Transport Canada Transports Canada

Advisory Circular

Subject: **Missed Approaches with Published Climb Gradients: Special Authorization and Guidance**

Issuing Office:	Civil Aviation, Standards	Document No.:	AC 700-049
File Classification No.:	Z 5000-34	Issue No.:	01
RDIMS No.:	13588722-V22	Effective Date:	2018-07-18

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1.0 INTRODUCTION

(1) Subject to paragraph (3), this Advisory Circular (AC) is provided for information and guidance purposes. It describes an example of an acceptable means, but not the only means, of demonstrating compliance with regulations and standards. This AC on its own does not change, create, amend or permit deviations from regulatory requirements, nor does it establish minimum standards.

(2) Operators are expected to follow the means of compliance described in this AC in all respects, unless the Minister approves an acceptable alternate means of compliance.

(3) The conditions of the associated special authorization (SA) appear in Appendix A of this AC. For air operators, the conditions published in Appendix A constitute part of the air operator certificate (AOC). As such, compliance with these conditions is mandatory.

1.1 Purpose

(1) The purpose of this AC is to inform the aviation industry that operators must obtain a Special Authorization (SA) in order to conduct instrument approach procedures (IAPs) which require a missed approach climb gradient greater than 425 feet per nautical mile (ft/nm). The final step in this operational approval is the issuance of the SA ***Instrument Approach Procedures with Missed Approach Climb Gradients Greater than 425 ft/NM*** to an air operator, foreign air operator, or private operator.

(2) This AC also serves to provide operators and Transport Canada Civil Aviation (TCCA) personnel with important safety information and guidance related to obstacle clearance when conducting a missed approach. It provides an explanation of missed approach climb gradient requirements and describes how these requirements compare with an aeroplane's climb performance capability. This comparison illustrates potential hazards associated with obstacle clearance which may exist during the missed approach.

(3) Finally, this AC will describe possible means of identifying and analyzing these potential hazards – and provides specific techniques and recommendations for mitigating them.

1.2 Applicability

(1) This AC addresses the conduct of instrument approach procedures which require special consideration of obstacle clearance. In particular, it addresses missed approach climb gradients greater than 425 ft/nm for aeroplanes and the associated SA.

(2) This document is also being made available to the aviation industry for the purpose of conveying flight safety information. All flight operations personnel should be aware of the missed approach climb gradient requirements and should understand how these requirements compare with their aeroplane's climb performance capability. Operators are encouraged to utilize this AC to assist them in reviewing this topic and to determine the applicability of its contents to their specific aircraft types and operating conditions.

(3) This AC is applicable to:

- (a) Canadian air operators holding an Air Operator Certificate (AOC) issued under Part 7 of the *Canadian Aviation Regulations* (CARs);
- (b) Foreign air operators, holding a Canadian Foreign Air Operator Certificate (FOAC), issued under subpart 701 of the CARs;
- (c) Canadian private operators holding a Private Operator Registration Document (PORD) issued under subpart 604 of the CARs;

(d) Pilots, flight dispatchers and other operations personnel employed by the air operators, foreign air operators and private operators listed above;

(e) Transport Canada Civil Aviation (TCCA) inspectors with certification and safety oversight responsibilities; and

(f) Individuals and organizations that exercise privileges granted to them under an External Ministerial Delegation of Authority.

(4) This AC should be used in conjunction with AC 700-016 — *Compliance with Regulations and Standards for Engine-Inoperative Obstacle Avoidance.*

(5) This information is also provided to the aviation industry at large for information and guidance purposes.

1.3 Description of Changes

(1) Not applicable, this is a new document.

2.0 REFERENCES AND REQUIREMENTS

2.1 Reference Documents

(1) It is intended that the following reference materials be used in conjunction with this document:

(a) *Aeronautics Act* (R.S., 1985, c. A-2);

(b) Chapter 523 of the Airworthiness Manual (AWM) — *Normal, Utility, Aerobatic and Commuter Category Aeroplanes*;

(c) Chapter 525 of the AWM — *Transport Category Aeroplanes*;

(d) Part VII, Subpart 04 of the CARs, Division IV — *Aircraft Performance Operating Limitations*;

(e) Part VII, Subpart 05 of the CARs; Division IV — *Aircraft Performance Operating Limitations*;

(f) Part I, Subpart 07 of the CARs; Division IV — *Safety Management System Requirements*;

(g) Advisory Circular (AC) 700-016 — *Compliance with Regulations and Standards for Engine-Inoperative Obstacle Avoidance*;

(h) AC 803-004 — *Restricted Instrument Procedures*;

(i) AC 803-006 — *Missed Approach Climb Gradient;*

(j) Commercial and Business Aviation Advisory Circular (CBAAC) No. 0141, 1998-05-13— *Notice to Pilots and Air Operators—Low-Energy Hazards / Balked Landing/Go-around*;

(k) Transport Canada Publication (TP) 308/GPH 209, Change 6.0 — *Criteria for the Development of Instrument Procedures*;

(l) TP 312, 5th Edition, dated September, 15 2015—Aerodromes Standards and Recommended Practices— Land Aerodromes;

(m) TP 12772, dated September 1996—Aero*plane Performance*;

(n) TP 14371, effective 0901Z, March 29, 2018 to 0901Z, October 11, 2018 (or later) — *Aeronautical Information Manual*;

(o) TP 14727, First Edition, Revision 1, dated June 2017 — *Pilot Proficiency Check and Aircraft Type Rating, Flight Test Guide (Aeroplane)*;

(p) Federal Aviation Administration Advisory Circular (FAA AC) 25-7A, 1998-03-31—*Flight Test Guide for Certification of Transport Category Airplanes*;

(q) FAA AC 120-91, 2006-05-05—*Airport Obstacle Analysis*;

(r) FAA AC 120-29A, 2002-08-12—*Criteria for Approval of Category I and Category II Weather Minima for Approach*;

(s) FAA Regulation FAR Part 23— *Normal, Utility, Aerobatic and Commuter Category Aeroplanes*;

(t) FAA Regulation FAR Part 25—*Airworthiness Standards: Transport Category Airplanes*;

(u) FAA Regulation FAR Part 77—*Objects Affecting Navigable Airspace*;

(v) Australian Government, Civil Aviation Authority, Civil Aviation Advisory Publication, CAAP 235-4(0), *Guidelines for the Consideration and Design of: Engine Out SID (EOSID) and Engine Out Missed Approach Procedures*, dated November 2006. Acknowledgement: Copyright Commonwealth of Australia reproduced by permission;

(w) International Civil Aviation Organization (ICAO) Annex 6 – Operation of Aircraft, Attachment C to ICAO Annex 6, Part 1—*Aeroplane Performance Operating Limitations*,—Example 3, Section 3—*Take-Off Obstacle Clearance Limitations;*

(x) ICAO Annex 10, Aeronautical Communications, Volume 1, *Radio Navigation Aids*; and

(y) Joint Aviation Authorities (JAA) JAR-OPS 1, Amendment 10, 2006-03-01—*Commercial Air Transportation (Aeroplanes).*

(2) The table below lists the regulatory authorities under which the SA for ***Instrument Approach Procedures with Missed Approach Climb Gradients Greater than 425 ft/NM*** is issued to air operators and private operators.

