RECOMMENDATION AND COMMENTS

NAME OF PROJECT:	Replacement of EMAS Block- Damaged Runway
PURCHASING AGENT:	Phyllis A. Head
USER DEPARTMENT:	DeKalb Peachtree Airport (PDK)
NOTES:	1) This service is needed due to replace the blocks that were damaged due to recent crash. 2) Per GDOT, to bring the system back to its original design requirements, the damaged materials must be from the original manufacturer. This will ensure that the system meets the approved FAA design requirements. 3) An agenda item will be created for this request.
RECOMMENDATION:	My recommendation is to approve this service due to the services that these devices provide to perform PDK needs. The inability for the Airport to use the EMAS system at the of the main runway could pose a risk to the public health, welfare and safety of human lives.

Department of Purchasing and Contracting
NON-COMPETITIVE PROCUREMENT REQUEST FORM

Requesting Department: Airport (PDK)
Department Contact Person: Mario A. Evans, Director Telephone: 770.936.5440
Email: maevans@dekalbcountyga.gov

Requisition Number: _____ Suggested Supplier: Runway Safe, Inc.
Estimated Amount of Purchase: $ 1,536,259.00
Detailed Description of the Goods or Services to be purchased:
Purchase of 393 EMASMAX blocks and 8 shields, installation (materials, contractor, supervision), shipping and handling costs to deliver to PDK

☑ **Emergency** (For Emergency Requests, Please check this box and answer all questions below.)

1. Date and Time of Emergency Occurrence: October 18, 2023 3:25pm

2. Please state the nature of the emergency posing a risk to public health, welfare, safety or resources:

A landing aircraft over-shot the runway and damage was caused to the EMAS System. 393 blocks and 8 shields must be replaced and installed to reduce risk to landing aircraft and its occupants (human life) and to assure safety on the main runway at PDK.

3. State how the Estimated Amount was determined to be Fair and Reasonable (attach supporting documentation):

Attached letter from Runway Safe, Inc. (per FAA Airport Circular 150/5220/22B.)

☑ **Sole Source** (Please check box and answer all of the following completely.)

1. Provide and explanation why the product, service or supplier requested is the only method that can satisfy the requirements. Please explain why alternatives are unacceptable. Be specific with regard to specification, features, characteristics, requirements, capabilities and compatibility. (Attach additional documents, if necessary):

Runway Safe, Inc. is the sole provider of EMAS blocks that are manufactured to conform to the existing blocks, in accordance with FAA Airport Circular 150/5220/22B.

2. Will this purchase obligate us to a particular vendor for future purchases? (Either in terms of maintenance that only this vendor will be able to perform and/or if we purchase this item, will we need more "like" items in the future to match this one?) Explain in detail.

In the event of a future crash or unforseen damage to the EMAS System, Runway Safeway, Inc. will be the vendor for future purchases.

3. Explain the impact to the County or Public if this request is not approved.

The Airport will be unable to use the EMAS System at the end of the main runway as it is damaged. Human life and aircraft safety will be compromised.

I hereby request that this non-competitive procurement request be approved for the purchase of the above stated work, material, equipment, commodity, or service.

Department Director (Typed/Printed Name): Mario A. Evans Signature: _____ Date: 11/06/2

Do Not Write Below – for the Department of Purchasing and Contracting Use Only

Procurement Agent (Typed/Printed Name) Mg As Agent Signature: Date:

Procurement Manager (Typed/Printed Name) Phyllis A. Head Signature: Phyllis A Head Date: 11/27/23

☑ Approved ☐ Not Approved

Signature: Michelle Butler Digitally signed by Michelle Butler DN: cn=Michelle Butler, o=DeKalb County Govt, ou=Purchasing and Contracting, email=mbutler@dekalbcountyga.gov, c=US Date: 2024.01.16 15:46:18 -05'00' Adobe Acrobat version: 2023.008.20458, Director, Department of Purchasing and Contracting Date: _____

P&C Rev. 12/13/2018

(Additional information, attach pages if required):

Contractor to Provide Replacement EMAS blocks, Installation and Shipping/Handling ($1,536,259.00):

Mike C. Barnes, C.M.
Life Cycle Management Director
Runway Safe, Inc.
2239 High Hill Road
Logan Township, NJ 08085
302.438.7511
856.491.6315
mike.barnes@runwaysafe.com

Todd Gressick CM
Head of Sales and Marketing - North America
RUNWAY SAFE GROUP
todd.gressick@runwaysafe.com | +1-856-508-0593
www.runwaysafe.com

Georgia Department of Transportation

Russell R. McMurry, P.E., Commissioner
One Georgia Center
600 West Peachtree Street, NW
Atlanta, GA 30308
(404) 631-1000 Main Office

November 20, 2023

Mr. Mario A. Evans, Airport Director
DeKalb Peachtree Airport
212 Administration Building
2000 Airport Road
Atlanta, Georgia 30341

Re: Request for Procurement Options to Replace EMAS System Blocks

Dear Mr. Evans,

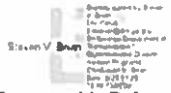
Per your request, the Georgia Department of Transportation (Department) understands you are exploring options to replace damage to the RunwaySafe EMAS System that was engaged by an aircraft on October 19th. It is our understanding the system performed as designed and the aircraft was brought to a stop with no injuries to passengers.

The System is designed to have the blocks that were damaged replaced to bring the system back to its original design requirements. The damaged materials must be obtained from the original manufacturer and the installation accomplished to their specification to ensure the system meets the approved FAA design requirements for this EMAS System.

The Department sees no options other than to acquire replacement RunwaySafe blocks to bring your system back to its original design standard.

If you have any questions, please contact me.

Sincerely,



Steven V. Brian
Manager, Aviation Programs

Cc: Colette Williams, Assistant Aviation Program Manager
Lew Walker, Project Manager, GDOT Aviation Program

November 1, 2023

DeKalb-Peachtree Airport
2000 Airport Road
Atlanta, GA 30341

Attention: Mr. Mario Evans

Subject: Proposal to Supply Materials for the Replacement of 393 blocks & 8 Shields for the EMAS on PDK 21 Departure End

Reference: Proposal for Supplying of Blocks, Materials, Labor, Shipping and Oversight to replace Three hundred & Ninity Three (393) EMAS blocks & 8 Shields for PDK Runway 21 Departure End

Dear Mario:

Runway Safe would like to offer the following proposal for your consideration: A proposal for replacing all three hundred & ninety-three (393) damaged blocks & 8 shields on the 21 Departure End EMAS bed at PDK.

Our price includes providing you with the following: 393 EMASMAX blocks, Installation materials, Contractor labor (Removal of 100 blocks, remediation of substrate, repair of the grade beam and installation of the replacement blocks), Runway Safe supervision and shipping are included in the quote. It is understood that Runway Safe will be onsite until project completion to ensure adherence to Runway Safe installation guidance and to certify and warranty all work. Runway Safe is supplying the following proposal for the EMAS repair:

- Three hundred & Ninity Three (393) EMASMAX® blocks - $1,049,075.00
- Installation (Materials, Contractor, and Supervision) - $418,284.00
- Shipping and handling costs to deliver the material to the airport - $68,900.00.

Price for Three hundred & Ninity Three (393) blocks & Eight (8) shield replacement: $1,536,259.00

Note

Runway Safe may require up to seven (7) weeks from receipt of a Notice to Proceed (NTP)/ Purchase Order (PO) to have the manpower and materials inventories and available support resources ready to make the repair. Please be advised, if you do not have a specific project start date due to the number of projects for this year, your actual project start will be on a first come service basis.

Please provide arrival address, name, and telephone number for onsite point of contact and any airport specific operating instructions. We thank you for the opportunity to provide this proposal and look forward to working with you on this project.

Sincerely,

Mike C. Barnes, C.M.
Life Cycle Management Director
Ph: (856) 491-6315
Email: mike.barnes@runwaysafe.com

Runway Safe, Inc. Terms & Conditions:

- **This proposal is quoted firm-fixed price and valid for a period of ninety (90) days from proposal submittal date.**

- **Payment terms are $460,878.00, 30% down and remaining balance $1,075,381.00, Net 30 days from invoice date.** Unless specifically stipulated on an invoice or otherwise agreed to in writing by Runway Safe, fees are in U.S. Dollars. Late payments accrue interest at a rate of 1.0% per month or portion thereof.

- These Terms and Conditions and the non-conflicting provisions in any quotation, acknowledgment, or invoice from Runway Safe (collectively, the "Agreement") govern in all respects the EMAS products and services provided by Runway Safe to you ("Buyer"). No terms stated by Client in any purchase order ("PO"), acceptance or acknowledgement become part of the Agreement unless expressly agreed to and accepted by Runway Safe in writing and Runway Safe hereby rejects any additional or different terms. When drafting the PO for the repair, Buyer must add the following statement to the PO: "Terms & conditions stated in the Runway Safe Proposal, dated November 1, 2023, for the amount of $1,075,381.00 after the down payment of $460,878.00 has been applied supersede and replace the terms and conditions on this purchase order".

- **Payment must be made by wire transfer or by [certified] check in the following manner:**

Wire Transfer:	**Mailing Address:**
ABA #: 026009593	Runway Safe Inc.
Swift Code: BOFAUS3N	2239 High Hill Road
Account: 858000092600	Logan Township NJ, 08085
135 S. LaSalle St. Chicago, IL 60603	Attention: CFO

- No sales, use, or other taxes are included in the quoted price. Any such taxes, if applicable, must be paid by Client directly to the taxing authority and Client shall reimburse Runway Safe for any taxes, charges or late fees assessed on Runway Safe. Pricing does not include any bond fees.

- Client must provide Runway Safe with the opportunity to schedule continuous 8-hour daylight weekday shifts ("call-offs", less than 8-hour continuous shifts, shortened shifts, declined access or workday cancellations will incur additional charges)

- Please note that Client is responsible to provide access and escorting for all courses of action. Badging costs are not included and are the responsibility of Client. Client is responsible for escorting Runway Safe personnel and contractors.

