U.S. GOVERNMENT ACCOUNTABILITY OFFICE

441 G St. N.W.
Washington, DC 20548

August 15, 2018

The Honorable James Mattis
Secretary of Defense

Military Aviation Mishaps: DOD Needs to Improve Its Approach for Collecting and Analyzing Data to Manage Risks

Dear Secretary Mattis:

In September 2017 we notified you that, in response to a provision in House Report 115-200, accompanying a bill for the National Defense Authorization Act for Fiscal Year 2018, we would be reviewing military training for rotary-wing aviation.[1] As part of this review, we are evaluating the relationship between training completed on rotary-wing aircraft and the number of aviation mishaps that have occurred.[2] During our review of aviation safety and the risk mitigation roles and responsibilities of the Office of the Secretary of Defense (OSD) and the military services, we became aware of Department of Defense (DOD) efforts to reorganize certain policy and oversight functions related to aviation mishaps. In addition, it is our understanding that Congress passed legislation that would establish an independent national commission to, among other things, study the causes contributing to military aviation mishaps and make recommendations on modifications to policies related to aviation safety.

Given DOD's current efforts to address aviation mishap-related policies and oversight issues, we are providing this report to you to share some of the issues we identified in the course of our ongoing review. This report includes observations on the extent to which DOD has a comprehensive approach for the collection, reporting, and analysis of mishap data to inform aviation risk-management decisions. Meanwhile, we are continuing our review of military

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[1]H.R. Rep. No. 115-200, at 107-108 (2017).

[2]A mishap is an unplanned event or series of events that results in damage to DOD property; occupational illness to DOD personnel; injury to on- or off- duty DOD military personnel; injury to on-duty DOD civilian personnel; or damage to public or private property, or injury or illness to non-DOD personnel, caused by DOD activities. An aviation mishap involves a DOD aircraft or flying operations.

training for rotary-wing aviation and will include information related to rotary-wing aviation mishaps, along with any additional findings, in the final report we expect to issue in early 2019.

To evaluate the extent to which DOD has a comprehensive approach for the collection, reporting, and analysis of mishap data to inform aviation risk-management decisions, we reviewed DOD Instruction 6055.07, *Mishap Notification, Investigation, Reporting, and Record Keeping*,[3] which establishes the roles and responsibilities of offices involved in the collection and reporting of aviation mishap data, as well as agreements between OSD and the Army, Navy, and Air Force safety centers (safety centers) on sharing data.[4] We compared the mishap data collected by the safety centers and reported to OSD as of May 2018 against the mishap data elements in the current agreement. We also reviewed documentation and interviewed officials from OSD and the safety centers on the data collected during mishap investigations in light of *Standards for Internal Control in the Federal Government*, which calls for obtaining relevant and reliable data to meet information requirements.[5]

We conducted this performance audit from September 2017 to August 2018 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objective.

In summary, we found gaps in DOD's approach for collecting, reporting, and analyzing aviation mishap data. Specifically, we found that the safety centers do not collect standardized data as part of their mishap investigations. Our analysis found that the safety centers did not collect standardized data for between 10 and 17 of the 35 agreed-upon data elements for aviation mishaps that were to be provided to OSD, depending on the service. In addition, we found a lack of consensus between the safety centers and OSD on the reporting of data to OSD on human factors that may have caused the mishap, which has contributed to limitations in the

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[3]Department of Defense Instruction 6055.07, *Mishap Notification, Investigation, Reporting, and Record Keeping* (June 6, 2011).

[4]The military service safety centers are the U.S. Army Combat Readiness Center, U.S. Air Force Safety Center, and U.S. Naval Safety Center. The Naval Safety Center also manages the Marine Corps' portion of the Naval Aviation Safety Program.

[5]GAO, *Standards for Internal Control in the Federal Government*, GAO-14-407G (Washington, D.C.: Sept. 2014).

analysis of aviation mishaps that OSD performs. Further, DOD does not consistently collect and analyze relevant training data from all mishap investigations, such as information on the pilot's recent flying experience or training proficiency in the task or mission performed during the mishap. Recent studies have suggested that training shortfalls are a potential indicator of trends in aviation mishaps.

