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Assessing the Effectiveness of the Collegiate Aviation Safety Reporting System (CASRS) at Western Michigan University's College of Aviation

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Abstract

Aviation is a safety focused industry that intends to continually improve safety. Many safety models have been created, but right now the most prominent model is the International Civil Aviation Organization's (ICAO) Safety Management System (SMS). It has four components: safety policy, safety risk management, safety assurance, and safety promotion. NASA's nationwide reporting system, the Aviation Safety Reporting System (ASRS) incorporates these four components, as does the program created by Western Michigan University's College of Aviation. Termed the Collegiate Aviation Safety Reporting System (CASRS), it was created to bring NASA's program to a local scale. This paper examines international safety systems and the relationship between ASRS, CASRS, and SMS. It uses specific data from reports and first-hand experience with CASRS and the College of Aviation safety committee to assess the system's effectiveness and make recommendations for its improvement. Overall, CASRS was found to be an effective system, but specific recommendations have been made to the College of Aviation regarding ways the system can be improved to ensure its continued success.

Keywords: Safety Management System, confidential incident reporting, just culture, Aviation Safety Reporting System, Western Michigan University, College of Aviation

Introduction

Aviation is a crucial industry in today's global economy. It is an industry that prides itself on safety, and there are many tested and proven safety models. ICAO's Safety Management System is designed to accomplish the goal of improving safety through four pillars.

The FAA created a joint program with NASA to confidentially collect safety reports from aviation professionals, with the idea that these reports and the data in them can be used to create policies that will make us safer. Western Michigan University's College of Aviation (CoA) followed suit in 2006 and created the Collegiate Aviation Safety Reporting System (CASRS). Alongside the CoA Safety Committee, CASRS is at the heart of the college's safety policy. It allows for anonymous reporting and accomplishes most of the goals of a safety management system.

Upon comparison of SMS programs and NASA's ASRS, it is clear that CASRS was effectively designed. Specific data also proves that CASRS has been effective and has helped reduce repeat safety incidents at the College of Aviation. However, data shows that the number of CASRS reports is not consistently trending with yearly changes in number of flight hours or the number of safety-sensitive students. This suggests CASRS is not as widely utilized as it should be, a critical factor in a system that relies on self-reporting to be successful.

CASRS could become more effective if awareness about the system was raised and if more people knew that reports are non-punitive. Regardless, while improvements continue to be made, the system overall is quite effective.

Western Michigan University's College of Aviation

College of Aviation Overview

Pilot training is one of the largest sectors of general aviation operations. Western Michigan University's College of Aviation is home to one of the largest collegiate aviation training programs in the country. Located at the W.K. Kellogg Regional Airport in Battle Creek, MI, the College of Aviation's operation includes a fleet of 40 aircraft, including the Cirrus SR-20 and Piper Seminole (College of Aviation, 2019).

The College of Aviation is one of Western Michigan University's nine academic colleges (Western Michigan University, 2019). It offers three undergraduate degree programs, including Aviation Flight Science, Aviation Management and Operations, and Aviation Technical Operations. Aviation Flight Science is the program that prepares students for a career as a professional pilot. The engine test cells and laboratories, maintained for Technical Operations students, also come with their own unique risks. Safety oversight is critical for this college.

Students can enter the program with no flight experience and leave 4 years later with a job offer and training date as a pilot with an airline, corporate flight department, or the military. Therefore, it follows that a uniquely high risk level is associated with a collegiate training operation that allows for low-time flight instructors to teach other low-time pilots in a congested airspace full of relatively inexperienced pilots.

Due to a strong safety culture, WMU has never had a fatal accident in the 80 years since flight training began in 1939. This is an accomplishment to be proud of. WMU has averaged 19,389.6 flight hours per year since 2007 (College of Aviation, 2007-2018).

The College of Aviation's official website states the following about aviation safety: "At the College of Aviation, safety is not just a rhetorical exercise. Safety is a practical exercise in risk identification, measurement, and mitigation. The focus on safety is broad and extends from the classroom, to the laboratory, to the flight line, to the skies above them all. The culture of safety impacts everyone at the college. Safety is at the core of what we do. The equipment and training tools used by the college, and the manner that individuals utilize the equipment, demonstrates the College of Aviation's commitment to safety" (College of Aviation, 2019).

An impeccable safety record is significant. The College of Aviation's goal is to have their safety record continue. In an environment like theirs, systems to aid in hazard identification and risk mitigation have been put in place to accomplish this goal.

Safety Management Systems

Safety Management System Overview

The term Safety Management System is a broad term that describes ICAO's approach to managing safety policies. SMS often encompasses the entirety of a company's safety policies and procedures. It is defined by the FAA as "the formal, top-down, organization-wide approach to managing safety risk and assuring the effectiveness of safety risk controls. It includes systematic procedures, practices, and policies for the management of safety risk." (Federal Aviation Administration, 2016).

SMS is a multi-faceted and holistic approach to aviation safety that is becoming standard throughout the industry. The FAA and ICAO consider it to be a reasonable next step in the evolution of aviation safety. The FAA website notes that SMS for service providers will integrate modern safety risk management and safety assurance concepts into repeatable, proactive systems (Federal Aviation Administration, 2016). It also points out the various benefits that SMS provides: a structured means of safety risk management decision making, a means of demonstrating safety management capability before system failures occur, increased confidence in risk controls through structured safety assurance processes, an effective interface for knowledge sharing between regulator and certificate holder, and a safety promotion framework to support a sound safety culture (Federal Aviation Administration, 2016).

SMS has four components: safety policy, safety risk management, safety assurance, and safety promotion (Chakib, 2018). Safety policy establishes senior management's commitment to safety performance and establishes clear safety objectives. Safety risk management determines the need for new or revised risk controls based on the assessment of acceptable risk. Safety assurance evaluates the continued effectiveness of implemented risk control strategies and assists in identifying new hazards. Finally, safety promotion involves training, communication, and other actions to create a positive safety culture in the company (Federal Aviation Administration, September 11, 2017). The whole purpose of SMS is to provide a systematic way of achieving acceptable levels of safety risk, and these components all come together to make up safety culture. Often intangible, this safety culture is a crucial part of SMS.

Establishing the Need for SMS

It is not difficult to understand the risks associated with aviation; this highlights the importance of risk identification and mitigation. However, identifying every risk, whether related to the flight crew, the aircraft, or weather, can be difficult. Providing a consistent and organized company-wide method of reacting to and mitigating those risks is also challenging.

It would likely be a large task for all departments such as flight operations, maintenance, dispatch/scheduling, line services, etc. to attempt to mitigate their own risks without a company-wide, unified framework. It would be almost as if each department has a similar goal, but each with an entirely different way of attempting to accomplish that goal. Communication suffers without a unified framework.

When it comes to safety, everyone benefits with open lines of communication to allow the sharing of ideas and the sharing of various issues and corrective actions. It is this need for a unified approach to safety in a company or industry that is solved with the implementation of SMS.

Safety Culture

A safety culture exists when everyone at an institution acts conscientiously to work to improve safety. A positive safety culture will be ingrained into the mind of each member of the organization, leading them to make every decision through the lens of safety. A positive safety culture can have impacts as seemingly obvious as ensuring that all gates are consistently closed, or major impacts such as double-checking that an aircraft has been appropriately returned to service after an inspection. There is no such thing as “too safe” in aviation.

SMS is a critical part of establishing a positive safety culture, as its four components work to embed the safety culture into the organization’s framework. Safety culture can often be the difference between success and failure as an organization. The infamous Chernobyl accident was the first in which a failed safety culture was cited as a contributing factor (Robertson, 2018).

If a safety culture is so critical to the success of an organization, then how can one be established? A 2018 study by Michael F. Robertson found that in collegiate flight schools, there is a positive relationship between SMS implementation and safety culture, safety promotion, and management commitment to safety (Robertson, 2018). Through surveys of 453 individuals from 13 schools, data was gathered to prove the correlation. The study also found a positive link between safety promotion and safety culture (Robertson, 2018), indicating that the more that management promotes safety, the stronger the safety culture will be. Additionally, the study found a significant and positive relationship between the Chief Flight Instructor/Supervisor of

Flight and safety culture; it showed that if there is more management commitment to the implementation of the SMS, then interactions with the Chief Flight Instructor tended to be perceived as more positive (Robertson, 2018). This clearly documents the positive link between implementation of an SMS and the establishment of a positive safety culture within the organization.

