



**Federal Aviation
Administration**

Fact Sheet – Engineered Material Arresting System (EMAS)

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Background

The Federal Aviation Administration (FAA) is actively working to improve runway safety areas (RSAs) at commercial service airports by the end of 2015. The RSA is typically 500 feet wide and extends 1,000 feet beyond each end of the runway. It provides a graded area in the event that an aircraft overruns, undershoots, or veers off the side of the runway. Many airports were built before the current 1,000-foot RSA standard was adopted approximately 20 years ago. In some cases, it is not practicable to achieve the full standard RSA because there may be a lack of available land. There also may be obstacles such as bodies of water, highways, railroads, and populated areas or severe drop-off of terrain.

The FAA began conducting research in the 1990s to determine how to improve safety at airports where the full RSA cannot be obtained. Working in concert with the University of Dayton, the Port Authority of New York and New Jersey, and the Engineered Arresting Systems Corporation (ESCO) of Logan Township, NJ, a new technology emerged to safely arrest overrunning aircraft. EMAS uses crushable material placed at the end of a runway to stop an aircraft that overruns the runway. The tires of the aircraft sink into the lightweight material and the aircraft is decelerated as it rolls through the material.

Benefits of the EMAS Technology

The EMAS technology improves safety benefits in cases where land is not available, or not possible to have the standard 1,000-foot overrun. A standard EMAS installation can stop an aircraft from overrunning the runway at approximately 80 miles per hour. An EMAS arrestor bed can be installed to help slow or stop an aircraft that overruns the runway, even if less than a standard RSA length is available.

EMAS Manufacturers

As of October 2014, there are two manufacturers of EMAS products that meet the FAA requirements of advisory circular 150-5220-22A, *"Engineered Materials Arresting Systems for Aircraft Overruns."* The FAA must review and approve each EMAS installation .

EMASMAX® is the latest, most durable version of ESCO's EMAS, developed with and technically accepted by the FAA. EMASMAX arrestor beds are composed of blocks of lightweight, crushable cellular cement material designed to safely stop airplanes that overshoot runways.

Runway Safe EMAS is a foamed silica bed which is made from recycled glass and is contained within a high-strength plastic mesh system anchored to the pavement at the end of the runway. The foamed silica is poured into lanes bounded by the mesh and covered with a poured cement layer and treated with a top coat of sealant.

Both EMAS products are located at the end of the runway and are typically the full width of the runway. The length depends on the airport configuration and the aircraft fleet using the airport.

Current FAA Initiatives

As of December 31, 2015, the FAA's Office of Airports has made RSA improvements at more than 500 commercial airports. This means that all practicable improvements, including the use of EMAS technology, have been made at approximately 1,000 runway ends at these airports. The RSAs have been improved to full standards or to the extent practicable, not including the relocation of FAA-owned navigational equipment.

EMAS Arrestments

To date, there have been 12 incidents where ESCO's EMAS has safely stopped 12 overrunning aircraft with a total of 282 crew and passengers aboard those flights.

EMAS Arrestments

Date	Crew and Passengers	Incident
May 1999	30	A Saab 340 commuter aircraft overran the runway at JFK Airport in New York
May 2003	3	A Gemini Cargo MD-11 overran the runway at JFK Airport in New York
January 2005	3	A Boeing 747 overran the runway at JFK Airport in New York
July 2006	5	A Mystere Falcon 900 overran the runway at Greenville Downtown Airport in South Carolina
July 2008	145	An Airbus A320 overran the runway at Chicago O'Hare Airport in Chicago, IL
January 2010	34	A Bombardier CRJ-200 regional jet overran the runway at Yeager Airport in Charleston, WVA
October 2010	10	A G-4 Gulfstream overran the runway at Teterboro Airport in Teterboro, NJ
November 2011	5	A Cessna Citation II overran the runway at Key West International Airport in Key West, FL
October 2013	8	A Cessna 680 Citation overran the runway at Palm Beach International in West Palm Beach, FL
January 2016	2	A Falcon 20 overran the runway at Chicago Executive Airport in Chicago, IL
October 2016	37	A Boeing 737 overran the runway
April 2017	2	A Cessna 50 Citation overran the runway at Burbank Airport in Burbank, CA

EMAS Installations with ESCO EMAS

Currently, ESCO's EMAS is installed at 106 runway ends at 67 airports in the United States, with plans to install 7 EMAS systems at 6 additional U.S. airports.