For operations conducted under the following Subparts of the CARs:	**The SA is pursuant to the following provisions:**
604	Section 604.74 of the CARs
701	Subparagraphs 701.08(g)(i) and 701.08(g)(vi) of the CARs
702	Subparagraphs 702.08(g)(ii) and 702.08(g)(xii) of the CARs
703	Subparagraphs 703.08(g)(ii) and 703.08(g)(x) of the CARs
704	Subparagraphs 704.08(g)(ii) and 704.08(g)(xi) of the CARs
705	Subparagraphs 705.08(g)(ii) and 705.08(g)(xi) of the CARs

2.2 Cancelled Documents

(1) Not applicable.

(2) By default, it is understood that the publication of a new issue of a document automatically renders any earlier issues of the same document null and void.

2.3 Definitions and Abbreviations

(1) The following **definitions** are used in this document:

(a) **Approach Climb Configuration**: The configuration of an aeroplane corresponding to the one-engine-inoperative climb as defined in subsection 523.67 (c)(4) of the Airworthiness Manual (AWM) — *Climb: One-Engine-Inoperative or subsection 525.121 (d) of the AWM — Climb: One-Engine-Inoperative.*

(b) **Balked Landing**: A discontinued landing attempt. The term is often used in conjunction with aircraft configuration or performance assessment, as in Balked landing climb gradient. Also see Rejected Landing.

(c) **Certified Engine-Inoperative Climb Performance Information**: In the context of this AC and AC 700-016, this term refers to Aircraft Flight Manual (AFM) performance information which satisfies the engine-inoperative take-off performance requirements that are specified in sections 704.47 and 705.57 of the CARs – *Net Take-off Flight Path* as well as the applicable provisions in the *Commercial Air Service Standard* (CASS) for *Take-off Minima Reported RVR 1,200 feet (1/4 mile) and Reported RVR 600 feet.* Aeroplanes certified in accordance with any of the following standards have the required AFM performance information to meet the above-noted engine-inoperative take-off performance requirements:

(i) Chapter 523 of the *Airworthiness Manual* (AWM) ; — *Normal, Utility, Aerobatic and Commuter Category Aeroplanes*;

(ii) Chapter 525 of the AWM — *Transport Category Aeroplanes;*

(iii) Federal Aviation Administration (FAA), Federal Aviation Regulations (FAR) 23 Commuter Category at amendment 23-34 or later;

(iv) FAA Regulation FAR Part 25 — *Airworthiness Standards: Transport Category Airplanes*; and

(v) FAA SFAR 41C and the performance requirements of International Civil Aviation Organization (ICAO) Annex 8.

(d) **Climb Gradient (CG)**: The ratio of change in height, during a portion of a climb, to the horizontal distance traversed in the same time period. Climb gradients are expressed in ft/NM or as a percentage. The formula used to determine climb gradient as a percentage appears below:

$$\text{Gradient (percent)} = \left(\frac{\text{Vertical Distance}}{\text{Horizontal Distance}} \right) \text{X } 100$$

Note: When calculating climb gradient, the same units of vertical and horizontal distance (typically feet), must be used.

(e) **Engine-Out Departure Procedure (EODP)**: For the purposes of this AC, an EODP is the departure procedure that should be followed – if an engine failure occurs during the

takeoff – in order to ensure obstacle clearance. EODPs can be developed for aircraft with certified engine-inoperative climb performance information; they provide flight crews with the necessary flight path guidance: specific routes and/or a specific climb profile to be followed should an engine failure occur during the takeoff. (The details of significant obstacles may also be included in the description of the procedure.) EODPs have a number of names which have been adopted by industry, including *Engine Out Contingency Procedures, Engine Out Escape Paths, Engine Out SIDs* (EOSIDs) and *Special Engine Out (Departure) Procedures*. EODPs are either developed by the air operator or contracted to a third party service provider on the air operator's behalf.

(f) **Engine-Out Missed Approach Procedure (EOMAP)**: For the purposes of this AC, an EOMAP is the missed approach procedure which should be followed – with an inoperative engine – in order to ensure obstacle clearance. EOMAPs can be developed for aircraft with certified engine-inoperative climb performance information; they provide flight crews with the necessary flight path guidance: specific routes and/or a specific climb profile to be followed when conducting an engine-inoperative missed approach. (The details of significant obstacles may also be included in the description of the procedure.) EOMAPs are either developed by the air operator or by a third party service provider on the air operator's behalf.

(g) **Go-Around**: A transition from an approach to a stabilized climb.

(h) **Landing Climb Configuration**: The configuration of an aeroplane corresponding to the all engine operating climb as defined in subsection 523.77 (c) of the AWM —*Balked Landing* or subsection 525.119 of the AWM — *Landing Climb: All-Engines-Operating.*

(i) **Missed Approach:** Means the procedure to be followed if, for any reason after conducting an instrument approach, a landing is not effected (CAR 101.01(1)).

(j) **Missed Approach Procedure**: The lateral and vertical flight path followed by an aircraft after the initiation of a go-around. Typically an aircraft conducting a "missed approach" follows the published missed approach segment of an instrument approach procedure, or follows alternative missed approach instructions (radar vectors) in order to return to landing, or divert to an alternate.

(k) **Non-Standard Climb Gradient**: A climb gradient associated with an instrument procedure that exceeds 200 ft/NM.

(l) **Operator**: For the purposes of this AC, the "operator" refers to the following:

(i) **Air Operator** – which means the holder of an air operator certificate,

(ii) **Foreign Air Operator** – which means the holder of a Canadian foreign air operator certificate,

(iii) **Private Operator** – which means the holder of a private operator registration document.

(m) **Procedure Design**: For the purposes of this AC, a procedure design is the specific data file for an instrument approach procedure (IAP) that contains all of the required information to define the procedure.

(n) **Private operator** means the holder of a private operator registration document (PORD).

(o) **Rejected Landing:** A discontinued landing attempt. A rejected landing typically is initiated at low altitude but prior to touchdown and typically is initiated below DA(H) or MDA(H) of an IAP. A rejected landing may be initiated in either visual meteorological conditions (VMC) or instrument meteorological conditions (IMC). A rejected landing typically results in a missed approach. If related to the consideration of aircraft configuration(s) or performance, it is sometimes referred to as a Balked Landing.

(p) **Special Authorizations (SA)** are authorizations issued by the Minister under Subpart 604 or Part VII of the CARs that permit the carrying out of an activity in respect of which the Minister has established requirements. Special Authorizations are included as part of the Operations Specifications.