DOD's Approach for the Collection, Reporting, and Analysis of Aviation Mishap Data Has Gaps

Each of the military departments has responsibility for the notification, investigation, and reporting of aviation mishaps, as stipulated in their individual department guidance.[6] For example, the safety centers within each military department are responsible for conducting investigations of service mishaps, identifying mishap causes and problem areas, recommending mitigation activities, and implementing risk management practices, among other responsibilities.[7] In addition, OSD officials stated that OSD is responsible for collecting and analyzing mishap data from the safety centers to provide the Secretary of Defense and other DOD leaders with information on risks, recommending mitigation strategies, and distributing lessons learned within and outside of DOD. However, we identified gaps in DOD's approach for the collection, reporting, and analysis of aviation mishap data. Specifically:

- **Safety centers do not collect standardized aviation mishap data**. Standardized aviation mishap data are not collected by the safety centers, despite various policies and agreements with OSD to collect uniform data for specific mishap data elements. From 2000 through 2017, offices within OSD issued a DOD Instruction and a memorandum, and executed three separate agreements with the safety centers related to collecting and sharing standardized mishap data with OSD, as shown in figure 1.

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[6]Army Regulation 358-10, *The Army Safety Program* (Feb. 24, 2017); Secretary of the Navy Instruction 5100.10K, *Department of the Navy Safety Program* (May 12, 2015); Air Force Instruction 91-202, *The US Air Force Mishap Prevention Program* (June 24, 2015) (incorporating change 1, Feb 15, 2017); Air Force Guidance Memorandum to AFI 91-202, *The US Air Force Mishap Prevention Program* (May 25, 2017).

[7]The military service safety centers are the U.S. Army Combat Readiness Center, U.S. Air Force Safety Center, and U.S. Naval Safety Center. The Naval Safety Center also manages the Marine Corps' portion of the Naval Aviation Safety Program.

Figure 1: Standardized DOD Mishap Data Collection and Reporting Requirements

Policy and instructions »

October 2000
Instruction 6055.07 established that the Deputy Under Secretary of Defense for Environmental Security will collect, aggregate, and analyze data from the DOD Components and distribute the results on the status of accident and illness prevention efforts

May 2008
OUSD (AT&L) memorandum tasks DOD Components with collecting 86 standard aviation-related mishap data fields

June 2011
Re-issue of Instruction 6055.07 established that DUSD (I&E) will collect and maintain mishap data from the DOD Components to provide the Secretary of Defense and other DOD leaders with information to make informed risk decisions

2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017

Agreements »

December 2005
Agreement for the Air Force to exchange 31 aviation-related mishap data fields with OSD, among others

September 2011
Memorandum of understanding for the Naval Safety Center to collect standard mishap data fields as defined in Instruction 6055.07

August 2017
Memorandum of understanding for the DOD Components to collect 57 standardized mishap data fields (supersedes previous agreements)
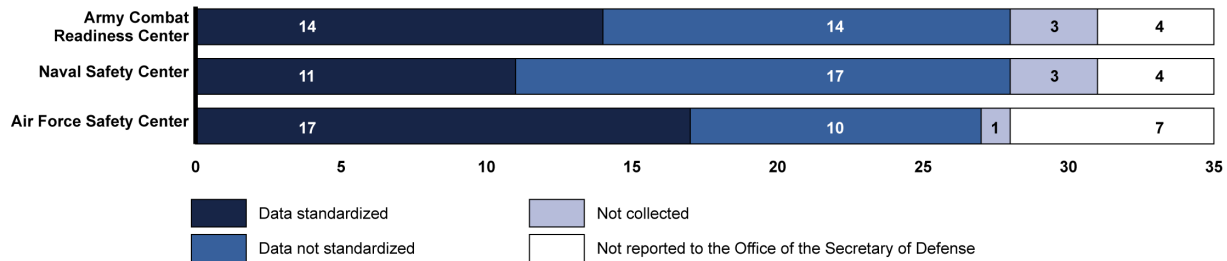
OSD   Office of the Secretary of Defense
DOD   Department of Defense
DUSD (I&E)   Deputy Under Secretary of Defense for Installations and Environment
OUSD (AT&L) Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics

Source: GAO analysis of Department of Defense documents. | GAO-18-586R

In particular, a May 2008 memorandum from the Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics directed all of the DOD Components, which include the safety centers, to collect minimum standard data elements in their information systems and aviation mishap investigation data gathering. More recently, an August 2017 memorandum of understanding identified 57 mishap data elements (35 of which relate to aviation mishaps) that should be collected by the safety centers in a standardized format and reported to the Office of the Under Secretary of Defense for Personnel and Readiness. Based on information provided by OSD, as of May 2018, we found that the safety centers collected from 11 to 17 of the 35 aviation mishap data elements, depending on the service, in a manner consistent with the August 2017 memorandum of understanding. However, for the remaining aviation mishap data elements, the safety centers were either not collecting them or were not collecting them in a standardized format (see fig. 2).[8]

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[8]For the purposes of our report, standardized data refers to data elements that did not require some level of interpretation or mapping by OSD to conform to the agreed upon list of values for each data element.

