases from 1995 to 2016 in the IDR and covered all categories. There were 85 cases of Laser Illumination Blindness. Of those 85 cases, 83 were classified as impairment, and two were classified as incapacitation. There were 73 Part 121 cases, four Part 135 cases, six Part 91 cases, and two Part 141 cases.

Manuscripts Published Using Incapacitation Data

- DeJohn, C., Wolbrink, A., & Larcher, J. (2004). *In-flight medical incapacitation and impairment of U.S. airline pilots - 1993-1998* (Office of Aerospace Medicine Report DOT/FAA/AM-04/16). Federal Aviation Administration.
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APPENDIX B: INCAPACITATION DATA REGISTRY USER'S GUIDE



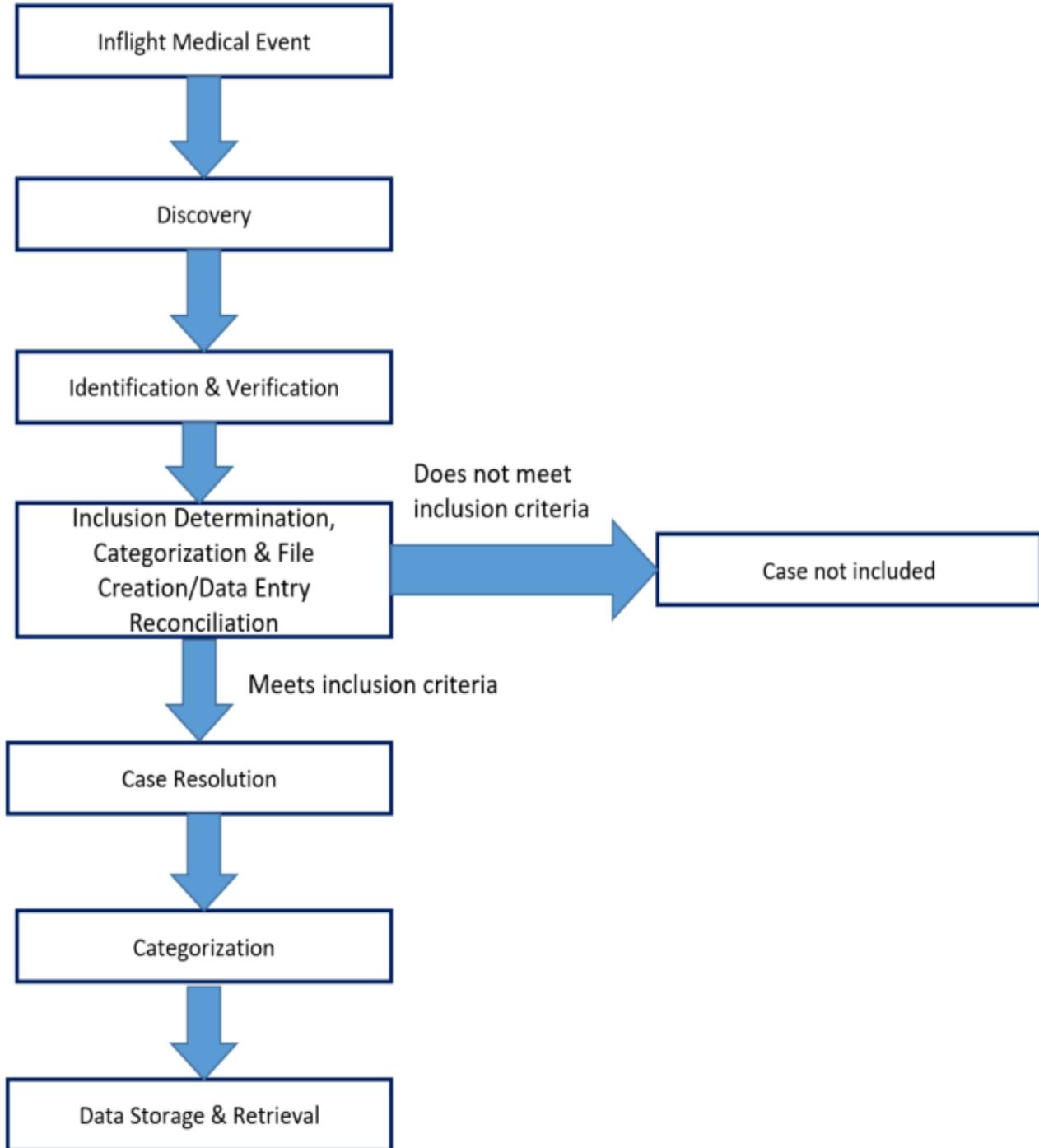
**INCAPACITATION DATA REGISTRY
USER GUIDE**

**Civil Aerospace Medical Institute (CAMI)
Aerospace Medical Research Division (AAM-600)**

June 2021

Figure 5.

Flowchart Procedure for Collecting and Recording Inflight Medical Events



USERS GUIDE

System Flow Description

A. Inflight Medical Event

- There is no requirement to report inflight medical incapacitation/impairment events to the Federal Aviation Administration (FAA) unless they result in the death of a pilot or an aircraft accident. These events must be proactively discovered, and related information collected and entered into the Incapacitation Data Registry.

B. Discovery of a suspected inflight medical event

- Discovery of possible inflight medical events must be **proactively** made using multiple available FAA and online resources, including but not limited to:
 - Communication with FAA Aerospace Medical Certification Division (AMCD) personnel
 - FAA's Emergency Operations Network (EON)
 - National Transportation Safety Board (NTSB) database
 - MedAire Inc: Medical, Security and Travel Safety (MOA)
 - Online Newspaper searches
 - Internet searches
 - Commercial Airline contacts (e.g., Chief Pilots)
 - Law enforcement and other local and state agencies

C. Identification and verification of event information

- Identification of:
 - Aircraft information
 - Flight information
 - Event information (i.e., What happened during the event?)
 - Pilot information
- Sources of information for the Sequence of Events include but are not limited to:
 - Aircrew/witness statements
 - Airline personnel contact interviews (e.g., Chief Pilot)
 - Treatment facility (e.g., hospital) records
 - Documenting Imaging Workflow System (DIWS)
 - Safety Performance Analysis System (SPAS)
 - NTSB database
 - Pathology codes in effect **at the time of the event** are entered into the Incapacitation Data Registry. Pathology codes resulting from the event are included under the FAA Action Taken tab

D. Inclusion Determination, Categorization, and File Creation/Data Entry

- Hardcopy case files are created, and case numbers are assigned. Case files are used to enter information into the database.
 - Information is saved to case files as the discovery process proceeds.
- Each case is reconciled for accuracy, including necessary inquiries for additional information before inclusion status is determined.

E. Inclusion Determination

- Each event is evaluated to determine if the inclusion criteria are met
- Inclusion Qualification Criteria:
 - Must involve flight crew during:
 - Flight preparation with intent to fly
 - Preflight
 - Taxiing
 - Takeoff
 - Cruise
 - Approach/Landing
 - Must involve the medical incapacitation or impairment of a pilot, including:
 - Cases where pilots tested positive on a random or reasonable suspicion drug and/or alcohol test
 - Laser exposure resulting in visual impairment.
 - If criteria are not met: excluded, no further verification required
 - Not an inflight medical event
 - Incident did not involve a pilot or copilot
 - Insufficient evidence
 - If criteria are met: information verified and case included
 - Consult with an aeromedical physician, toxicologist, and/or medical examiner for final inclusion determination if necessary
 - Included cases are entered for subsequent tracking, investigation, information collection, and resolution (e.g., FAA certification action)

F. Categorization

- Appropriate categories for events are assigned by the technician, with medical/toxicological consult when necessary.
- The primary category is the one that precipitated the event inflight.
- Subsequent categories, which may have contributed to the primary category, are listed as secondary and tertiary categories.
- Table 1 presents a data dictionary with field names and descriptions.