(2) The following **abbreviations** are used in this document:

(a) **AC**: Advisory Circular;

(b) **AEO**: All-Engines-Operating;

(c) **AFM**: Aircraft Flight Manual;

(d) **ATS**: Air Traffic Services;

(e) **AWM**: Airworthiness Manual;

(f) **CARs**: Canadian Aviation Regulations;

(g) **CASS**: Commercial Air Service Standard;

(h) **CBAAC**: Commercial and Business Aviation Advisory Circular;

(i) **CG**: Climb Gradient;

(j) **COM**: Company Operations Manual;

(k) **DA**: Decision Altitude;

(l) **DH**: Decision Height;

(m) **EODP**: Engine-Out Departure Procedure

(n) **EOMAP**: Engine-Out Missed Approach Procedure

(o) **FFS**: Full Flight Simulator;

(p) **FTA**: Flight Track Analysis;

(q) **FTD**: Flight Training Device;

(r) **ft/NM**: feet per nautical mile

(s) **IAP**: Instrument Approach Procedure;

(t) **IFR**: Instrument Flight Rules;

(u) **MAP**: Missed Approach Point;

(v) **MDA**: Minimum Descent Altitude;

(w) **OAA**: Obstacle Assessment Area;

(x) **OCS**: Obstacle Clearance Surface;

(y) **OEI**: One-Engine-Inoperative;

(z) **PIC**: Pilot-in-Command;

(aa) **POH**: Pilot Operating Handbook;

(bb) **PORD**: Private Operator Registration Document;

(cc) **ROC**: Required Obstacle Clearance;

(dd) **SA**: Special Authorization;

(ee) **SMS**: Safety Management System;

(ff) **TAS**: True Air Speed;

(gg) **TC**: Transport Canada;

(hh) **TCCA:** Transport Canada Civil Aviation;

(ii) **TDZ**: Touch Down Zone.

(3) Additional **definitions** and **abbreviations** can be found in:

(a) AC 700-016 — Compliance with Regulations and Standards for Engine-Inoperative Obstacle Avoidance;

(b) AC 803-004 — Restricted Instrument Procedures; and

(c) AC 803-006 — Missed Approach Climb Gradient.

3.0 BACKGROUND

3.1 General

(1) Under certain conditions, an aircraft may not be able to achieve the missed approach climb gradient for an instrument approach procedure (IAP), thereby compromising obstacle clearance. An inoperative engine is considered the most limiting of these conditions.

(2) Operators must obtain a Special Authorization (SA) in order to conduct IAPs which require a missed approach climb gradient greater than 425 ft/nm.

(3) Operators should utilize the principles of risk analysis, in association with their safety management system (SMS), if applicable, to identify, analyze and address (through the application of appropriate safety mitigation techniques) those missed approach procedures which pose potential hazards respecting obstacle clearance.

(4) Under normal conditions, published missed approach procedures provide adequate terrain clearance. However, further analysis may be required in some circumstances. Operators should consider all conditions that may result in climb performance degradation during the missed approach. This AC is based on the assumption that an inoperative engine during a missed approach is the most critical case in terms of degraded aeroplane climb performance.

Note: *Further information respecting the types of circumstances which merit further consideration is provided in Appendix B, Section B.1 – Overview, Paragraph (3).*

3.2 Context

(1) Essential technical information respecting the issue of obstacle clearance during the missed approach is provided in **Appendix D of this AC – *Technical Requirements***.

3.3 Application and Structure of this Advisory Circular

(1) This AC provides the conditions and associated guidance applicable to the Special Authorization (SA) for ***Instrument Approach Procedures with Missed Approach Climb Gradients Greater than 425 ft/NM***. It also describes possible means of identifying, analyzing and mitigating obstacle clearance hazards during a missed approach.

(2) To accomplish the above stated objectives, this AC is structured in the following sections:

(a) **Main Body**: Provides background information and general guidance.

(b) **Appendix A**: Stipulates the conditions which operators must meet when issued the subject SA. Compliance with these conditions is mandatory for operators and pilots conducting the subject IAPs. Adherence to these conditions is also recommended as a

means of addressing potential hazards associated with obstacle clearance that may exist during the missed approach, under some circumstances.

(c) **Appendix B**: Provides specific guidance respecting the conditions for the subject SA (Appendix A). To facilitate cross-reference, the guidance in Appendix B utilizes the same numbering as the conditions in Appendix A of this AC.

(d) **Appendix C**: Features a compliance checklist for the conditions of the subject SA (Appendix A). This compliance checklist has been developed to assist operators to confirm that they are in compliance with the conditions of the SA. It also serves as an aid to Transport Canada Civil Aviation (TCCA) personnel for certification and safety oversight purposes.

(e) **Appendix D**: Provides detailed information respecting technical requirements and associated guidance associated with obstacle clearance during the missed approach.

(f) **Appendix E**: Provides a list of the provisions in the *Canadian Aviation Regulations* (CARs) and *Commercial Air Service Standards* (CASS) that are applicable to air operators and private operators conducting IAPs with missed approach procedures that have published climb gradients and other obstacle clearance considerations.

4.0 TRANSPORT CANADA CIVIL AVIATION APPROVAL

(1) Operators must obtain the SA ***Instrument Approach Procedures with Missed Approach Climb Gradients Greater than 425 ft/NM*** in order to conduct the subject IAPs.

(2) All documentation associated with this SA are subject to TCCA safety oversight as per the applicable provisions in the *Aeronautics Act* and CARs.

5.0 FUTURE DISPOSITION

(1) TCCA is committed to maintaining a viable civil aviation transportation system, while not compromising safety. This AC will remain in effect for information purposes until further notice.

6.0 INFORMATION MANAGEMENT

(1) Not applicable.

7.0 DOCUMENT HISTORY

(1) Not applicable.

8.0 CONTACT OFFICE

For more information, please contact:

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Suggestions for amendment to this document are invited, and should be submitted via: the-email and fax number provided above.

Robert Sincennes
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APPENDIX A — CONDITIONS FOR SPECIAL AUTHORIZATION: INSTRUMENT APPROACH PROCEDURES WITH MISSED APPROACH CLIMB GRADIENTS GREATER THAN 425 FT / NM

AUTHORITY

The **SPECIAL AUTHORIZATION:** ***Instrument Approach Procedures with Missed Approach Climb Gradients Greater than 425 ft/NM*** is issued pursuant section 604.74, subparagraphs 701.08(g)(i),701.08(g)(vi), 702.08(g)(ii), 702.08(g)(xii), 703.08(g)(ii), 703.08(g)(x), 704.08(g)(ii), 704.08(g)(xi), 705.08(g)(ii) and 705.08(g)(xi) of the *Canadian Aviation Regulations* (CARs). It authorizes the conduct of instrument approach procedures (IAPs) with missed approach procedure (MAP) climb gradients greater than 425 ft/NM in an aeroplane.

CONDITIONS

This authority is granted subject to the following conditions:

1. OPERATOR REQUIREMENTS

1.1 DOCUMENTATION

1.1.1 The air operator's company operations manual (COM) or private operators' operations manual (OM) shall address the conduct of instrument approaches with climb gradients exceeding 425 ft/NM. The contents of the COM, respecting the subject instrument approach procedures shall include, but is not limited to:

(a) the method used by the air operator to determine the maximum weights specified in paragraphs 1.5.1 and 1.5.2; and

(b) the procedures used to fly the subject missed approach procedures with all engines operating and with an inoperative engine.

