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Security of Air Cargo Shipments, Operations, and Facilities

Updated January 24, 2018

Congressional Research Service
https://crsreports.congress.gov
R45082

CRS REPORT
Prepared for Members and
Committees of Congress

Summary

U.S. policies and strategies for protecting air cargo have focused on two main perceived threats: the in-flight detonation of explosives concealed in an air cargo shipment and the hijacking of a large all-cargo aircraft for use as a weapon to attack a ground target such as a major population center, critical infrastructure, or a critical national security asset. Additionally, there is concern that chemical, biological, or radiological agents or devices that could be used in a mass-casualty attack in the United States might be smuggled as international air cargo.

The October 2010 discovery of two explosive devices being prepared for loading on U.S.-bound all-cargo aircraft overseas prompted policy debate over air cargo security measures and spurred debate regarding targeted risk-based screening versus comprehensive 100% screening of all air cargo, including shipments that travel on all-cargo aircraft. In coordination with industry, Customs and Border Protection (CBP) and the Transportation Security Administration (TSA) have been pilot testing a risk-based approach to vet air cargo shipments known as the Air Cargo Advance Screening (ACAS) system, with a particular emphasis on improving scrutiny of overseas shipments. In the 115th Congress, the Department of Homeland Security Authorization Act (H.R. 2825), as well as the Air Cargo Security Improvement Act of 2017 (H.R. 4176), would require the full deployment of ACAS for inbound international air cargo.

With respect to protecting passenger airliners from explosives placed in cargo, policy debate focused on whether risk-based targeting strategies and methods such as ACAS should be used to identify shipments requiring additional scrutiny or whether all or most shipments should be subject to more intensive physical screening. While the air cargo industry and TSA argued for risk-based approaches, Congress mandated 100% screening of all cargo placed on passenger aircraft using approved methods in 2007. To meet this requirement, TSA established a voluntary Certified Cargo Screening Program (CCSP) that allows TSA-approved cargo screening, carried out by industry personnel, to take place at off-airport manufacturing sites, warehouses, distribution centers, and freight transfer facilities. This off-airport screening is coupled with strict chain-of-custody measures designed to maintain the integrity of screened cargo.

To increase flexibility under CCSP, there has been recent interest in expanding the role of canine explosives detection teams to screen air cargo, and industry has advocated for the use of third-party canine teams, particularly at off-airport air cargo screening facilities. H.R. 2825 would direct TSA to develop standards for third-party canine explosives screening for air cargo.

A number of other policies under consideration in Congress include

- cooperative efforts with international partners and industry stakeholders;
- the implementation challenges and effectiveness of risk-based targeting approaches like ACAS;
- TSA oversight of the Certified Cargo Screening Program (CCSP);
- the feasibility and challenges of using third-party canine teams for explosives screening; and
- the costs and benefits of requiring blast-resistant cargo containers to protect aircraft from in-flight explosions in cargo holds.

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The Air Cargo Industry

The air cargo industry consists of a complex distribution network linking manufacturers and shippers to freight forwarders, off-airport freight consolidators, and airport sorting and cargo handling facilities where shipments are loaded on and unloaded from aircraft.[1] While only a small fraction of cargo shipments travels by air, items shipped on aircraft generally consist of time-sensitive and high-value commodities. By weight, air freight comprised only 0.05% of all domestic and international shipments to U.S. points in 2015, but these accounted for 6.1% of the value of freight shipments.[2]

Common examples of air cargo include high-value machine parts and manufacturing equipment, electronic components for manufactured goods, consumer electronics, jewelry, and perishable items such as flowers, fruits, and fresh fish. Specialized freight that requires specific handling—such as unique scientific instruments, highly specialized tools and equipment, and even thoroughbred horses—is also transported as air cargo. Most outbound air cargo packages are consolidated at off-airport facilities and arrive at airports on bulk pallets or in special containers known as unit load devices. It is estimated that about 75% of all air cargo by weight travels on bulk pallets.[3]

Typically, shippers have no foreknowledge of the route or aircraft by which a particular shipment will be transported. Freight forwarders and airlines make such determinations, using logistics software, databases, and computerized flight schedules to optimize the flow of air cargo. Both domestic and international air cargo movements generally rely on a hub-and-spoke network of airports to link origins and destinations. Most international air cargo that enters the U.S. transits through large hub facilities in Europe and Asia.

While business and consumer demand for the fast and efficient shipment of goods fueled rapid growth in the air cargo industry in the 1980s, 1990s, and early 2000s, the industry saw little growth over the past decade, and it was not until 2017 that air cargo shipments surpassed 2007 levels reached prior to the 2007-2009 recession. Through October 2017, however, air cargo activity increased more than 10% from 2016 levels, the largest year-over-year growth in more than a decade, with the largest growth seen among international shipments to and from the United States, particularly shipments from Europe. The Federal Aviation Administration (FAA) forecasts that steady U.S. and world economic growth will drive more modest annual increases of about 3% in air cargo shipments over the next two decades,[4] while Boeing notes that e-commerce could spur additional demand for worldwide air freight shipments.[5]

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[1] Shippers are the owners of air cargo items and may be either individuals or businesses. Freight forwarders are brokers or middlemen that do not operate aircraft, but make arrangements for moving cargo and may operate distribution centers that store incoming shipments and then send them on to final recipients. Since freight forwarders do not operate aircraft, but broker air cargo services, they are referred to in regulation as indirect air carriers (IACs).

[2] Department of Transportation, Bureau of Transportation Statistics, *Freight Facts & Figures 2017—Chapter 2: Freight Moved in Domestic and International Trade*, https://www.bts.gov/bts-publications/freight-facts-and-figures/freight-facts-figures-2017-chapter-2-freight-moved.

[3] Andy Pasztor, Keith Johnson, and Daniel Michaels, "Focus on Cargo Security Steps," *Wall Street Journal*, November 1, 2010.

[4] Federal Aviation Administration, *FAA Aerospace Forecast: Fiscal Years2017-2037*, https://www.faa.gov/data_research/aviation/aerospace_forecasts/media/FY2017-37_FAA_Aerospace_Forecast.pdf.

[5] Boeing, *World Air Cargo Forecast 2016-2017*, http://www.boeing.com/commercial/market/cargo-forecast/.

About 22 billion pounds of freight cargo were shipped on domestic flights in 2016. Of this, FedEx transported about 11.6 billion pounds, while UPS carried about 6.3 billion pounds.[6] Collectively, these two carriers transported about 81% of all domestic air cargo in 2016, and were by far the largest two operators in the U.S. air cargo industry.

Additionally, in 2016, approximately 19 billion pounds of international air cargo were transported to and from the United States. While FedEx and UPS were the largest carriers by weight carried, combined they transported only about 13.2% of international air cargo to and from the United States. Their comparatively smaller role in the international sector reflects a greater number and diversity of air carriers that transport cargo that originates overseas, including a number of relatively small operators and much greater reliance on passenger air carriers.

Passenger aircraft play a greater role in transporting air cargo internationally than within the United States. On international routes to and from the United States, about 38.5% of air cargo by weight is transported on passenger aircraft. In the domestic market, on the other hand, only 5.5% of air cargo is carried in the bellies of passenger planes.[7] This characteristic is of particular interest with respect to potential security vulnerabilities, as cargo shipments could provide a means of placing explosive devices aboard international passenger flights destined for the United States.