Figure 2: Status of Aviation Mishap Data Element Collection by the Military Services' Safety Centers, as of May 2018

	Data standardized	Not collected
■ Data not standardized		□ Not reported to the Office of the Secretary of Defense

Note: These numbers represent the 35 data elements that the Office of the Secretary of Defense has identified as related to aviation mishaps. The Naval Safety Center also manages the Marine Corps' portion of the Naval Aviation Safety Program.

For example, the Army Combat Readiness Center and Naval Safety Center do not collect data for the "area of responsibility" data element that specifies under which combatant command the mishap occurred. In addition, according to OSD, for 10 to 17 of the 35 elements, the safety centers record the data in different formats that are not consistent with the memorandum of understanding. According to officials, OSD must perform time-consuming manipulation and interpretation of certain data elements received from the safety centers to facilitate comparative analyses because of the safety centers' collection of nonstandard data, which introduces the risk of errors in the analysis. For example, officials told us that for the data element "aviation mishap type," the safety centers are to choose 1 of 20 standard values, such as "midair collision" or "wildlife strike," to characterize the mishap. However, the Army collects these data using its own process, whereby it selects up to 3 out of 102 values to describe the aviation mishap type.

DOD Instruction 6055.07 states that standardizing data across all of the DOD Components provides a common language for all mishaps, and that the use of standard data allows for accurate mishap trending, efficient hazard analysis, and more effective sharing of lessons learned. However, according to officials, the safety centers utilize separate, service-specific data systems that evolved independently over time to collect data to meet the unique requirements for each military service, which contributes to the lack of standardized data across the safety centers. Furthermore, these officials stated that the safety centers have developed and upgraded their data systems over time based on their individual needs.

To address these data standardization issues, OSD officials stated that the inclusion of mishap data elements in DOD's business enterprise architecture would likely compel the safety centers to adopt standardized data because, once implemented, the DOD Components would have to comply with the architecture in order to make upgrades to their data systems.[9] However, DOD has been developing the data elements for the business enterprise architecture since 2014, and the safety centers have experienced delays in updating their data systems in the past. For example, Naval Safety Center officials told us that delays in their system upgrades have affected their compliance with the standard mishap data elements, with current upgrades being scheduled for December 2018. In addition, officials from the Army Combat Readiness Center noted that changes to their data systems take time to implement, but that it is working on a system update scheduled for fiscal year 2019 to better capture the agreed-upon data elements.

OSD officials stated that the development of a standard data dictionary for mishaps that was associated with the 2017 memorandum of understanding has not achieved the goal of collecting standardized aviation mishap data because the memorandum lacks an enforcement mechanism to compel the safety centers to provide standardized data. During our review, OSD also could not identify any additional actions it has taken since August 2017 to ensure that the safety centers better collect standardized aviation mishap data in accordance with the data dictionary. Therefore, OSD will continue to receive non-standard aviation mishap data until DOD includes the mishap data elements in its business enterprise architecture and the safety centers upgrade their data systems to comply with that architecture—a process that could take years. Without taking steps to ensure that the safety centers collect standardized aviation mishap data in the interim period, OSD will be unable to minimize the inefficient, time-consuming effort to align data that are provided in different formats, thereby affecting the timeliness of providing critical information to decision makers to inform risk-management decisions.

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[9]An enterprise architecture is intended to provide a clear and comprehensive picture of a functional or mission area that cuts across more than one organization. An architecture describes the enterprise in logical terms (such as interrelated business processes and business rules, information needs and flows, and work locations and users), as well as in technical terms (such as hardware, software, data, communications, and performance standards).