Through a 2016 PhD dissertation, Embry Riddle's Kevin O'Leary further examined the relationship and effects of safety culture and ethical leadership on safety performance. Ethical leadership means "the demonstration of normatively appropriate conduct through personal actions and interpersonal relationships, and the promotion of such conduct to followers through two-way communication, reinforcement, and decision-making" (O'Leary, 2016). It was determined that there is a strong and significant relationship between safety culture and ethical leadership. Though focused specifically on fractional pilots, the report references a 1986 study that showed a link between pilot attitudes towards safety and overall safety performance (O'Leary, 2016). This supports the hypothesis that organizational climate has a significant impact on safety climate. In turn, safety climate influences self-reported safety compliance, and safety climate is a predictor of safety performance (O'Leary, 2016).

Both reports emphatically prove the same point: it starts at the top. Safety promotion and SMS implementation have been proven to be positively related to establishing a positive safety culture, which has been proven to be positively related to safety performance. These reports found that management influences safety culture, and that if management acts appropriately and ethically to implement an SMS and promote safety, a positive safety culture/climate and in turn positive safety performance will follow.

NASA's Aviation Safety Reporting System (ASRS)

History and Purpose

The desire to collect and disseminate aviation incident data is nothing new. In 1958, United Airlines President William A. Patterson commented on the need to develop accurate safety trend information. A few years later, in 1966, Bobbie R. Allen, director of the Bureau of Safety of the U.S. Civil Aeronautics Board, commented that "it might be profitable if we explored a system of incident reporting which would assure a substantial flow of vital information to the computer for processing, and at the same time, would provide some method designed to effectively eliminate the personal aspect of the individual occurrences so that the information derived would be helpful to all and harmful to none" (Billings, Cheaney, Hardy, & Reynard, 1986).

In December 1974, TWA flight 514 crashed in Virginia amidst confusion between the crew and ATC, after the crew misinterpreted an approach plate. The NTSB investigation found that six weeks before, a United Airlines crew almost made the same mistake (Billings, Cheaney, Hardy, & Reynard, 1986).

In January 1974, United Airlines created an internal reporting system named the "Flight Safety Awareness Program." The pilots from the United flight informed the company, which then told other pilots and the FAA. This event marked the formal beginnings of a system that was decades in the making (Billings, Cheaney, Hardy, & Reynard, 1986).

In May 1975, the FAA issued Advisory Circular 00-46, formally announcing a confidential, non-punitive incident reporting program. It was called the Aviation Safety Reporting Program (ASRP), but it would later be re-named the Aviation Safety Reporting System (ASRS). Its purpose would be "to encourage the reporting and identification of deficiencies and discrepancies in the system before they cause accidents or incidents" (Federal Aviation Administration, 1975) In August 1975, it was announced that NASA would serve as a third-party to review and analyze the data. The FAA understood that the success of the program depended on the free and unrestricted flow of confidential information.

Aviation Safety Reporting System (ASRS) Overview

Since its creation in 1975, ASRS has served one purpose: to review, process, and analyze voluntary submissions from aviation professionals and disseminate that information to stakeholders (National Aeronautics and Space Administration, 2018). It is intended to improve the industry by providing a place for the free exchange of information related to aviation safety. The FAA and NASA understood that everyone benefits from open communication, so they set out to create a system where aviation professionals can voluntarily report safety related incidents under a set of guidelines, with immunity guaranteed if protocol is followed.

The idea is that the reports will be received, de-identified, analyzed, and disseminated to the industry as a whole so that each member of the industry may learn from the mistakes of others. The idea is that if one incident happens, like United's near miss into Dulles, the entire industry can become safer as a result of the reporting of the incident and the sharing of the data so that other professionals may learn from previous mistakes and avoid the same situation themselves.

The FAA has various tools to use against certified aviation professionals or certified companies. Among them is enforcement action which can result in a letter in a file for two years. They can also pursue certificate action, which can include the suspension or revocation of a certificate. For a pilot, the suspension or revocation of a certificate can be career ending, depending on the gravity of the offense and violation committed.

Under the ASRS program, individuals who submit what has come to be known as “a NASA form” are eligible for immunity from FAA enforcement or certificate action, provided they meet the program specifications. Advisory Circular 00-46, which created the program, included specific details. AC 00-46E, the current version of the document, states the following:

> The FAA considers the filing of a report with NASA concerning an incident or occurrence involving a violation of 49 U.S.C. subtitle VII or the 14 CFR to be indicative of a constructive attitude. Such an attitude will tend to prevent future violations. Accordingly, although a finding of violation may be made, neither a civil penalty nor certificate suspension will be imposed if:
>
> 1. The violation was inadvertent and not deliberate;
> 2. The violation did not involve a criminal offense, accident, or action under 49 U.S.C. §44709, which discloses a lack of qualification or competency, which is wholly excluded from this policy;
> 3. The person has not been found in any prior FAA enforcement action to have committed a violation of 49 U.S.C. subtitle VII, or any regulation promulgated there for a period of 5 years prior to the date of occurrence; and
> 4. The person proves that, within 10 days after the violation, or date when the person became aware or should have been aware of the violation, he or she completed and delivered or mailed a written report of the incident or occurrence to NASA (Federal Aviation Administration, 2011).

Essentially, the individual is eligible for immunity if the violation was not intentional, if it was not a criminal offense or aircraft accident, if the individual has not been the subject of

FAA enforcement action within the previous 5 years, and if the report is submitted within 10 days of the violation or within 10 days of when the individual would have become aware of the violation.

Confidentiality clause

The FAA attempted to create a program similar to ASRS in the 1960s, but it never gained traction because most people lacked confidence in the promised immunity (Billings, Cheaney, Hardy, & Reynard, 1986). Former Air Line Pilots Association (ALPA) President Clarence Sayen was quoted as early as 1954 cautioning all airlines that, “incident reporting systems aren’t working because pilots fear disciplinary action by the carriers or the government if they reflect dangerous occurrences” (Billings, Cheaney, Hardy, & Reynard, 1986). On the second attempt in 1975, the FAA got it right. There is no shortage of documents governing ASRS and its confidentiality clause; the FAA and NASA wanted there to be no doubt that they were taking confidentiality and immunity seriously.

FAR §91.25 states the following: “The Administrator of the FAA will not use reports submitted to the National Aeronautics and Space Administration under the Aviation Safety Reporting Program (or information derived therefrom) in any enforcement action except information concerning accidents or criminal offenses which are wholly excluded from the program” (14 C.F.R. §91.25, 2019).

FAA Order JO 7200.20, governing ATC professionals, states, “The Air Traffic Organization will not use either the written report or the content of a written report to initiate or support any disciplinary action, unless the reported event meets the exclusionary criteria” (Federal Aviation Administration, 2012). AC 00-46E says, “the NASA ASRS security system ensures the confidentiality and anonymity of the reporter, and other parties as appropriate, involved in a reported occurrence or incident. The FAA will not seek, and NASA will not release or make available to the FAA, any report filed with NASA under the ASRS or any other information that might reveal the identity of any party involved in an occurrence or incident reported under the ASRS" (Federal Aviation Administration, 2011).

AC 00-46E explains that there has not been a single breach of confidentiality in more than 34 years of ASRS under NASA management (Federal Aviation Administration, 2011). Furthermore, NASA's ASRS website section about confidentiality and incentives to report indicates that more than one million reports have been submitted, and to date no reporter's identity has ever been breached (National Aeronautics and Space Administration, 2019). All reports are de-identified and generalized prior to being entered into the database. This system is working, largely due to the FAA learning from history and placing a high priority on confidentiality, leading people to feel comfortable submitting reports without a fear of retribution.

ASRS Relationship with Safety Management Systems

ASRS is an excellent example of a component of SMS. SMS is the newest trend in aviation safety, representing an industry-wide approach to safety management. If a standard SMS is top-down and starts with senior leadership, ASRS fits in perfectly. The FAA is the top of aviation regulation and safety in the United States. The FAA and NASA created this system, and in doing so set a perfect example for the industry and the world. From the top down in this country, safety is on the forefront.

Safety Policy

In addition to incorporating a top-down approach to safety like SMS, ASRS shares many of the main components of SMS. It mirrors safety policy closely; safety policy is about establishing senior management's commitment to continually improving safety. With the FAA creating this program to collect, analyze, and disseminate data related to aviation safety, ASRS clearly embodies SMS by demonstrating the FAA's commitment to continually improving safety.