1.1.2 For the subject instrument approach procedures, the air operator's or private operator's standard operating procedures (SOPS) shall stipulate that the flight crew's approach briefing will include the procedures to be followed if a missed approach is conducted:

(a) with all-engines-operating; and

(b) with one-engine-inoperative.

1.2 OPERATIONAL CONTROL

1.2.1 The air operator or private operator shall ensure that only those aircraft that are capable of meeting the aircraft requirements specified in paragraph 2.1.1 are permitted to conduct an instrument approach procedure with a climb gradient greater than 425 ft/NM.

1.2.2 The air operator or private operator shall ensure that only those pilots who have been qualified in accordance with training requirements specified in paragraphs 1.3.1 through 1.4.4 will be permitted to conduct an instrument approach procedure with a climb gradient greater than 425 ft/NM.

1.2.3 Air operators or private operators who utilize a flight dispatchers shall ensure that only those flight dispatchers who have been qualified in accordance with the requirements specified in paragraphs 1.3.2 through 1.3.4 will exercise authority respecting an operational flight plan, or conduct flight watch, for a flight where the destination or alternate aerodrome requires the use of an instrument approach procedure with a climb gradient greater than 425 ft/NM.

1.3 GROUND TRAINING (INITIAL AND RECURRENT)

1.3.1 The air operator or private operator shall have an approved initial and recurrent ground training program to qualify pilots respecting the conduct of instrument approach procedures with a climb gradient greater than 425 ft/NM.

1.3.2 Air operators or private operators who conduct flight operations which require flight dispatchers shall have an approved initial and recurrent ground training program to qualify flight dispatchers respecting the conduct of instrument approach procedures with a climb gradient greater than 425 ft/NM.

1.3.3 The Initial and recurrent ground training for pilots and flight dispatchers shall include:

(a) the depiction of the subject instrument approach procedures, including climb gradient information;

(b) the method used by the air operator to determine the maximum weights specified in paragraphs 1.5.1 and 1.5.2; and

(c) the procedures used to fly the subject missed approach procedures with all-engines-operating and with one-engine-inoperative.

1.3.4 The validity period of initial and recurrent ground training for pilots and flight dispatchers specified in paragraphs 1.3.1 through 1.3.3 expires on the first day of the thirty-seventh month following the month in which the training was completed, and is also subject to the following:

(a) Where the initial or recurrent ground training is renewed within the last 90 days of its validity period, its validity period is extended by 36 months (from the date when the pilot's validity period was to have expired); and

(b) The Minister may extend the validity period of initial or recurrent ground training by up to 60 days where the Minister is of the opinion that aviation safety is not likely to be affected;

(c) Where all of the elements of initial or recurrent ground training have been taught within the last 90 days of the ground training instructor's validity period, that instructor's validity period (for initial or recurrent ground training) is extended by 36 months (from the date when the instructor's validity period was to have expired).

1.4 FLIGHT TRAINING (INITIAL AND RECURRENT)

1.4.1 The air operator or private operator shall have an approved initial and recurrent flight training program to qualify pilots respecting the conduct of instrument approach procedures with a climb gradient greater than 425 ft/NM.

1.4.2 The initial and recurrent flight training for pilots shall consist of a minimum of one missed approach which has a climb gradient greater than 425 ft/NM. This missed approach shall include a simulated engine failure.

1.4.3 Initial and recurrent flight training for pilots can be conducted in:

(a) an approved full flight simulator (FFS), certified to Level C or higher where the missed approach is initiated from below the DH/DA/MDA;

(b) a flight training device (FTD), Level 6 or higher, or a FSS Level A or higher, where the missed approach is initiated at or above the DH/DA/MDA; or

(c) an aeroplane, subject to the safety mitigation specified in Appendix B of this AC.

1.4.4 The validity period of initial and recurrent flight training specified in paragraphs 1.4.1 through 1.4.3 expires on the first day of the thirty-seventh month following the month in which the training was completed, and is also subject to the following:

(a) Where the initial or recurrent flight training is renewed within the last 90 days of its validity period, its validity period is extended by 36 months (from the date when the pilot's validity period was to have expired); and

(b) The Minister may extend the validity period of initial or recurrent flight training by up to 60 days where the Minister is of the opinion that aviation safety is not likely to be affected.

1.5 PERFORMANCE

1.5.1 The air operator or private operator, and the pilot-in-command, shall ensure that, with all engines operating normally, the aircraft's weight shall not be greater than that which will allow the aircraft to achieve the required climb gradient published for the missed approach of the subject instrument approach procedure.

1.5.2 The air operator or private operator, and the pilot-in-command (PIC), shall ensure that, with the critical engine inoperative, the aircraft's weight shall not be greater than that which will allow the aircraft to either:

(a) meet the climb gradient published for the subject instrument approach procedure, while following the published missed approach procedure; or

(b) achieve a flight path during the missed approach that will safely clear all obstacles.

1.5.3 Calculations made to determine the maximum aircraft weight for the purpose of paragraph 1.5.1 and 1.5.2 shall be based on the pilot:

(a) using 15 degrees or less of bank at or below 400 feet; and

(b) using no more than 25 degrees of bank thereafter, aircraft speed and configuration permitting.

1.5.4 In determining the maximum weight specified in paragraphs 1.5.1 and 1.5.2, corrections shall be made for the following conditions:

(a) pressure altitude;

(b) ambient temperature;

(c) the wind component, where not more than 50 per cent of the reported headwind component or not less than 150 per cent of the reported tailwind component is considered;

(d) climb gradient loss associated with any turns; and

(e) the capability of the aircraft's navigation system to accurately maintain the required track.

2. AIRCRAFT REQUIREMENTS

2.1 CERTIFICATION STANDARDS

2.1.1 The aeroplane utilized for the subject instrument approach procedure must have Aircraft Flight Manual (AFM) performance information to meet the above-noted engine-inoperative take-off performance requirements specified in paragraph 1.5.2 and must be certified in accordance with:

(a) Chapter 523 of the *Airworthiness Manual* (AWM)—*Commuter Category Aeroplanes*;

(b) Chapter 525 of the AWM;

(c) Federal Aviation Administration (FAA), Federal Aviation Regulations (FAR) 23 Commuter Category at amendment 23-34 or later;

(d) FAA SFAR 41C and the performance requirements of International Civil Aviation Organization (ICAO) Annex 8; or

(e) FAA FAR 25.

APPENDIX B — SPECIFIC GUIDANCE RESPECTING THE CONDITIONS OF THE SPECIAL AUTHORIZATION: INSTRUMENT APPROACH PROCEDURES WITH MISSED APPROACH CLIMB GRADIENTS GREATER THAN 425 FT / NM

B.1 Overview

(1) The matrix below provides specific guidance corresponding to the conditions specified for the **SPECIAL AUTHORIZATION (SA): *INSTRUMENT APPROACH PROCEDURES WITH MISSED APPROACH CLIMB GRADIENTS GREATER THAN 425 FT/NM*** which appears in Appendix A of this AC. Each row of the matrix provides:

(a) an Item Number to identify the portion of text;

(b) the specific condition of the SA to be discussed; and

(c) the corresponding guidance information related to that specific condition.