- Shipping Terms: FOB Destination

- Client is to receive blocks and materials prior to the start of the repair (forklifts needed by Client). Client is responsible for storing materials on site (blocks and materials will ship prior to the start of work). Blocks and materials to be stored in an enclosed area at the Client. Client is responsible for risk of loss of blocks and materials upon delivery.

- Client is responsible for maintaining security, providing flagmen and providing lighted X's (if required).

- Client must provide a storage and staging area on asphalt or concrete pavement at Client close to the EMAS.

- Client shall provide space at the Client for block storage and staging (to park trucks, stage blocks) at no cost to Runway Safe. Extended storage fees (TBD) could apply if installations are delayed from target installation dates (TBD-mutually agreed upon between Runway Safe and Client).

- Runway Safe will provide a 90-day limited commercial warranty against defects in materials and workmanship provided Runway Safe supervises the repair and the process is completed in accordance with Runway Safe standards (as validated and accepted by Runway Safe representatives upon completion of the repair). See the attached warranty for details.

- The materials provided are in accordance with FAA Advisory Circular 150/5220-22B.

RUNWAY SAFE, INC. ENGINEERED MATERIAL ARRESTING SYSTEM LIMITED WARRANTY

RUNWAY SAFE, Inc. ("Runway Safe") warrants to the original purchaser (the "Owner") of the Runway Safe Engineered Material Arresting System replacement materials ("EMAS Replacement Materials") that, for a period of 90 days from the date the EMAS Replacement Materials are installed, and subject to the limitations stated herein, the EMAS Replacement Materials (excluding base surface preparation) will be free from defects in materials and workmanship. This Warranty is expressly conditioned on the Owner's satisfying all of the following requirements:

MAINTENANCE: Runway Safe requires that the Owner initiate and follow a preventative maintenance program in accordance with the Runway Safe Inspection, Maintenance and Repair Manual listed under the clause "Applicable Documents".

RIGHT OF INSPECTION: The Owner shall provide Runway Safe with reasonable access to the EMAS Replacement Materials after their installation for the purpose of conducting inspections if necessary. Reasonable access shall include, without limitation, access during daylight hours to permit careful visual assessment of the condition of the EMAS Replacement Materials and access to all records of maintenance carried out by the Owner.

NOTIFICATION: If the Owner believes that it has a claim arising from the failure of the EMAS Replacement Materials to conform with this Warranty, the Owner must notify Runway Safe of the claim, within ten (10) days after discovering the conditions giving rise to the claim, and in any case before the Warranty period has expired. All such notices shall be given by certified mail addressed to **Quality Assurance Manager, Attention: Warranty Claim;** Runway Safe, Inc., 2239 High Hill Road, Logan Township, NJ 08085, USA.

Failure to adhere to any of the conditions stated above shall void this Warranty.

WARRANTY REMEDY If the Warranty set forth above is breached, Runway Safe will, at its sole option, either (1) correct the non-conformity at its own cost within a reasonable time after receiving notice of the breach, or (2) a refund of the price of the non-conforming EMAS Replacement Material(s) at its own cost within a reasonable time after receiving notice of the breach. The Owner shall give Runway Safe reasonable access to the EMAS that allows Runway Safe to perform its warranty obligations on its most cost-effective basis possible.

EXCLUSIONS

Runway Safe shall not be liable for any damage to the EMAS Replacement Materials or other property attributable to any of the following (or any combination thereof):

1. Standing water in and around the EMAS bed,
2. Vehicular traffic;
3. Aircraft traffic in contact with the EMAS bed;
4. Damage caused by snow removal equipment that does not meet Runway Safe specifications detailed under the clause "Applicable Documents" which were provided with the original EMAS installation;
5. Acts of nature, including, but not limited to, lightning, flood, winds in excess of 100 mph, earthquake, hurricane, tornado, hail storm, wildfire, or impact of objects or other violent storm or casualty;
6. Damage caused by wild life indigenous to the installation location;
7. Repairs or alterations of the EMAS, unless performed by personnel trained and qualified by Runway Safe and in a manner meeting the Runway Safe specifications and procedures listed under the clause "Applicable Documents", which were provided with the initial EMAS installation;
8. Excessive buildup of debris in and around the EMAS bed;
9. Impact or contact with other objects, spilled liquids or immersion in liquids (including fuel dropped from over-flying aircraft);

10. Use of the EMAS for purposes other than those for which it is customarily used;
11. Improper maintenance, abuse or other neglect;
12. Exposure to chemicals other than de-icers and aircraft engine exhaust;
13. Jet blast in excess of 100 mph;
14. Damage or defect due to faulty or improper workmanship, including installation of the product that is not in accordance with Runway Safe's published specifications and installation recommendations in effect at the time of installation;
15. Damage to the EMAS Replacement Materials related to or caused by the base surface not being constructed per the drawings and specifications. Runway Safe must check and accept the base surface prior to the start of EMAS arrestor bed installation; and
16. Any subsequent failure of the base surface whether or not originally constructed per the drawings and specifications.

APPLICABLE DOCUMENTS

Inspection, Maintenance and Repair Manual, Current Version

WARRANTY EXCLUSIVE/LIMITATION OF LIABILITY

THE EXPRESS WARRANTY SET FORTH ABOVE IS EXCLUSIVE AND NO OTHER WARRANTIES OF ANY KIND, WHETHER STATUTORY, ORAL, WRITTEN, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, SHALL APPLY. THE OWNER'S EXCLUSIVE REMEDIES AND RUNWAY SAFE'S ONLY OBLIGATIONS ARISING OUT OF OR IN CONNECTION WITH DEFECTS OR NON-CONFORMITIES IN THE EMAS REPLACEMENT MATERIALS, WHETHER BASED ON WARRANTY, CONTRACT, TORT (INCLUDING NEGLIGENCE) OR OTHERWISE, SHALL BE THOSE STATED HEREIN. NOTWITHSTANDING ANY PROVISION TO THE CONTRARY IN ANY CONTRACT DOCUMENT, RUNWAY SAFE'S TOTAL LIABILITY TO THE OWNER ARISING FROM OR RELATING TO DEFECTS OR NON-CONFORMITIES IN THE EMAS REPLACEMENT MATERIALS SHALL BE LIMITED TO THE ORIGINAL PURCHASE PRICE OF THE EMAS REPLACEMENT MATERIALS PAID TO RUNWAY SAFE. RUNWAY SAFE SHALL HAVE NO LIABILITY TO THE OWNER FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES. REGARDLESS OF ANY STATUTORY LIMITATION PERIODS, RUNWAY SAFE SHALL NOT BE LIABLE FOR ANY BREACH OF WARRANTY OF WHICH IT IS NOT NOTIFIED AS REQUIRED BEFORE THE WARRANTY PERIOD HAS EXPIRED.

NO WARRANTY MODIFICATIONS

This Warranty shall not be modified except in a writing signed by Runway Safe's Group CEO. No representative, employee, or agent of Runway Safe, or any person, other than the Group CEO of Runway Safe, has the authority to assume for Runway Safe any additional liability or responsibility in connection with the EMAS or this Warranty.

To ensure registration of this Warranty, please return a signed copy to:

Quality Assurance Manager
Runway Safe Inc.
2239 High Hill Road
Logan Township, NJ 08085
Phone (302) 438.7511

Name (Please Print) of Owner's Authorized Representative: Mario A. Evans C.M.

Signature: _____ Date: 11/6/23

Title: Airport Director, DeKalb Peachtree Airport

IN WITNESS WHEREOF, the parties hereto have set their hands and caused their seals to be affixed each to be considered as an original by their authorized representatives.

DEKALB COUNTY, GEORGIA

By: _____(SEAL)
Signature

_____
Name (Typed or Printed)

_____
Title

_____
Federal Tax I.D. Number

_____ by Dir.(SEAL)
MICHAEL L. THURMOND
Chief Executive Officer
DeKalb County, Georgia

ATTEST:

_____
Signature

_____
Name (Typed or Printed)

_____
Title

ATTEST:

_____
BARBARA H. SANDERS, CCC, CMC
Clerk of the Chief Executive Officer
and Board of Commissioners of
DeKalb County, Georgia

APPROVED AS TO SUBSTANCE:

_____
Department Director

APPROVED AS TO FORM:

_____
County Attorney Signature

_____
County Attorney Name (Typed or Printed)

U.S. Department of Transportation

Federal Aviation Administration

Advisory Circular

Subject: Engineered Materials Arresting Systems (EMAS) for Aircraft Overruns	Date: 9 27 2012	AC No: 150 5220-22B
	Initiated by: AAS-100	Change:

1. **PURPOSE.** This advisory circular (AC) contains standards for the planning, design, installation, and maintenance of Engineered Materials Arresting Systems (EMAS) in runway safety areas (RSA). Engineered Materials means high energy absorbing materials of selected strength, which will reliably and predictably deform under the weight of an aircraft.

2. **CANCELLATION.** This AC cancels AC 150 5220-22A, Engineered Materials Arresting Systems (EMAS) for Aircraft Overruns, dated September 30, 2005.

3. **BACKGROUND.** Aircraft can and do occasionally overrun the ends of runways, sometimes with devastating results. An overrun occurs when an aircraft passes beyond the end of a runway during an aborted takeoff or while landing. Data on aircraft overruns over a 12-year period (1975 to 1987) indicate that approximately 90% of all overruns occur at exit speeds of 70 knots or less and most come to rest between the extended runway edges within 1000 feet of the runway end (References 3 and 4, Appendix 4).

To minimize the hazards of overruns, the Federal Aviation Administration (FAA) incorporated the concept of a safety area beyond the runway end into airport design standards. To meet the standards, the safety area must be capable, under dry conditions, of supporting the occasional passage of aircraft that overrun the runway without causing structural damage to the aircraft or injury to its occupants. The safety area also provides greater accessibility for emergency equipment after an overrun incident. There are many runways, particularly those constructed prior to the adoption of the safety area standards, where natural obstacles, local development, and or environmental constraints, make the construction of a standard safety area impracticable. There have been accidents at some of these airports where the ability to stop an overrunning aircraft within the runway safety area would have prevented major damage to aircraft and/or injuries to passengers.