- **Lack of consensus on reporting causal factors to OSD for DOD-wide analysis.**
  According to military service and OSD officials, there is no consensus between the safety centers and OSD with regard to OSD's role in conducting causal analysis of aviation mishaps. Due to this lack of consensus, the safety centers do not report all data elements to OSD, including the causal factors related to aviation mishaps, despite their agreement in the August 2017 memorandum of understanding to provide these data.[10] As of May 2018, we found that the Army and Naval safety centers were not reporting 4 of the 35 agreed upon data elements, and the Air Force Safety Center was not reporting 7 data elements (see fig. 2). Specifically, none of the safety centers were reporting information on human factors that contributed to the mishaps, which according to DOD represent the leading cause of DOD mishaps.[11] Human factors can cover a range of factors that contributed to the mishap including performance-based errors, physical problems, and mental awareness, among others.

  Standards for Internal Control in the Federal Government states that agencies should assign responsibility and delegate key roles throughout the entity. However, according to military service and OSD officials, department-wide and service instructions and policies are unclear on OSD's responsibilities for conducting causal analysis. For example, DOD Instruction 6055.07 requires the Deputy Under Secretary of Defense for Installations and Environment to collect, aggregate, and analyze mishap data from the DOD Components, but it does not specify whether the analysis should include causal factors. Officials with the Air Force and Army safety centers told us they do not report data to OSD on the human factors contributing to aviation mishaps or the findings and recommendations that investigators identify in the aviation mishap investigations because OSD's access to causal information is not explicit in current DOD instructions. For example, DOD Instruction 6055.07 requires the DOD Components to collect, maintain, analyze, and report human error, human factors, and human performance data identified in safety investigations, but the instruction is unclear as to which OSD organizations, if any, they should report this information.

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[10]According to DOD, there are three broad categories of mishap causal factors: human factors, materiel factors, and environmental factors.

[11]DOD has developed a Human Factors Analysis and Classification System guide to assist mishap investigators in determining root causes of the mishap and to provide a standard system of categorizing human errors. The guide is also intended to allow for an analysis of patterns in human errors categories.

OSD officials told us that without receiving the underlying human factor categories, they have been limited in the type of analysis that they can develop. Specifically, OSD conducts descriptive analysis on overall trends in mishaps, such as the increase or decrease in the aggregate number of certain classes of mishaps.[12] However, according to OSD officials, OSD has been unable to conduct analysis on patterns in human factors—including patterns that may cross cut the military services—due to the data not being provided. Until there is agreement within DOD on OSD's role in analyzing trends in mishaps and its access to causal information, OSD will not be positioned to conduct effective analyses on patterns in mishaps, including any patterns that may have broad applicability across the military services, to provide the Secretary of Defense and other DOD leaders with information to make aviation risk-management decisions.

- **DOD does not consistently collect relevant training data to analyze trends in mishaps**. We found that certain training data related to pilots' training records are not being collected in all mishap investigations. For example, an official from the Air Force Safety Center told us that a pilot's recent flying hours may not be captured if the investigator does not believe that that information is relevant to the mishap. Officials from the Army Combat Readiness Center also stated that the collection of mishap data, such as training-related data, can be inconsistent because there are varying levels of quality in mishap investigations due to variance in the expertise of the investigators assigned, which in turn depends on the severity of the accident. In addition, we found that information related to the proficiency of a pilot in conducting the training tasks or mission may not be captured. An Air Force Safety Center official told us that proficiency information would be maintained by the service's operational flying units and would not necessarily be included in the mishap database.

  Based on our review of the safety centers' data systems, we also found variations in how training-related data are captured among the safety centers. For example, the human-factor data elements include broad categories related to training, such as "failed to provide proper training" and "organizational training is inadequate or unavailable." However, officials from

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[12]DOD Instruction 6055.07 establishes requirements for assigning a mishap class. Mishaps are classified according to the severity of resulting injury or property damage. Class A mishaps involve damages of $2 million or more, a destroyed aircraft, or a fatality or permanent total disability. Class B mishaps involve damage ranging from $500,000 to less than $2 million, permanent partial disability or inpatient hospitalization of three or more people. Class C mishaps involve damage ranging from $50,000 to less than $500,000 or an event involving one or more DOD personnel that results in one or more days away from work. Class D mishaps involve damage ranging from $20,000 to less than $50,000.

the Air Force and Naval safety centers told us that human factors related to training are optional categories and are not consistently identified in the mishap investigation, due to the subjectivity involved in determining a training-related mishap. Instead, these officials stated that training-related findings and recommendations in the mishap investigation may be identified, but that they are recorded in a narrative summary of the report. As a result, these data fields must be individually searched, which creates a challenge in extracting the data for the purposes of broader analysis of mishap causes.

