

Runway

Excursions: RESA

Improvements &

Mitigation Practices

The Five Ws &

One H

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Seminar on Airport Master
Planning

Alberto Cruz, P.E., C.M.

By: Federal Aviation Administration,
Office of Airports, Western-Pacific,
Regional Engineer

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Federal Aviation
Administration



Alberto O. Cruz P.E., C.M.

Mr. Cruz has over 25 years in Airport Engineering.

Mr. Cruz serves as the Regional Engineer for the FAA Western- Pacific Region. In this capacity, he serves as the subject matter expert for airport design, pavement, and construction standards. He is the region's point of contact and provides guidance to airport operators.

Prior to this position, Mr. Cruz served as Manager for the Design and Construction Branch located in Washington DC.

The Airport Design & Construction Branch is responsible for developing engineering standards for design, equipment, construction, and maintenance of civil airports.



SFO Incident



Runway Excursions

1. What are they?
2. Where are REs happening?
3. Why are REs happening? (contributing factors)
4. When to perform review?
5. Who is involved?
6. How we assess?



Who is responsible for SAFETY?



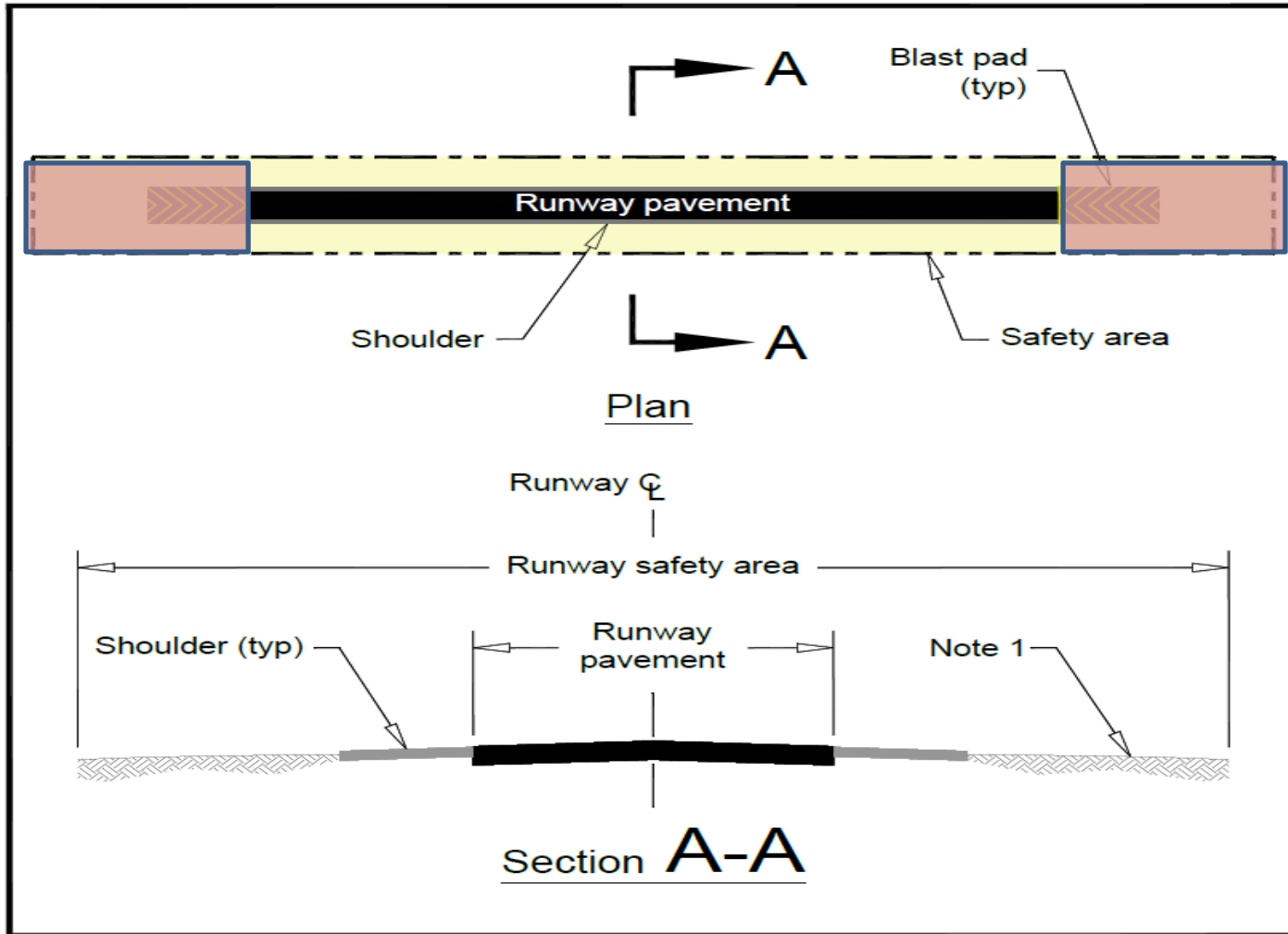
What are they?