Security of air cargo shipments within the United States and international shipments to and from the United States is regulated by the Transportation Security Administration (TSA). Additionally, international air cargo shipments entering the United States are regulated by U.S. Customs and Border Protection (CBP). Over the past decade, particular attention has been devoted to overseeing the security of cargo loaded on passenger aircraft. In addition to domestic operations at about 450 commercial service airports, nonstop flights from about 140 foreign airports in more than 80 countries transport cargo to the United States. TSA points out that a large proportion of the cargo shipped to the United States does not originate at these last-point-of-departure airports and is often carried on multiple legs using both passenger and all-cargo aircraft before being loaded onto a U.S.-bound flight. Addressing potential threats requires security measures along the cargo supply chain, with particular attention to ensuring that risk-based evaluation and physical screening of shipments are conducted using techniques and technologies that comply with statutory and regulatory requirements.[8]

Security Threats to Air Cargo

Despite concern over the potential use of air cargo to introduce an explosive device aboard a passenger aircraft, no such attack has ever been successfully carried out. Concern over this type of threat is largely predicated on the belief that more stringent measures to screen passengers and baggage may cause terrorists to consider the detection of an explosive device in air cargo to be less likely. In response to these concerns, U.S. policy has shifted from risk-based approaches for vetting cargo placed on passenger aircraft to mandatory 100% physical screening requirements for all air cargo that travels within the United States or to the United States aboard passenger aircraft.

[6] CRS analysis of Bureau of Transportation Statistics, Air Carriers: T-100 Domestic Market (U.S. Carriers) data.

[7] All statistics are based on CRS analysis of calendar year 2016 air carrier T-100 domestic and international market data reported to and maintained by the U.S. Department of Transportation, Bureau of Transportation Statistics.

[8] Transportation Security Administration, *Fiscal Year 2016 Congressional Justification, Aviation Security*.

In contrast, all-cargo aircraft have generally been considered less attractive targets for terrorist bombings, and TSA has continued to apply risk-based measures for vetting shipments placed on all-cargo aircraft. Prior to 2010, one of the few known plots to place a bomb aboard U.S.-bound cargo planes in the mid-1990s was broken up and did not result in significant policy changes.[9]

Hijackings

Historically, security measures surrounding all-cargo operations have focused on the threat of hijackings, particularly hijackings that could result in a suicide attack using the aircraft as a weapon of mass destruction. The potential for such an attack was illustrated in a dramatic incident that occurred on April 7, 1994, several years prior to the use of hijacked aircraft to attack the World Trade Center and the Pentagon on September 11, 2001. In the 1994 incident, an off-duty FedEx flight engineer attempted to hijack a FedEx DC-10 aircraft and crash it into the company's Memphis, TN, headquarters. The hijacker boarded the airplane in Memphis under the guise of seeking free transportation (a practice known in the industry as deadheading) to San Jose, CA. His only luggage was a guitar case that concealed hammers, mallets, a knife, and a spear gun. At the time, there was no federal requirement or company procedure to screen personnel or personal baggage carried aboard cargo aircraft. The three flight crew members thwarted the hijacker's attempt to take over the airplane and made a successful emergency landing in Memphis despite all three crew members on board having sustained serious and life-threatening injuries.[10]

Explosives

The threat of explosives has been a long-standing concern for cargo loaded on passenger aircraft. Several incidents have shown that terrorists may seek to target U.S.-bound air cargo shipments, including shipments placed on all-cargo aircraft, by exploiting weaknesses in air cargo security overseas.

On October 29, 2010, intelligence and law enforcement agencies in Dubai, United Arab Emirates, and in the United Kingdom discovered explosive devices concealed in packages shipped as air cargo bound for the United States. According to media reports, the explosives were not detected by initial screening, but were discovered upon reexamination after authorities received a tipoff from a member of the Al Qaeda terrorist organization who had turned himself in to officials in Saudi Arabia prior to the incident.

The first shipment was located among parcels offloaded from a UPS cargo flight that arrived at East Midlands Airport, England, after having transited on all-cargo flights from Sana'a, Yemen, to Dubai; from Dubai to Cologne/Bonn, Germany; and from Cologne/Bonn to East Midlands. The package was scheduled to continue via Philadelphia, PA, to Chicago, IL. The second parcel was discovered on a Qatar Airways passenger jet in Dubai after having flown from Sana'a to Doha, Qatar, and on to Dubai aboard two passenger flights. The package was scheduled to continue on a U.S.-bound FedEx all-cargo aircraft to Chicago via Newark, NJ.[11] Authorities in the United

[9] Mark Clayton, "Yemen Packages: Air Cargo Was a Target Before. Why Is It Still Vulnerable?," *Christian Science Monitor*, November 2, 2010.

[10] Dave Hirschman. *Hijacked: The True Story of the Heroes of Flight 705* (New York: William Morrow & Co, 1997).

[11] Joseph Berger and Robert F. Worth, "Bombs Were Set to Explode Inflight; Officials in Washington Weigh Their Options for Response to Failed Attack," *International Herald Tribune*, November 1, 2010.

Kingdom surmised that the explosives were probably intended to detonate in flight, possibly over a U.S. city, and were capable of bringing down the aircraft.[12]

Both explosive devices contained pentaerythiritol tetranitrate (PETN), a powerful explosive that is difficult to detect, in quantities considered sufficient by explosives experts to cause catastrophic damage to a large airliner if detonated during flight.[13] Their discovery prompted a rethinking of the generally accepted belief that bombing an all-cargo aircraft is considerably less attractive to terrorists than bombing a passenger plane. Much remains unknown about the motives and objectives behind these incidents. The possibility that the terrorists intended to bring about more restrictive regulations and thus cause widespread economic damage to the air cargo industry cannot be excluded.[14]

The details of the October 2010 plot highlighted a number of specific challenges to securing air cargo. First, the explosives were only discovered after a tip from intelligence sources, but even then proved difficult to detect. Reportedly, initial inspections by British authorities at Midlands Airport using canines, explosives detection equipment, and visual searches did not detect the explosives.[15] This raised concerns that well-concealed explosives could be difficult to detect with routine methods of physically screening cargo. Second, the nature of the shipments, given that Yemen is not a usual source of printer cartridges supplied to the United States, raised questions regarding the implementation and effectiveness of risk-based targeting methods to identify suspicious cargo.[16] Third, the multiple international airports and air cargo facilities that served as intermediate transfer points illustrated the highly interconnected nature of the international air cargo industry, which necessitates close collaboration and coordination among governments, forwarders, air carriers, and airport operators to address security. Finally, the transfer of one of the explosives-laden shipments between passenger aircraft and all-cargo aircraft is not unusual, highlighting the fact that passenger and all-cargo shipments cannot be easily divided or treated separately for security purposes without impacting freight logistics.

A plot to bomb a passenger aircraft in Sydney, Australia, in July 2017 revealed that similar weaknesses in the air cargo system may persist.[17] In that plot, bomb-making materials intended to take down the passenger plane were transported from Turkey to Australia undetected in an air cargo shipment. In response to the incident, TSA and CBP mandated 100% screening of all air cargo bound to the United States from Turkey.[18]

The complexities of air cargo operations introduce a number of security challenges. However, they may also render air cargo a less attractive means for terrorists to attack aircraft, as shippers typically lack specific control or foreknowledge of how or when a shipment will travel. Reportedly, the perpetrators of the October 2010 air cargo bomb plot conducted a "dry run" one

[12] "Air Freight from Yemen and Somalia Banned," *BBC News*, November 1, 2010.