Recognizing the difficulties associated with achieving a standard safety area at all airports, the FAA undertook research programs on the use of various materials for aircraft arresting systems. These research programs, as well as, evaluation of actual aircraft overruns into an EMAS have demonstrated its effectiveness in arresting aircraft overruns.

4. **APPLICATION.** RSA standards cannot be modified or waived. The standards remain in effect regardless of the presence of natural or man-made objects or surface conditions that might create a hazard to aircraft that overrun the end of a runway. A continuous evaluation of all practicable alternatives for improving each sub-standard RSA is required. FAA Order 5200.8, Runway Safety Area Program, explains the evaluation process.

FAA Order 5200.9, Financial Feasibility and Equivalency of Runway Safety Area Improvements and Engineered Material Arresting Systems, is used in connection with FAA Order 5200.8 to determine the best practicable and financially feasible alternative for an RSA improvement.

The FAA does not require an airport operator to reduce the length of a runway or declare its length to be less than the actual pavement length to meet runway safety area standards if there is an adverse operational impact to the airport. An example of an adverse operational impact would be an airport's inability to accommodate its current or planned aircraft fleet. Under these circumstances, installing an EMAS is another way of enhancing safety.

A standard EMAS provides a level of safety that is equivalent to a full RSA built to the dimensional standards in Chapter 3, Runway Design, of the latest version of AC 150 5300-13, Airport Design. It also

provides an acceptable level of safety for undershoots (by providing the minimum 600 feet of runway safety area), in addition to overruns.

The FAA recommends the guidelines and standards in this AC for the design of EMAS. In general, this AC is **not mandatory** and does not constitute a regulation. It is issued for guidance purposes and to outline a method of compliance. However, use of these guidelines is **mandatory** for an airport operator installing an EMAS funded under Federal grant assistance programs or on an airport certificated under Title 14 Code of Federal Regulations (CFR) Part 139, Airport Certification. Mandatory terms such as "must" used herein apply only to those who seek to demonstrate compliance by use of the specific method described by this AC.

If an airport operator elects to follow an alternate method, the alternate method must have been determined by the FAA to be an acceptable means of complying with this AC, the runway safety area standards in the latest version of AC 150/5300-13, and 14 CFR Part 139.

5. **PRINCIPAL CHANGES.**

a. Corrected references to appendices in "BACKGROUND" paragraph.

b. Changed reference of "airport sponsor" to say "airport operator".

c. Clarified that the latest versions of all ACs listed in this AC are to be referenced.

d. Provided further clarification that the planning charts are based on previously simulated information and that final design must be done by the EMAS manufacturer.

e. Deleted the term "pool braking" throughout. Replace with "0.25 braking friction coefficient."

f. Clarified the term "passive system."

g. Clarified service life requirement for newly constructed EMAS beds.

h. Changed the word "should" to "must" in many sections.

i. Clarified the requirements on the minimum width of an EMAS based on the standard runway width for the applicable airplane design group.

j. Clarified the requirements for snow removal compatibility, a snow removal plan and to protect functionality of navigational aids from snow and ice.

k. Clarified the terms of the 45 day repair requirement.

l. Added guidance for requirements prior to and during construction or repair.

m. Clarified the requirements to material characteristics as it pertains to wildlife and added anti-icing fluids, and herbicides.

n. Modified the required design submittal date.

o. Clarified inspection and maintenance requirements.

6. **RELATED READING MATERIAL.** Appendix 4, Related Reading Material, contains a list of documents with supplemental material relating to EMAS. These documents contain information on materials evaluated, as well as design, construction, and testing procedures utilized. Testing and data generated under these FAA studies may be used as input to an EMAS design without additional justification.

7. **PLANNING CHARTS.** The figures included in Appendix 2, Planning Charts, are for general planning purposes only. They are intended as a preliminary screening tool based on previously simulated information on EMAS beds and are not sufficient for final design. Final design must be done by the EMAS manufacturer and must be customized for each installation. The figures illustrate estimated EMAS stopping distance capabilities for various aircraft types. The design used in each chart is optimized specifically for the aircraft noted on the chart. Charts are based on standard design conditions, i.e. 75-foot set-back, no reverse thrust, and an 0.25 braking friction coefficient.

a. **Example 1.** Assume a runway with a DC-9 (or similar) as the design aircraft. Figure A2-1 shows that an EMAS 400 feet in length (including a 75-foot set-back) is capable of stopping a DC-9 within the confines of the system at runway exit speeds of up to 75 knots.

b. **Example 2.** Assume the same runway, but assume the design aircraft is a DC-10 (or similar). Figure A2-2 shows an EMAS of the same length, but designed for larger aircraft, can stop the DC-10 within the confines of the system at runway exit speeds of up to 62 knots.

8. PRELIMINARY PLANNING. Follow the guidance in FAA Orders 5200.8 and 5200.9 to determine practicable, financially feasible alternatives for RSA improvements. Additional cost and performance information for EMAS options to consider in the analysis can be obtained from the EMAS manufacturer.

9. SYSTEM DESIGN REQUIREMENTS. For purposes of design, the EMAS can be considered to be fixed by its function and frangible since it is designed to fail at a specified impact load. EMAS is exempt from the requirements of 14 CFR Part 77, Safe, Efficient Use, and Preservation of the Navigable Airspace. When EMAS is the selected option to upgrade a runway safety area, it is considered to meet the safety area requirements of 14 CFR Part 139. The following system design requirements must prevail for all EMAS installations:

a. **Concept.** An EMAS is designed to stop an overrunning aircraft by exerting predictable deceleration forces on its landing gear as the EMAS material deforms. It must be designed to minimize the potential for structural damage to aircraft, since such damage could result in injuries to passengers and or affect the predictability of deceleration forces. An EMAS must be designed for a 20-year service life.

b. **Location.** An EMAS is located beyond the end of the runway and centered on the extended runway centerline. It will usually begin at some setback distance from the end of the runway to avoid damage due to jet blast and undershoots (Figure A1-2, Appendix 1). This distance will vary depending on the available area and the EMAS materials. Where the area available is longer than required for installation of a standard EMAS designed to stop the design aircraft at an exit speed of 70 knots, the EMAS should be placed as far from the runway end as practicable. Such placement decreases the possibility of damage to the system from short overruns or undershoots and results in a more economical system by considering the deceleration capabilities of the existing runway safety area.

An EMAS is not intended to meet the definition of a stopway as provided in the latest version of AC 150/5300-13. The runway safety area and runway object free area lengths begin at a runway end when a stopway is not provided. When a stopway is provided, these lengths begin at the stopway end.

The airport operator, EMAS manufacturer, and the appropriate FAA Regional Airports Division/Airports District Office (ADO) must consult regarding the EMAS location to determine the appropriate position beyond the end of the runway for the EMAS installation for a specific runway.

c. **Design.** An EMAS design must be supported by a validated design method that can predict the performance of the system. The design (or critical) aircraft is defined as that aircraft using the associated runway that imposes the greatest demand upon the EMAS. This is usually, but not always, the heaviest-largest aircraft that regularly uses the runway. EMAS performance is dependent not only on aircraft weight, but landing gear configuration and tire pressure. In general, use the maximum take-off weight (MTOW) for the design aircraft. However, there may be instances where less than the MTOW will require a longer EMAS. All configurations should be considered in optimizing the EMAS design. To the extent practicable, however, the EMAS design should consider both the aircraft that imposes the greatest demand upon the EMAS and the range of aircraft expected to operate on the runway. In some instances, a composite design aircraft may be preferable to optimizing the EMAS for a single design aircraft. Other factors unique to a particular airport, such as available RSA and air cargo operations, should also be considered in the final design. The airport operator, EMAS manufacturer, and the appropriate FAA Regional Airports Division ADO must consult regarding the selection of the design aircraft that will optimize the EMAS for a specific airport.

The design method must be derived from field or laboratory tests. Testing may be based either on passage of an actual aircraft or an equivalent single wheel load through a test bed. The design must consider multiple aircraft parameters, including but not limited to allowable aircraft gear loads, gear configuration, tire contact pressure, aircraft center of gravity, and aircraft speed. The model must calculate imposed aircraft gear loads, g-forces on aircraft occupants, deceleration rates, and stopping distances within the arresting system. Any rebound of the crushed material that may lessen its effectiveness must also be considered.

d. **Operation.** The EMAS must be a passive system which requires no external means to initiate/trigger the operation of the EMAS to arrest an aircraft.

e. **Width.** The minimum width of the EMAS must be the width of the runway (plus any sloped area as necessary—see 9.h below). Also, the minimum width of the EMAS (not including the

sloped area) should be based on the standard runway width for the applicable airplane design group per AC 150/5300-13.

f. **Base.** The EMAS must be constructed on a paved base (Figure A1-1) extending from the runway threshold which is capable of supporting the occasional passage of the critical design aircraft using the runway and fully loaded Aircraft Rescue and Fire Fighting (ARFF) vehicles without deformation of the base surface or structural damage to the aircraft or vehicles. It must be designed to perform satisfactorily under all local weather, temperature, and soil conditions. It must provide sufficient support to facilitate removal of the aircraft from the EMAS. Full strength runway pavement is not required. Pavement suitable for shoulders is suitable as an EMAS base. The latest version of AC 150/5320-6, Airport Pavement Design and Evaluation, provides recommendations on pavement for shoulders. State highway specifications may also be used.

g. **Entrance Speed.** To the maximum extent possible, the EMAS must be designed to decelerate the design aircraft expected to use the runway at exit speeds of 70 knots without imposing loads that exceed the aircraft's design limits, causing major structural damage to the aircraft or imposing excessive forces on its occupants. The airport operator must coordinate through the responsible FAA Regional Airports Division/ADO to contact the FAA's Office of Airport Safety and Standards, Airport Engineering Division (AAS-100) at 202-267-7669 for guidance when EMAS design is proposed for aircraft that are not approach category C or D.

When there is insufficient RSA available for a standard EMAS, the EMAS must be designed to achieve the maximum deceleration of the design aircraft within the available runway safety area. However, a 40-knot minimum exit speed must be used for the design of a non-standard EMAS. For design purposes, assume the aircraft has all of its landing gear in full contact with the runway and is traveling within the confines of the runway and parallel to the runway centerline upon overrunning the runway end.