A runway excursion (RE) is a veer off or overrun from the runway surface (ICAO).

- occur while an aircraft is taking off or landing, and involve many factors ranging from unstable approaches to the condition of the runway.
- involve all parties (Pilots, Air Traffic Controllers, Airport Authorities, etc.) work together to mitigate the hazards that result in an RE.
- **Take action.** REs are a top safety risk where the likelihood and severity can be mitigated through proactive action.



Where are REs happening?



Runway Strip/Runway End Safety Area

Code No. 3 & 4 PIR Runway – ICAO Annex 14, 3.4

• 3.4.3 Runway strip for PIR shall extend, wherever practical, laterally 150 m (500') of CL.

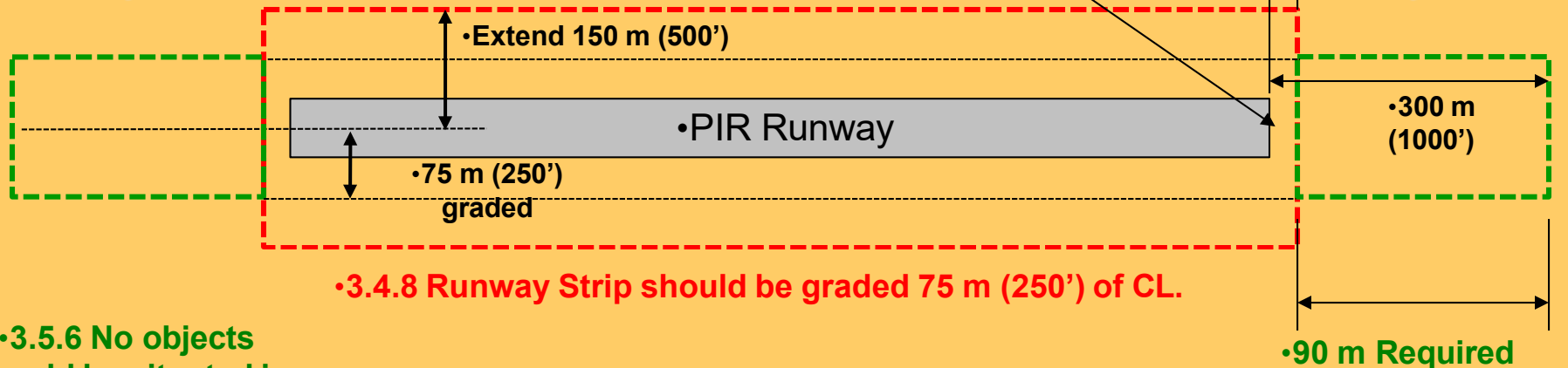
• 3.4.11 Runway Strip should have blast erosion protection 30 m (100') prior to threshold

• Runway Strip extends 60m (200') past thresholds

• Runway End Safety Area

• Runway Strip

• Runway End Safety Area



• 3.4.8 Runway Strip should be graded 75 m (250') of CL.

• 3.5.6 No objects should be situated in RESA that may endanger planes.

• 3.4.7 No Fixed Objects other than frangible visual aids permitted in Runway Strip within 60 m (200') of CL or 77.5 m (250') of CL for Code 4F runway.

• 90 m Required

• 240 m Recommended

• 3.5.7 RESA should be graded and cleared to reduce risk of damage to planes undershooting or overrunning the runway.

• 3.4.6 An object situated on a runway strip which may endanger aeroplanes should be regarded as an obstacle and should, as far as practical, be removed.

• Width shall be at least twice runway width. Recommended width same as graded width of Runway Strip (75 m).

• 3.11.5 Taxiway strip should be graded 22 m (72') from centre line for Code Letter E.

Why are they happening?