G. Case Resolution

- Resolution is complete when all case information has been obtained, verified, and entered into the Incapacitation Data Registry, including the FAA certification action taken and subsequent pathology codes resulting from the event.

H. Data Storage and Retrieval

- Completed cases entered into the database can be identified and retrieved using assigned sequential case numbers.
- Hardcopy case files can be stored, if desired, following Health Insurance Portability and Accountability Act (HIPAA) guidelines.

Table 1.

Data Dictionary

FIELD NAME	DATA TYPE	LENGTH	DESCRIPTION
CASE_NBR	Long Integer	4	Unique identifier assigned to each case
INC_DATE	Date/Time	8	Date of incapacitation of impairment
LAST_NAME	Text	30	Last name
FIRST_NAME	Text	30	First name
INITIAL	Text	1	Middle initial
SEX	Text	1	Gender
DOB	Date/Time	8	Date of birth
AGE	Integer	2	Age
SSN	Text	9	Social security number
PILOT_CERTIF_NBR	Text	15	Pilot certificate number
PI_NBR	Text	15	PI_number
MEDICAL_CLASSIFICATION	Text	8	Medical classification
MEDICAL_CLASS	Text	8	Medical class (e.g., I, II, III)
CREW_MEMBER	Text	15	Crew member (e.g., Pilot, Captian, First Officer)
FLIGHT_TIME_TOTAL	Long Integer	4	Flight time total

FIELD NAME	DATA TYPE	LENGTH	DESCRIPTION
FLIGHT_TIME_LAST_SIX_MONTHS	Long Integer	4	Flight time over the last six months
EMPLOYER_CODE	Text	5	Employer code
OCCUPATION_CODE	Text	5	Occupation code
DECEASED	Text	3	Deceased (yes/no)
DIED_ONBOARD_AIRCRAFT	Text	10	Died onboard aircraft (yes, no, N/A)
PRIMARY_CAUSE_OF_DEATH	Text	20	Primary cause of death
SECONDARY_CAUSE_OF_DEATH	Text	20	Secondary cause of death
CAUSE_OF_DEATH_NARR	Memo	0	Cause of death narrative
TOX_ID_NBR	Text	12	CAMI Toxicology number
AUTOPSY	Memo	0	Autopsy narrative
ORIGIN_CITY	Text	30	City - Origin of flight
ORIGIN_STATE	Text	30	State - Origin of flight
ORIGIN_COUNTRY	Text	30	Country - Origin of flight
ORIGIN_LOCATION_ID	Text	5	Location ID - Origin of flight
DESTINATION_CITY	Text	30	City - Destination of flight
DESTINATION_STATE	Text	30	State - Destination of flight
DESTINATION_COUNTRY	Text	30	Country - Destination of flight
DESTINATION_LOCATION_ID	Text	5	Location ID - Destination of flight
DIVERSION_OCCURED	Text	3	Diversion Occured (yes/no)
DIVERSION_CITY	Text	30	City to which flight diverted
DIVERSION_STATE	Text	30	State to which flight diverted

FIELD NAME	DATA TYPE	LENGTH	DESCRIPTION
DIVERSION_COUNTRY	Text	30	Country to which flight diverted
DIVERSION_LOCATION_ID	Text	5	Location ID to which flight diverted
ACCIDENT_OCCURED	Text	3	Accident Occured (yes/no)
ACCIDENT_CITY	Text	30	City where accident occurred
ACCIDENT_STATE	Text	30	State where accident occurred
ACCIDENT_COUNTRY	Text	30	Country where accident occurred
ACCIDENT_LOCATION_ID	Text	5	Location ID where accident occurred
AIRCRAFT_MFG	Text	30	Aircraft manufacturer
AIRCRAFT_MODEL	Text	30	Aircraft Model
AIRCRAFT_TYPE	Text	15	Aircraft Type (e.g., aircraft, rotorcraft)
CFR_PART	Text	15	CFR flight was operating under at time of incident
TAIL_NBR	Text	7	Aircraft tail number
FLIGHT_NBR	Text	10	Flight number
SCHEDULED	Text	12	Scheduled or nonscheduled flight
FLIGHT_ACTIVITY	Text	20	Flight activity at time of incident (e.g., personal, cargo, passenger)
HOMEBUILT/SPORT UTILITY	Text	50	Homebuilt or Sport utility aircraft
FLIGHT_PHASE	Text	20	Phase of flight (e.g., taxiing, take off, landing)
FATAL	Long Integer	4	Number of fatal injuries onboard