EMAS Installations

Airport	Location	# of Systems	Installation Date(s)
JFK International	Jamaica, NY	2	1996(1999)/2007 (2014)
Minneapolis St. Paul	Minneapolis, MN	1	1999(2008)
Little Rock	Little Rock, AR	2	2000/2003
Rochester International	Rochester, NY	1	2001
Burbank	Burbank, CA	1	2002*
Baton Rouge Metropolitan	Baton Rouge, LA	1	2002
Greater Binghamton	Binghamton, NY	2	2002 (2012)/2009***
Greenville Downtown	Greenville, SC	1	2003**/2010***
Barnstable Municipal	Hyannis, MA	1	2003
Roanoke Regional	Roanoke, VA	1	2004
Fort Lauderdale International	Fort Lauderdale, FL	4	2004, 2014
Dutchess County	Poughkeepsie, NY	1	2004**
LaGuardia	Flushing, NY	4	2005 (2014)/2015
Boston Logan	Boston, MA	2	2005/2006 (2012) (2014)
Laredo International	Laredo, TX	1	2006/2012***
San Diego International	San Diego, CA	1	2006
Teterboro	Teterboro, NJ	3	2006+/2011/2013
Chicago Midway	Chicago, IL	2	2006/2007****
Merle K (Mudhole) Smith	Cordova, AK	1	2007
Charleston Yeager	Charleston, WV	1	2007
Manchester	Manchester, NH	1	2007
Wilkes-Barre/Scranton Intl.	Wilkes-Barre, PA	2	2008
San Luis Obispo	San Luis Obispo, CA	2	2008
Chicago-O'Hare	Chicago, IL	2	2008

() Bed replaced

* Widened in 2008

** General aviation airport

*** retrofitted bed

+ Reliever airport

Airport	Location	# of Systems	Installation Date(s)
Newark Liberty International	Newark, NJ	2	2008/2015
Charlotte Douglas International	Charlotte, NC	1	2008
St. Paul Downtown	St. Paul, MN	2	2008+
Worcester Regional	Worcester, MA	2	2008/2009**
Reading, Regional	Reading, PA	1	2009**
Kansas City Downtown	Kansas City, MO	2	2009+/2010
Smith Reynolds	Winston-Salem, NC	1	2010
New Castle County	Wilmington, DE	1	2010
Key West International	Key West, FL	2	2010/2015
Arcata-Eureka	Arcata, CA	1	2010
Telluride Regional	Telluride, CO	2	2010
Palm Beach	Palm Beach, FL	1	2011
Republic	Farmingdale, NY	2	2011/2013
Martin County	Stuart, FL	2	2011
Lafayette	Lafayette, LA	3	2011/2013/2016
Cleveland Hopkins	Cleveland, OH	2	2011
Groton	Groton-New London, CT	2	2011
Augusta State	Augusta, ME	2	2011
Elmira-Corning	Elmira, NY	1	2012
Trenton-Mercer	Trenton, NJ	4	2012/2013
New Bern	New Bern, NC	1	2012
Memphis	Memphis, TN	1	2013
Burke Lakefront	Cleveland, OH	1	2013
San Francisco	San Francisco, CA	4	2014
T.F. Green	Providence, RI	1	2014
Addison	Addison, TX	1	2014
Chicago Executive	Wheeling, IL	1	2014
Reagan National	Washington, DC	3	2014/2015
Monterey	Monterey, CA	1	2015

() Bed replaced

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+ Reliever airport

Airport	Location	# of Systems	Installation Date(s)
Oakland International	Oakland, CA	1	2015
Nome	Nome, AK	1	2015
Lehigh Valley	Allentown, PA	2	2015
John Tune	Nashville, TN	1	2015
Kodiak	Kodiak, AK	2	2015
Rutland	Rutland, VT	1	fall 2015
Sikorsky	Bridgeport, CT	1	fall 2015
T. F. Green	Providence, RI	1	fall 2015
Monterey Regional	Monterey, CA	1	fall 2015
McAllen International	McAllen, TX	1	fall 2015
Sandiford	Louisville, KY	1	fall 2015
Chicago Exec	Wheeling, IL	1	fall 2015
Venice	Venice, FL	1	2016
Boca Raton	Boca Raton, FL	1	2016
() Bed replaced			
* Widened in 2008			
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Additional ESCO projects currently under contract

Airport	Location	# of Systems	Expected Installation Date
DeKalb/Peachtree	Atlanta, GA	1	2017
Boca Raton	Boca Raton, FL	1	2017
Providence	Providence, RI	1	2017
Cuyahoga	Cleveland, OH	2	2017/2018
Burbank	Burbank, CA	1	2017
Lafayette	Lafayette, LA	1	2017

EMAS Installations Using Runway Safe EMAS

Currently, Runway Safe EMAS is installed at 1 runway end at 1 airport in the U.S., with plans to install 3 EMAS systems at 1 U.S. airport.

Airport	Location	# of Systems	Installation Date
Chicago Midway	Chicago, IL	4	fall 2014/2015/2016

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