Recent studies have identified training shortfalls as a potential indicator of trends in aviation mishaps. For example, in a 2018 internal DOD review to determine the common root causes of Class A and B mishaps for the previous 5 years, the safety centers concluded that there was a need to better assess and resolve training gaps that potentially contributed to the aviation mishaps during this period.[13] Officials from the Naval Safety Center told us that this conclusion was based on a subjective review of individual mishap reports because a query of available mishap data would provide an incomplete picture of the association between training and the mishaps and additional data would be required for further analysis. In addition, a 2008 study by CNA found that a low number of recent flying hours for a pilot can influence pilot-caused mishaps, but the study noted that its results were limited by the quality of the training data collected.[14]

Standards for Internal Control in the Federal Government state that agencies should obtain relevant data from reliable internal and external sources in a timely manner based on the identified information requirements. However, training-related data, including information related to a pilot's training record, were not identified as department-wide mishap data elements to be collected in the August 2017 memorandum of understanding. An official from the Office of the Under Secretary of Defense for Personnel and Readiness told us that future updates to the mishap data elements will be conducted at the direction of DOD's Chief Management Officer and that a working group is currently considering potential mishap data elements that could be included in the business enterprise architecture. Reconsidering the data that should be consistently captured as part of every mishap

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[13]Class A mishaps involve damages of $2 million or more, a destroyed aircraft, or a fatality or permanent total disability. Class B mishaps involve damage ranging from $500,000 to less than $2 million, permanent partial disability or inpatient hospitalization of three or more people.

[14]CNA, *Air Wing Training Study: Flight Hours, Mishap Rates, and Tactical Proficiency*, (Aug. 2008).

investigation, such as training-related data, and incorporating those data into OSD analyses would allow DOD to consider all relevant information on mishap causes and help it better identify all risks.

Conclusions

DOD has taken a number of steps to ensure that the safety centers provide more complete and consistent data to OSD on aviation mishaps. However, there are several gaps in its current approach to collecting, reporting, and analyzing aviation mishap data. Specifically, because standardized data elements are not being collected across the safety centers, DOD is limited in its ability to compare mishap data across the military services, and must engage in inefficient and time-consuming efforts to align the data with reporting requirements. Further, because OSD's responsibilities for conducting analysis is unclear, it has had limited access to mishap causal data, and this further limits DOD's ability to conduct analyses on patterns in mishaps that apply across the military services. Finally, reconsidering relevant training data as part of any review of aviation mishap data elements would allow DOD to conduct broader mishap analysis that could inform risk-management decisions and improve aviation safety.

Recommendations for Executive Action

We are making the following three recommendations to DOD.

The Secretary of Defense ensures that the Offices of the Under Secretary of Defense for Personnel and Readiness and Under Secretary of Defense for Acquisition and Sustainment in coordination with the Secretaries of the Army, Navy, and Air Force take interim steps to help ensure that standardized aviation mishap data elements are collected by the safety centers. (Recommendation 1)

The Secretary of Defense ensures that the Offices of the Under Secretary of Defense for Personnel and Readiness and Under Secretary of Defense for Acquisition and Sustainment in coordination with the Secretaries of the Army, Navy, and Air Force update department-wide and service instructions and policies to clarify the responsibility of the Office of the Secretary of Defense for conducting analysis and its access to the military services' information on human factors that contributed to aviation mishaps. (Recommendation 2)

The Secretary of Defense ensures that the DOD Chief Management Officer in coordination with the offices of the Under Secretary of Defense for Personnel and Readiness and Under Secretary of Defense for Acquisition and Sustainment and the Secretaries of the Army, Navy, and Air Force identify relevant training-related data to collect as part of any update of the aviation mishap data elements and incorporate these data into future analyses. (Recommendation 3)

Agency Comments and Our Evaluation

We provided a draft of this report to DOD for review and comment. DOD provided written comments, which are reprinted in Enclosure I. In its comments, DOD concurred with all three recommendations and stated ongoing and planned actions it is taking to address the recommendations.