FIELD NAME	DATA TYPE	LENGTH	DESCRIPTION
SERIOUS	Long Integer	4	Number of serious injuries onboard
MINOR	Long Integer	4	Number of minor injuries onboard
NONE	Long Integer	4	Number of non-injured onboard
INCAP	Text	15	Incapacitation or impairment
INCAP_POSSIBILITY	Text	10	Possibility of incapacitation or impairment (e.g., possible, probable, certain)
AME_CODE	Text	8	Aeromedical Examiner code
SI_CODE	Yes/No	1	Special issuance (yes/no)
CATEGORY_COMMENTS	Memo	0	Category comments
CAMI_NARR	Memo	0	CAMI narrative
FAA_CAUSE	Memo	0	FAA cause
FAA_NARR	Memo	0	FAA narrative
NTSB_NBR	Text	21	NTSB number
NTSB_FACTORS	Memo	0	NTSB factors
NTSB_CAUSE	Memo	0	NTSB cause
NTSB_NARR	Memo	0	NTSB narrative
NTSB_FULL_REPORT	Memo	0	NTSB full report
AT_CERTIF_SURRENDERED	Yes/No	1	Action taken - Certificate surrendered (yes/no)
AT_CERTIF_SURRENDERED_COMMENTS	Memo	0	Action taken - Certificate surrendered comments
AT_CORRESPONDENCE	Yes/No	1	Action taken - Correspondence (yes/no)

FIELD NAME	DATA TYPE	LENGTH	DESCRIPTION
SENT_609_OR_709_LETTER	Yes/No	1	Action taken - Sent 609 or 709 letter (yes/no)
RESPONDED_609_OR_709_LETTER	Text	3	Action taken - Responded 609 or 709 letter (yes, no, N/A)
COMMENTS_609_OR_709_LETTER	Memo	0	Action taken - 609 or 709 letter comments
ELIGIBILITY_LETTER_SENT	Yes/No	1	Action taken - Eligibility letter sent (yes/no)
RESPONDED_ELIGIBILITY_LETTER	Text	3	Action taken - Responded eligibility letter (yes, no, N/A)
ELIGIBILITY_LETTER_COMMENTS	Memo	0	Action taken - Eligibility letter comments
AT_DECEASED	Yes/No	1	Action taken - Deceased (yes/no)
AT_DENIED_COMMENTS	Memo	0	Action taken - Denied comments
AT_EKG_CODES	Yes/No	1	Action taken - EKG codes assigned (yes/no)
AT_FOREIGN_OR_UNKNOWN	Yes/No	1	Action taken - Foreign or unknown (yes/no)
AT_FOREIGN_OR_UNKNOWN_COMMENTS	Memo	0	Action taken - Foreign or unknown comments
AT_HISTORY_CODES	Yes/No	1	Action taken - History codes assigned (yes/no)
AT_HISTORY_CODES_COMMENTS	Memo	0	Action taken - History codes assigned comments
AT_NOT_APPLICABLE	Yes/No	1	Action taken - Not applicable (yes/no)
AT_NOT_APPLICABLE_COMMENTS	Memo	0	Action taken - Not applicable comments
AT_NONE	Yes/No	1	Action taken - None (yes/no)