(2) The information provided in this matrix also provides air operators with specific guidance and recommendations which can be used to mitigate the hazards associated with obstacle clearance during the missed approach.

(3) While the SA specifically addresses climb gradients greater than 425 ft/NM, it is also recommended that air operators utilize the principles of risk analysis, in conjunction with their SMS (if applicable), to identify any other missed approaches that may present obstacle clearance hazards – particularly with an inoperative engine. In particular, an analysis of the climb gradient requirements of the missed approach procedures, compared to the climb capability of the aircraft, should be conducted for any of the following circumstances:

(a) the published missed approach procedure has a non-standard climb gradient requirement;

(b) departure procedure for the runway has a published minimum climb gradient;

(c) an engine-out departure procedure (EODP) is required in order to meet the regulatory requirements stipulated in the CARs;

(d) there are runways that are used for landing but not for take-off; or

(e) any other circumstances where terrain and obstacles may present challenges respecting obstacle clearance during the missed approach procedure, particularly with an inoperative engine.

(4) Additional background information related to technical issues can be found in Appendix D of this AC.

ITEM NO.	CONDITION OF SA (APPENDIX A)	GUIDANCE INFORMATION
1	**Paragraph 1.1.1** *Company Operations Manual (COM) / Private Operators' Operations Manual (OM)*	(1) It is recognized that the quantity of information necessary to design engine-out procedures is too large to be contained within a COM/OM. For this reason, a separate design or procedures manual referenced in the COM/OM is appropriate. Any additional documentation or manuals will not require approval by TCCA, but should include the applicable information and criteria provided within this AC.

ITEM NO.	CONDITION OF SA (APPENDIX A)	GUIDANCE INFORMATION
2	**Paragraph 1.1.2** *Standard Operating Procedures (SOPS)*	**Standard Operating Procedures / Approach Briefings** (1) Preparedness for the missed approach, increased situational awareness and the capacity to properly execute a missed approach are greatly enhanced through a thorough approach briefing. (2) For the approach briefing where a specified climb gradient and/or obstacle clearance hazards are present, it is recommended that the following elements be included (as applicable): (a) required climb gradient as well as the location of critical obstacles and/or high terrain, if applicable; (b) engine-inoperative procedure to be conducted, including: (i) missed approach track to be followed, specifically whether or not to follow the: (A) published missed approach procedure; or (B) a special engine-inoperative procedure ***Note:*** *This should include a discussion of the selection of an appropriate engine-out missed-approach track, if more than one missed approach track is published.* (ii) acceleration altitude for flap retraction; (iii) minimum altitude(s) and/or any waypoint(s) to commence a turn; (iv) required navigation aids; (v) the configurations for: (A) an approach with an engine-inoperative, and (B) an engine-inoperative go-around; (vi) requirement to declare an emergency (if not following the published missed approach procedure; (vii) any other information pertaining to the EOMAP. (c) minimum safe altitude which will allow the aircraft to return to the aerodrome or to proceed to another destination or a suitable alternate; (d) higher minimum altitudes (MDA, DA, DH); and (e) maximum landing weight considerations.

ITEM NO.	CONDITION OF SA (APPENDIX A)	GUIDANCE INFORMATION
3	**Paragraph 1.2.1 through 1.2.3** *Operational Control*	Reserved
4	**Paragraph 1.3.1 through 1.3.3** *Ground Training (Initial and Recurrent)*	**Ground Training** (1) The goal of initial and recurrent ground training is to ensure that flight crews and flight dispatchers clearly understand the hazards and procedures necessary to ensure obstacle clearance during the missed approach. (2) In particular, they should understand: (a) the climb gradient and obstacle clearance requirements associated with the missed approach; (b) the factors that can negatively influence an aeroplane's climb capability during the missed approach; (c) that under some conditions, an aeroplane's climb capability may prevent it from achieving the required climb gradient for the missed approach procedures; in this regard, an engine failure is normally the most performance limiting case; (d) that reduced obstacle clearance margins and a possible collision with terrain or an obstacle may result if the aeroplane is unable to meet the required climb gradient for the published missed approach; and (e) the process used by the air operator to identify and evaluate these hazards and the processes that have been implemented to manage the associated risks. (3) Additionally, air operators conducting operations under subpart 705 of the CARs, must comply with the regulatory requirements specified in section 705.111 of the CARs — *Route and Aerodrome Qualifications* and the associated standards which are specified in subsection 725.124(30) of the CASS. (4) Additional information can be found in Appendix D, Section D.8.4 of this AC *Information Provided to Flight Operations Personnel.* (5) Ground training instructors have been given the flexibility to have their own personal validity period – for initial or recurrent ground training – renewed through the action of providing instruction.

ITEM NO.	CONDITION OF SA (APPENDIX A)	GUIDANCE INFORMATION
5	**Paragraph 1.4.1 through 1.4.4** *Flight Training (Initial and Recurrent)*	**Flight Training** (1) The goal of initial and recurrent flight training is to ensure that flight crews have the necessary skills to conduct approaches and missed approaches which require climb gradients greater than 425 ft/NM. (2) Flight training cannot be considered to have been completed until the pilot trainee can demonstrate proficiency in the conduct of the subject instrument approach procedures. (3) Flight training should address IAPs that have an established EOMAP (or utilize an EODP for this purpose). In general, flight training should be provided for the IAP in an air operator's route structure that has the most challenging EOMAPs and under the most limiting weather conditions applicable to the approach. (4) Flight training should include all the procedures necessary to transition from the approach to the missed approach until the aircraft has reached a minimum safe altitude to return for a landing or continue to an alternate aerodrome. (5) Flight training does not need to be provided for more than one aerodrome unless there are special considerations at other aerodromes that must be addressed. Sufficient training should be provided for a flight crew to demonstrate proficiency in EOMAPs at such aerodromes. (6) The missed approach must be conducted with a simulated engine failure, with the simulated engine failure occurring under one of the following conditions: (a) prior to commencing the approach - when an engine-inoperative approach is to be conducted; (b) during go-around initiation; or (c) after go-around initiation – when the aircraft is established in the missed approach.

