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GENERAL AVIATION SECURITY: A SAFETY MANAGEMENT SYSTEM MODEL FOR COLLIGATE LEARNING

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Abstract

A well constructed plan-do-check-act (PDCA) tool, in the context of a Safety Management System (SMS), and incorporating a structured field survey, can help students prepare for real-world problems, situations and crises in general aviation (GA) security by providing an actual professional environment to study. Thus, through the examination of an actual GA airport, students are given the opportunity to work issues through the trials, tribulations, experiences, and research findings of others. In this paper all the elements of GA airport security plan are analyzed at the collegiate level. It is suggested that this PDCA tool be implemented as a SMS model for the study of future airport security courses used in the collegiate environment.

Introduction to General Aviation Security

Providing effective general aviation (GA) security is a complex problem because of the size of an airport, the diversity among users, and the unpredictable nature of terrorism. A comprehensive SMS approach to all elements of GA security is a goal to strive for while recognizing the complexity of airport security programs. Title 49 Code of Federal Regulations will continue to evolve as new technologies and capabilities are developed; as will the protocols for GA security measures to prevent terrorist acts against the United States (Transportation Security Administration, 2008)

According to the FAA (200) the background of SMS stems from a systematic, proactive, and well-defined safety program. A SMS approach:

> ... allows an organization producing a product or service to strike a realistic and efficient balance between safety and production. The forecast growth in air transportation will require new measures and a greater effort from all aviation producers—including airport operators—in order to achieve a continuing improvement in the level of aviation safety. The use of SMS at airports can contribute to this effort by increasing the likelihood that airport operators will detect and correct safety problems before those problems result in an aircraft accident or incident. (¶ 1)

Role of the Transportation Security Administration

The Transportation Security Administration (TSA) is required to prescribe rules to protect persons and property on aircraft against acts of criminal violence and aircraft piracy, and to prescribe rules for screening passengers and property for dangerous weapons, explosives, and destructive substances. To carry out the provisions of the Aviation Transportation and Security Act of 2001 (ATSA), the TSA has adopted former FAA rules requiring airport operators, air carriers, indirect air carriers, and foreign air carriers to carry out various duties for civil aviation security. Title 49, Code of Federal Regulations (CFR), incorporates the following Transportation Security Regulations (TSRs) that concern aviation security: Part 1542 applies to certain airport operators; Part 1544 governs certain air carriers; Part 1546 applies to the operation of foreign air carriers; and Part 1548 applies to indirect air carriers such as freight forwarders, who engage indirectly in air transportation of property within the United States and sometimes operate out of GA facilities (Quilty, 2005; Transportation Security Administration, 2008).

TSR Parts 1520, 1540, 1542 and 1548

Part 1520 forbids the disclosure of information that may compromise or be harmful to the safety and security of the traveling public. Additionally, the regulation sets forth the rules that allow the federal government to withhold information from public disclosure even when requested under the Freedom of Information Act (FOIA), in litigation, or in rulemaking. Airport operators and air carriers are required to restrict the availability of information contained in security programs to those with a need-to-know. This need-to-know is defined by the Airport Security Program. Under this Part, airport management must withhold sensitive security information (SSI) from unauthorized disclosure. If SSI is released to unauthorized persons, the TSA must be notified. This permits the TSA to evaluate the risk presented by the release of the information, and to take whatever actions may be needed to mitigate that risk (Quilty, 2005; Transportation Security Administration, 2008).

New Part 1540 outlines the rules that apply to all segments of civil aviation security and includes rules that govern individuals and other persons. This regulation applies both to individuals who work at the airport and to the passengers using airports. Part 1540 also outlines definitions and terms used in Parts 1542, 1548 and others. For example, the widely used term *escort* is given a definition within this regulation. Another significant addition to the regulatory language is the inclusion of *individual accountability*. The TSA believes that "the contribution of individuals to the success of the civil aviation security program cannot be over-emphasized," and for that reason the "agency believes that holding individuals accountable for their security violations will serve as a direct and effective corrective action and may prove to be a positive deterrent" (Quilty, 2005, p.8). The TSA believes that by incorporating a level of individual responsibility in tandem with existing airport security programs a higher level of aviation security integrity will be ensured (Quilty, 2005)

The TSRs contain general requirements for promoting civil aviation security. Each airport operator, air carrier, foreign air carrier, and indirect air carrier covered by these parts is required to have a security program that contains information that specifies how they will perform their regulatory and statutory responsibilities. Again, all these security programs are available only to those persons having a need-to-know (Quilty, 2005; Transportation Security Administration, 2008)