FIELD NAME	DATA TYPE	LENGTH	DESCRIPTION
AT_NONE_COMMENTS	Memo	0	Action taken - None comments
AT_OTHER	Yes/No	1	Action taken - Other (yes/no)
AT_OTHER_COMMENTS	Memo	0	Action taken - Other comments
AT_PATH_CODES	Yes/No	1	Action taken - Path codes assigned (yes/no)
AT_PATH_CODES_COMMENTS	Memo	0	Action taken - Path codes assigned comments
AT_REAFFIRMED	Yes/No	1	Action taken - Reaffirmed (yes/no)
AT_REAFFIRMED_COMMENTS	Memo	0	Action taken - Reaffirmed comments
AT_RECERTIFIED	Yes/No	1	Action taken - Recertified (yes/no)
AT_RECERTIFIED_COMMENTS	Memo	0	Action taken - Recertified comments
AT_SI_CODES	Yes/No	1	Action taken - Special issuance codes assigned (yes/no)
AT_SI_CODES_COMMENTS	Memo	0	Action taken - Special issuance codes assigned comments
OUTCOME	Memo	0	Outcome narrative
FOLLOW-UP COMMENTS	Memo	0	Follow-up narrative
TEACHING_CASE	Yes/No	1	Is this a good teaching case (yes/no)
TEACHING_CASE_SELECTOR_INITIALS	Text	5	Initials of physician that selected this case as a teaching case

FIELD NAME	DATA TYPE	LENGTH	DESCRIPTION
TEACHING_CASE_NARR	Memo	0	Explanation why this case was selected as a teaching case
FORM_USED	Yes/No	1	Was a medical case alert form used (yes/no)
FORM_USED_REGION	Yes/No	1	Form completed by region (yes/no)
REGION_ID	Text	3	Region which completed case alert form
MCA_DATE_REGION	Date/Time	8	Date form completed by region
FORM_USED_CAMI	Yes/No	1	Form completed by CAMI (yes/no)
MCA_DATE_CAMI	Date/Time	8	Date form completed by CAMI
SUSPENSE_DATE	Date/Time	8	Date to revisit this case
RECORD_COMPLETE	Yes/No	1	Data entry complete (yes/no)
COCKPIT_INTERVENTION	Text	7	Cockpit intervention required (yes/no)
SAFETY_OF_FLIGHT	Text	4	Safety of flight compromised (yes/no)
SAFETY_OF_FLIGHT_NARR	Memo	0	Safety of flight narrative
MULTIPLE_ENTRIES	Text	3	Airman has multiple records in database (yes/no)
DIWS_APPLICANT_ID	Text	50	DIWS unique airman identifier
SSN_ALTERNATE	Text	9	Alternate social security number
DEADHEADING_CREWMEMBER	Yes/No	1	Airman deadheading (yes/no)
PAX_CREWMEMBER	Yes/No	1	Airman passenger (yes/no)

FIELD NAME	DATA TYPE	LENGTH	DESCRIPTION
WHO_ENTERED_COCKPIT	Text	50	Name of person who entered the cockpit
Physician_Reviewed	Yes/No	1	Physician has Reviewed the Case
JGL_Complete	Yes/No	1	Medical Records Technician (in this case Julie G. Larcher) is done with the case and it is ready for Physician review
Tox_Reviewed	Yes/No	1	Toxicology Results Reviewed
MID	Text	15	Medical ID # (Exam ID)
APPID	Text	15	Applicant ID
Class_Issued	Text	3	Class Issued (e.g., 1st, 2nd, 3rd)
Scanned	Yes/No	1	Relevant files and information have been digitally scanned

Note. All entries are at the time of event. CAMI = Civil Aerospace Medical Institute; CFR = Code of Federal Regulations; DIWS = Document Imaging Workflow System; EKG = electrocardiogram; FAA = Federal Aviation Administration; NTSB = National Transportation Safety Board; N/A = not applicable.