Safety Risk Management

Additionally, ASRS includes elements of safety risk management. Risk management involves assessing, controlling, and analyzing the risk. With each report submitted (over 1.5 million so far (National Aeronautics and Space Administration, 2018)), a specific process helps analyze the report. NASA has various alerting procedures that can be followed if the report is critical. They can use an alert message to inform controlling agencies immediately of items such as a defective navigation-aid, confusing procedures, or an aircraft system anomaly. To date, ASRS has sent 6,322 alert messages (National Aeronautics and Space Administration, 2018). In addition, they can issue a quick response to quickly analyze and issue operational guidance to entities like the FAA, DOT, NTSB, NASA, and the U.S. Congress (National Aeronautics and Space Administration, 2018).

Safety Assurance

Another component of SMS is safety assurance, which identifies new hazards and risks. With ASRS set up to receive reports from all over the country about any safety related topic, from inoperative navigation-aids to improper control methods or instructions, ASRS is continually identifying and helping mitigate new risks. Proof of that can be found in its origins as it relates to the United near-miss and eventual TWA accident.

Safety Promotion

Finally, ASRS contains elements of safety promotion, the final component of SMS. Safety promotion focuses heavily on disseminating lessons learned and sharing experiences with colleagues and other professionals in the industry. ASRS understands that the industry is safer when everyone is informed of safety issues and operational issues. Several components of ASRS are specifically designed to help share information and promote safety. A monthly newsletter named *Callback* includes snippets from reports with supporting commentary and lessons learned (Yodice, 2012). *Callback* is sent to subscribers and contains valuable information to prevent similar situations from occurring again. In 2017, there were over 29,000 subscribers (National Aeronautics and Space Administration, 2018). Along with the newsletter, NASA has made the de-identified information in the ASRS database available. Individuals can search the database for specific reports based on a number of criteria. NASA can then search its database and send relevant reports to the individual requesting them (National Aeronautics and Space Administration, 2018).

It has been proven that an SMS is a beneficial addition to safety policy in the United States. While ASRS is not specifically a component of an SMS, it is explicitly clear that all four elements of SMS are embedded into ASRS. This makes it an incredibly valuable tool to the aviation industry. If ASRS works on a national scale, its processes can be applied in other areas as well; it has applications to other industries such as the medical industry, and it even has applications to internal aviation operators such as individual airlines or collegiate flight schools.

Western Michigan University's Collegiate Aviation Safety Reporting System

Purpose and Overview

The overall efficacy and positive impact to safety on a national level which results from ASRS is astounding. Aviation is all about learning from mistakes, accidents, and incidents; ASRS is no exception. The benefit of having a system in which individuals can safely report and raise awareness for safety issues, which in turn can be used to make others safer, is almost intangible. In light of the effects that both SMS and ASRS have on safety culture and the overall level of safety, many entities have created internal reporting systems which mirror ASRS, simply on a smaller scale.

At Western Michigan University's College of Aviation, that internal reporting system is called CASRS – the Collegiate Aviation Safety Reporting System. CASRS was created in 2006. While the CoA does not have a formal SMS, it operates CASRS to this day. The system was created as a model of ASRS, and CASRS fully represents the top-down approach to safety that is so clearly identified in SMS. Just as ASRS has a strong relationship with SMS, CASRS does too. It is simply ASRS on a college-wide scale instead of a national scale.

CASRS shares the same qualities and benefits to safety as ASRS and SMS. It has specific applications to the four components of an SMS: safety policy, safety assurance, safety risk management, and safety promotion. While the efficacy of SMS programs and ASRS is clear, no such study has yet been completed on the efficacy of CASRS at WMU's College of Aviation.

How CASRS Works

CASRS was created in 2006 by a CoA employee. He still maintains it to this day on an as-needed basis, despite having a full-time job. With an extensive IT background, he worked to set up the system to allow it to do everything that was desired by college leadership. It provides an interface that allows authorized users to receive, analyze, sort, and code reports. CASRS is designed to receive reports from people around the college, including students, faculty, staff, and flight instructors. Reports are intended to be about anything that can impact safety. In the past, topics have included more than just flight operations. CASRS has received reports of people slipping in icy parking lots, chemical spills in maintenance labs, and even reports of doors at the secure airport facility being stuck open due to snow drifts. Flight operations certainly contribute to most of the CASRS reports, but it is not the exclusive focus of the system.

Once a report is submitted, it is stored indefinitely. Each report gives college leadership and the safety committee a chance to assess the impact to safety and, if necessary, recommend policy changes to prevent a recurrence. This falls right in line with the aviation industry's long history of learning from mistakes; indeed, it falls right in line with the origins of ASRS, dating back to TWA flight 514.

When a report is submitted, an email is automatically generated and sent to several employees. This list reinforces the idea that CASRS helps drive a top-down approach to safety. The list includes the executive director of flight operations/director of safety, associate dean, chief flight instructor/director of flight operations, associate director of flight operations, program manager and director of standards, faculty chair, director of maintenance, manager of line services, manager of dispatch and scheduling, manager of the Battle Creek Air Traffic Control Tower, and both administrative assistants that help facilitate the system. This email helps those individuals quickly determine the level of risk and whether immediate action is warranted.

College of Aviation Safety Committee

The College of Aviation has created a safety committee to oversee the CASRS system and facilitate analysis of each report. It meets on a biweekly basis to discuss each report that has been submitted since the last meeting. The committee is made up of the list of individuals identified previously, in addition to student representatives, faculty members, flight instructors, a representative from WMU's main campus OSHA team, and the airport operations manager.

While the College of Aviation still does not have a formal FAA-approved SMS, it does have many of the crucial components. A report discussing a safety management model for FAR 141 approved flight schools explicitly identifies a safety committee as part of that model (Carney & Mendonca, 2017). The report specifically discusses safety policy, internal investigations, risk assessment, hazard identification, safety training and education, and safety communication, all of which are crucial components to the CASRS system and the safety committee (Carney & Mendonca, 2017).

When a report is submitted, it is assigned to two members of the committee. Each member is responsible for reviewing the report, discussing it with the individuals involved (if possible, as reports may be submitted anonymously), and then voting on it. The committee member is tasked with assigning a risk level to each report (green, yellow, or red), and assigning up to two causal factors. Some examples of causal factors include inadvertent disregard for policy or procedure, misapplication of flight controls, experience level, bird strike, or air traffic congestion. There are 46 causal factors that can be assigned to a report (CASRS, 2006-2019).

Each reviewer shall vote on the report individually. If both reviewers agree the first time, the report will be closed at the meeting. If their votes disagree, they have a second chance to review. If both reviewers do not agree on the causal factors and risk level after the second review, the report will be sent to the full committee for discussion.

After a report has been given a risk level and causal factors, the system codes it accordingly. It allows users to view various graphs that help visualize trends in reports. The idea is to help determine when a pattern of reports for a particular causal factor is forming. For example, if six reports for magnetos being left on come in over a few weeks, then college leadership and the safety committee is able to see this and react appropriately.

Each report is designed to help make the environment safer at the College of Aviation. As such, there is follow up with each report. If the committee deems necessary, reports can be used to institute new policies aimed at reducing the frequency of such reports or preventing them from happening again. This is another component of CASRS that mirrors ASRS. A 1986 document discussing the development of ASRS talks about using ASRS data to determine trends. It says, “trend analysis remains an important goal of the ASRS group, and research in this area continues to be pursued aggressively” (Billings, Cheaney, Hardy, & Reynard, 1986). The extensive database of reports is vital to the success of CASRS, because it allows leadership and committee members to use the data and trends to create policies to make the college safer.

In addition to providing a forum in which safety reports can be discussed, the safety committee provides a place for the leaders of each department, as well as students and part-time staff, to be together for discussion. Discussion at these meetings is not always limited to safety reports; there have been specific instances in which the committee was used as a forum for discussion on topics not related to safety reports.

For instance, at one meeting, a discussion started that led to the resolution of miscommunication between management and flight instructors. One member brought up a post in the WMU CFI Facebook page that was asking if any CFI had a list of the airplanes with “good” landing lights. Maintenance was concerned to hear this. The committee learned that WMU maintenance had been testing different landing lights in the SR-20, and that instructors were noticing one to be so dim it was hard to see lines at night. The other landing light was said to be sufficiently bright. Maintenance was previously unaware of the large discrepancy, because it is the instructors and students who fly the aircraft in all of the varying weather conditions and situations. Through discussion at the safety committee, maintenance was briefed on a previously unknown issue, and they were able to fix it proactively, before a report was ever submitted due to an unsafe situation stemming from a dim landing light.