TSR Part 1542 *Airport Security* prescribes rules for airport operators servicing and facilitating U.S. certificated air carriers, foreign air carriers, and both foreign and domestic air cargo carriers. The purpose of Part 1542 is to prevent any act of unlawful interference with the safety of persons and goods in air transportation. To accomplish this goal, the TSA has extended its security regulations to airports as the first practical line of defense (Quilty, 2005; Transportation Security Administration, 2008)

The TSA's congressionally authorized area of jurisdiction and responsibility focuses on protecting persons and property in air transportation against acts of criminal violence, air piracy, and terrorism. However, to effect security of aircraft in-flight, the TSA extends security measures to the airport operator by requiring airport management to regulate the movement of persons and vehicles having access to all aircraft while on the ground and within the airport boundary. In all respects, the security of civil aviation operations begins at an airport's perimeter fence and terminal building interface (Quilty, 2005; Transportation Security Administration, 2008)

Part 1548, indirect air carrier security program, covers security procedures for cargo that are accepted for transport on aircraft. In general, indirect air carriers are required to carry out security procedures for handling cargo that will be carried on aircraft (Quilty, 2005; Transportation Security Administration, 2008)

Aviation Security Advisory Committee

Recognizing the need for tighter GA security at the nation's airports to protect against terrorist threats, vandalism, and other illegal acts on aviation, in April 2003 the TSA requested the Aviation Security Advisory Committee (ASAC) of general aviation professional trade associations such as the Aircraft Owners and Pilots Association (AOPA), National Business Aircraft Association (NBAA), and American Association of Airport Executives (AAAE), etc. to establish a working group made up of industry stakeholders to develop guidelines for security enhancements for GA operations and airports. The working group consisted of the trade associations, airport operators, and state and federal government representatives.

Members of the working group engaged in extensive meetings to review GA airport security recommendations and to develop a list of GA *best practices*. As a result, a list of best practices was designed to establish non-regulatory standards for GA operations and security. The primary purpose was to assist GA operators in the prevention of terrorist acts using GA aircraft against the United States. (Transportation Security Administration, 2006)

On November 17, 2003, the ASAC communicated their recommendations to TSA. TSA used this document as a baseline from which to draft a document titled *Security*

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Guidelines for General Aviation Airports. This document was intended to provide GA airport owners, operators, and users with the guidelines concepts, technology, and enhancements to secure aircraft and facilities, as well as mitigate terrorist activities (Transportation Security Administration, 2006).

Based on the list of GA *best practices* recommended by the ASAC, students could use the survey instrument below to study GA security at a local airport. Students would first need to obtain the permission from a local airport operator to survey their airport security posture. In the case of several universities with aviation programs, such as the University of Central Missouri, this may include a university owned GA airport.

General Aviation Security Survey

According to the Transportation Security Administration (2006) a number of issues should be addressed by the owners/operators of GA airports. The main purpose of this survey is to establish the operational status of airport security in relation to the operational recommendations of the ASAC. The resulting survey report will comprise three parts:

1. Fact-finding Survey,
2. Gap Analysis, and
3. Risk Assessment

The fact-finding part displays compliance or non-compliance covering the relevant security areas. Fact-finding survey results will form the basis for the gap analysis and risk assessment against standards and recommended ASAC guideline. For purposes of this model, the following survey is proposed for student learners:

Personnel

Passengers

1. Do the Pilots-in-Command of GA aircraft ensure that the identity of all occupants is verified; that all occupants are aboard at the invitation of the pilot, and that all baggage and cargo is known to the occupants?

Pilots

2. Do pilots using the airport (excluding transient pilots) have government-issued photo identification?

Student Pilots

3. Do aircraft owners control aircraft ignition keys so that the student pilots cannot start aircraft until instructors are ready for a flight to begin? Or, do student pilots have limited access to aircraft keys until the student pilots have reached an appropriate point in their training curriculum?
4. Do student pilots check-in with a specific employee (i.e. dispatcher, aircraft scheduler, flight instructor, or other "management" official) before being allowed access to parked aircraft?
5. Do student pilots sign or initial a form then not receive keys until an instructor or other "management official" also signs or initials?

Flight Schools and Aircraft Renters

1. Does the school/renter require the identity of all individuals renting an aircraft to be verified by checking a government-issued photo ID as well as the airman certificate and current medical certificate (if necessary for that operation)?
2. In addition to any aircraft-specific operational and training requirements, are first-time rental customers asked to familiarize themselves with local airport operations, including security procedures used at the GA facility?
3. Do operators renting aircraft look for suspicious activities and report these activities to appropriate officials? This applies to individuals that inquire about aircraft rental without possessing the necessary knowledge or certifications to operate such aircraft.