➤ Some contributing factors of Runway Excursions:

- Rubber accumulation
- Runway longitudinal grade issues
- Lack of Runway Distance Remaining Signs
- Runway Grooving
- Insufficient Runway Safety Areas



Things we may not have control:

- Human Factors involving Pilot Error
- Aircraft mechanics



Gradual Rubber Accumulation and other contaminants



Snow and Ice Control Plan (SICP)



Heavy Rubber Build-Up



Excessive Runway Longitudinal Grades



Distance Remaining Signs



FAA AC 150/5340-18
Not found in Annex 14 Volume 1



Runway Grooving



The FAA's
Technical Center
includes a Runway
Pavement Testing
Facility.
AC-150/5320-12



NAVIGATIONAL AIDS



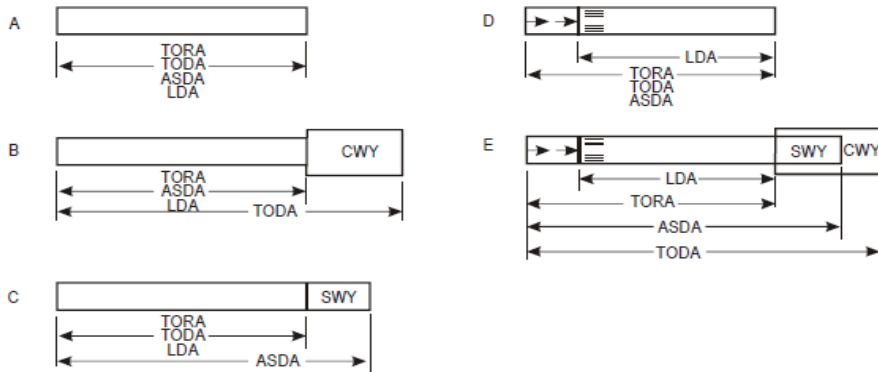
Runway Safety Area Improvements

1. Construct a standard RSA when able. When inadequate:
2. Relocate or shift a runway to establish the proper RSA dimension off the ends of runways. If the runways can not be moved:
3. *Implement declared distances, or
4. Install arresting bed system at runway end.

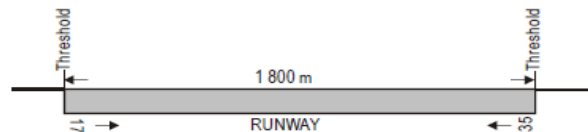
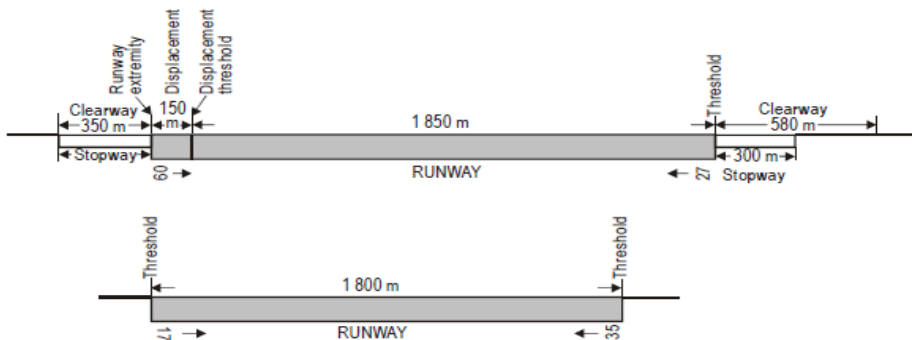
FAA AC-150/5220-22, *Engineered Material Arresting Systems (EMAS) for Aircraft Overruns*



Declared Distances



Note.— All declared distances are illustrated for operations from left to right.



F

	RUNWAY	TORA	ASDA	TODA	LDA
	m	m	m	m	m
09	2 000	2 300	2 580	1 850	1 850
27	2 000	2 350	2 350	2 000	2 000
17	NU	NU	NU	1 800	1 800
35	1 800	1 800	1 800	NU	NU

Adjust Lengths of:

- Landing Distance Available (LDA)
- Accelerate Stopping Distance Available (ASDA)

Annex 14 Volume I



SFO Incident



Engineered Materials Arresting Systems (EMAS)

- consists of material designed to “arrest” or safely stop aircraft which overrun the end of the runway
- disintegrates around the landing gear, deaccelerating the aircraft faster than open space