ITEM NO.	CONDITION OF SA (APPENDIX A)	GUIDANCE INFORMATION
	Paragraph 1.4.1 through 1.4.4 *Flight Training (Initial and Recurrent)* ***Continued...***	(7) To the maximum extent possible, flight training respecting engine-inoperative missed approach procedures should be provided in an approved flight simulation training device (FSTD): (a) An approved full flight simulator (FFS), certified to Level C or higher is required where the missed approach is initiated from below the DH/DA/MDA, because of the requirement for visual maneuvering with reference to the runway; or (b) A flight training device (FTD), Level 6 or higher, or a FSS Level A or higher, is required where the missed approach is initiated at or above the DH/DA/MDA, because there is no requirement for a visual system.
6	**Paragraph 1.4.1 through 1.4.4** *Flight Training (Initial and Recurrent)* ***Continued...***	**Flight Training Conducted in an Aeroplane** (1) **WARNING:** Air operators, private operators and those conducting flight training must utilize conservative judgement to ensure that adequate safety margins are provided during flight training conducted in an aeroplane. (2) Training in an aeroplane should only be provided if sufficient safety mitigations are provided to ensure that there is no degradation in required safety levels. Prior to any training in aeroplane, a risk-assessment should be conducted to ensure all potential hazards are identified and the appropriate mitigations are put in place. (3) Operators need to observe and be thoroughly familiar with the safe training practices provided in numerous sources including, but not limited to, the following: (a) Subpart 722 of the *Commercial Air Service Standard* (CASS), Schedule I — *Pilot Proficiency Check (PPC) — Aeroplane*; (b) Subpart 723 of the CASS (Aeroplane), Schedule I — PPC; (c) Subpart 724 of the CASS (Aeroplane), Schedule II — PPC — Aeroplane; (d) Subpart 725 of the CASS (Aeroplane), Schedule II — PPC — Aeroplane; (e) Transport Canada Publication (TP) 6533 — Tenth Edition, June 2017 — *Approved Check Pilot Manual, Appendix A — Safe Checking Practices*; and (f) TP 14727E, First Edition, Revision 1 (06/2017) — *Pilot Proficiency Check and Aircraft Type Rating, Flight Test Guide (Aeroplanes)*

ITEM NO.	CONDITION OF SA (APPENDIX A)	GUIDANCE INFORMATION
7	**Paragraph 1.5.1** *Performance – All engines operating*	(1) Compliance with this condition requires that the aircraft is able to maintain the required climb gradient, with all engines operating, when the aircraft flies the vertical flight path and lateral path (track or heading) specified in the published missed approach. (2) In complying with this condition of the SA, operators must address the regulatory requirements specified in subsection 602.127 (1) of the CARs. (3) For the purpose of compliance with this condition, it is acceptable to assume that an aircraft which has the climb capability to achieve the requirements specified above, with one-engine-inoperative, will also have the climb capability to fulfill these requirements with all engines operating.

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ITEM NO.	CONDITION OF SA (APPENDIX A)	GUIDANCE INFORMATION
8	**Paragraphs 1.5.2 through 1.5.4** *Performance – One-engine-inoperative*	(1) In order to account for the obstacle clearance with an inoperative engine during the missed approach, air operators may: (a) utilize manufacturer-designed software which has been developed for this purpose; or (b) adapt the methods and techniques, including software, which have been developed to address the regulatory requirements that address engine-inoperative obstacle clearance during take-off. (2) The regulations and standards which address engine-inoperative obstacle clearance requirements for takeoff are specified in: (a) Sections 704.47 and 705.57 of the CARs — *Net Take-off Flight Path*; (b) Applicable Standards for *Take-off Minima*, including: (i) Section 721.20 of the CASS — *Take-off Minima Reported RVR 1,200 feet (1/4 mile) Visibility* and *Aeroplanes Take-off Minima Reported RVR 600 feet,* (ii) Section 723.30 of the CASS — Take-off Minima Reported Visibility RVR 1200 feet (1/4 mile) - Aeroplanes with Certified Engine-out Take-off and Climb Performance, (iii) Subparagraph 724.26(2)(a)(i) of the CASS —*Take-off Minima Reported Visibility RVR 1200 feet (1/4 mile) - Aeroplanes with Certified Engine-out Take-off and Climb Performance,* (iv) Paragraph 724.26(2)(c) of the CASS —*Take-off Minima Reported RVR 600 feet,* (v) Subsection 725.34(1) of the CASS — Take-off Minima - Reported Visibility - RVR 1200 feet (1/4 mile), and (vi) Subsection 725.34(2) of the CASS — Take-off Minima - Reported Visibility - RVR 600 feet; and (c) Section 604.49(a)(v) of the CARs – *Take-off Minima.*

ITEM NO.	CONDITION OF SA (APPENDIX A)	GUIDANCE INFORMATION
	Paragraphs 1.5.2 through 1.5.4 *Performance – One-engine-inoperative* ***Continued...***	(3) It is recognized that many operators contract out the design of EODPs and EOMAPs to third party procedure designers, to benefit from their expertise and experience. As the certificate holder, it is still the operator's responsibility to: (a) ensure that their engine-inoperative procedures are safe and effective; (b) ensure that their engine-inoperative procedures comply with the applicable regulations and standards; and (c) ensure that flight crews and other operations personnel thoroughly understand the engine-inoperative procedures they are using. (4) TCCA does not approve individual EODPs or EOMAPs that an air operator may publish, but approves the Company Operations Manual (COM). During any audits, reviews or safety assessments, TCCA may examine individual procedures, the COM and any associated manuals. During these reviews TCCA may request that the air operator demonstrate that EODPs or EOMAPs: (a) are safe; (b) comply with all relevant regulatory requirements; (c) comply with the AFM; (d) provide the required obstacle clearance; (e) can be executed by flight crews of average skill; and (f) contain the correct and required information. (5) As per Section 1.0, the methods and guidelines presented in this AC and AC 700-016 are not the only acceptable methods. An air operator who desires to use an alternate means should ensure that alternate assumptions, methods and criteria used are well documented and substantiated, and are acceptable to the Minister.

ITEM NO.	CONDITION OF SA (APPENDIX A)	GUIDANCE INFORMATION
	Paragraphs 1.5.2 through 1.5.4 *Performance – One-engine-inoperative* ***Continued...***	(6) Operators should establish procedures which will provide guidance and information to the flight crews, flight dispatchers and other applicable flight operations personnel on the safest way to conduct such an analysis, should it be required. (7) Additional information can be found the following Sections of Appendix D of this AC: D.7 *Addressing Climb Gradient Requirements and Aircraft Climb Performance Capability.* D.8 *Engine-Inoperative Missed Approach Procedures (EOMAP).* D.9 *Distinctions and Special Conditions.*
9	**Paragraph 2.1.1** *Aircraft Requirements*	(1) Information can be found the following Sections in Appendix D: D.4 *Aeroplane Climb Performance Capability.* D.5 *Certification Standards.*

APPENDIX C – COMPLIANCE CHECKLIST

C.1 Overview

(1) The matrix below has been developed to assist air operators and private operators in ensuring that they are in compliance with the conditions specified for the **SPECIAL AUTHORIZATION (SA): *INSTRUMENT APPROACH PROCEDURES WITH MISSED APPROACH CLIMB GRADIENTS GREATER THAN 425 FT/NM*** (Appendix A). This matrix also serves as an aid for TCCA personnel for the purposes of certification and safety oversight.

(2) This matrix provides:

(d) A reference to the specific condition in the SA;
(e) The assessment of compliance (to be made by the air operator/private operator/TCCA personnel); and
(f) An area to record the details of the air operator's/private operator's means of compliance. (This can include, such things as the applicable references in the company operations manual, etc.)

(3) This matrix can be reproduced locally.