Confidential Incident Reporting

Just as ASRS is confidential, the CASRS system allows for anonymity as well. Individuals submitting reports have the opportunity to identify themselves, which is encouraged. This allows the committee and leadership to counsel individuals involved in order to prevent occurrences from happening again. After all, WMU is a training environment where people come to learn; mistakes are inevitable. However, it is crucial to note that the CASRS system is explicitly non-punitive and does allow users to submit reports anonymously.

ASRS maintains a non-punitive system as well, provided that the report was not disqualified by factors previously discussed, including a crime or intentional violation. CASRS operates the same way. If the report does not describe intentional violations or occurrences, no one will be punished for their mistakes. The option to submit anonymously is important to the CASRS system. The fear of punishment can easily lead some people to not file reports, which hurts the system and its effectiveness. In aviation, everyone wins with the free flow of information related to safety incidents, so not having a report submitted hurts the college's ability to improve safety. An un-dated NASA report regarding confidential incident reporting states that "people are generally willing to share their knowledge if they are assured their identities will remain confidential, and ultimately, anonymous and the information they provide will be protected from disciplinary and legal consequences" (National Aeronautics and Space Administration, n.d.).

CASRS builds on this very principle in order to encourage the submission of more reports. Minutes are sent out to students every two weeks containing information about each report, but they are heavily de-identified to ensure that no single report can be tied back to an individual. This confidential option of CASRS is undoubtedly one of its most important features, because sometimes the most important reports in terms of making changes to safety policy are the ones that people are afraid to submit because of how serious the results could be.

Just Reporting Culture

In terms of incident reporting, the ability to submit anonymously is important. However, perhaps even more important is the presence of a just culture. A just culture is one in which all employees are encouraged to provide, and feel comfortable providing, safety-related information (International Civil Aviation Organization, 2016). It is an environment in which employees know they will be treated fairly based on their actions, and not be punished for self-reporting mistakes. It is crucial to incident reporting because the fear of retribution leads people to withhold reports. ICAO notes that a strong just culture is perceived as the basis for a successful safety culture (International Civil Aviation Organization, 2016). Even more important than being able to submit anonymously is not feeling like you *have* to submit anonymously. The benefits of a just culture include increased reporting, more effective safety management, and building trust between front-line employees and managers (Global Aviation Information Network, 2004). WMU has worked hard to maintain its just culture, which helps CASRS be successful.

Assessing the Effectiveness of CASRS

Overall

In order to assess the effectiveness of a program like CASRS, the assessment needs to include both a holistic view of the program and specific data points. The holistic view can be used to determine if the system was set up and designed properly, and if it appropriately accomplishes its goals. The specific data points can be used to confirm or deny that previous hypothesis.

CASRS was designed to mirror its national counterpart, ASRS. It does so excellently. The ASRS database has two functions, the first of which is to notify the FAA and the aviation industry of hazards in the system. The second is to explain why the hazard exists (Reynard, n.d.). CASRS follows the same philosophy; it serves to inform college leadership and the population of various hazards or occurrences that WMU crews are experiencing, and it provides a forum to figure out why that hazard exists. If it can be determined why a hazard exists, it can be determined how to mitigate or even eliminate that risk.

CASRS is a top-down approach to safety management and falls in line with each component of SMS, especially risk management and safety promotion. The program itself has intangible benefits which lead to the conclusion that it is effective. It openly supports a just culture in the College of Aviation. Flight instructors and flight students serve on the committee in roles called "peer advocates." The purpose of their presence is to represent students and instructors. This gives comfort to the outside students and CFIs, because most of the reports submitted come from those two groups. They can rest easy knowing that they have people in the safety committee who share their same interests and serve to ensure that no one is punished for their actions. This thought also comes from the top-down, as management is clear that the system is non-punitive.

Every two weeks, the minutes of the safety committee are sent in an email to all students. This email encourages the students to log into the system to view the minutes. The opportunity for students to read the reports mirrors NASA's *Callback* publication, and it is a large component of safety promotion. This ensures that all students, or at least the ones who read their emails, have the ability to learn from the reports and remain informed about the committee's work.

A 1995 report titled *Measuring Safety with Flight Data* talks about database mining and lists three specific features that are important to facilitate proper database mining. They are: easy access to data, extensive data visualization, and vast statistical capabilities (Chappell, 1995). CASRS, in a way, checks all three boxes.

The system features a tab on the website that says "Management." Users with permission simply click that link, and it takes them to a page that allows the data to be easily viewed. It has a link to view all reports, which will show information about each report since 2006.

Additionally, it has a tab labeled "Analyze Data." Clicking on this link takes users to a page that allows them to view all reports in the last 52 weeks by event type/causal factor. It puts out a graph that has the week on one axis and the event type/causal factor on the other. If a report was filed 37 weeks ago for event type "bird strike," there would be a black 1 in that box. If multiple reports with the same factor or event type were filed in the same week, it will show the number of reports. If there were three or more reports, the color becomes red to draw attention. The safety committee uses these graphs at the end of each meeting to look for clusters of similar reports, and determine if certain events are becoming frequent enough that they require intervention. It is an excellent way to analyze the data visually, the second feature noted in the 1995 report.

S M (T) W T F S		EVENTS BY: TYPE / Causal Factors																																																			
Weeks ago:		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
Aircraft Damage - Intent for Flight	6						1		1	1																						1		1														1					
ATC Incident - Controller Error	4													1																											1		2										
ATC Incident - Other	4													1	1														1					1																			
ATC Incident - Pilot Error	16						1																		1	2			1			1		2		2	1			1								1			1		2
Autopilot - Failure	1																																												1								
Bird/Wildlife Strike	5																				1						1																	1				1			1		
Brake System - Fire/Overheat	1																																1																				
CAPS Pin	2																										1																					1					
Comm/Nav - Comm Failure	1				1																																																
Door Unlatch	2						1																	1																													
Electrical System - Failure	1																							1																													
Electrical System - Other	2														1																	1																					
ELT (Emergency Locator Transmitter)	2													2																																							
Engine System - Failure	1																												1																								
Engine System - Other	10				1											1						1		1																			1		1							2	2
Facilities General	2								1																																					1							
Flight Controls - Elevator	1																																				1																
Flight Controls - Flaps	1																																											1									
Flight Training Device - Other	1																																								1												
Fuel System - Fuel Cap	3																										1										1					1											
Fuel System - Management	4									2																																				2							
Fuel System - Other	3							1						1																							1																
Hard Landing	4				1																																2											1					
In-flight Adjustment (course/altitude/speed) for Traffic (Non-NMAC)	11															1																		2						1					1	1	1	1			1		2
Landing Gear System - Management	1																																																	1			
Landing Gear System - Tire	1				1																																																
Laser Illumination - Unauthorized	5			1											1																															1	1			1			
Near Mid-air Collision (NMAC)	3															1									1															1													
Operating Procedures - FOM - Aircraft Security	4															1							1							1			1																				
Operating Procedures - FOM - Chocks	5			1	1																								1			1														1							
Operating Procedures - FOM - Cross-Country	6																				2																						3					1					
Operating Procedures - FOM - Cross-Country - Overdue Aircraft	2														1						1																																
Operating Procedures - FOM - Dispatch	4						1		1																																		1	1									
Operating Procedures - FOM - Other	13						1											1			1							1				1				3							2			1					1		1
Operating Procedures - FOM - Required Aircraft Documents	2																												1							1																	
Operating Procedures - Maintenance - Inspection Schedule	1																											1																									
Operating Procedures - Maintenance - Open Squawk	1					1																																															
Operating Procedures - Maintenance - Other	3					1																				1																											1
Operating Procedures - POH Checklist - Other	1																																															1					
Operating Procedures - POH Checklist - Postflight	7																											1					1				1					1			1							2	
Operating Procedures - POH Checklist - Postflight - Mags Left ON	4			1	1		1																												1																		
Operating Procedures - POH Checklist - Preflight	1																																	1																			
Operating Procedures - SOP - Departure	1																																				1																
Operating Procedures - SOP - Other	6										1				1												1																					1	1	1			
Operating Procedures - SOP - Pattern Entry	1																												1																								
Propeller System - Other	1																																			1																	
Runway - Incursion	2																															1																		1			
Tail Strike	3									1						1																											1										
Weather - Icing	2									1																																						1					
Weather - Other	2				1																											1																					

(CASRS, 2006-2019).