[13] "Cargo Bombs Were Powerful Enough to Bring Down Plane, Say Experts," *Daily Post* (Liverpool, UK), November 2, 2010.

[14] Robert W. Poole Jr., "Fighting the Last War on Air Cargo," *Airport Policy News*, Issue 62, November 2010, Los Angeles, CA: The Reason Foundation.

[15] John F. Burns, "Yemen Bomb Could Have Gone Off at East Coast," *New York Times*, November 20, 2010.

[16] See, e.g., Sarah Moore, "Closing the Gaps in Air Cargo Security," *Journal of Transportation Security*, 8, (2015), pp. 115-137; Ellis Mishulovich and Anthony Giovanniello, "Law, Risk-Based Security, and International Air Cargo," *Air and Space Lawyer*, April 2014, p. 1.

[17] Jacqueline Williams, "Australia Details 'Sophisticated' Plot by ISIS to Take Down Plane," *New York Times*, August 4, 2017.

[18] Rene Marsh and Sophie Tatum, "TSA will mandate air cargo from Turkey must be screened," *CNN*, September 7, 2017, http://www.cnn.com/2017/09/07/politics/tsa-air-cargo-turkey/index.html.

month prior to shipping the bombs, sending shipments of books and household items to random Chicago addresses.[19] Tracking those shipments through information provided online by companies like FedEx and UPS is thought to have provided the plotters with only a rudimentary sense of how to set timers on the printer cartridge bombs so they might detonate above the United States.

The Insider Threat

While shippers may have limited ability to target a specific aircraft or even predict if an item will move on a passenger aircraft or an all-cargo aircraft, insiders working in the air cargo industry could use their access and knowledge to carry out a more sophisticated targeted attack. For this reason, the so-called "insider threat" to air cargo security has received considerable policy attention. Historically, in the United States, air cargo supply chains have been infiltrated by organized criminal elements conducting systematic theft and smuggling operations.[20] Overseas, there is growing concern that terrorist networks could infiltrate airports and air cargo operations to gather information about possible weaknesses and exploit vulnerabilities in the supply chain.

The October 2015 crash of a Russian charter flight shortly after its departure from Sharm El Sheikh International Airport in Egypt has highlighted these concerns.[21] Investigators concluded that the aircraft was bombed by an improvised explosive. They reportedly identified an airport mechanic as a suspect as well as two policemen and a baggage handler as possible accomplices.[22]

Internationally, the insider threat to aviation has been widely recognized, and screening of airport workers and others with access to aircraft is a recommended practice, although it is often implemented using risk-based targeting and unpredictable and random screening rather than 100% screening of all airport and air cargo workers.[23] Despite such measures, detecting and preventing terrorist acts carried out with the internal support of individuals with access to aircraft and security-restricted areas poses complex challenges.

TSA regulations[24] issued in 2006 mandate access restrictions to cargo aircraft and cargo operations areas and methods to deter individuals from introducing weapons, explosives, and other threats into the system, but 100% screening of air cargo workers has been widely regarded as too costly, complex, and inflexible to meet the demands of air cargo and airport operations. Consequently, efforts to address insider threats have focused on vetting air cargo and airport workers. This vetting includes all regulated air cargo workers employed by airports, airlines, and freight forwarders, as well as employees of manufacturers, warehouses, distribution centers, and

[19] Scott Shane and Robert F. Worth, "Earlier Flight May Have Been Dry Run for Plotters," *New York Times,* November 1, 2010.

[20] See, e.g., Selwyn Raab, "Kennedy Airport: Mob's Candy Store," *New York Times,* August 3, 1994; Vivian S. Toy, "56 Are Indicted in Thefts of Kennedy Airport Cargo," *New York Times,* December 17, 1998.

[21] Owen Matthews, "Metrojet Crash: Why the Insider Threat to Airport Security Isn't Just Egypt's Problem," *Newsweek,* May 24, 2016, http://www.newsweek.com/2016/06/03/egyptair-metrojet-flight-9268-airport-security-462784.html.

[22] "Exclusive: EgyptAir Mechanic Suspected in Russian Plane Crash," Reuters, January 29, 2016, https://uk.reuters.com/article/us-egypt-crash-suspects/exclusive-egyptair-mechanic-suspected-in-russian-plane-crash-idUKKCN0V712V.

[23] Ruwantissa Abeyratne, "Air Cargo Security: The Need for Sustainability and Innovation," *Air and Space Law,* vol. 38 (2013), pp. 21-32.

[24] Transportation Security Administration, "Air Cargo Security Requirements," 71 *Federal Register* 30477-30517, May 25, 2006.

so on, that voluntarily participate in TSA's Certified Cargo Screening Program (CCSP).[25] Most air cargo workers undergo TSA security threat assessments, comparing biographic information to terrorist databases, while some with broader access to transportation logistics capabilities or passenger aircraft must pass more detailed criminal history background checks.

Enhancing vetting capabilities through more detailed and more thorough lookbacks and periodic reviews of cargo workers' potential ties to criminal activity and terrorism could enhance threat detection. Statutory changes included in the FAA Extension, Safety, and Security Act of 2016 (P.L. 114-190) allow for more detailed records checks of certain cargo workers, but systematic reviews of the process and of emergent capabilities to improve vetting techniques could further enhance current requirements. The act also directed TSA to evaluate air cargo security programs in foreign countries to ensure that they are on par with those in the United States, and authorized TSA to train foreign governments in aviation security including methods to mitigate insider threats, as well as the use of canines in explosives detection, operation and maintenance of screening technology, perimeter security measures, and various other topics.

Enforcement Challenges

Ongoing challenges to implementing effective air cargo and supply chain security include fostering international cooperation and effectively engaging with and overseeing industry air cargo security practices. TSA and CBP generally receive strong cooperation from industry and foreign governments. However, enforcement overseas is largely up to authorities in other countries. If they do not concur with the U.S. approach, disagreement over security standards could complicate U.S. foreign relations and could potentially impact foreign trade.

Shippers of international air cargo rely on a diverse set of operators and aircraft, including passenger aircraft. Unscheduled charter service accounts for about 13% of U.S. international freight traffic.[26] Although the large majority of international air cargo shipped to the U.S. transits through a relatively small number of major airports overseas and enters the United States at a relatively small number of large freight hub airports, charter flights may carry freight from small airports abroad or to smaller airports in the United States. Security procedures may be more difficult to enforce consistently at airports that see relatively few air freight movements.[27]

The United States currently enforces no general requirement for screening of cargo aboard all-cargo aircraft. According to industry estimates reported in 2010, the overall percentage of international shipments screened prior to transit to the United States may be as low as 50%.[28] While considerable policy attention has been focused on inbound international air cargo since then, the amount of cargo screened that is physically screened may not have increased significantly. Rather, the approach pursued by U.S. policymakers and industry has focused on risk-based measures, relying on vetting protocols based on information provided in cargo

[25] Transportation Security Administration, "Air Cargo Screening," 74 *Federal Register* 47671-47710, September 16, 2009.

[26] Department of Transportation, Office of the Assistant Secretary for Aviation and International Affairs, *U.S. International Air Passenger and Freight Statistics,* March 2017, https://www.transportation.gov/office-policy/aviation-policy/us-international-air-passenger-and-freight-statistics-report-march-15.