REQUIREMENT		COMPLIANCE (Y/N)	MEANS OF COMPLIANCE (References / Documentation)
OPERATOR REQUIREMENTS	Company Operations Manual (COM) / Private Operators' Operations Manual (OM) Paragraph 1.1.1		
	Standard Operating Procedures (SOPS) Paragraph 1.1.2		
	Operational Control - Aircraft Paragraph 1.2.1		

REQUIREMENT		COMPLIANCE (Y/N)	MEANS OF COMPLIANCE (References / Documentation)
OPERATOR REQUIREMENTS ***Continued...***	Operational Control – Pilots Paragraph 1.2.2		
	Operational Control – Flight Dispatchers Paragraph 1.2.3		
	Approved Initial and Recurrent Ground Training Program - Pilots Paragraph 1.3.1		
	Approved Initial and Recurrent Ground Training Program – Flight Dispatchers Paragraph 1.3.2		
	Ground Training Program – Course Content Paragraph 1.3.3		
	Ground Training Program – Validity Periods Paragraph 1.3.4		

REQUIREMENT		COMPLIANCE (Y/N)	MEANS OF COMPLIANCE (References / Documentation)
OPERATOR REQUIREMENTS ***Continued...***	Approved Initial and Recurrent Flight Training Program - Pilots Paragraph 1.4.1		
	Training Program – Course Content Paragraph 1.4.2		
	Flight Training – Aeroplane and FSTD requirements Paragraph 1.4.3		
	Flight Training– Validity Periods Paragraph 1.4.4		
	All Engine Operating Required Climb Gradient Paragraph 1.5.1		

REQUIREMENT		COMPLIANCE (Y/N)	MEANS OF COMPLIANCE (References / Documentation)
OPERATOR REQUIREMENTS ***Continued***	One-Engine-Inoperative Required Climb Gradient Paragraph 1.5.2		
	Calculations Paragraph 1.5.3		
	Corrections Paragraph 1.5.4		
AIRCRAFT REQUIREMENTS	Certification Standards Paragraph 2.1.1		

APPENDIX D – TECHNICAL REQUIREMENTS / GUIDANCE

D.1 Overview

(1) Essential background information respecting obstacle clearance during the missed approach, is described in this appendix, as follows:

D.1 Overview

D.2 Instrument Approach Procedure Design Criteria.

D.3 Obstacle Clearance as a Function of Climb Gradient

D.4 Aeroplane Climb Performance Capability

D.5 Aircraft Certification

D.6 Safety during the Missed Approach

D.7 Addressing Climb Gradient Requirements and Aircraft Climb Performance Capability

D.8 Engine-Inoperative Missed Approach Procedures (EOMAP)

D.9 Distinctions and Special Conditions

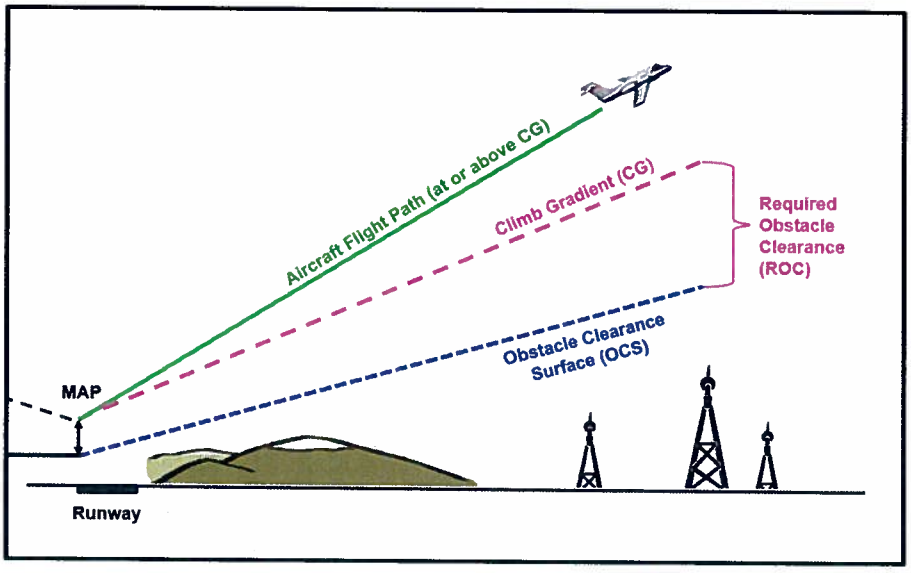
D.2 Instrument Approach Procedure Design Criteria

(1) The instrument approach procedures (IAPs) that appear in the *Canada Air Pilot* (CAP) are designed in accordance with the procedure design criteria contained in Transport Canada Publication TP308/GPH209. The criteria used in the United States are contained in FAA Order 8260.3C, *United States Standard for Terminal Instrument Procedures* (TERPS) and the ICAO criteria are found in the ICAO *Procedures for Air Navigation Services—Aircraft Operations* (PANS-OPS).

(2) The missed approach procedures of published IAPs are constructed in a manner that will ensure obstacles clearance. An obstacle clearance surface (OCS) is a surface that is established to clear all obstacles. The OCS can be thought of as a surface (flat, angled plane) which is used for the containment (enclosure) of all obstacles.

(3) The required obstacle clearance (ROC) can be thought of as a safety margin which is provided to ensure that aircraft do not penetrate the OCS. The climb gradient (CG) is the product of the ROC (safety margin) and the OCS. Aircraft must maintain, or exceed, the required climb gradient, as shown in Figure D.1.

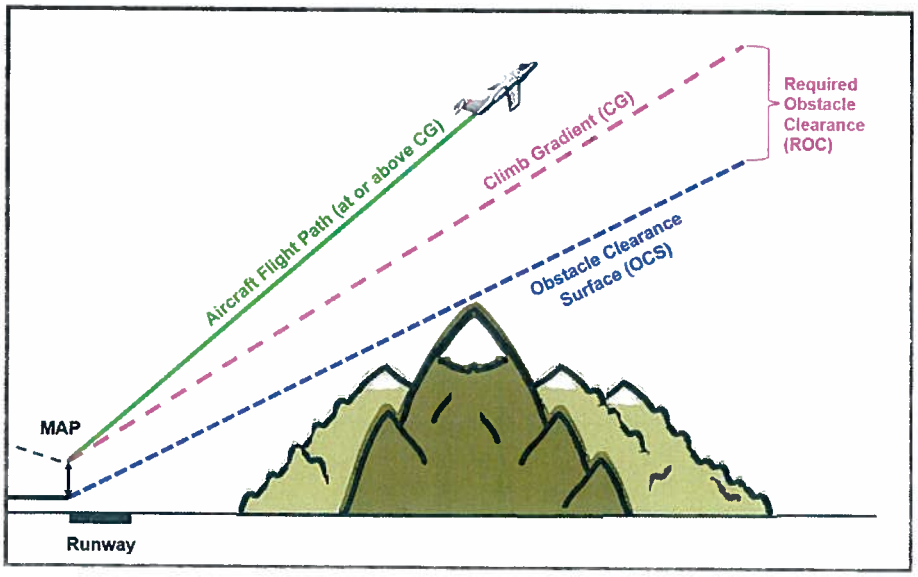
Figure D. 1 Obstacle Clearance Surface, required Obstacle Clearance and Climb Gradient



(4) A "standard" climb gradient of 200 feet/NM does not appear on a published IAP.