The final feature noted in the report was vast statistical capabilities. It may not be entirely accurate to claim that CASRS has "vast" statistical capabilities, but it does nonetheless have statistical capabilities. The system allows users to search for specific reports by criteria. A search can be generated for all reports from a specific date range, broken down by event type. For example, a search from 2006 to 2019 with events coded as "aircraft damage – intent for flight" returns 23 reports (CASRS, 2006-2019). The system then allows the user to view the associated details for each report. It also shows statistics for how many reports in the last 52 weeks have been coded for each particular causal factor or event type. Again, these may not be vast statistical capabilities, but they certainly are useful.

Additionally, CASRS does an excellent job of formalizing the top-down approach to safety which is so important to SMS and safety policy. The head of the safety committee is the executive director of flight operations/director of safety. This is the person responsible for overseeing all aspects of the day-to-day operations of the College of Aviation. Reporting directly to the dean, the director of safety is one of the most influential positions at the college. Much of the rest of the committee is made up of department heads from other entities at the college: dispatch/scheduling, flight operations leadership, academic leadership, maintenance, and more. The committee brings together the leaders of various departments, all there for the same reason: to make the college safer. This system and the bi-weekly committee meetings formalize the idea that safety is a priority, especially with top leadership.

Specific Data

Over the last few years, the safety committee has not hesitated to change College of Aviation policies and procedures based on report data. These actions come after it is noticed that reports with the same causal factor or same event type are being submitted with an alarming frequency. Some specific cases help prove the efficacy of CASRS as a safety management tool.

CAPS pins

The first instance came in November 2017. WMU's primary trainer, the SR20, features a component called "CAPS," the Cirrus Aircraft Parachute System. It is a parachute that can be activated in flight to safely bring the aircraft back to the ground following a catastrophic situation such as a flight control malfunction, spin, or loss of engine power in terrain unsuitable for a forced landing. WMU has never had a CAPS activation, intentionally or inadvertently.

To allow CAPS to work, extensive testing was done, and the parachute was installed with a ballistic rocket just behind the passenger compartment. The rocket's purpose is to propel the parachute far enough away from the aircraft to be effective and to aid in parachute deployment. However, dozens of aircraft on a ramp in a training environment, each equipped with a rocket, can be a serious threat to safety. The rockets accelerate up to more than 100MPH in the first 0.1 second (Deener, 2018), and an untethered rocket would make its way thousands of feet into the air, posing a threat to aircraft above. Anyone on the ground would likely experience fatal injuries if that person were in the path of the rocket.

To prevent inadvertent activation, CAPS is armed and disarmed with the placement of a pin. It has a large red tag that says, "remove before flight," and it locks the handle in place to prevent activation. The system is considered to be armed if the pin is removed, because it could be activated.

Since CASRS was created in 2006, WMU has received 44 reports of the CAPS pin being left un-secured following the flight (CASRS, 2006-2019). The reports began increasing with frequency in 2016 and 2017. In October 2016 alone, there were three reports, some only five days apart (CASRS, 2006-2019). In 2017, there were seven reports (CASRS, 2006-2019). The committee noticed the increasing frequency of the reports and took action.

On November 21, 2017, a Flight Information File (FIF) was issued. An FIF is required reading for all faculty, staff, and students at the college. Policy dictates that an aircraft cannot be dispatched without the student and instructor first confirming with their PIN that they have read the FIF. This FIF included checklist revisions to address CAPS pins. Among them was the addition of a checklist item on the "aircraft securing" section that directs pilots to re-install the CAPS pin (College of Aviation, November 21, 2017). It was previously understood that each pilot had to do this, but the checklist lacked an item formally instructing pilots to do so. Since the policy was amended in 2017, there have been just three reports of CAPS pins being left out of place, and they were spread months apart (CASRS, 2006-2019). This shows that the steps taken by the committee have been effective. It shows that CASRS is working.

Ballast

In addition to the CAPS pins, the safety committee took action on another issue in August 2018. A weight and balance form is completed before each flight. The pilot can use this to calculate the aircraft's specific center of gravity (CG). Aircraft manufacturers publish charts showing an envelope that is acceptable; if the CG falls within that envelope, flight can be performed. If the aircraft is not within the envelope, steps must be taken before flight, such as moving, adding, or removing weight. Having the CG within the envelope is critical. An aircraft outside the envelope can experience undesirable characteristics that make it difficult to control or recover from situations such as a stall.

One of the most common times an aircraft is outside the envelope is if there are two heavier pilots up front. This can cause it to be under the maximum allowable weight but have a CG that is too far forward. The solution to this is often to add ballast to the baggage compartment. Ballast is a 25-pound weight that can be used to bring the CG back into the envelope. This is sufficient for that specific crew and configuration that required the ballast. However, if ballast is left in the aircraft, it poses a threat to the next crew. What may have been a flight performed within the envelope could now be pushed out of the envelope if the crew is unaware of the presence of 25+ pounds in the baggage compartment.

At the CoA, ballast used to be stored in a corner in the flight planning area. If a crew required ballast, they would simply take what was needed, carry it to the plane, and fly. There was no formal oversight of ballast, and it led to ballast repeatedly being left in the aircraft, which again poses a threat to the crew flying the plane afterwards. In a span of six months alone in 2018, the safety committee received nine reports of ballast being left in the back of an aircraft (CASRS, 2006-2019). Some of these were discovered only after a crew had inadvertently flown with ballast.

The safety committee took action. At the August 21st meeting, a new policy was implemented dictating that ballast would now be checked out at dispatch (College of Aviation, 2018). If a student needs ballast, the student asks dispatch. In exchange for something of value such as car keys, the dispatcher will provide ballast. Concurrently, the dispatcher will place a yellow ballast tag into the tin for that specific aircraft. The student will not receive the item of value until ballast has been returned, and the yellow tag calls attention to the fact that ballast is in the aircraft. This policy imposed a higher level of control and organization on the use of ballast at the college. There have been no reports of ballast being left in an aircraft since the policy was implemented (CASRS, 2006-2019).

Student pilot endorsements

Another instance of committee intervention came after a report described a situation in which the Supervisor of Flying (SOF; an individual responsible for supervision of flight activities) inadvertently let a solo student pilot practice take-offs and landings at another airport without an endorsement. A student pilot legally requires an endorsement in his/her logbook allowing flight to each specific airport. The SOF inadvertently did not check the student's logbook endorsements, and the flight was allowed to continue. It was discovered upon landing that the student did not have the proper endorsements and thus was not legal to make the flight that had been conducted. The student was advised to fill out a NASA report, in addition to the CASRS report.

The SOF is a revolving position that can be filled by dozens of people. SOF-qualified employees range from part-time CFIs to full-time faculty. However, with so much going on at the desk, it is understandable that an SOF could miss checking some documents for solo students. To assist, a laminated sheet had been stored at the desk, prompting SOFs to look for specific documents, such as a student's pilot license, medical, pilot qualification card, and more. Upon discussion within the committee, it was discovered that "appropriate logbook endorsements" was missing from that checklist. This left the possibility of a repeat occurrence open. A member of the safety committee volunteered to re-do the checklist to include endorsements, and it now hangs at the SOF desk.

These instances and resulting safety committee actions show that the system is working. They are specific and are in addition to the intangible benefits resulting from the committee's work. These examples show that if the committee sees a sharp rise in reports of the same nature or an alarming increase in frequency, problems truly can be corrected with the appropriate action. CASRS and the safety committee are intended to collect reports, analyze them, and prevent them from happening again. These instances prove that the committee and CASRS are both effectively doing just that.

Recommendations for Improvements to CASRS

It is clear both overall and statistically that CASRS is effective and successful in its mission to promote and increase safety at the College of Aviation, but no system is without flaws. No system is without areas that can be targeted for improvements. There are a few areas in which CASRS can be improved, and they can be understood after gaining first-hand experience with the system and the committee.