[27] See Department of Transportation, *U.S. International Passenger & Freight Statistics - YTD 2017 Freight,* https://www.transportation.gov/office-policy/aviation-policy/us-international-passenger-freight-statistics-ytd-2017-freight.

[28] Andy Pasztor, Keith Johnson, and Daniel Michaels, "Focus on Cargo Security Steps," *Wall Street Journal,* November 1, 2010.

manifests to identify and screen only that cargo considered to be high risk prior to its loading aboard aircraft destined for U.S. airports. So far, these risk-based protocols that trigger physical screening and inspection of cargo prior to loading are voluntary and have not yet been adopted or mandated industry-wide.

TSA concedes that screening international cargo poses unique challenges and constraints due to shippers' limited control over their foreign supply chains, the scale and diversity of worldwide supply chains, and diplomatic considerations.[29] To address these challenges, TSA's International Air Cargo Workgroup developed a risk-based rating system and scheduling tool to prioritize air cargo facility inspections overseas. In 2008, TSA entered into a bilateral agreement with the European Union as well as a quadrilateral agreement on air cargo security with the European Union, Canada, and Australia.[30] More broadly, it has worked closely with the International Civil Aviation Organization (ICAO) to draft worldwide standards for all-cargo security, which were adopted in November 2010 and emphasize more extensive screening of cargo as well as improved standardization of screening equipment.[31]

Risk-Based Evaluations of Shipments

TSA employs a number of risk-based strategies to evaluate the security risk of air cargo shipments. Assessing risk to prevent transport on passenger aircraft and to target all-cargo shipments for screening involves analysis of data provided on the air cargo waybill, particularly information about the shipper. By statute, all cargo placed on passenger aircraft must be shipped by a qualified known shipper whose name and address information matches records contained in the Transportation Security Administration's (TSA's) Known Shipper Management System. Moreover, 100% of such cargo must undergo physical screening before being loaded on a passenger aircraft. For targeted screening of shipments placed on all-cargo aircraft, TSA is assessing the effective use of waybill data in its Air Cargo Advance Screening (ACAS) pilot program. In the 115th Congress, the House-passed Department of Homeland Security Authorization Act (H.R. 2825) as well as the Air Cargo Security Improvement Act of 2017 (H.R. 4176) contain language directing TSA to fully implement the ACAS program for all air cargo inbound to the United States.

The Known Shipper Program

The principal means for pre-screening or profiling cargo has been through the use of air carrier and freight forwarder "known shipper" programs. The development of known shipper programs in the mid-1990s was prompted by industry experts and Congress. Key concerns included the need for increased compliance with guidelines for the shipment of hazardous materials and the need to deter terrorists from using cargo as a means to place explosives or incendiary devices on aircraft. In addition, congressional hearings regarding the 1996 ValuJet crash in Miami that resulted from a cargo hold fire concluded that air cargo safety could be achieved only through a comprehensive inspection program encompassing all components of the air cargo network.[32]

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[29] Transportation Security Administration, *Fiscal Year 2011 Congressional Justification, Aviation Security*.

[30] Transportation Security Administration, *Cargo Programs*, https://www.tsa.gov/for-industry/cargo-programs

[31] International Civil Aviation Organization, "ICAO Strengthens Air Cargo Security Measures," November 17, 2010, https://www.icao.int/Newsroom/Pages/icao-strengthens-air-cargo-security-measures.aspx,

[32] Department of Transportation, Office of the Inspector General. *Aviation Security: Federal Aviation Administration* (Report No. AV-1998-134, May 27, 1998).

In December 1996, FAA's Aviation Security Advisory Committee Security Baseline Working Group issued a series of recommendations that formed the basis for FAA's effort to strengthen air cargo safety and security. The White House Commission on Aviation Safety and Security, formed after the 1996 crash of TWA Flight 800 and commonly referred to as the Gore Commission, urged adoption of the recommendations of the Baseline Working Group regarding the profiling of "known" and "unknown" shippers.[33] FAA subsequently established a known shipper program, outlining procedures for freight forwarders and air carriers to review the security practices of known frequent customers and establish cargo security plans. With the passage of the Aviation and Transportation Security Act (ATSA, P.L. 107-71) in 2001, oversight of cargo security measures was transferred from FAA to TSA. TSA has continued to rely on known shipper programs as a principal means for pre-screening air cargo.

In May 2006, TSA issued a final rule establishing an industry-wide known shipper database for vetting all shipments placed on passenger aircraft.[34] According to TSA, the database lists millions of known shippers that are approved to ship cargo on passenger aircraft.[35] Shipments from parties that do not appear in the database may not be placed aboard passenger aircraft. This applies to inbound international flights as well as domestic flights. H.R. 4176 would require TSA to conduct a comprehensive review of these regulations and recommend modifications to or possible elimination of the program giving consideration to the fact that 100% of all cargo placed on passenger aircraft now undergoes mandated physical screening.

Vulnerability Assessments and Risk-Based Targeting

In 2007, reflecting concerns over the logistics and costs associated with mandatory cargo screening, air cargo industry stakeholders voiced considerable opposition to requiring 100% screening of air cargo, urging Congress instead to "focus on realistic solutions based on a framework that identifies and prioritizes risks, works methodically to apply effective and practical security programs, and makes optimal use of federal and industry resources."[36] The industry has repeatedly advocated for a risk-based screening system that incorporates threat assessment and targeting capabilities, provides incentives for shippers to strengthen supply chain measures, and focuses increased inspections on cargo determined to be of elevated risk through risk assessment and targeting capabilities.

These arguments roughly parallel TSA's former strategic plan for air cargo security, which, prior to congressional mandates for 100% screening of cargo placed on passenger aircraft, focused on risk-based targeted screening of cargo. Under the framework of a risk-based strategy for cargo security, industry has specifically recommended the increased use of canine explosives detection teams; enhanced supply chain security; enhanced targeting of shipments based on CBP experience with the Automated Targeting System (ATS); expanded use of explosive trace

[33] White House Commission on Aviation Safety and Security. *Final Report to President Clinton*. Vice President Al Gore, Chairman. February 12, 1997. Washington, DC: The White House.

[34] Department of Homeland Security, Transportation Security Administration. "Air Cargo Security Requirements; Proposed Rule." *Federal Register*, (69) 217, 65258-65291.

[35] Transportation Security Administration, *Air Cargo, Transportation Sector Network Management*.