Transient Pilots

1. Are there sign-in/sign-out procedures for all transient operators identifying where their parked is aircraft?

Aircraft

Securing Aircraft

2. Are pilots directed to make it as difficult as possible for an unauthorized person to gain access to their airplane? This would include using existing mechanisms such as door locks, keyed ignitions, hangaring aircraft or using an auxiliary lock to further protect aircraft from unauthorized use. Commercially available options for auxiliary locks include locks for propellers, throttle, and prop controls, and tie-downs. Are hangar doors locked to prevent

unauthorized access or tampering with the aircraft is important?

Airports/Facilities

Airport Vehicle Access

3. Is vehicle access restricted to facilities and ramps? Are there signage, fencing, gates and/or other positive control techniques in place? This must include restricting access to the airside to as few locations as possible, balancing the need for authorized access with access control.
4. Where there is access control, is it periodically reviewed for access authorization -- including codes, cards and locks -- to vehicular and pedestrian gates leading to airside?

Lighting

1. Are outdoor areas lighted to help improve the security of (a) aircraft parking and hangar areas; (b) fuel storage areas, (c) airport access points; and other appropriate areas? Are proximity sensors used?

Hangars

2. Are hangar/personnel doors secured when unattended?

Signage

3. Is appropriate signage posted? Wording may include -- but is not limited to -- warnings against trespassing, unauthorized use of aircraft and tampering with aircraft as well as reporting of suspicious activity. Does signage include phone numbers of the nearest responding law enforcement agency, 9-1-1, or TSA's 1-866-GASECURE, whichever is appropriate?

Surveillance

Airport Community Watch Program

1. Is there an established Airport Watch Program in effect?
2. Is there a Aircraft Owners and Pilots Association Airport Watch Program in effect?

Law Enforcement Officer Support

1. Have procedures been developed by the airport operator to have security patrols for ramp, aircraft hangars, and parking areas?
2. Has the airport operator communicated and educated local law enforcement agencies on security procedures at the airport? This should include include: What does a pilot license look like; who is authorized to drive on the ramp; how do you get airport access (who has key); and what are "normal" operations?

Security Plans and Communications

Security Plan

1. Is there an emergency locator map at the airport? Does it identify gates, hydrants, emergency shelters, buildings and hazardous materials sites on a grid map? Is a copy of this map provided to fire and law enforcement agencies? Are procedures established for handling bomb threats and suspect aircraft?

Threat Communication System

2. Has the airport operator developed a tiered comprehensive local phone and contact list and distribute on a need-to-know basis. Include the following 24-hour phone numbers on the contact list.
3. Does the airport operator have radio communication capabilities with local law enforcement?
4. Are the TSA and industry best practices posted on the airports web site and relate information about securing aircraft and airport facilities?
5. Are security courses available from industry identified on the airport operators web site? This should include those from the American Association of Airport Executives, Aircraft Owners and Pilots Association, Experimental Aircraft Association, and National Air Transportation Association.
6. Does the airport operator communicate all new security policies and procedures to airport tenants and the flying public when issued by the TSA?
7. Does the airport operator conduct regular meetings with airport tenants

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and the flying public to discuss the security issues and challenges?

8. Does the airport operator have a qualified, single Point-of-Contact (POC) for disseminating security information?

Specialty Operations

Agricultural Aircraft Operations

1. Does the airport operator direct each owner/operator of agricultural aircraft to take appropriate steps to secure the aircraft when unattended? Examples of existing mechanisms include throttle and control locks, propeller locks and hidden ignition switches. When storing aircraft, does the airport operator recommend that aircraft be stored in hangars with steel doors that are locked with electronic security systems? When hangers are not available for storage, does the airport operator recommend that heavy equipment be parked in the front and back of agricultural aircraft when not in use? (pp. 8-19)

Safety Risk Management

According to the FAA (2007), safety risk management (SRM) "... is a fundamental component of SMS. To be truly effective a SMS must have a formal risk assessment program that identifies and documents hazards on the airport" (p. 9). The FAA (2007) further states that an SRM:

- determines associated risk(s)
- identifies the severity and probability of the occurring risk(s)
- develops mitigation strategies as appropriate
- applies, tracks, and monitors the mitigation strategy
- assesses and modifies strategies as necessary

A hazard is a condition, object or activity with the potential for causing damage, loss, or injury. A risk is the chance of loss or injury measured in terms of severity and probability. (p. 9)