Data Field Description

The following describes the data fields in the Incapacitation Data Registry. There is no requirement to report incapacitation cases to the FAA unless they involve an onboard death or an aircraft accident. The information must be proactively discovered using various sources and may be obtained or entered in a different order than presented here. In addition, different sources of information may be required to discover the same details from one case to another. No single set of guidelines for data collection will apply to all cases.

Figure 6.

Incapacitation Database Main Screen

The screenshot shows the main screen of the Incapacitation Database. At the top left, there is a logo for the Civil Aeromedical Institute. To the right of the logo, the text reads "Incapacitation Database" and "Version: Standalone Model". Below this, there is a form with various input fields. The form includes fields for Case # (1), Airman Multiple Entries (No), Suspense Date, NTSB # or DOT Reason, Complete (checked), Teaching Case (unchecked), Last Name (Doe), First Name (Jake), Initial (P), IncDate (10/23/1995), DOB (06/20/1943), Age (52), Gender (M), Social Security # (128-67-5309), PI # (6854798), Pilot Certificate # (123456789), Crew Member (Pilot), Occupation Code (5), Employer Code (Self), MID# (38675309), APP ID (1238675309), Class Issued (2nd), Scanned (unchecked), Physician Reviewed (checked), JGL Complete (checked), and Tax Reviewed (unchecked). There is also a "Follow Up" section on the right side of the form.

The system automatically assigns the sequential Case # at the time of case entry. Pilot demographics are entered on this screen (Figure 6) along with the level of review completed (e.g., physician, toxicologist, or technician), **Suspense Date**, **NTSB #**, whether the event would be a good **Teaching Case**, general **Follow Up** notes on progress, and whether the case is **Complete**.

Figure 7.

Incapacitation Database Medical Information Screen

The screenshot shows a web interface titled "Medical Information". At the top, there are several input fields: "Medical Class" with the value "II", "Medical Classification" with a dropdown menu showing "22", "TOX ID" with the value "123456789012", and "AME Code" with the value "12345". Below these fields are several tabs: "History Codes", "Restriction Codes", "EKG Codes", "Medications", "Incidental Autopsy Findings", "Path Codes", "SODA/Waiver Codes", "SI Codes", "SOF Codes", "Category", and "Cause of Death". The "SODA/Waiver Codes" tab is selected, displaying a table with two columns: "SODA / Waiver Code" and "Description". The table is currently empty. At the bottom of the screen, there is a navigation bar with "Record: 1 of 1", "No Filter", and a "Search" button.

This section includes medical certification information that was in effect *at the time of the event*, such as **Medical Class** issued, certification **Codes** assigned (e.g., **Path Codes**, **EKG Codes**, **SI Codes**), the event **Category** (most proximal to event listed first), **Medications**, **Cause of Death**, and **Incidental Autopsy Findings** if applicable. **SODA/Waiver Code** is selected here (Figure 7).

Figure 8.

Incapacitation Database Toxicology Screen

The screenshot shows a web interface titled "Toxicology". It displays a table with the following columns: "TOX Case#", "Name", "Concentration", "Units", and "Specimen". The table contains four rows of data:

TOX Case#	Name	Concentration	Units	Specimen
123456789012	Carboxyhemoglobin	0	(%)	Blood
123456789012	Cyanide	0	(ug/mL)	Blood
123456789012	Ethanol	0	(mg/dL, mg/hg)	Urine
123456789012	NO DRUGS listed above detected	0		Blood

At the bottom of the screen, there is a navigation bar with "Record: 1 of 4", "No Filter", and a "Search" button.

This section contains results from the CAMI Toxicology database. In this case, no drugs were detected (Figure 8).

Figure 9.