[36] Air Carrier Association of America, Airforwarders Association, Air Transport Association, Cargo Network Services Corporation (CNS), High Tech Shippers Coalition, International Warehouse Logistics Association, National Air Carrier Association (NACA), National Customs Brokers and Forwarders Association of America, Inc., National Fisheries Institute, Regional Airline Association, Society of American Florists, and the U.S. Chamber of Commerce, *Letter to The Honorable Daniel Inouye and The Honorable Ted Stevens*, January 8, 2007, p. 1.

detection technology for targeted screening; and accelerated research and development of technologies that can more efficiently inspect elevated-risk cargo.[37]

Under CBP's "advance manifest rule,"[38] carriers operating inbound international flights must forward cargo manifest information to CBP four hours prior to arrival in the United States. The four-hour requirement is relevant in carrying out CBP's mission of screening items as they enter the United States, but may be inadequate for use in targeting shipments from an aviation security standpoint. In many cases, aircraft may have departed for the United States before CBP receives the manifest information and analyzes it using ATS to identify high-risk cargo. This concern does not apply to flights originating in Canada, Mexico, and the Caribbean, for which CBP requires the manifest information before departure. In January 2018, CBP and TSA also stepped up notification requirements for flights operating from specific airports in the Middle East.[39] Under an emergency order issued by TSA, airlines must provide shipment information to CBP at the earliest practical point prior to loading the cargo on a U.S.-bound flight. The order affects all U.S.-bound flights departing from airports in Egypt, Jordan, Qatar, Saudi Arabia, and the United Arab Emirates.[40]

Whereas CBP's mission is focused on detecting threats to the United States arriving at points of entry, including U.S. airports, TSA's aviation security mission considers threats to airborne aircraft before they enter U.S. airspace. The October 2010 attempted bombing incidents raised questions about the adequacy of current manifest screening requirements and targeting procedures for detecting potential threats to U.S.-bound flights. Congress may want to seek additional information and input regarding whether earlier transmittal of manifest information could improve targeting capabilities aimed at identifying high risk cargo and, if so, what impacts such requirements may have on international air cargo shipments.

Following the October 2010 incidents, TSA applied additional screening measures to inbound international air cargo assessed to be high risk.[41] While the specific details of how TSA assesses risk are regarded as sensitive security information, factors may include country of origin and possibly risk scores based on data regarding the sender, the recipient, and other characteristics of the shipment. For example, cash payment of shipping costs may be considered an indicator of risk in certain markets, although this characteristic, by itself, may not raise suspicion in all cases.

Building on this, CBP, in collaboration with TSA, continues to pilot test the Air Cargo Advance Screening (ACAS) system, which was initiated in response to October 2010 incidents. In October 2012, the ACAS pilot program was formalized and expanded,[42] and has been extended as a voluntary pilot program several times since. Under the ACAS pilot project, freight forwarders and airlines voluntarily submit key data elements of cargo manifests before departure, which is earlier than the current regulatory requirement of four hours prior to arrival in the United States. Based on results of the pilot program, CBP and TSA seek to identify the appropriate data elements and

[37] Ibid.

[38] U.S. Customs and Border Protection, "Required Advance Electronic Presentation of Cargo Information," 68 *Federal Register* 68139-68177, December 5, 2003.

[39] Joan Lowy, "U.S. Orders Extra Air Cargo Screening for Flights from Mideast," *Washington Post,* January 22, 2018.

[40] Lewis King, "Citing Increased Bombing Risk, TSA Mandates Additional Security on Middle East Airfreight," *Air Cargo World,* January 22, 2018, https://aircargoworld.com/allposts/citing-increased-bombing-risk-tsa-mandates-additional-security-on-middle-east-airfreight/.

[41] Derek Kravitz and Ashley Halsey III, "U.S. Tightening Air Cargo Security," *Washington Post,* November 9, 2010.

[42] U.S. Customs and Border Protection, "Air Cargo Advance Screening (ACAS) Pilot Program," 77 *Federal Register* 6506-65009, October 24, 2012.

time frame for receiving data in order to conduct effecting targeting. In July 2017, CBP further extended the pilot program for an additional year.

While the ultimate objective is to develop uniform industry-wide regulation for advance cargo screening, slow progress toward this goal has raised questions over the adequacy of resources devoted to this effort, despite favorable views of the concept and active industry participation. In 2016, the Aviation Security Advisory Committee expressed concern that while the pilot program had been ongoing for five years, it had not yet been fully tested and TSA had not devoted adequate staffing and resources to the project.[43] Both H.R. 2825 and H.R. 4176 would require regulations mandating risk-based vetting and screening of all high-risk cargo under the ACAS program for inbound international air cargo destined for or transiting through the United States.

Adopting and Harmonizing Global Standards and Industry Best Practices

While TSA can require that inbound air cargo shipments and procedures at last point of departure airports meet all U.S. regulatory requirements, it has limited resources to oversee and inspect foreign airports and off-airport air cargo facilities. One way to address security risks in those locations is to adopt and enforce international standards requiring adherence to best practices.

Under its National Cargo Security Program, TSA evaluates whether a foreign government's air cargo security measures are commensurate with TSA regulatory requirements and standards. TSA has found the air cargo security programs of more than 40 countries, including all European Union member nations, Switzerland, Japan, New Zealand, Canada, Australia, Israel, China, South Korea, Singapore, and South Africa, to be in compliance. Collectively these countries account for more than 70% of the air cargo that enters the United States from foreign destinations.

International efforts to improve air cargo security have focused on providing more robust and timelier information about shipments to allow security agencies to assess risk. Development and harmonization of security data standards could increase the usefulness of initiatives such as the ACAS program, which is currently voluntary but could be developed into a required regulatory standard. The logistics industry is actively seeking to improve supply chain quality management and better monitor and track shipments, and these initiatives can also have direct security benefits.[44] Further improvements in air cargo security along these lines are most likely achievable through continued cooperative efforts involving industry and international trading partners.

Cargo Screening Procedures

Whereas the air cargo industry has favored risk-based approaches for both cargo planes and cargo placed aboard passenger aircraft, some policymakers have argued that more comprehensive screening of cargo is needed to make cargo security comparable to the screening of airline passengers and baggage. Congress responded to these arguments in a series of enactments since the 9/11 terrorist attacks. Initially, these laws mandated incremental increases to the amount of cargo that was physically screened, as the pros and cons of 100% screening requirements for cargo placed on passenger aircraft continued to be an issue of prominent debate.

[43] Aviation Security Advisory Committee, Meeting Minutes, February 29, 2016. https://www.tsa.gov/sites/default/files/asac_meeting_minutes_29feb2016-508.pdf.

[44] See, e.g., Luca Urciuoli, "Supply Chain Security – Mitigation Measures and a Logistics Multi-Layered Framework," *Journal of Transportation Security,* 3 (2010), pp. 1-28.

The Implementing Recommendations of the 9/11 Commission Act of 2007 (P.L. 110-53), enacted in August 2007, required 100% physical screening and inspection of all cargo placed on passenger aircraft by August 2010. The act specified screening methods acceptable in meeting this requirement, including X-ray systems, explosives detection systems, explosives trace detection, TSA-certified explosives detection canine teams, and physical searches conducted in conjunction with manifest verifications. Additional methods may be approved by TSA. However, the act provided that cargo documents and known shipper verification, by themselves, are not acceptable screening methods.

The act, however, did not specify who is to conduct the screening. TSA has interpreted the language to allow airlines, freight forwarders, or, in some cases, shippers, manufacturers, and third-party screening facilities to conduct screening at off-airport locations, so long as they can ensure the security of a shipment until it is loaded onto an aircraft.[45] TSA maintains that this is the only viable means for meeting the mandate for 100% physical screening, as the agency claims it lacks the resources to screen the volume of cargo placed on passenger aircraft using its own employees.[46] TSA's approach, implemented through its voluntary Certified Cargo Screening Program (CCSP), has pushed much of the operational cost associated with cargo screening and inspection on to airlines, freight forwarders, and shippers. The extent to which air carriers and freight forwarders have been able to pass along these costs to shippers and consumers may be an issue of interest to Congress.

