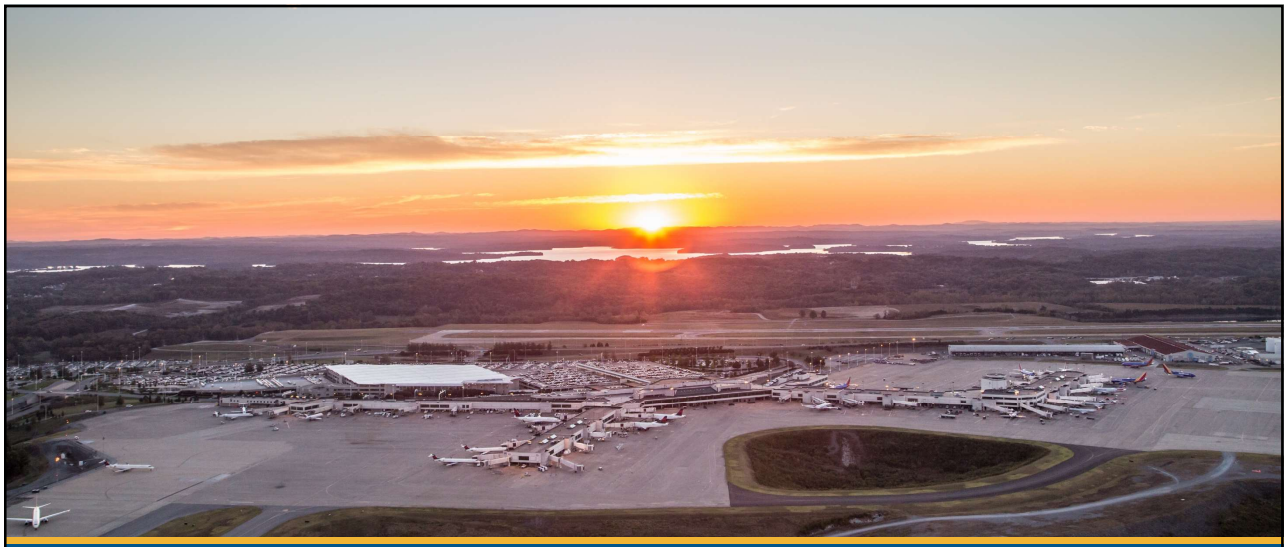


JOHN C. TUNE AIRPORT ENGINEERED MATERIAL ARRESTING SYSTEM (EMAS)

CAITLIN DILLON, PE

JWN John C. Tune Airport

EMAS DESIGN AND CONSTRUCTION

JOHN C. TUNE AIRPORT 2015

JWN John C. Tune Airport

JWN Airport pre-2014

JWN John C. Tune Airport

JWN "A New Tune" Project Goals

Existing Conditions

- Airport was **designed for a smaller aircraft fleet mix** than what it had come to serve
  - 5,500ft Runway was already too short
  - FAR Part 135 requires aircraft to operate at a weight that would allow a full stop at 70% of effective runway length
- **Runway Safety Area** deficiencies further reduced effective runway length

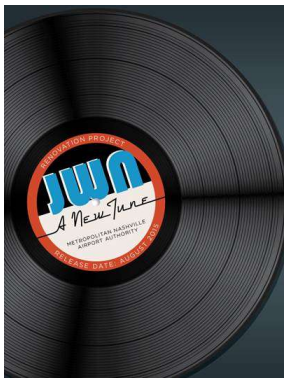
Runway Safety Area (RSA) = a defined surface surrounding the runway, typically 500ft wide and extending 1,000ft beyond each runway end. It provides a safely graded area for if an aircraft overruns, undershoots or veers off the side of the runway.

  - Only 100 feet available to the north due to road and terrain; first 500 feet of runway displaced
  - Only 500 feet available to the south due to localizer antenna (navigational aid for runway users)
  - Congress mandated that all runway ends have adequate RSA's by 2015
- **Obstructions** to the airspace around JWN contributed to navigation challenges for pilots
- Older airport with examples of **nonconformities with modern design guidelines**
  - Taxiway 500 feet short of being full-length parallel to the north, requiring back-taxiing
  - Runway and taxiway grades did not meet FAA standards
  - Taxiway A-2 extended directly from aircraft parking apron to runway

JWN John C. Tune Airport

JWN "A New Tune" Project Goals

Declared Distances = the distances the airport owner declares available for use in meeting an airplane's takeoff run, takeoff distance, accelerate-stop distance and landing distance requirements. Insufficient RSA will reduce Declared Distances.