The airport operator, EMAS manufacturer, and the appropriate FAA Regional Airports Division/ADO must consult regarding the selection of the appropriate design entrance speed for the EMAS installation.

Note that current EMAS models are not as accurate for aircraft with a maximum take-off weight of less than 25,000 pounds.

h. **Aircraft Evacuation.** The EMAS must be designed to enable safe ingress and egress as well as movement of ARFF equipment (not necessarily without damage to the EMAS) operating during an emergency. If the EMAS is to be built above existing grade, sloped areas sufficient to allow the entrance of ARFF vehicles from the front and sides must be provided. Provision for access from the back of the EMAS may be provided if desirable. Maximum slopes must be based on the EMAS material and performance characteristics of the airport's ARFF equipment.

i. **Maintenance Access.** The EMAS must be capable of supporting regular pedestrian traffic for the purposes of maintenance of the arresting material and co-located navigation aids without damage to the surface of the EMAS bed. **An EMAS is not intended to support vehicular traffic for maintenance purposes.** Reference Appendix 3, Inspection and Maintenance Program.

j. **Undershoots.** The runway safety area should provide adequate protection for aircraft that touch down prior to the runway threshold (undershoot). Adequate protection is provided by either: (1) providing at least 600 feet (or the length of the standard runway safety area, whichever is less) between the runway threshold and the far end of the EMAS bed if the approach end of the runway has instrument or visual vertical guidance or (2) providing the full length standard runway safety area when no vertical guidance is provided. The EMAS must not cause control problems for aircraft undershoots which touch down in the EMAS bed. Fulfillment of this requirement may be based exclusively on flight simulator tests. The tests will establish the minimum material strength and density that does not cause aircraft control problems during an undershoot. Materials whose density and strength exceeds these minimums will be deemed acceptable.

k. **Navigational Aids.** The EMAS must be constructed to accommodate approach lighting structures and other approved facilities within its boundaries. It, along with any snow or ice that may accumulate prior to its removal in accordance with the inspection and maintenance program, must not cause visual or electronic interference with any air navigational aids. All navigational aids within the EMAS must be frangible as required by the latest version of AC 150/5220-23, Frangible Connections.

To meet the intent of this regulation, approach light standards must be designed to fail at two points. The first point of frangibility must be three inches or less above the top of the EMAS bed. The second point of frangibility must be three inches or less above the expected residual depth of the EMAS bed after passage of the design aircraft. As a part of the EMAS design, the EMAS manufacturer must provide the expected residual depth to allow the determination of this second frangibility point.

l. **Drainage.** The EMAS must be designed to prevent water from accumulating on the surface of the EMAS bed, the runway or the runway safety area. The removal and disposal of water, which may hinder any activity necessary for the safe and efficient operation of the airport, must be in accordance with the latest version of AC 150/5320-5, Surface Drainage Design.

The EMAS design must consider ice accumulation, and in areas that are subject to snow or ice removal requirements, must be designed to be mechanically or manually cleared of ice and snow. Requirements/limitations must be addressed in the approved inspection and maintenance program discussed in paragraph 15 and Appendix 3.

m. **Jet Blast.** The EMAS must be designed and constructed with adequate set back so that it will not be damaged by expected jet blast.

n. **Repair.** The EMAS must be designed for repair to a usable condition (in which the bed is completely repaired) within 45 days of an overrun by the design aircraft at the design entrance speed.

An EMAS bed that is damaged due to an incident (overrun undershoot, etc.) must be repaired within this 45 day repair period not including any days that present any conditions that delay repair of the bed (i.e. severe weather, operational constraints, etc.) The undamaged areas of the EMAS bed must be protected from further damage until the bed is repaired.

Refer to the latest version of AC 150/5370-2, Operational Safety on Airports During Construction, for acceptable safety and phasing options when repairing an EMAS during operations.

10. MATERIAL QUALIFICATION. The material comprising the EMAS must have the following requirements and characteristics:

a. **Material Strength and Deformation Requirements.** Materials must meet a force vs deformation profile within limits having been shown to assure uniform characteristics, and therefore, predictable response to an aircraft entering the arresting system.

b. **Material Characteristics.** The materials comprising the EMAS must:

(1) Be water-resistant to the extent that the presence of water does not affect system performance.

(2) Not attract, or be physically vulnerable to vermin, birds, wildlife or other creatures to the greatest extent possible.

(3) Be non-sparking.

(4) Be non-flammable.

(5) Not promote combustion.

(6) Not emit toxic or malodorous fumes in a fire environment after installation.

(7) Not support unintended plant growth with proper application of herbicides.

(8) Exhibit constant strength and density characteristics during all climatic conditions within a temperature range appropriate for the locale.

(9) Be resistant to deterioration due to:

(a) Salt.

(b) Approved aircraft and runway deicing and anti-icing fluids and solids.

(c) Aircraft fuels, hydraulic fluids, and lubricating oils.

(d) UV resistant.

(e) Water.

(f) Freeze/thaw.

(g) Blowing sand and snow.

(h) Paint.

(i) Herbicides.

11. Material Conformance Requirements. An EMAS manufacturer must establish a material sampling and testing program including testing frequency to verify that all materials are in

conformance with the initial approved material force versus deformation profile established under paragraph 10.a. Materials failing to meet these requirements must not be used.

The initial sampling and testing program must be submitted to and approved by the FAA, Office of Airport Safety and Standards for each design method found by the FAA to be an acceptable means of complying with this AC. Once approved, the program may be used for subsequent projects.

12. DESIGN PROPOSAL SUBMITTAL. The EMAS design must be prepared by the design engineer and the EMAS manufacturer for the airport operator. The airport operator must submit the EMAS design through the responsible FAA Regional Airports Division/ADO, to the FAA, Office of Airport Safety and Standards, for review and approval. The EMAS design must be certified as meeting all the requirements of this AC and the submittal must include all design assumptions and data utilized in its development as well as proposed construction procedures and techniques. The EMAS design must be submitted at least 45 days prior to the bid advertisement date for the project, however interim progress report submissions made in advance are encouraged.

13. QUALITY ASSURANCE (QA) PROGRAM. A construction quality assurance program must be implemented for each EMAS project to ensure that installation/construction is in accordance with the approved EMAS design. The construction contractor and EMAS manufacturer prepare the construction QA program for the airport operator. The airport operator must submit the construction QA program to the responsible FAA Airports Region/District Office for approval 14 days prior to the project notice to proceed.

14. MARKING. An EMAS must be marked with yellow chevrons as an area unusable for landing, takeoff, and taxiing in accordance with AC 150/5340-1, Standards for Airport Markings (latest version). Paint application must be in accordance with AC 150/5370-10, Standards for Specifying Construction of Airports, P-620, Runway and Taxiway Painting, and the EMAS manufacturers' recommendations for the EMAS system.

15. INSPECTION AND MAINTENANCE. The EMAS manufacturer must prepare an inspection and maintenance program for the airport operator for each EMAS installation, prior to completion of the final design. The airport operator must submit the program to the responsible FAA Regional Airports Division/ADO for approval prior to final project acceptance. The airport operator must implement the approved inspection and maintenance program. The program must include any necessary procedures for inspection, preventive maintenance and unscheduled repairs, particularly to weatherproofing layers. It should also include testing and evaluation procedures and criteria for determining when an installed EMAS has reached the end of its service life. Procedures must be sufficiently detailed to allow maintenance/repair of the EMAS bed with the airport operator's staff. The airport operator may also elect to have the EMAS manufacturer maintain the EMAS bed. The program must include appropriate records to verify that all required inspections and maintenance have been performed by the airport operator and/or EMAS manufacturer. These records must be made available to the FAA upon request. Appendix 3, Inspection and Maintenance Program, outlines the basic requirements of an EMAS inspection and maintenance program.

The airport operator or certificate holder must be notified that the EMAS is designed to fail under load and that precautions should be taken when activities require personnel to be on, or vehicles and personnel to be near, the EMAS.

16. AIRCRAFT RESCUE AND FIRE FIGHTING (ARFF).

a. **ARFF Vehicle Access During an Emergency.** As required by paragraph 9.h, an EMAS is designed to allow movement of typical ARFF equipment operating during an emergency. However, as the sides of the system are typically steeply sloped or stepped, and the system will be severely rutted after an aircraft arrestment, ARFF vehicles so equipped should be shifted into all-wheel-drive prior to entering and maneuvering upon an EMAS.

b. **Firefighting Tactics.** Any fire present after the arrestment of an aircraft will be three-dimensional due to the rutting and breakup of the EMAS material. A dual-agent attack and/or other tactics appropriate to this type of fire should be employed.

17. NOTIFICATION. Upon installation of an EMAS, its length, width, and location must be included as a remark in the Airport Facility Directory (AFD) and also depicted in the airport diagram. To assure timely publication, the airport operator must forward the required information to the FAA Aeronautical Information Management (AIM) as soon as possible, but not later than the "cut-off" dates listed in the AFD, for publication on the desired

effective date. (The AIM address and cut-off dates are listed on the inside front cover of the AFD.) The airport operator must also notify the appropriate FAA Regional Airports Division/ADO.

The following is an example of a typical entry:

"Engineered Materials Arresting System. 400'L x 150'W. located at departure end of Runway 16."

MICHAEL J. O'DONNELL
Director of Airport Safety and Standards

When an EMAS is damaged due to an overrun or determined to be less than fully serviceable, a NOTAM must be issued to alert airport users of the reduced performance of the EMAS.

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Appendix 1. Standard EMAS and Typical Sections.