The PDCA Cycle

A plan-do-check-act (PDCA) cycle can be used effectively to implement the SRM. The PDCA cycle is a widely-known and very popular tool; in fact, the Airports Council International has endorsed this classic tool in its education and deployment strategy (see http://www.aci-safetynetwork.aero/). The PDCA cycle was developed by Dr. Walter Shewhart, and made popular by Dr. Edwards Deming, considered the father of modern quality control. PDCA should be thought of as a continuous cycle, repeating as quickly as possible, in upward spirals that converge on the ultimate goal. The cycle accounts for limitations in knowledge and skills as well as the subsequent increase in knowledge as you work your way through the process, providing rapid improvement. The PDCA cycle is an iterative four-step quality control process. The elements include: a) plan, b) do, c) check, and d) act. In the context of SMS, the cycle should be thought of as a cycle within a system of cycles that makes up a security management system (Dartmouth College, n.d.). The power of this method is simplicity as it is very easy to comprehend as follows:

1. Plan - Establish the objectives and processes necessary to identify and deliver the stated security objectives.
2. Do - Implement the processes to carry out the plan.
3. Check - Monitor and evaluate the processes and results against the stated objectives and report the outcomes.
4. Act - Apply actions to the outcomes for necessary improvements and/or corrections. This means reviewing all steps (Plan, Do, Check, Act) and modifying the process to improve the results before its next implementation (see figure 1 below).

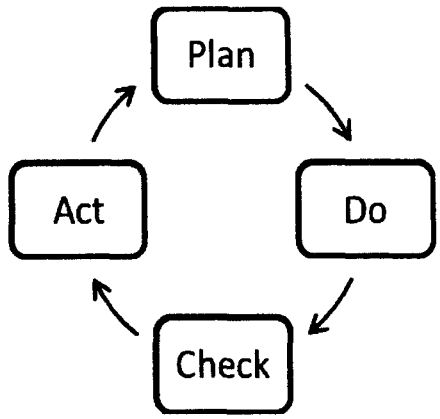

Figure 1. The PDCA Cycle

Using the survey and the PDCA Cycle to Identify the Gap

Using the airport survey, several site visits and the PDCA cycle, learners can perform a risk assessment and a gap analysis to identify the gap between the optimized security outcomes recommended by the ASAC and the integration of these outcomes by the airport operator at the airport studied. This helps provide students with insight into areas that have room for improvement. The gap analysis process involves determining, documenting and approving the variance between recommended ASAC security measures and the risk assessment and current capabilities at the airport studied (Dartmouth College, n.d.).

Risk Assessment

Learners can then use the risk assessment criteria of AC 150/552—37 to assess the security risk. The risk levels used in the FAA (2007) matrix are defined as:

1. High risk – Unacceptable level of risk: The security measure should not be implemented or the activity continued unless hazards are further mitigated so that risk is reduced to medium or low level. Tracking and management involvement are required, and management must approve any proposed mitigating controls. Catastrophic hazards are caused by:
   a. single-point events or failures
   b. common-cause events or failures
   c. undetectable latent events in combination with single point or common cause events are considered high risk, even if extremely remote
2. Medium risk – Acceptable level of risk: Minimum acceptable safety objective; the security measure may be implemented or the activity can continue, but tracking and management are required.
3. Low risk – Target level of risk: Acceptable without restriction or limitation; the identified hazards are not required to be actively managed but are documented.

Hazards are ranked according to the severity and the likelihood of their risk, which is illustrated by where they fall on the risk matrix. Hazards with high risk receive higher priority for treatment and mitigation. (p. 11)

The risk assessments are based on the risk assessment in table 1 below.

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Table 1
Risk Assessment Matrix

Severity / Likelihood	No Safety Effect	Minor	Major	Hazardous	Catastrophic
Frequent					
Probable					
Remote					
Extremely Remote					
Extremely Improbable					

Low Risk
Medium Risk
High Risk

Note. Source: (FAA, 2007)

Student Recommendations

Gap analysis naturally flows from benchmarking and other assessments. Once the general expectations of performance in security are understood, it is possible for students to compare those expectations with the level of performance at which the airport currently functions. The comparison of the risk assessment to the level of the security measures identified in the survey instrument forms the gap analysis, which is the basis for learner recommendations at the conclusion of the exercise (FAA, 2007).

Conclusion

General aviation security is a complex problem because of the diversity among aircraft types, airports, and GA operational considerations as well as the unpredictable nature of terrorism. Much vulnerability exists at airports that can be exploited. This model provides students with a comprehensive approach to understanding and using the elements of GA airport security. It also provides information necessary to recognize the complexity of good GA airport security programs. The TSRs and GA airport security will continue to evolve as new technologies and capabilities are developed. Protocols for new security processes will be developed and implemented at GA facilities. The knowledge of some of these protocols and new GA airport security processes can be gained by use of this model in colligate learning.✈

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