Recommendations to Committee Members

While it seems simple, one way the system can be improved is with timely voting by committee members. Safety committee meetings occur on Tuesday morning, but the reports are assigned well in advance. An email reminder is sent a few days before each meeting. However, at many meetings, the votes on some reports have not been submitted. In times when the assigned member is absent, it can lead to situations where a report may be voted on and given a risk level by the committee based on a less than ideal amount of information, such as first-hand discussions with those involved in the report. There are some cases in which members have both voted, but the system failed to properly code their votes, indicating a bug of some sort. Regardless, if members are given a deadline to submit votes, such as the close of business two days prior to the meeting, it could allow the staff members who facilitate the system to properly code all reports prior to the meeting. This could eliminate the situation where a report is either tabled for the next meeting or voted on with minimal information, and help identify times when a bug is preventing votes from being submitted.

Recommendations to the College of Aviation Leadership

Flight instructor training

Many of the reports submitted to CASRS come from flight instructors. CFIs are present on most flight events. While flying is not the only safety-sensitive activity in which the CoA is engaged, it makes up the vast majority of reports due to the high volume of flight events. There are fewer CFIs than active flight students, but most reports tend to come from CFIs. This is partly because CFIs are taught how to submit CASRS reports during basic standards. However, the proper way to use the system is still lost on many, likely due in part to the fact that new-hire standards can be a lot of information overload. In order to keep the CASRS system active and at the forefront of the minds of instructors, it is recommended that each year at a CFI meeting, a refresher course be taught over CASRS. This can be done on a yearly basis, similar to the annual TSA training that employees must go through. Doing so would provide a supplement to the training at basic standards but emphasize yet again the college's dedication to safety. If more CFIs know how to submit reports, training could increase the number submitted, having a positive impact on safety.

Risk assessment matrix

When committee members vote on reports, they must identify a risk level. The member uses the report's details to code it green, yellow, or red, with red being the most severe and indicating that immediate action must be taken. Despite the importance placed on risk level, members are given no formal guidance during voting for which criteria could make a report green, yellow, or red. It leaves the color up to a certain level of subjectivity and can even lead to reports of the same event type (ex: magnetos left on) being coded as different colors. This inconsistency is not beneficial. It is recommended that a formal risk assessment matrix, similar to that included below, be incorporated into the system to ensure more consistent coding of reports. Reports could be coded into the same colors based on the frequency or likelihood that the event would happen again and the severity of the consequences resulting from the incident reported. This matrix still has an element of subjectivity but is a step in the right direction by providing members with some guidance while voting, which can help risk level assignment be more consistent.

Severity / Likelihood	Minimal 5	Minor 4	Major 3	Hazardous 2	Catastrophic 1
Frequent A	[Green]	[Yellow]	[Red]	[Red]	[Red]
Probable B	[Green]	[Yellow]	[Red]	[Red]	[Red]
Remote C	[Green]	[Yellow]	[Yellow]	[Red]	[Red]
Extremely Remote D	[Green]	[Green]	[Yellow]	[Yellow]	[Red]
Extremely Improbable E	[Green]	[Green]	[Green]	[Yellow]	[Red] * [Yellow]

High Risk [Red]
Medium Risk [Yellow]

* High Risk with Single Point and/or Common Cause Failures

(FAA, May 2, 2017)

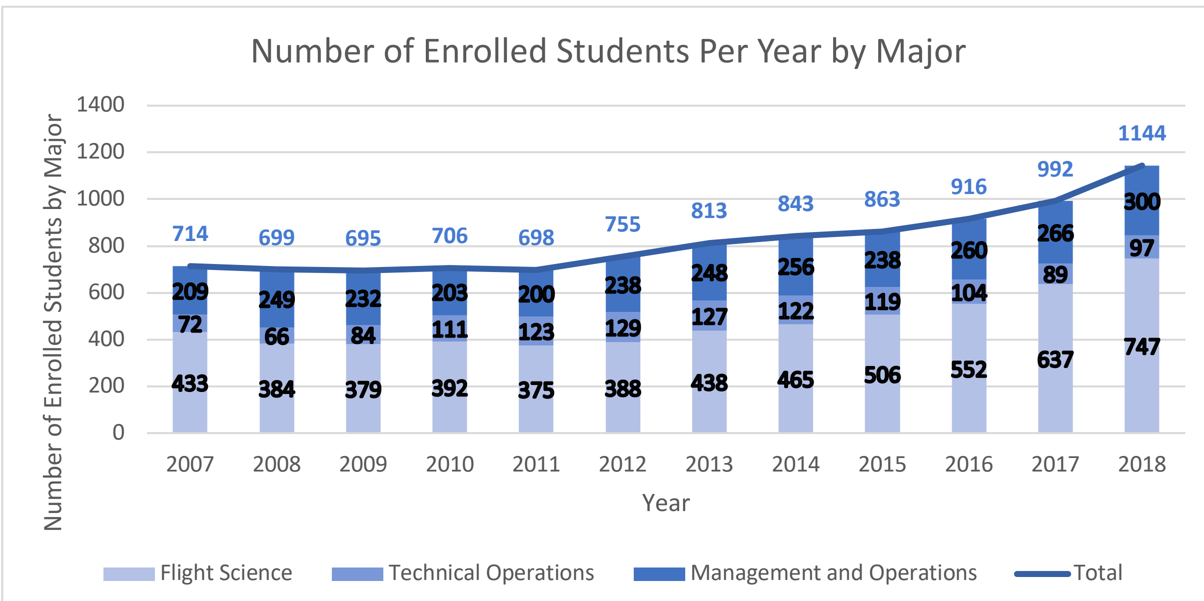
<u>Flight operations manual update</u>

CASRS is a non-punitive system which allows reports to be submitted anonymously. CASRS is referenced and described in the WMU Flight Operations Manual (FOM) under section 2.6. It says that pilots are "expected" to report safety concerns, and does mention that they can be submitted anonymously (College of Aviation, August 15, 2017). However, the formal description in the FOM makes no mention of the non-punitive nature of the system. While the WMU website does indicate "remediation without retribution," (College of Aviation, 2019), that is not a formal document with the same level of authority as the FOM. A just culture leads to increased reporting and helps with trend identification. A just culture begins with an atmosphere of trust where people are encouraged to submit safety reports, not an atmosphere where people are afraid to submit reports for fear of retribution (Global Aviation Information Network, 2004).

It would be beneficial to formally state the non-punitive nature of the system in the FOM, confirming to all that CASRS is not designed to punish.

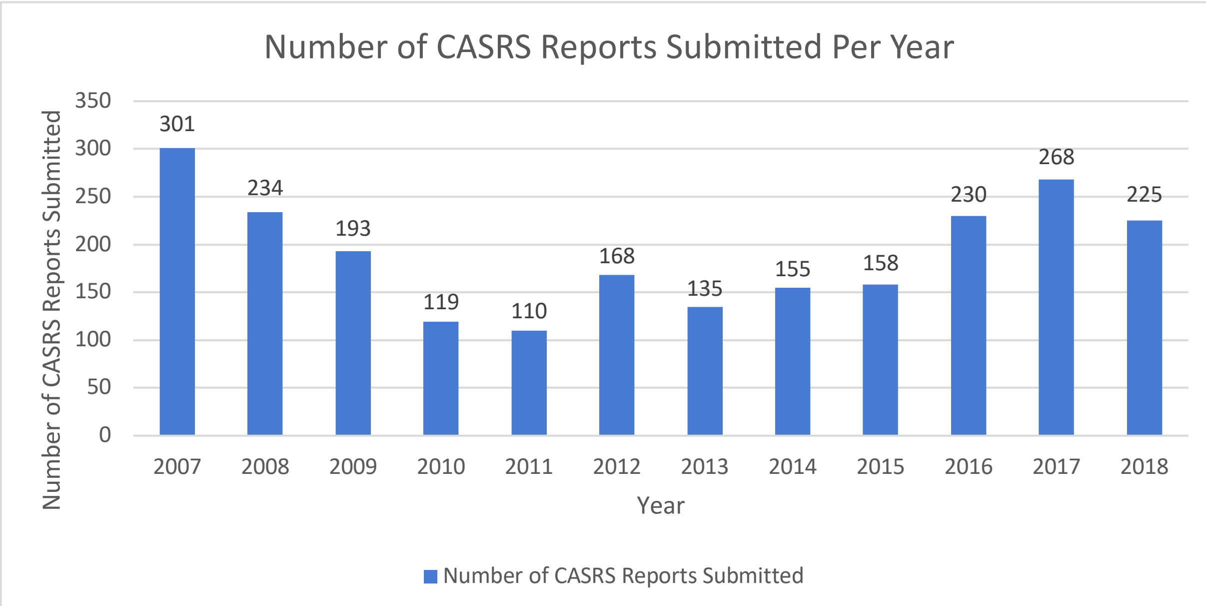
CASRS integration with required classes

CASRS was created in 2006, and the College of Aviation has grown significantly since then, seeing steady increases in enrollment in every year since 2012 (Western Michigan University Office of Institutional Research, 2007-2018). The number of safety sensitive students (defined as flight science students and technical operations students) has also increased. But has the number of CASRS reports changed along with the number of safety-sensitive students? Has it changed with the number of flight hours flown each year? The following is a graph showing the number of students enrolled in each program for each full year of CASRS data, 2007-2018.