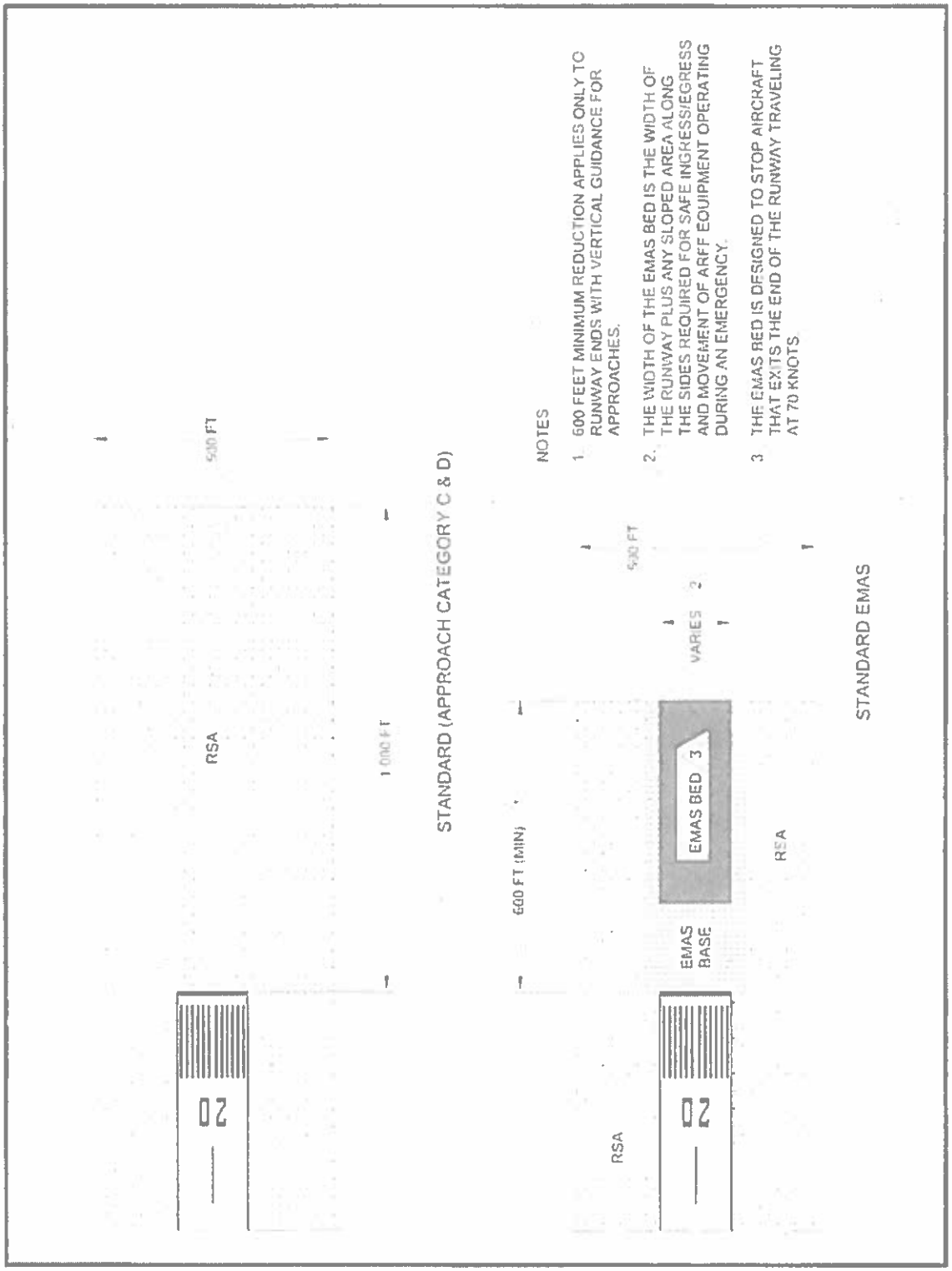

Figure A1-1. Standard EMAS Installation Provides a Level Of Safety That is Equivalent to a Standard Runway Safety Area (RSA).

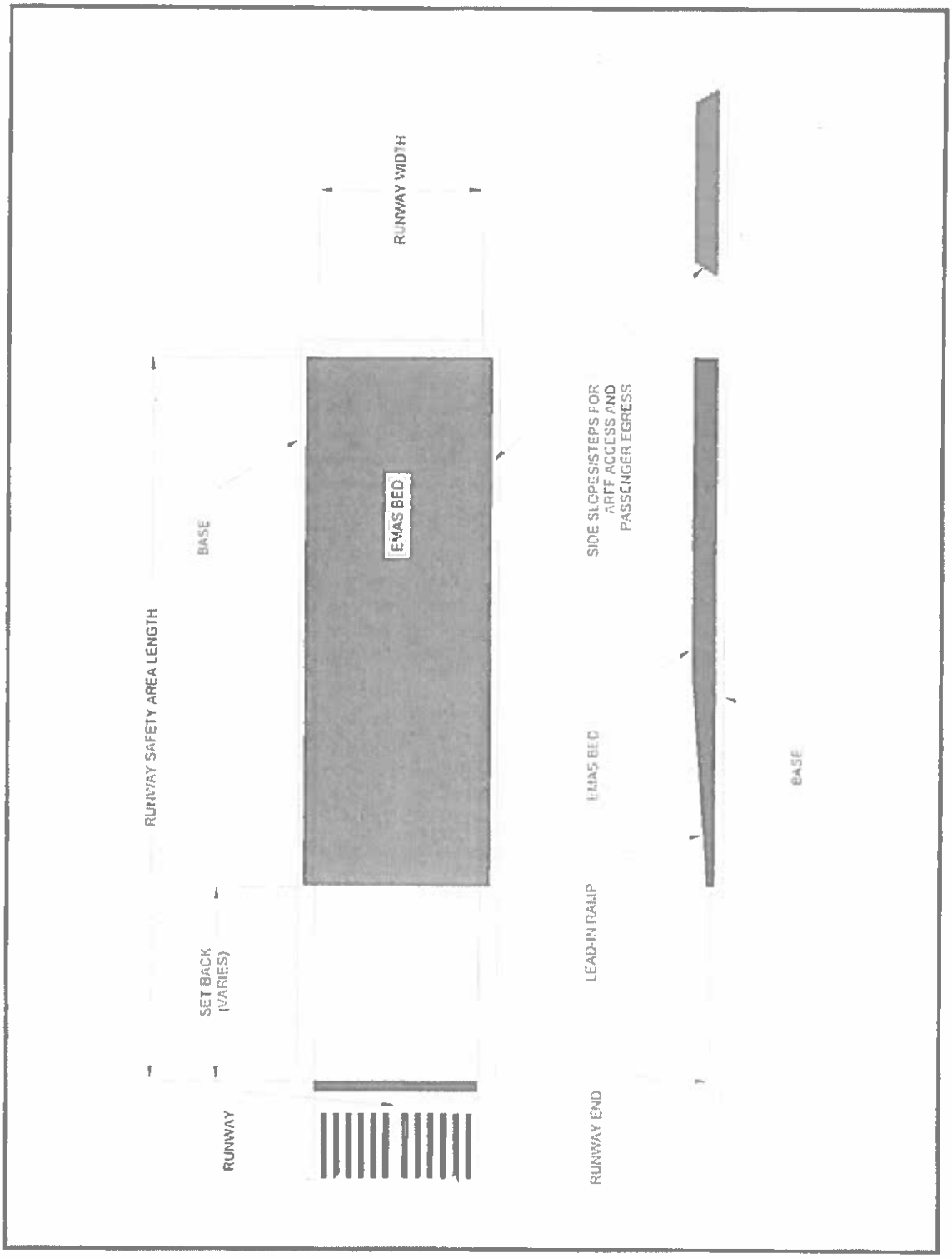

Figure A1-2. EMAS Typical Section.

Appendix 2. Planning Charts.

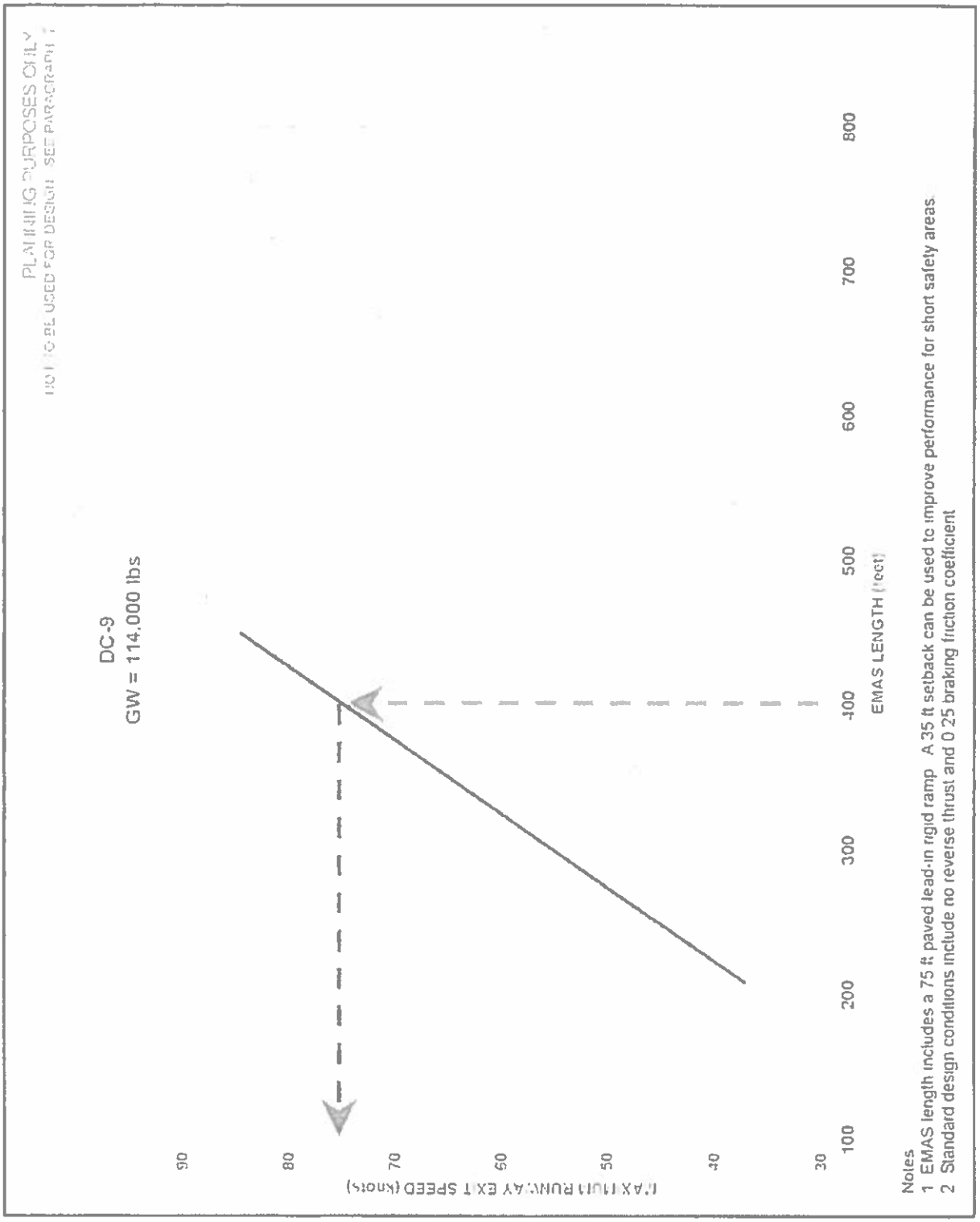

Figure A2-1.