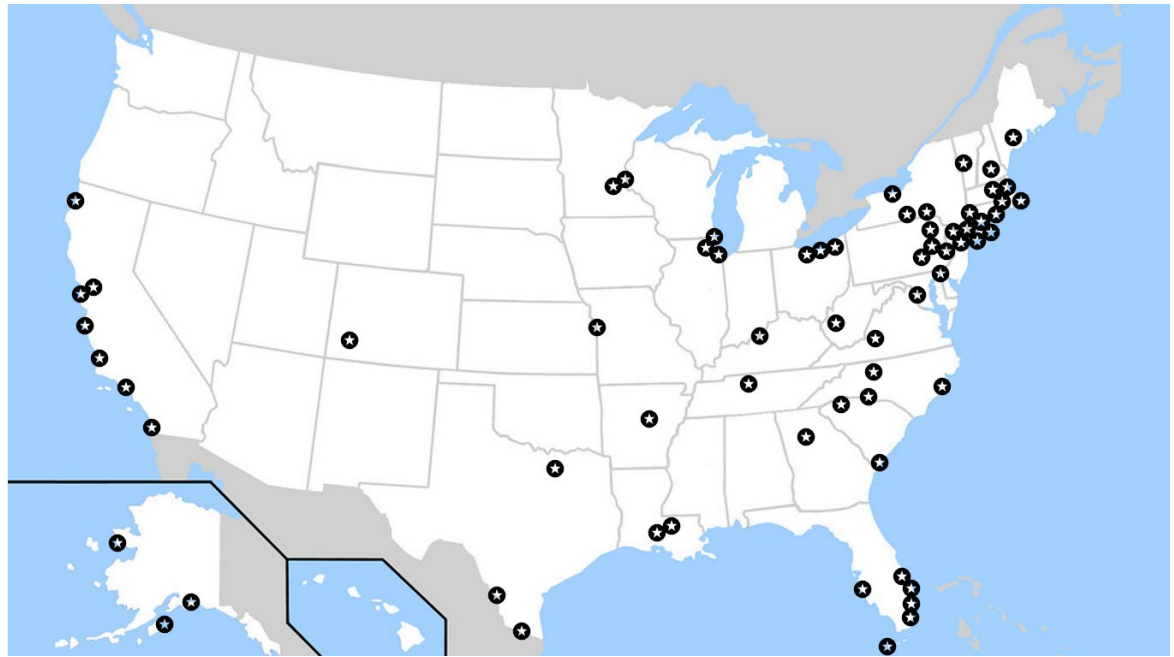


Arrestor Bed System- EMAS



EMAS DEPLOYMENT

EMAS protects
117 runways at
69 airports
across the United
States



Airport locations approximate



EMAS SUCCESS

EMAS has “arrested” 18 aircraft with 419 “souls” on board

Aircraft	Souls	Airport	Year	Aircraft	Souls	Airport	Year
Saab 340	30	JFK	1999	Falcon 20	2	PWK	2016
Gemini Cargo MD-11	3	JFK	2003	Boeing 737	37	LGA	2016
Boeing 747	3	JFK	2005	Cessna 750 Citation	2	BUR	2017
Mystere Falcon 900	5	GMU	2006	Beech Jet 400A	4	BLK	2018
Airbus A320	145	ORD	2008	Boeing 737	117	BUR	2018
Bombardier CRJ-200	34	CRW	2010	Embraer Phenom 100	1	MCI	2019
G-4 Gulfstream	10	TEB	2010	Dassault F900	2	PWK	2021
Cessna Citation II	5	EYW	2011	Cessna Citation Excel	9	RDG	2021
Cessna 680 Citation	8	PBI	2013	Aero L-39	2	SUA	2021



Recent Related Research



- EMAS Perimeter Markers
- EMAS Signs



When are we looking improvements?

- Project Planning and Programming
 - Master Planning / ALP review

- Assess existing Runway End Safety Areas



How we assess existing conditions?

- **Runway Safety Area Program - FAA Order 5200.8**
- **Runway Safety Area Inventory and Determinations**
- **Financial Feasibility and Equivalency of RSA Improvements & EMAS – FAA Order 5200.9**



Who is involved?

- Aerodrome operators (with consultant, if any)
- (CAA) Agency Engineers & Planners
- (CAA) Regional Office
 - SMS specialist, Cert Inspector, Regional Engineer
- Lines of Businesses (LOB)
- FAA Headquarters



FAA - Lines Of Businesses'

- **Operates Control Towers, TRACONS, Centers**
- **Develops Flight Procedures and impacts during construction**
- **Technical standards to ensure safe flight procedures**
- **Installs and maintains FAA communications, navigation and surveillance equipment**
- **Manages system-wide traffic flow management during good and bad weather days, and construction**
- **Construction safety and airport certification**
- **Gateway to the ATO, including integration with capital planning and reimbursable agreements for NAVAIDs implementation**

ATS: Air Traffic Services

AJV: Mission Support,
Flight Procedures Team

AFS: Flight Standards

AJW: Technical Operations

AJR: System Operations

ARP: Airport District Office

AJV: NAS Planning
and Integration



SUMMARY

→ What are Runway Excursions and how data influenced design standards

→ **Not** meeting standards are not enough, need to assess existing conditions & implement incremental improvements to enhance safety.

→ EMAS implementation



Discussion



Alberto.Cruz@faa.gov



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