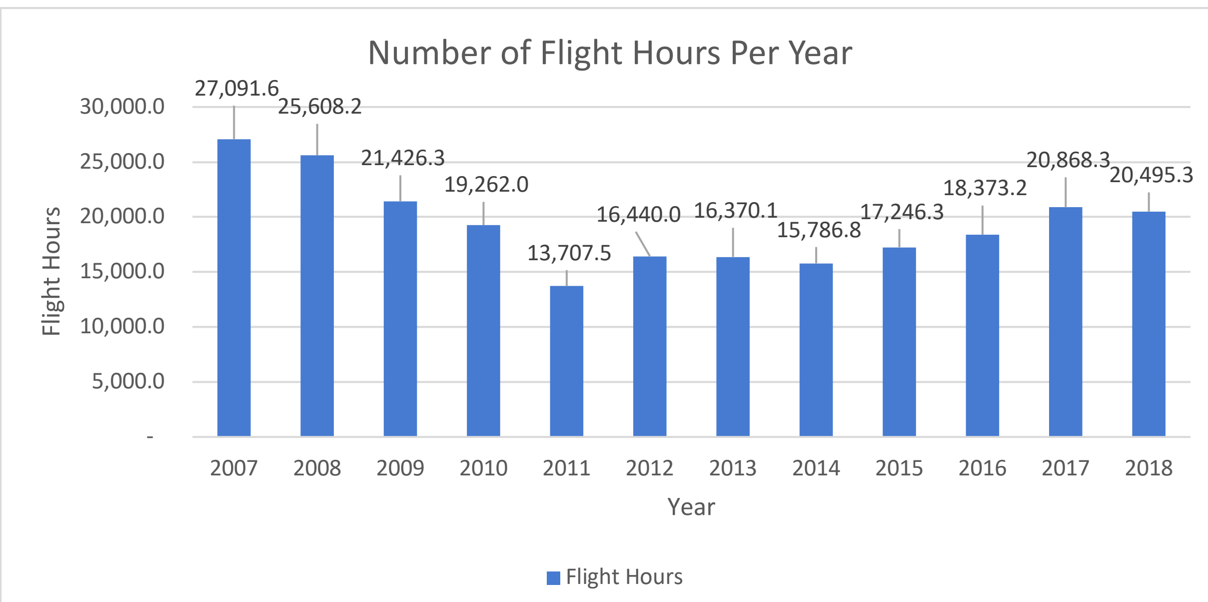


(Western Michigan University Office of Institutional Research, 2007-2018).

That graph shows a steady rise in students from 2012 to 2018. Next is a graph showing the number of CASRS reports submitted each year from 2007 to 2018. It is followed by a graph depicting the number of flight hours performed each year since 2007.

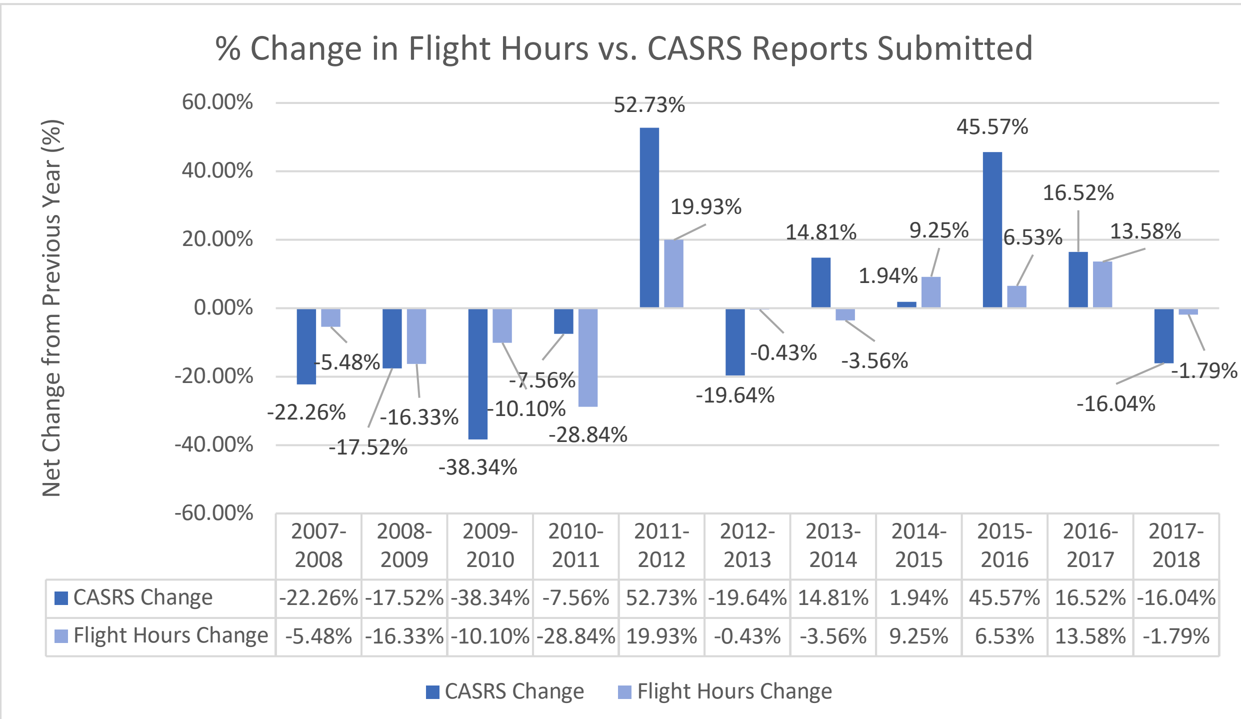


(CASRS, 2006-2019).



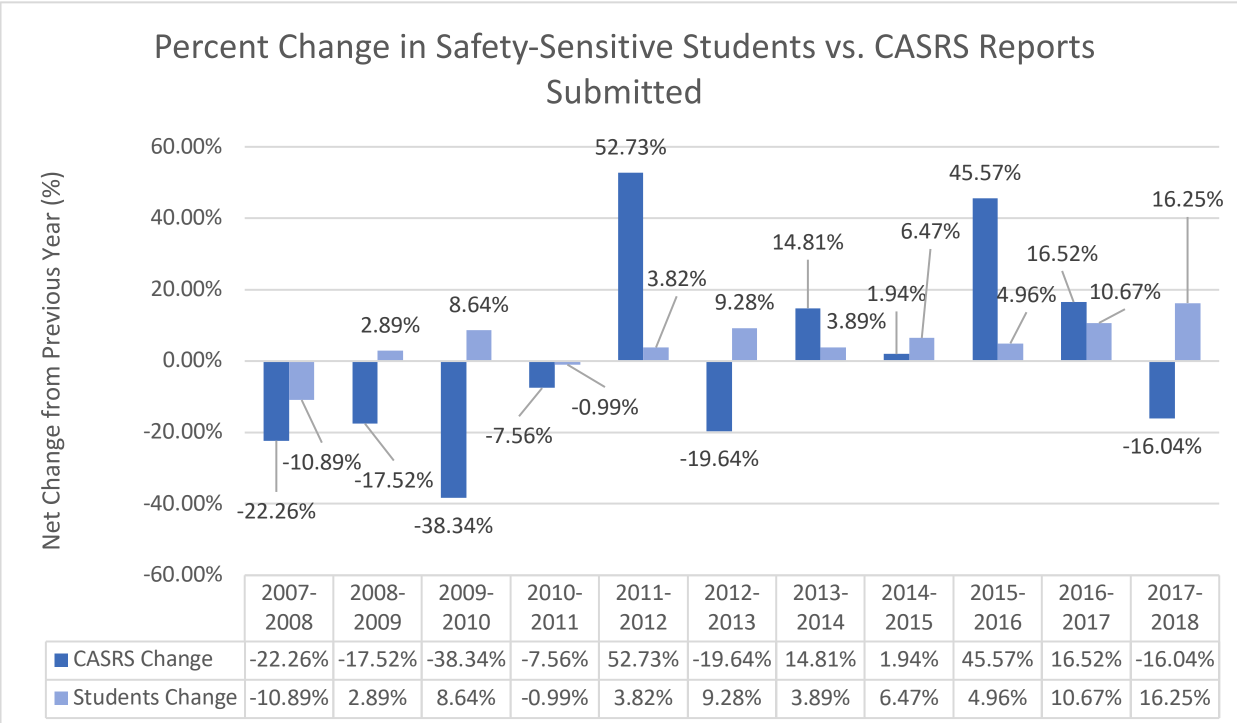
(College of Aviation, 2007-2018).