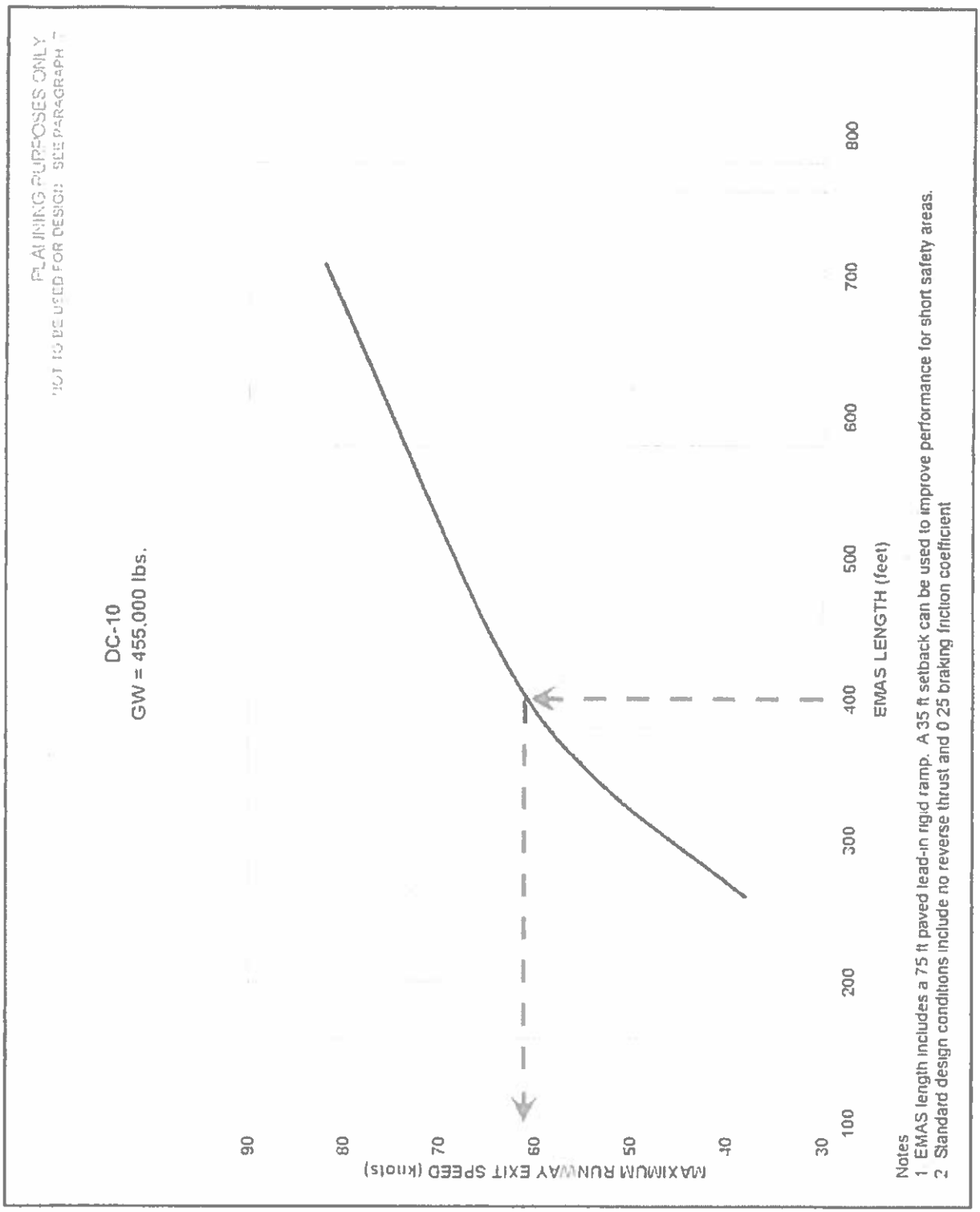
PLANNING PURPOSES ONLY
NOT TO BE USED FOR DESIGN SEE PARAGRAPH
DC-10
GW = 455,000 lbs.
MAXIMUM RUNWAY EXIT SPEED (knots)
90
80
70
60
50
40
30
100
200
300
400
500
600
700
800
EMAS LENGTH (feet)
Notes
1 EMAS length includes a 75 ft paved lead-in rigid ramp. A 35 ft setback can be used to improve performance for short safety areas.
2 Standard design conditions include no reverse thrust and 0 25 braking friction coefficient

Figure A2-2.

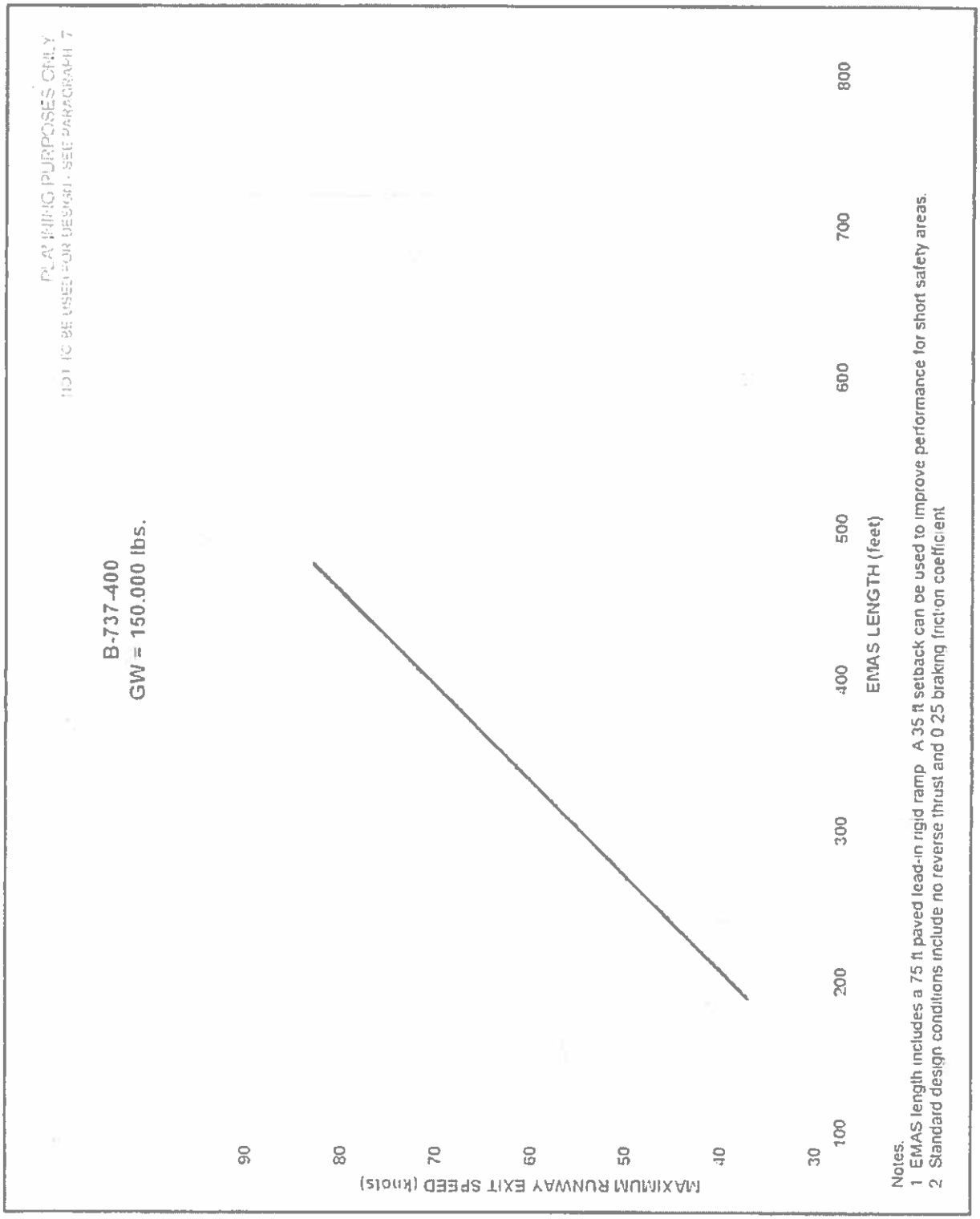
PLANNING PURPOSES ONLY
NOT TO BE USED FOR DESIGN - SEE PARAGRAPH 7
B-737-400
GW = 150,000 lbs.
MAXIMUM RUNWAY EXIT SPEED (knots)
90
80
70
60
50
40
30
100
200
300
400
500
600
700
800
EMAS LENGTH (feet)
Notes:
1 EMAS length includes a 75 ft paved lead-in rigid ramp A 35 ft setback can be used to improve performance for short safety areas.
2 Standard design conditions include no reverse thrust and 0 25 braking friction coefficient

Figure A2-3.