Mandatory screening requirements for cargo on passenger flights may place passenger airlines at a competitive disadvantage against all-cargo airlines, so long as all-cargo carriers face less stringent requirements. In addition, if security screening requirements discourage shipments on passenger flights, some routes may no longer be profitable for airlines.[47]

The Certified Cargo Screening Program

The requirement to screen 100% of air cargo placed on passenger aircraft has raised challenges due to a lack of suitable bulk screening technologies. TSA and industry experts concluded that the only viable means of meeting the screening requirements has been to conduct screening at the piece level at various points in the supply chain and implement a variety of measures to secure cargo after screening it at off-airport locations.

Screening pallets and containers can be complex, potentially requiring that the shipments be broken down so that individual items can be examined. CCSP is intended to minimize these logistical complexities by allowing screening to occur at factories, warehouses, third party logistics providers, and off-airport cargo consolidation facilities, so long as the operator of the facility tenders cargo to either an air carrier or a freight forwarder.[48] TSA must approve the screening procedures as well as supply chain security measures to prevent tampering with shipments once they have been screened, and it audits participants' performance. The CCSP program is voluntary, but widespread industry participation reflects considerable perceived benefits.[49]

[45] "TSA Says It Will Adhere to Cargo Screening Deadlines." *World Trade*, *20*(12), December 2007, p. 10.

[46] Ibid.

[47] Thomas Frank, "Bill Would Order All Air Cargo Screened," *USA Today*, January 8, 2007.

[48] Transportation Security Administration, *CCSP Overview—9/11 Act Screening Requirement*.

[49] Transportation Security Administration, *Fiscal Year 2011 Congressional Justification*, *Aviation Security*.

By late August 2010, just after the 100% screening mandate went into effect, over 1,000 facilities—including more than 500 indirect air carrier facilities, almost 100 independent cargo screening facilities, and almost 400 shippers—had been certified under the CCSP program. According to TSA FY2016 data, the current program size remains at approximately 1,000 cargo facilities.[50]

To participate in CCSP, employers must allow TSA to conduct security threat assessments to check the names of workers with access to air cargo against government terrorist watchlists. The threat assessments are conducted upon initial employment at a CCSP facility or on-airport air cargo facility and every five years thereafter while employed as an air cargo worker.[51] In FY2018, TSA anticipates collecting $5.2 million in fees, a projected increase of $1.7 million.[52]

Cargo Screening Technologies

TSA has approved a number of detection systems for screening air cargo to meet the requirements of the 100% screening mandate.[53] Essentially, these are adaptations of technologies used extensively for screening checked baggage and carry-on items.

However, none of these devices is approved for the screening of palletized or containerized cargo. Procedures stipulate that screening must instead be done on individual cargo items since available technologies, especially explosives detection systems, can only accommodate objects slightly more than 3 feet wide and about 8 feet long, far too small for large cargo items, much less cargo containers and pallets. The limitations of explosives detection systems in the air cargo environment have led to extensive reliance on explosives trace detection, particularly at airport screening locations, coupled with canine teams. It is estimated that palletized cargo makes up 75% of all cargo carried on passenger planes.[54] The lack of an approved technology for screening pallets leaves the industry dependent on work-around solutions, largely involving the off-airport screening of cargo coupled with approved supply-chain security measures to prevent tampering after the item is screened under CCSP procedures.

Imaging systems are employed at seaports and border crossings to scrutinize entire trucks and multimodal containers. These systems, which use a variety of gamma-ray, x-ray, x-ray backscatter, and millimeter wave imaging technologies, are generally not considered suitable in the air cargo domain because they require intensive human observation to detect potential threats. Moreover, they generally do not offer adequate image resolution or automated or assisted threat detection capabilities for identifying relatively small explosive devices capable of bringing down an airliner.

Neutron beam technologies offer a potential solution, allowing automated explosives detection capabilities of containerized and palletized cargo. Under a pilot program, a pulsed fast neutron analysis scanner was installed at Houston's George Bush Intercontinental Airport in 2005, at a cost of $8 million. The unit was touted as a potential means to automatically screen large

[50] Transportation Security Administration, *Fiscal Year 2016 Congressional Justification, Aviation Security*.

[51] Transportation Security Administration, "Air Cargo Screening Fees," 77 *Federal Register* 30542-30546, May 23, 2012.

[52] Transportation Security Administration, *Fiscal Year 2018 Congressional Justification, Operations and Support*.

[53] Transportation Security Administration. *Non-Sensitive Security Information (SSI) Version of the TSA Air Cargo Screening Technology List (ACSTL)*. July 16, 2010.

[54] Andy Pasztor, Keith Johnson, and Daniel Michaels, "Focus on Cargo Security Steps," *Wall Street Journal*, November 1, 2010.

containers and bulk cargo shipments for explosives, hazardous chemicals, radiological and nuclear materials, and other potential threats based on sub-atomic properties. In 2007, the pilot program was suspended, reportedly for financial reasons, despite high detection rates and low false alarm rates across a wide range of threat types and container sizes.[55] The technology is being used to screen cargo and baggage in Singapore and Hong Kong, and to screen truck containers at a border checkpoint in El Paso, TX.[56] However, the high cost and large footprint of the machines have been significant deterrents to their use in the air cargo industry.

Absent a suitable technology for screening palletized and containerized cargo at airport facilities, the reliance on off-airport cargo screening under CCSP and the logistic demands of the air cargo industry pose unique challenges for maintaining security throughout the supply chain. Current efforts appear to be focused on expanding the size of a single box that can be screened using available technology and improving the throughput of this equipment. H.R. 4176 would establish a two-year pilot program to test the expanded use of computed tomography (CT) technology for screening air cargo and would require TSA to develop a plan for integrating CT technology in domestic and international air cargo operations, including operations at foreign last-point-of-departure airports. Historically, CT systems have had limited application in the air cargo environment because of their cost, large footprint, and limitations on the size of objects they can scan. Alternatively, technologies that rely on chemical analysis of explosive vapors using mass spectrometry may allow for more efficient and cost-effective screening of cargo shipments, but the technology is still being tested.[57] Vapor analysis using mass spectrometry has also been suggested as a means to study canine detection of explosives and improve the training methods and operational procedures for canine explosives detection teams.[58]

Canine Teams

TSA has trained over 650 canine explosives detection teams that local law enforcement agencies deploy at airports and other transportation facilities. Under cooperative agreements, TSA pays for the training, certification, and maintenance of the dogs and partially reimburses law enforcement agencies for handler salaries and other costs. These teams devote about 25% of their time to air cargo screening.

In addition, TSA has about 166 of its own multimodal canine teams that, among other duties, screen cargo at the 20 busiest airports. These teams focus on large bulk cargo configurations that cannot be efficiently screened using currently available technologies.[59] In addition, TSA has established a National Explosives Detection Canine Security Program recognition under which it evaluates and approves explosives detection canine teams in foreign countries for use in aviation security, including the screening of air cargo. So far, canine programs in the Netherlands, France, South Africa, and New Zealand have attained this recognition by TSA.[60]

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[55] Dan A. Strellis, Tsahi Gozani, and John Stevenson, "Air Cargo Inspection Using Pulsed Fast Neutron Analysis," *International Topical Meeting on Nuclear Research Applications and Utilization of Accelerators, 4-8 May 2009 Vienna Austria*. International Atomic Energy Agency: Vienna, Austria.

[56] Derek Kravitz and Ashley Halsey III, "U.S. Tightening Air Cargo Security," *Washington Post*, November 9, 2010.