Declared Distances – Before

Declared Distance	Runway 2	Runway 20
Accelerated Stop Distance Available	4,600	5,000
Takeoff Runway Available	5,500	5,500
Takeoff Distance Available	5,500	5,500
Landing Distance Available	4,500	4,500

Declared Distances - After

Post-Construction Declared Distances	Runway 2	Runway 20
Accelerated Stop Distance Available	6,000	6,000
Takeoff Runway Available	6,000	6,000
Takeoff Distance Available	6,000	6,000
Landing Distance Available	6,000	6,000

JWN John C. Tune Airport

PERSONNEL/FIRMS ASSOCIATED WITH THIS PROJECT:

Metropolitan Nashville Airport Authority
Atkins
AMEC/Foster –Wheeler
Geotek Engineering Company
Thornton & Associates
Connico Incorporated
Burns Engineering
Woolpert, Inc.
Zodiac Aerospace
Civil Constructors LLC
LoJac Enterprises
Archangel Protective Services
Gibco
McFall Seed and Sod
Pozzolanic
STC-Memphis
WMC Contracting
Five-D Enterprises Inc.
Mid TN Erosion
Tom Arnold Construction

PROJECT SCHEDULE AND FEES:

Overall Program Schedule = 54 Months

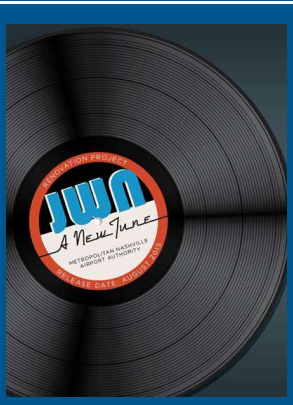
Construction Schedule = 27 Months (all three phases)

Airport Closure = 60 days

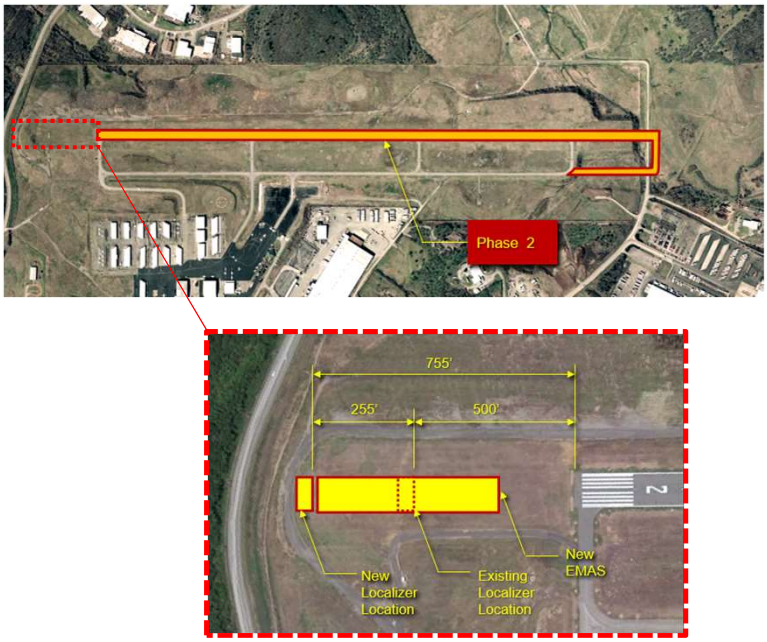
Design Fees = $2,060,805.33 (all three phases)

Construction Fees = $22,598,217.47 (all three phases)

A New Tune



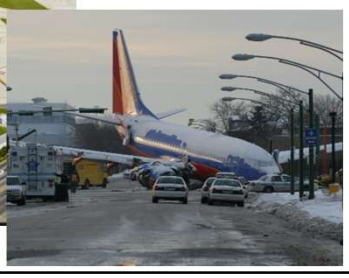
JWN John C. Tune Airport



A New Tune (Phase II)