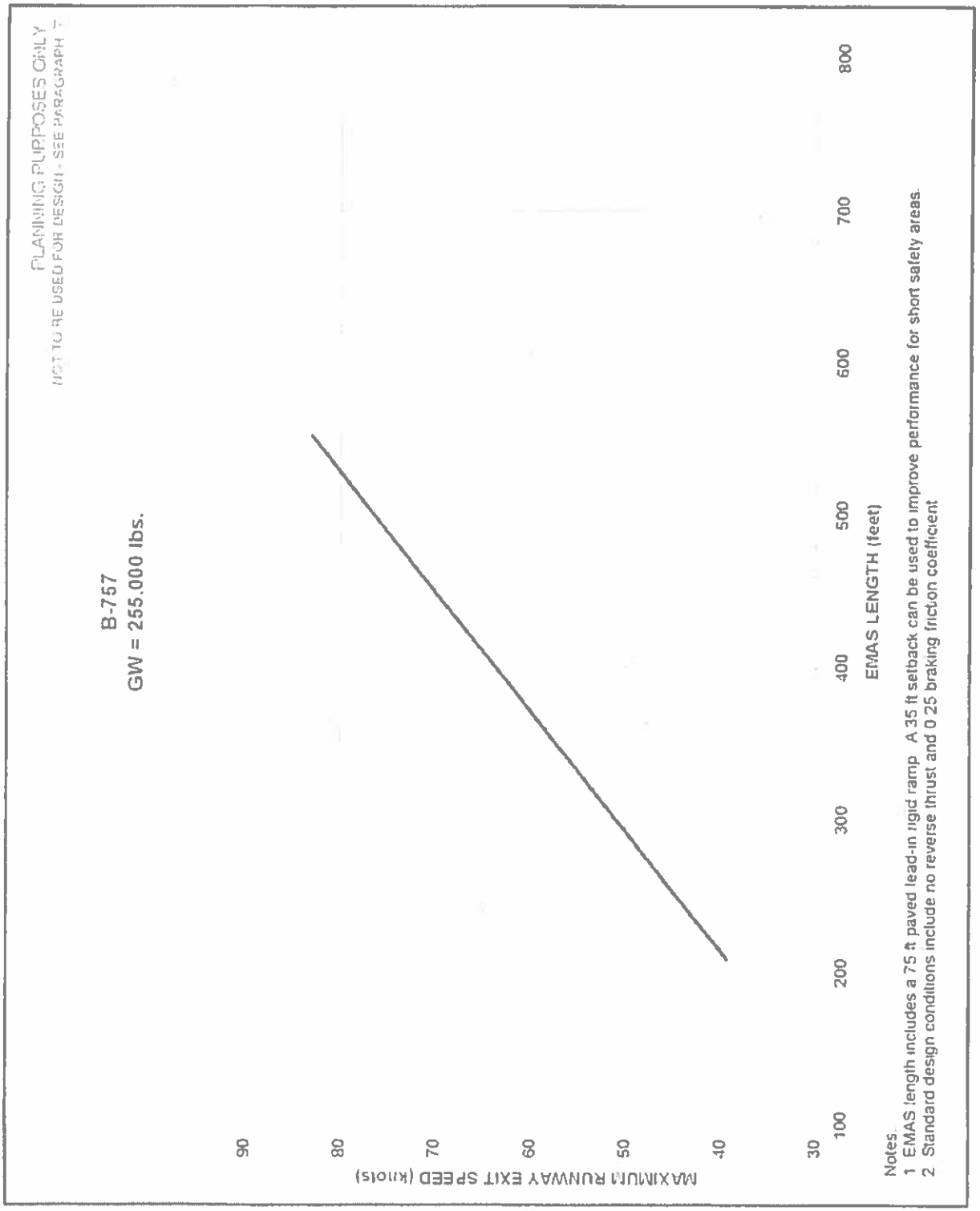
PLANNING PURPOSES ONLY
NOT TO BE USED FOR DESIGN - SEE PARAGRAPH
B-757
GW = 255,000 lbs.
MAXIMUM RUNWAY EXIT SPEED (knots)
90
80
70
60
50
40
30
100
200
300
400
500
600
700
800
EMAS LENGTH (feet)
Notes:
1 EMAS length includes a 75 ft paved lead-in rigid ramp A 35 ft setback can be used to improve performance for short safety areas.
2 Standard design conditions include no reverse thrust and 0 25 braking friction coefficient

Figure A2-4.

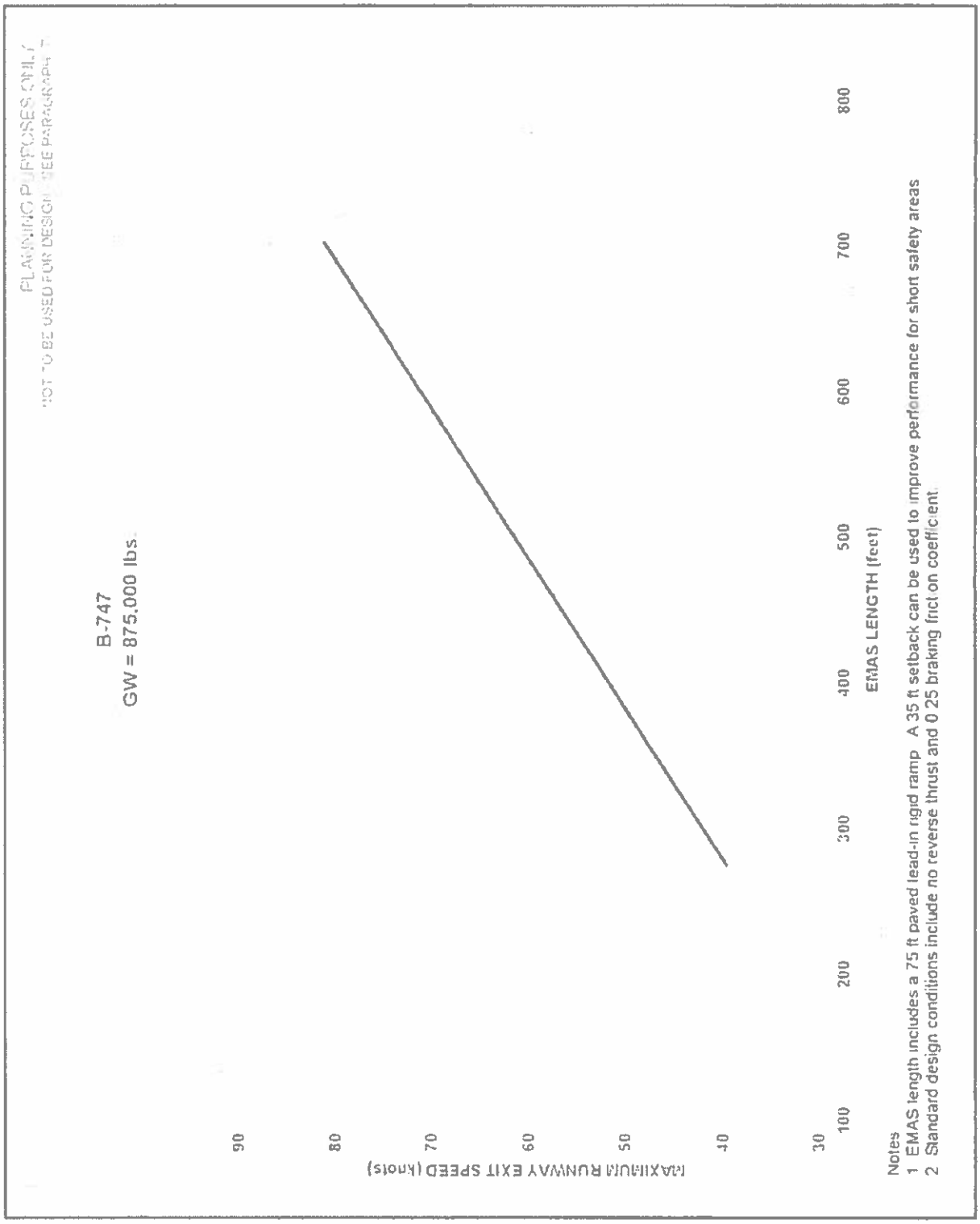
PLANNING PURPOSES ONLY
NOT TO BE USED FOR DESIGN (SEE PARAGRAPH
B-747
GW = 875,000 lbs.
MAXIMUM RUNWAY EXIT SPEED (knots)
90
80
70
60
50
40
30
100
200
300
400
500
600
700
800
EMAS LENGTH (feet)
Notes
1 EMAS length includes a 75 ft paved lead-in rigid ramp A 35 ft setback can be used to improve performance for short safety areas
2 Standard design conditions include no reverse thrust and 0 25 braking fric on coefficient

Figure A2-5.