Incapacitation Database Flight Information Screen

Flight Information											
CFR Part	91	Scheduled	N/A	Flight Activity	Positioning						
Flight ID	N/A	Aircraft Tail Number	N1234E	Phase Of Flight	Taxing						
Aircraft Mfg.	CESSNA	Aircraft Model	A180E	Aircraft Type	Aircraft	Homebuilt	N/A				
Diversion	No	Accident	Yes	Deceased	Yes	Died Onboard Aircraft	Yes				
Cockpit Intervention	N/A	Who Entered Cockpit	N/A	SOF	Yes	Deadheading Crewmember		PAX Crewmember			
Total Fatalities/Injuries				Hours of Flight							
Fatalities	1	Serious	0	Minor	0	None	0	Last Six Months	102	Total	21760

This section contains flight event information (e.g., **CFR Part**, **Flight Activity**), aircraft information (e.g., **Aircraft Tail Number**, **Manufacturer**, and **Model** numbers), NTSB injury classification (e.g., **Fatal**, **Serious**, **Minor**, **None**), accident information when appropriate, other miscellaneous event information usually obtained from the NTSB Accident Database, and pilot's flight time normally obtained from the DIWS (**Last Six Months** and **Total**; Figure 9).

Figure 10.

Incapacitation Database Narratives Screen

Narratives			
CAMI Narrative	FAA Narrative	Safety of Flight	
NTSB Cause	NTSB Factors	NTSB Narrative	NTSB Full Report
NTSB Cause Probable Cause THE PILOT IN COMMAND BECOMING PHYSICALLY INCAPACITATED (HEART ATTACK).			

This section contains examples of several possible narratives. While the **CAMI** and **Safety of Flight** narratives created by CAMI are most frequently populated, fields are provided for other possible narratives, including the **FAA**, **NTSB (Probable) Cause**, **NTSB Factors**, **NTSB Narrative**, and **NTSB Full Report**. The **NTSB Cause** narrative is shown in Figure 10.

Figure 11.

Incapacitation Database Action Taken Screen

Comments	Action Taken	Outcome
Operating as an Air Taxi (Part 135).	Deceased.	

Action Taken

- Foreign/Unknown
- Deceased
- Not Applicable
- None
- ReAffirmed
- EKG Codes Assigned
- History Codes Assigned
- Path Codes Assigned
- SI Codes Assigned
- Correspondence
- Denied
- ReCertified
- Certificate Surrendered
- Other

Action Taken

This section addresses FAA aeromedical certification actions taken because of the event. In this case, the pilot was deceased, and no further action was taken (Figure 11).

Figure 12.

Incapacitation Database Location Information Screen

The screenshot displays a web-based form titled "Location Information" with four main sections: Origin, Destination, Diversion, and Accident. Each section contains several data entry fields. The Origin section includes fields for Origin City (Unknown), Origin State/Point (Unknown), Origin Country (USA), and Origin Location Identifier (XXX). The Destination section includes Destination City (Crashtown), Destination State/Point (Pennsylvania), Destination Country (USA), and Destination Location Identifier (None). The Diversion section includes Diversion City (N/A), Diversion State/Point (N/A), Diversion Country (N/A), and Diversion Location Identifier (N/A). The Accident section includes Accident City (Crashtown), Accident State/Point (Pennsylvania), Accident Country (USA), and Accident Location Identifier (XXX). At the bottom of the screen, there is a navigation bar showing "Record: 1 of 1134", a "No Filter" indicator, and a "Search" button.

Section	Field	Value
Origin	Origin City	Unknown
	Origin State/Point	Unknown
	Origin Country	USA
	Origin Location Identifier	XXX
Destination	Destination City	Crashtown
	Destination State/Point	Pennsylvania
	Destination Country	USA
	Destination Location Identifier	None
Diversion	Diversion City	N/A
	Diversion State/Point	N/A
	Diversion Country	N/A
	Diversion Location Identifier	N/A
Accident	Accident City	Crashtown
	Accident State/Point	Pennsylvania
	Accident Country	USA
	Accident Location Identifier	XXX

This section contains information on the **Origin**, **Destination**, and, when appropriate, the **Diversion** and/or **Accident** location (Figure 12).