- Reconstruct existing runway
- 500ft runway extension
- New Localizer
- Asphalt run-up bed for EMAS
- Runway lighting
- Installation of EMAS

JWN John C. Tune Airport



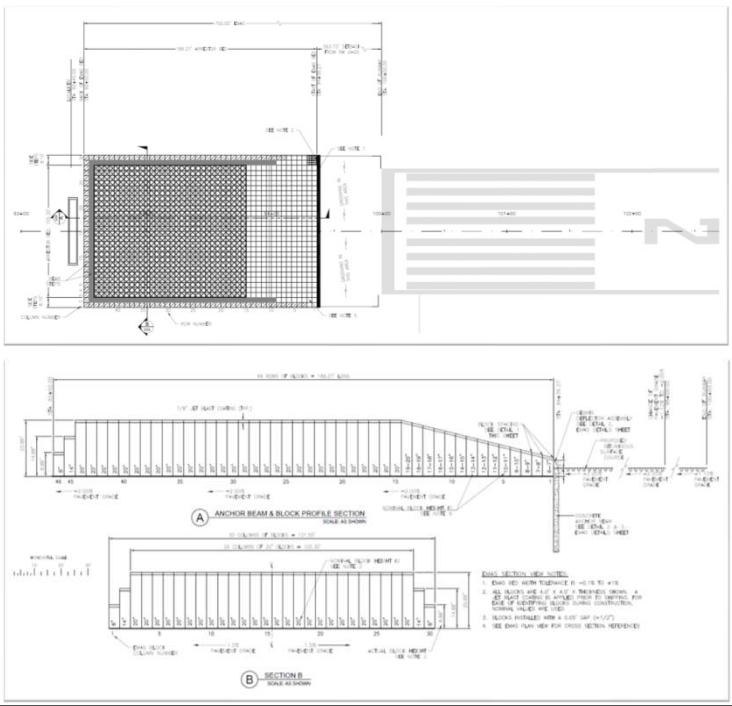
What is an EMAS

- EMAS = Engineered Material Arresting System
  - Where land is not available or it's not possible to have a 1,000ft runway overrun.
  - Crushable material placed at the end of a runway to stop an aircraft
  - Tires of an aircraft sink into the material causing the aircraft to decelerate quickly and safely
  - One time use
  - There have been 18 incidents where EMAS systems have safely stopped overrunning aircraft 1999-2022; the largest was a A320 with 145 passengers at ORD
- Research began in the 1990s at University of Dayton, Port Authority of NY and NJ
- EMAS Manufacturers are approved by the FAA

JWN John C. Tune Airport

WHAT IS AN EMAS

JWN John C. Tune Airport



JWN's EMAS

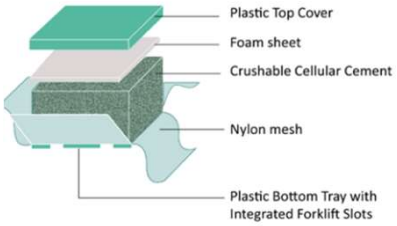
- JWN EMAS was the 99th install in the country (121 Total so far)
- JWN's EMAS is made of lightweight crushable concrete blocks in a 30x46 grid ; each block is about 4x4 with variable height
- $2.5 Million
- Design based on airfield dimensions and aircraft fleet mix

JWN John C. Tune Airport

JWN's EMAS - Design

Design

- EMAS blocks were prefabricated by Zodiac Aerospace (New Jersey)
- Anchor Block was constructed locally by prime contractor (reinforced concrete)



Mix Design

- FAA AC 15/5220-22 Engineered Materials Arresting Systems for Aircraft Overruns
- Ultra-lightweight cellular concrete (cement slurry with entrained air)
  - Foam mixed into cement/water slurry, with bubble stabilizer (Aluminum Sulfate)
  - Material is mixed, formed, and cured in a controlled environment chamber (70°F)
  - Little to no vibration or compaction
  - Delivered to the site by barge/truck

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JWN's EMAS - Installation

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EMAS Installation

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EMAS Installation

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EMAS Installation

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Questions

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