We are sending copies of this report to appropriate congressional committees. In addition, the report is available at no charge on the GAO website at http://www.gao.gov.
If you or your staff have any questions about this report, please contact me at (202) 512-5431 or russellc@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report include Matt Ullengren (Assistant Director), Russell Bryan (Analyst in Charge), Kevin Copping, Alexandra Gonzalez, Ron La Due Lake, Danny Lee, and TyAnn Lee.

Sincerely yours,

Cary Russell
Director, Defense Capabilities and Management

Enclosures – 1

Enclosure I: Comments from the Department of Defense

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
4000 DEFENSE PENTAGON
WASHINGTON, D.C. 20301-4000

READINESS

JUL 3 1 2018

Mr. Cary Russell
Director, Defense Capabilities and Management
U.S. Government Accountability Office
441 G Street, NW
Washington DC 20548

Dear Mr. Russell:

This is the Department of Defense (DoD) response to the Government Accountability Office (GAO) Draft Report GAO-18-586R, "Military Aviation Mishaps: DoD Needs to Improve Its Approach for Collecting and Analyzing Data to Manage Risks," dated June 22, 2018 (GAO Code 102305).

The Department appreciates the opportunity to comment on the draft report. We concur with the recommendations and the Department's comments are attached.

The point of contact for this effort is Dr. Shep Barge, who can be reached, at (571) 372-5394, or walter.s.barge.civ@mail.mil.

Sincerely,

Veronica Daigle
Principal Deputy Assistant Secretary of
Defense (Readiness)

Attachment:
As stated

"MILITARY AVIATION MISHAPS: DOD NEEDS TO IMPROVE ITS APPROACH FOR COLLECTING AND ANALYZING DATA TO MANAGE RISKS"

**DEPARTMENT OF DEFENSE COMMENTS
TO THE GAO RECOMMENDATIONS**

RECOMMENDATION 1: *The Secretary of Defense ensures that the Offices of the Under Secretary of Defense for Personnel and Readiness (OUSD(P&R)) and Under Secretary of Defense for Acquisition and Sustainment (OUSD(A&S)) in coordination with the Secretaries of the Army, Navy, and Air Force take interim steps to help ensure that standardized aviation mishap data elements are collected by the safety centers.*

DoD RESPONSE: Concur. The Safety Information Management Working Group, with representation from the OUSD(P&R), OUSD(A&S), and the Military Departments, is developing DoD data standards for mishap data. The resulting DoD data standards will be submitted to the Chief Management Officer (CMO) for inclusion into the DoD Business Enterprise Architecture for subsequent inclusion in DoD issuances, as appropriate. The CMO will enforce implementation of the data standards in future safety information system development.

RECOMMENDATION 2: *The Secretary of Defense ensures that the OUSD(P&R) and OUSD(A&S), in coordination with the Secretaries of the Army, Navy, and Air Force, update Department-wide and Service instructions and policies to clarify the responsibility of the OUSD for conducting analysis and its access to the military services' information on human factors that contributed to aviation mishaps.*

DoD RESPONSE: Concur. The Deputy Secretary of Defense (DepSecDef) memo, "Realignment of Safety and Occupational Health Policy and Oversight Functions in the Office of the Secretary of Defense", dated July 16, 2018, designates the OUSD(P&R) as the Principal Enterprise Safety Official (PESO), which is the lead for integrated safety assessment and reporting, trend analysis, and mishap and accident reduction and mitigation activities. The PESO is also responsible for policy and oversight of operational mishap safety programs, including aviation, ground, motor vehicle, afloat, and space. The DepSecDef has directed the OUSD(P&R) to review data sets collected and analytics performed to ensure that the Department has the most effective means to identify risks and trends and establish safety goals, to include the identification of those data elements which must be standardized across the Department for inclusion in the Business Enterprise Architecture.

RECOMMENDATION 3: *The Secretary of Defense ensures that the DoD CMO, in coordination with the offices of the OUSD(P&R) and OUSD(A&S) and the Secretaries of the Army, Navy, and Air Force, identify relevant training-related data to collect as part of any update of the aviation mishap data elements and incorporate these data into future analysis.*

DoD RESPONSE: Concur. The Safety Information Management Working Group—currently developing DoD data standards with representation from the OUSD(P&R), OUSD(A&S), and the Military Departments—will include training-related data in the DoD data standards.

(102806)