

Historical Context for Pilot Incapacitations

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Pilot Incapacitation Events seem to have been receiving extra attention. We at US Freedom Flyers have been collaborating with Dr Makis on Pilot Incapacitation Event data (Covid Intel). Each event is news and noteworthy, but is the number of Pilot Incapacitation Events in 2023 actually on track to exceed historical averages? While we certainly hope this is not the case, the current data should be examined against the available statistics. To provide this context, we can turn to some prior studies conducted by the FAA.

One such study published by the Office of Aerospace Medicine in October of 2004 was named 'In-Flight Medical Incapacitation and Impairment of U.S. Airline Pilots: 1993-1998. (See [this](#))

The Results section on pages 3-4 state that there were 39 pilot incapacitations and 11 pilot impairments on 47 flights over approximately 85,732,000 revenue hours of airline flight operations. If we combine both categories, we find that there are 0.58 events per one million revenue hours. ($47/85,732,000 * 1,000,000$)

RESULTS

Frequency and Rate of In-Flight Medical Events

We found 39 incapacitations and 11 impairments of U.S. airline pilots on 47 flights during the period 1993 to 1998 (More than one pilot was affected on three flights. See Table A-2, Case Summaries, in Appendix A.). During

this period, U.S. airlines flew a total of 85,732,000 revenue passengers hours (26); therefore, the rate of in-flight incapacitations and impairments was 0.04549 per 100,000 hours (95% CI 0.04545, 0.04553) and 0.01283 per 100,000 hours (95% CI 0.01281, 0.01285), respectively. A summary of the in-flight medical events is contained in Appendix A, Table A-2.

More current studies from the Office of Aerospace Medicine show a similar statistic of 0.61 events per one million revenue hours. This can be found on pages A2-A3 of the link below: see [this](#).

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.

A2

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.

If we examine cardiac incapacitations only from 1993-1998, we can see that on page 5 there are only 5 cardiac events out of the total of 47. This breaks down to .058 events per one million revenue flight hours. ($5/85,732,000 * 1,000,000$). Another way to look at cardiac incapacitation events is that they comprise 13% of all incapacitation and impairment events. ($5/47=.13$)

Categories of In-Flight Medical Incapacitations

All 39 in-flight medical incapacitations were classified as “certain.” The most frequent categories were loss of consciousness (LOC) (9), gastrointestinal (GI) (6), neurological (6), cardiac (5), and urological (3). Of the nine loss of consciousness cases, four were caused by vasovagal syncope, one was the result of neurogenic syncope, one was due to pain secondary to a duodenal bulb ulcer, one was the result of decompression sickness, and two were due to unknown causes. The six gastrointestinal

If we look for cardiac events from 1993-2015 in the second linked study, the percentage is 11% (page A3 shown above).

The Bureau of Transportation Statistics has data for total airline revenue hours, and also by category such as domestic, international. There are further subdivisions that show revenue hours by type of operator (major, national, regional).

See [this](#).

	A	AA	AB	AC	AD	AE
1	Air Carrier Profile					
2		2016	2017	(R) 2018	(R) 2019	2020
54	Aircraft revenue-hours					
55	Total certificated, all services ^{a,d}	18,670,911	18,973,464	19,710,064	20,226,963	12,255,518
56	Domestic, total ^{a,d}	14,128,890	14,359,119	14,961,853	15,437,512	9,568,299
57	Majors, all services	12,186,311	12,394,579	12,882,537	13,527,996	8,382,945
58	Nationals, all services	1,877,894	1,893,975	2,017,586	1,843,412	1,140,275
59	Large regionals, all services	64,685	70,565	61,730	66,104	45,079
60	International, total ^{a,d}	3,756,458	3,827,263	3,935,133	3,950,465	2,189,139
61	Majors, all services	3,505,683	3,580,845	3,659,028	3,693,143	1,982,088
62	Nationals, all services	193,920	191,718	207,363	236,875	184,716
63	Large regionals, all services	56,855	54,700	68,742	20,447	22,335

If we look at the 2018 and 2019 total domestic revenue hours, we can see there is an average of 15,199,682 revenue hours. Currently I cannot find a revenue hour statistic for 2022, however by comparing domestic revenue miles of 2022 vs 2018-2019, we can see that 2022 was at approximately 94% of the previous average. The revenue miles in 2023 are trending higher than 2022, so it appears we are on track to have similar data as 2019. (See [this](#))

2018	TOTAL	777,972,787
2019	1	58,034,262
2019	2	55,679,481
2019	3	70,234,129
2019	4	66,938,654
2019	5	71,364,145
2019	6	72,790,418
2019	7	75,281,916
2019	8	72,729,199
2019	9	63,991,365
2019	10	69,936,836
2019	11	64,827,417
2019	12	69,737,438
2019	TOTAL	811,545,260

2022	12	62,350,685
2022	TOTAL	750,280,057
2023	1	58,062,899
2023	2	56,529,238
2023	TOTAL	114,592,137

If we then assume that domestic revenue hours in 2023 will be approximately equal to the 2018-2019 rounded average of 15,200,000, and if the total pilot incapacitation and impairment events runs at 0.58-0.61 per 1,000,000 revenue hours, then we could reasonably predict 9-10 events in 2023. ($0.6 \times 15.2 = 9.12$), or one event every 40 days.

If the total cardiac events runs at the historic average of 11-13% of all pilot incapacitation events, then we could expect 1 such event per year ($9.12 \times .12 = 1.09$).

Currently, Dr Makis's substack has a detailed list of all Pilot Incapacitation Events that we are aware of this year. As we are tracking these events in real time, we caution against drawing hard and fast conclusions in either direction. Instead we invite all those who are concerned about this issue to take a few action steps.

First, please analyze the list of Pilot Incapacitation Events in the Covid Intel Substack.

Second, please reach out to US Freedom Flyers if you are aware of any events that were not in the list, and to alert us of any new Pilot Incapacitation Events.

Third, if you are an aviation professional, please review the National Transportation Safety Board regulation 830 or if you're in another country, any respective regulatory analogue. While most operators may be responsible for the reporting, our awareness is key for transparency. Of particular note are the definition of Aircraft Accident, and the Immediate Notification requirements. Accessing specific data on pilot incapacitation requires in-depth research and analysis of various sources. This is because some data may be subject to privacy regulations or limitations imposed by the organizations responsible for its collection and dissemination.

§ 830.2 Definitions.

As used in this part the following words or phrases are defined as follows:

Aircraft accident means an occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight and all such persons have disembarked, and in which any person suffers death or serious injury, or in which the aircraft receives substantial damage. For purposes of this part, the definition of "aircraft accident" includes "unmanned aircraft accident," as defined herein.

Subpart B—Initial Notification of Aircraft Accidents, Incidents, and Overdue Aircraft

§ 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 National Transportation Safety Board (NTSB) office,^[1] when:

- (a) An aircraft accident or any of the following listed serious incidents occur:
 - (1) Flight control system malfunction or failure;
 - (2) Inability of any required flight crewmember to perform normal flight duties as a result of injury or illness;

See [this](#).

As always, if you're an aviation industry professional, please consider filing ASAP reports for any such event or for any safety related issue. The ASAP program is a powerful way to make others aware of safety issues. Thank you for your active participation in this data collection effort, and while we hope that these events are not on the rise, we will revisit the data and compare against the historical statistics we have presented.

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