These seem to show a solid trend, indicating that the number of CASRS reports is tied to the number of flight hours performed. That is intuitive; it makes sense that the more the college flies, the greater the number of reports should be submitted, because the more the college flies, the more its members are exposed to potentially risky situations. However, comparing the percentage or net change of each category year to year shows a bit more.



(CASRS, 2006-2019) (College of Aviation, 2007-2018)

While it is true that every year besides 2013 to 2014 saw the number of reports change in the same direction as the number of flight hours, the change was not always on the same scale, as could be expected. Some years, the number of flight hours dropped dramatically (ex: -19.64% 2012-2013), while the number of CASRS reports was significantly different (only -0.43%). From 2015-2016, the number of flight hours performed rose an astounding 45.57% over the previous year, but the number of CASRS reports only grew 6.53%, much less than other years. This suggests that there is more to the puzzle than a simple, linear relationship between the number of hours flown and the number of reports submitted.



	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
CASRS Change	-22.26%	-17.52%	-38.34%	-7.56%	52.73%	-19.64%	14.81%	1.94%	45.57%	16.52%	-16.04%
Students Change	-10.89%	2.89%	8.64%	-0.99%	3.82%	9.28%	3.89%	6.47%	4.96%	10.67%	16.25%

(CASRS, 2006-2019) (College of Aviation, 2007-2018)

A comparison of the percent change in safety-sensitive students vs. CASRS reports submitted shows much of the same. There were four years where the trends went in opposite directions, as the CoA saw a decline in enrollment of safety-sensitive students, but a rise in CASRS reports (2008-2009, 2009-2010, 2012-2013, and 2017-2018). In the 2011-2012 year, WMU had 52.73% more safety sensitive students in the CoA. However, CASRS reports rose only 3.82%, which does not come even close to matching the trend, especially seeing that in other years, the number of safety sensitive students went down while reports submitted went up.

These graphs show that there is more at play than simply the number of safety-sensitive students, or the number of flight hours flown. A system like CASRS does not work without self-reporting. It does not work without consistent and strong promotion of the system to students and staff. If more students know about the system, know how to use it, and know the benefits it provides to aviation safety, they are more likely to submit a report when the time comes that it is necessary. Therefore, it is recommended that a discussion of CASRS and a tutorial over how to use it be included in AVS 2050: Aviation Safety.

Aviation Safety is a required course for each aviation student. This ensures that each student who graduates from this program has an opportunity to learn about CASRS. In addition, it is a lower level class, meaning that students have the ability to benefit from learning about CASRS early on, perhaps before they even begin flying or taking maintenance classes that deal with dangerous chemicals or substances.

The discussion about CASRS could be a scenario-based lesson where students are assigned a specific scenario and tasked with submitting a report. CASRS has a trainer website that allows students to submit a phantom report. Upon submission of the report, this test site sends the report to a database separate from the one that stores real reports. It gives users the ability to use a replica of the system, but without interfering with overall operations. The CASRS (or ASRS) system would be an excellent database and source of real-life scenarios that could be used for training (Frank, Mangold, Morrison, n.d.).

Students could submit their own report, be assigned to reports submitted by other students, and follow through the process of reviewing and voting on a report like the safety committee does. It would work them through the process of a CASRS report from start to finish, greatly expanding their knowledge of the top-down approach used at WMU. Students would get experience with the system, making them more likely to use it in a real scenario, but they would also benefit from seeing the importance of the system and seeing how the safety committee works. Coupled with a discussion of how CASRS fits into SMS, it could be very beneficial.

A 2015 report examined classes involving SMS education in collegiate aviation programs, and it found that common topic areas in those courses include risk management, safety assurance, safety promotion, and the development and analysis of aviation safety programs (Velazquez & Bier, 2015). As it was already shown how CASRS and ASRS include elements of each concept, then the CASRS lesson would fit well into any one of those topics.

Report sharing

In aviation, everyone benefits from a free flow of safety-related information between various entities in the industry. WMU is not the only collegiate flight program in the country, and it is not the only school to operate Cirrus SR20 or Piper Seminole aircraft. Many of the events that WMU experiences are likely experienced by other flight schools or operators of those particular aircraft. In the interest of transparency and open communication to facilitate safety, it is recommended that CoA leadership reach out to other schools of our stature such as ERAU, UND, and Purdue to discuss a potential partnership to include sharing de-identified reports. If WMU can learn from the reports and create policies to help solve them, then all indications would point to another similar collegiate program and SR20 operator such as Purdue being able to do the same. In open communication and when safety is involved, everyone wins if more is known about how to keep students safe.

This sharing of databases and lessons learned could also open new solutions. Maybe WMU has a system more effective than Purdue at reducing incidents of CAPS pins being left out, or vice versa. Despite these schools being competitors when it comes to students, there is no competition in safety. This would open safety systems to peer review, which some call a professional responsibility. Many also note that peer review also provides a great opportunity for increased quality and value as far as safety systems are concerned (Canders, 2016).

It is also recommended that the College of Aviation leadership work with WMU leadership to determine if there are any other departments or colleges at WMU that could benefit from confidential incident reporting. A document published by NASA's ASRS explores the cross-industry applications of a confidential reporting model. It explores specifically some other industries that could benefit from a confidential reporting system, including the medical industry and the security industry (Connell, n.d.). This report brings up a fascinating but powerful point: incident reporting can lead to a safer healthcare system and a safer security system. For example, it is easy to see how the world could learn from a doctor who reports a mistake in surgery or a security officer who reports how a security procedure was circumvented and what the solution was. The system could also have applications to programs like Chemistry that deal with dangerous chemicals and strict safety protocols. It would likely be beneficial for the College of Aviation leadership to work with the Provost to introduce the subject and explore whether CASRS, modeled in its own way for other departments, could have value for the WMU Police Department, the WMU Homer Stryker M.D. School of Medicine, or other departments.

Improvements to CASRS coding

The CASRS interface itself is not quite as user-friendly or bug-free as it could be. The system contains a fair amount of broken links. For example, clicking on the tab called "CASRS Wiki" at the bottom takes users to a page that no longer exists. Clicking on "management" and then "analyze data" takes users to a page with five options; of the five, two links, "view all data (de-identified)" and "data de-identified by causal factor/event type" are broken links. Clicking on them simply takes users to a blank white page. Additionally, when viewing the results of a criteria-based search, users are given a list of reports that matched the criteria. Clicking on the hyperlink under "Report ID" simply takes users to a page which says, "no reports match your criteria." As discussed already, several committee members have indicated that they voted in agreement with each other, but the system failed to properly record their votes. The system is maintained on a part-time, volunteer basis by a former employee. Nevertheless, it could certainly be improved if a list of broken links or bugs was provided as a suggestion to be fixed. After all, improvements to CASRS lead to overall improvements to safety.

Conclusion

SMS, the newest trend in aviation, is a four-pillar approach to safety management which is considered by many to be the next step in improving aviation safety. NASA's nationwide ASRS program captures those four pillars, safety policy, safety risk management, safety assurance, and safety promotion, in a single, confidential incident reporting program. That program is aimed at making the aviation industry safer through self-reporting and risk identification/mitigation. On a smaller, college wide-level, the College of Aviation's CASRS program matches ASRS' application of the four SMS pillars, through a similar self-reporting model. This tool has been proven to be greatly effective at incorporating SMS components while reducing repeat safety incidents and identifying new risks facing the College of Aviation. There is certainly room for improvement, but overall this system is doing an excellent job of fulfilling the role for which it was intended.

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