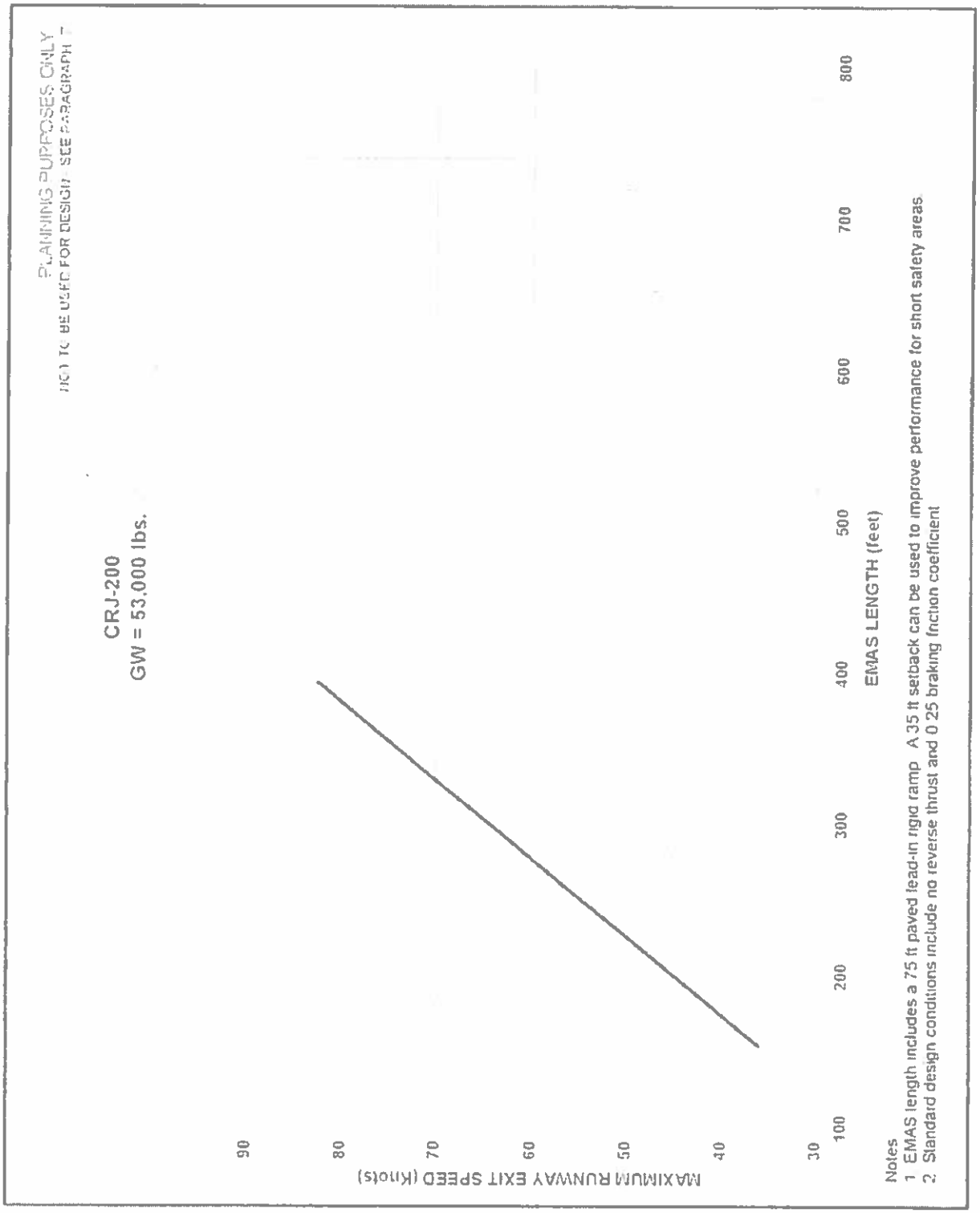
PLANNING PURPOSES ONLY
NOT TO BE USED FOR DESIGN - SEE PARAGRAPH
CRJ-200
GW = 53,000 lbs.
MAXIMUM RUNWAY EXIT SPEED (Knots)
90
80
70
60
50
40
30
100
200
300
400
500
600
700
800
EMAS LENGTH (feet)
Notes
1 EMAS length includes a 75 ft paved lead-in rigid ramp A 35 ft setback can be used to improve performance for short safety areas
2 Standard design conditions include no reverse thrust and 0 25 braking friction coefficient

Figure A2-6.

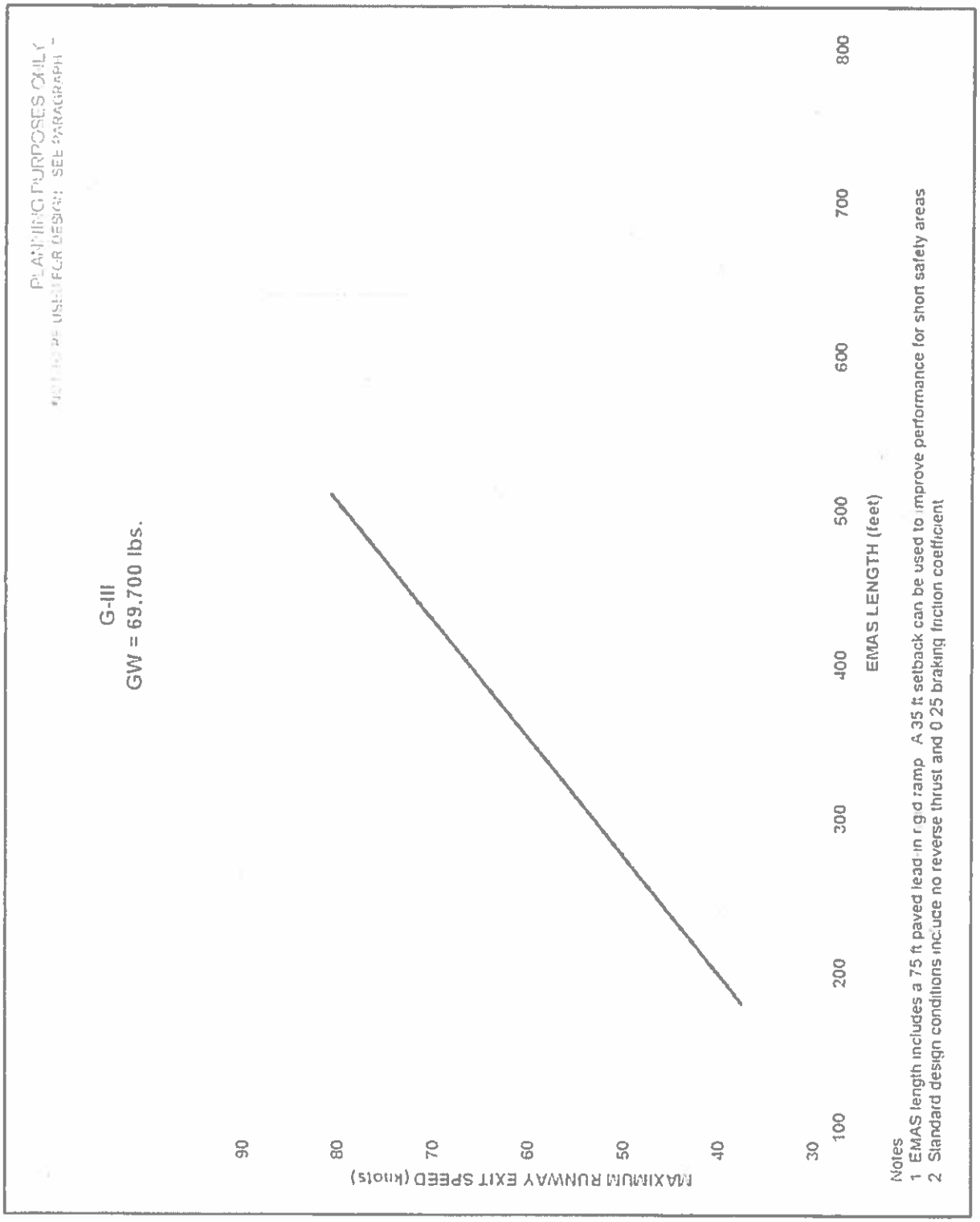
PLANNING PURPOSES ONLY
G-III
GW = 69,700 lbs.
MAXIMUM RUNWAY EXIT SPEED (knots)
90
80
70
60
50
40
30
100
200
300
400
500
600
700
800
EMAS LENGTH (feet)
Notes
1 EMAS length includes a 75 ft paved lead-in rigid ramp A 35 ft setback can be used to improve performance for short safety areas
2 Standard design conditions include no reverse thrust and 0 25 braking friction coefficient

Figure A2-7.

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Appendix 3. Inspection and Maintenance Program.

An inspection and maintenance program, prepared by the EMAS manufacturer, will be submitted to and approved by the FAA Regional/Airports District Office. The Airport operator must implement the approved inspection and maintenance program. On airports certificated under 14 CFR part 139, the inspection and maintenance program must be incorporated into the airport operator's FAA-approved Airport Certification Manual. Determining the party responsible for carrying out a basic EMAS inspection and maintenance program can be negotiated between the operator and the EMAS manufacturer. At a minimum, the maintenance plan must address the following areas:

1. General information on the EMAS bed including:
   - A description of the EMAS bed
   - Material description
   - Contact information for the EMAS manufacturer
2. Inspection requirements including:
   - Type and frequency of required inspections
   - Training of personnel
   - Checklist(s) and instructions on how to conduct each inspection
   - List of typical problems and possible solutions
   - Testing and evaluation procedures, and criteria for determining when an installed EMAS has reached the end of its useful service life
   - Required documentation for inspections
   - Inspection forms
3. Maintenance and repair procedures including:
   - List of approved materials and tools
   - Description of repair procedures for typical damage to an EMAS bed such as repairing depressions holes, abrasion damage, replacing a damaged block, repairing coatings, caulking joint repair, etc
4. Any unique requirements due to location (both geographically and within the airport), such as snow removal requirements and methods, in order to protect the operation of the airfield and its facilities. Identify compatible deicing agents. Specify snow removal equipment that is compatible with the EMAS bed and recommended clearing procedures and or limitations.
5. Warranty information.

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Appendix 4. Related Reading Material.

This appendix contains a listing of documents with supplemental material relating to the subject of EMAS. These documents contain certain information on materials evaluated as well as design, construction, and testing procedures utilized to date. Most publications may be obtained from the National Technical Information Service (NTIS): http://www.ntis.gov.

1. DOT/FAA/PM-87/27, Soft Ground Arresting Systems, Final Report, Sept. 1986-Aug. 1987, published Aug. 1987 by R.E. Cook, Universal Energy Systems, Inc., Dayton, OH.

2. DOT/FAA/CT-93/4, Soft Ground Arresting Systems for Commercial Aircraft, Interim Report, Feb. 1993 by Robert Cook.

3. DOT/FAA/CT-93/80, Soft Ground Arresting Systems for Airports, Final Report, Dec. 1993 by Jim White, Satish K. Agrawal, and Robert Cook.

4. DOT/FAA/AOV/90-1, Location of Commercial Aircraft Accidents/Incidents Relative to Runways, July 1990, by R.E. David.

5. UDR-TR-88-07, Evaluation of a Foam Arrestor Bed for Aircraft Safety Overrun Areas, 1988 by Cook, R.E., University of Dayton Research Institute, Dayton, OH.

ACs and Orders are available on the FAA Airports website at http://www.faa.gov/airports/:

1. AC 150/5300-13, Airport Design

2. Order 5200.8, Runway Safety Area Program

3. Order 5200.9, Financial Feasibility and Equivalency of Runway Safety Area Improvements and Engineered Material Arresting Systems

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