[57] Geoffrey Harvey, "Explosives Vapor Detection Technology: The New 'Sniff Test,'" News Release, Pacific Northwest National Laboratory, U.S. Department of Energy, February 20, 2013, https://www.pnnl.gov/news/release.aspx?id=972.

[58] Ta-Hsuan Ong, Ted Mendum, and Geoff Geurtsen, et al., "Use of Mass Spectrometric Vapor Analysis to Improve Canine Explosive Detection Efficiency," *Analytical Chemistry*, vol. 89, no. 12 (June 2017), pp. 6482–6490.

[59] Transportation Security Administration, *Fiscal Year 2011 Congressional Justification, Aviation Security*.

[60] Transportation Security Administration, *Fiscal Year 2016 Congressional Justification, Aviation Security*.

There is considerable policy interest in the certification and deployment of TSA-approved third-party explosives detection canine teams to screen air cargo. While many in industry support the approach, TSA had put this concept on hold after results from a 2011 pilot project failed to demonstrate reliable conformity to TSA performance standards. TSA is currently exploring options to reevaluate the concept. Both H.R. 2825 and H.R. 4176 would direct TSA to develop standards for the use of third-party explosives detection canine teams for the primary screening of air cargo carried out by air carriers, foreign air carriers, freight forwarders, and shippers.

Security of Air Cargo Facilities and Operations

Air cargo operators and freight forwarders in the United States and at overseas locations that handle U.S.-bound shipments must apply TSA-approved security programs, the details of which are considered sensitive security information. Broadly, these programs include access control measures, site surveillance and physical security, mandatory background checks and security threat assessments of air cargo workers, and employee security training and awareness:

- Major passenger airlines must implement TSA's Aircraft Operator Standard Security Program, including detailed security measures for transported cargo.
- All-cargo operators that operate any aircraft weighing roughly 100,000 pounds (45,000 kg) or more, such as FedEx, UPS, and operators of large freight aircraft, are covered under the Full All-Cargo Aircraft Operator Standard Security Program.
- Cargo operators and charter operators that also consign cargo shipments aboard aircraft that are larger than 12,500 pounds but less than roughly 100,000 pounds must implement a TSA-approved Twelve-Five Standard Security Program.
- Domestic freight forwarders must implement an Indirect Air Carrier Standard Security Program (IACSSP).
- Other components of the air cargo network, such as shippers, third-party logistics companies, and independent air cargo consolidation and screening facilities, may voluntarily participate in the Certified Cargo Screening Program (CCSP).

Supply Chain Security Measures

Various supply chain security measures provide options for preventing and detecting tampering and maintaining the integrity of cargo shipments. These measures include tamper-evident and tamper-resistant packaging, cargo tracking technologies, and identifiers to designate screened cargo.

Tamper-Evident and Tamper-Resistant Packaging

A number of methods exist for sealing cargo shipments and cargo containers to prevent tampering. Relatively low-cost solutions such as tamper-evident tapes that provide visual indications of tampering can be utilized in combination with facilities and transit security measures as an additional security layer to deter the introduction of explosives into air cargo shipments. Such measures are important components of TSA's Certified Cargo Screening Program, which allows goods to be screened at off airport locations and therefore necessitates safeguards to ensure the integrity of items between the time they are screened and the time they are loaded aboard an aircraft.

At cargo handling facilities, tamper-evident seals and locks can be utilized on cargo containers to prevent theft and the introduction of contraband or threat objects. Electronic seals may serve as an additional deterrent by providing more immediate detection of tampering. Electronic seals typically have alarms that transmit a signal when tampered with.[61] However, currently available electronic seals have a limited transmission range, which could limit their utility beyond warehouse and sorting facility environments.[62]

Tracking Technologies

The air cargo industry, particularly the express package sector, relies on tracking technologies such as the global positioning system (GPS) and radio-frequency identification to process, sort, and track shipments. The technology also has potential security applications. Tracking technologies could identify suspicious origins or unexplained delays or detours in transit.

Bar code scanning and similar practices are commonly used to log shipments when they enter and depart various nodes in the supply chain. This tracking is commonly integrated into logistics management tools to track and route shipments, but does have limitations because it does not allow for continuous or passive tracking capabilities. Therefore, other tracking technologies, such as radio frequency identification (RFID) tags and GPS trackers, may also be used. Often RFID technology is used for tracking items at a facility such as a warehouse or sorting facility, whereas GPS is well suited for tracking items in transit or vehicles utilized to move goods through the supply chain. These same technologies can additionally provide a security benefit by detecting anomalies in the shipping process that could raise security concerns and indicate a need for risk-based screening.

Screened Cargo Identifiers

TSA relies primarily on a system of identifiers to designate that a piece of cargo has been properly screened and is eligible for shipment on passenger aircraft. TSA approves a variety of stickers, stamps, and tags to be used as screened cargo identifiers.[63] The security and integrity of these identifiers is a key element of CCSP, as stolen or counterfeit identifiers could be used to pass off unscreened cargo as screened. However, given the highly diverse and geographically distributed nature of the supply chain, it may be difficult to detect falsified or counterfeit stamps beyond the point of screening.

Additional safeguards, such as indicating screened status in shipping databases and allowing access to details about screened status to authorized individuals through bar code scanning of packages, could provide additional means to validate the status and ensure the integrity of security-screened shipments.

In-Flight Security Measures

In-flight air cargo security options address the primary perceived vulnerabilities of a potential hijacking of an all-cargo flight or the bombing of a passenger aircraft using an explosive device carried in a cargo shipment. Protecting access to the cockpit and arming all-cargo pilots have

[61] "Electronic cargo security seals" *Frontline Solutions*, 3(6), 42 (June 2002).

[62] U.S. Government Accountability Office. *Aviation Security: Federal Action Needed to Strengthen Domestic Air Cargo Security*, October 2005, GAO-06-76.

[63] Transportation Security Administration, *Certified Cargo Screening Program Participant Newsletter*, August 20, 2010.

been viewed as the primary in-flight options to reduce the vulnerability of all-cargo aircraft to potential hijackings. Blast-resistant cargo containers are being considered as an option to protect passenger airliners from explosives.

Hardened Cockpit Doors and Protective Barriers

While ATSA required the installation of hardened cockpit doors, FAA regulations exempted all-cargo aircraft from the requirement after the FY2003 appropriations act (P.L. 108-7) limited federal funding to doors on passenger aircraft. While some cargo aircraft have hardened cockpit doors to thwart potential stowaway hijackers, many do not.

The use of protective barriers, such as metal gates and thick cable fences that are less costly than hardened cockpit doors, has been considered as an alternative means to secure the cockpits of all-cargo aircraft. In 2004, United Airlines voluntarily installed protective secondary barriers on some of its passenger aircraft. However, it has since phased those aircraft out of its fleet and has not equipped replacement aircraft with secondary barriers. Other airlines have not installed the barriers and currently no U.S. air carrier aircraft have them.

Similar to prior legislative efforts that sought to mandate the barriers, the Saracini Aviation Safety Act of 2017 (H.R. 911, S. 911) would require the installation of a barrier on all commercial transport aircraft, including all cargo aircraft, weighing more than 75,000 pounds. Both the 21st Century Aviation Innovation, Reform, and Reauthorization Act (H.R. 2997), the FAA reauthorization measure under consideration in the House, and the Federal Aviation Administration Reauthorization Act of 2017 (S. 1405), the FAA reauthorization measure under consideration in the Senate, contain language that is more limited in scope and would only require secondary cockpit barriers to be installed on newly manufactured aircraft delivered to passenger air carriers.

Arming All-Cargo Pilots

Provisions allowing pilots of passenger airliners to receive firearms training and fly armed were included in the Homeland Security Act of 2002 (P.L. 107-296). The act, however, did not allow for all-cargo pilots to participate in the Federal Flight Deck Officer (FFDO) program, despite concern about the risk of hijackings by stowaways. In 2003, the statute was amended to allow all-cargo pilots and flight engineers to participate (P.L. 108-176). Air carriers, in general, have been hesitant about the program because of liability concerns, even though the Homeland Security Act extended specific liability protections to the airlines and pilot participants.

The FFDO program, along with other flight crew security training initiatives, has received annual appropriations of about $25 million since FY2004. While TSA has opened additional recurrent training and requalification sites in Texas and New Jersey, other aspects of the program remain largely unchanged and Congress opposed proposals by the Obama Administration to reduce program funding. Congress may at some point address lingering concerns such as the convenience of training and requalification sites, the carriage of firearms outside the cockpit (which is presently highly restricted), and program liability surrounding the role of the federal flight deck officer as both an airline pilot and a deputized federal officer.

Blast-Resistant Cargo Containers

The use of blast-resistant cargo containers has long been considered a possible option for mitigating the consequences of an in-flight explosion. The 9/11 Commission, established by law[64] in November 2002 to investigate the September 2001 terrorist attacks, recommended the deployment of at least one hardened container on every passenger aircraft that carries cargo.[65] The National Intelligence Reform Act of 2004 (P.L. 108-458) required TSA to establish a pilot program to explore the feasibility of this concept and authorized the use of incentives to airlines to offset added fuel, maintenance, and other operational costs associated with using hardened cargo containers in an effort to encourage voluntary participation. The act authorized $2 million for the pilot program.

The Implementing Recommendations of the 9/11 Commission Act of 2007 (P.L. 110-53) directed TSA to evaluate the pilot program and, based on its findings, to implement a program to pay for, provide, and maintain blast-resistant cargo containers for use by air carriers on a risk-managed basis. However, no such program has been initiated. The airline industry and aviation experts have been skeptical of the approach because of both its direct and indirect costs, with indirect costs mostly related to additional fuel consumption and decreased payload capacity due to the additional weight of the hardened containers.

Moreover, if only one hardened cargo container were deployed per aircraft, a relatively small fraction of available cargo space would be reinforced. For example, a Boeing 747-400 passenger jet is capable of holding up to 13 full-width or 26 half-width containers.[66] Since one hardened container could house only a small fraction of the cargo aboard such an aircraft, decisions would be required as to which shipments should be placed inside the hardened containers. The 9/11 Commission recommended that any suspicious packages going aboard a passenger aircraft be placed in a hardened container, implying that a pre-screening or risk evaluation process should be used to assign cargo to the hardened container. This recommendation left unanswered the question of whether suspicious cargo should be allowed to travel on passenger aircraft at all.

The concept never gained traction for a variety of reasons including cost, weight, and susceptibility to damage from normal "wear and tear" in the air cargo environment. The hardened containers were primarily designed for long-haul wide-body aircraft and are not universally compatible with the various narrow-body aircraft that dominate the commercial passenger airline fleet, which limits their utility.[67]

A relatively new approach to containing explosives may offer a viable alternative. Lighter weight bomb-resistant bags that can absorb the energy of an explosion have been successfully tested in the United Kingdom. These may address many of the concerns associated with hardened containers.[68]

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[64] See Title VI of P.L. 107-306, the Intelligence Authorization Act for Fiscal Year 2003.

[65] National Commission on Terrorist Attacks Upon the United States. *The 9/11 Commission Report.*

[66] Boeing Commercial Airplanes. *747-400 Airplane Characteristics for Airport Handling*. D6-58326-1, December 2002.

[67] Graham Warwick, "Europe's Fly-Bag Develops Blast-proof Baggage Containers," *Aviation Week & Space Technology*, November 23, 2015.

[68] Ibid.

Current Legislative Issues

In addition to the various ongoing challenges of monitoring domestic and international air cargo from a security perspective, recent managerial changes and budget reductions to TSA's air cargo program have raised some concerns regarding oversight of both domestic and international air cargo security programs as well as TSA's ability to maintain effective outreach and engagement with the air cargo industry. Language in the Air Cargo Security Improvement Act of 2017 (H.R. 4176) calls for the creation of an air cargo security office headed by a senior level executive and staffed by at least four full-time-equivalent positions.

Budget pressures and competing security priorities may impact TSA's ability to effectively regulate and oversee air cargo security and work with industry. FY2017 funding for Air Cargo Security totaled about $91 million, considerably less than the $123 million appropriated for this activity in FY2010 and the $115 million enacted in FY2011.

TSA staffing for air cargo stands at about 615 full-time equivalent positions, more than 100 below the FY2014 level of 739. This workforce is primarily comprised of TSA air cargo inspectors, who are responsible for overseeing about 300 domestic aircraft operators and foreign air carriers, more than 4,400 regulated freight forwarders, and more than 1,000 facilities that participate in the CCSP.[69] TSA reports that it conducts almost 3,000 random security inspections each month, in addition to completing cargo vulnerability assessments at major cargo airports and other selected airports. The scope and depth of random site inspections and audits of air cargo security may be issues of particular interest to Congress as it assesses the degree to which deficiencies in regulatory compliance are being identified and corrected.

While some of the decrease in funding and staffing for air cargo operations reflects cost-saving measures and efficiencies, the decrease also reflects a shift to other priorities, mainly passenger screening. In contrast to passenger screening, where TSA has a direct operational responsibility, air cargo screening is largely carried out by industry, and industry directly bears the associated direct costs of this screening. TSA's role is to ensure regulatory compliance among air carriers and freight forwarders, as well as among shippers that voluntarily participate in the Certified Cargo Screening Program (CCSP). Reducing the security-related costs to industry poses a particular challenge. Legislative language addressing lower-cost screening alternatives, including low cost technologies and the use of canines, could potentially address persistent concerns over the private sector's costs of complying with cargo security mandates.

Also in the 115th Congress, the Department of Homeland Security Authorization Act (H.R. 2825), as passed by the House, includes language that would require CBP to establish a formal Air Cargo Advance Screening (ACAS) program based on the ongoing pilot program and would require TSA to develop standards for third-party canine cargo screening. The language would mandate the physical inspection of all air cargo identified as high-risk under the criteria established by the ACAS program prior to loading aboard a U.S.-bound aircraft or at an earlier point in the supply chain.

H.R. 4176 contains similar language that would also mandate a full ACAS program and establish standards for third-party canine explosives detection. The bill also seeks to establish a formal air cargo security office within TSA to carry out air cargo security policy and engage with industry stakeholders. The bill would mandate a review of existing regulations governing the CCSP, and would require TSA to report on its findings regarding CCSP program effectiveness, persisting vulnerabilities, and actions to be taken to improve the program. It would also require TSA to

[69] Transportation Security Administration, *Air Cargo Transportation Sector Network Management*.

implement a pilot program to test the expanded use of explosives detection technologies using computed tomography (CT) to screen air cargo placed on passenger aircraft. The bill would also require the Government Accountability Office to review various aspects of TSA's approach to air cargo security and carry out a comprehensive review and security assessment of the known shipper program.

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