(5) In mountainous terrain and obstacle rich environments, the missed approach OCS may be steeper than the standard 200 feet/NM. Aircraft must maintain, or exceed, this steeper required climb gradient, as shown in Figure D.2.

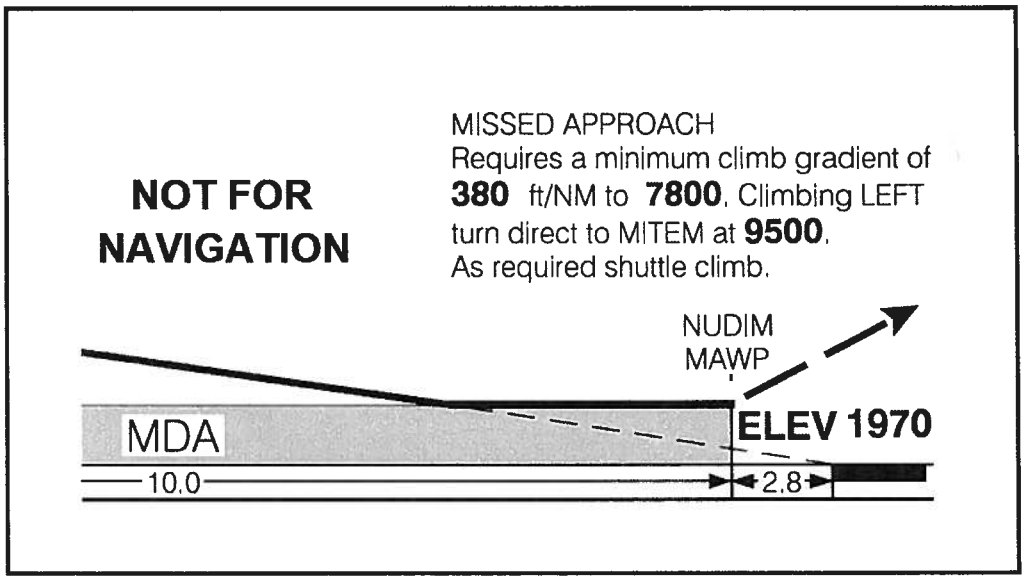
Figure D. 2 Steeper climb gradient (CG) in mountainous terrain



(6) In the circumstances described above, the missed approach instructions will indicate a *specific climb gradient* and the altitude or point to which the *specific climb gradient* must be maintained, as depicted in Figure D.3. As the climb continues above that specified altitude, or beyond that

specified point, a minimum 200 ft/NM climb gradient must be maintained until reaching a minimum safe altitude.

Figure D. 3 Published IAP with a "specific" missed approach climb gradient



(Illustration used with the kind permission of Nav Canada.)

(7) The conduct of an instrument approach procedure (IAP) that requires a missed approach climb gradient up to 425 feet/NM does not require a Special Authorization (SA) and may be published in the Canada Air Pilot (CAP).

(8) An IAP that requires a missed approach climb gradient in excess of 425 feet/NM, must be published as a Restricted Instrument Procedure (RIP) in the *Restricted Canada Air Pilot* (RCAP).

(9) The SA: *Instrument Approach Procedures with Missed Approach Climb Gradients Greater than 425 ft/NM* is required in to order to conduct an IAP with a missed approach climb gradient greater than 425 feet/NM. The conditions for this SA appear in Appendix A of this AC.

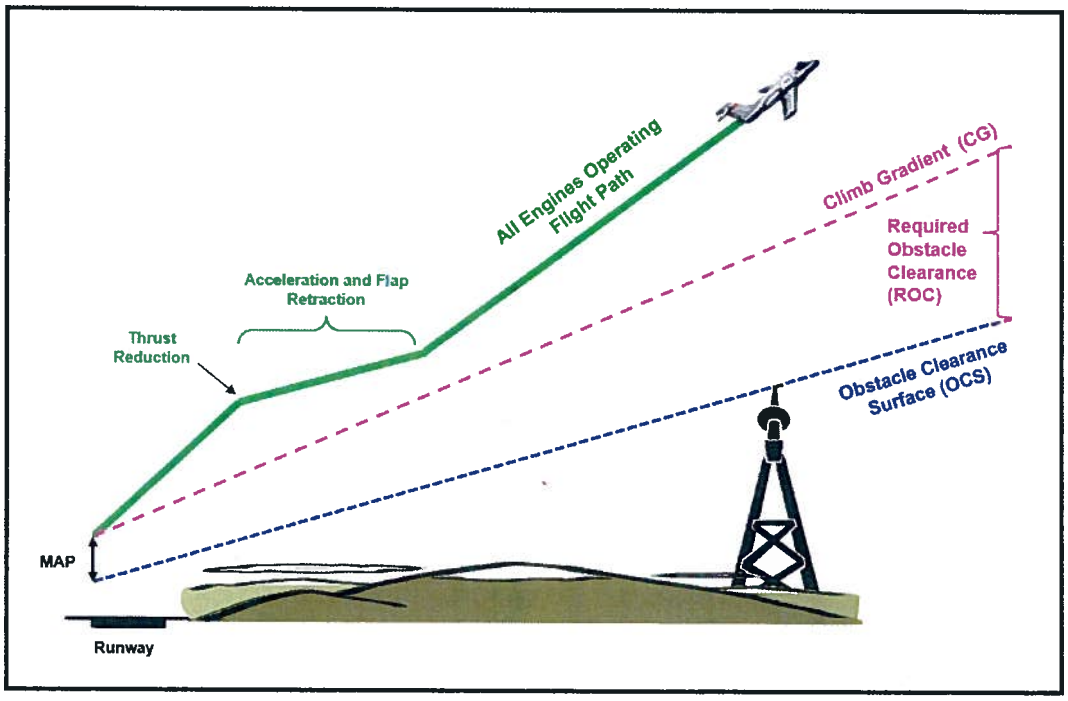
D.3 Obstacle Clearance as a Function of Climb Gradient

(1) In order to ensure obstacle clearance, any climb gradient requirement, whether published or not, must be treated as a surface which must not be penetrated from above until reaching a specified height or position rather than as a gradient which must be exceeded at all points in the path.

(2) The aircraft's actual flight path must at all times remain above the plane defined by the required climb gradient. The relationship between the aircraft's flight path and the required climb gradient is explained with the following examples and corresponding illustrations:

(a) **Flight path with all-engines-operating (AOE) – CG requirement met:** With all engines operating, there is typically an acceleration segment during which the flaps are retracted. During this segment, the aircraft's climb gradient may be less than the required climb gradient. This is permissible, as long as the aircraft's overall climb gradient meets or exceeds the required climb gradient, as shown in Figure D.4.

Figure D. 4 Overall AEO climb gradient must meet or exceed the required climb gradient



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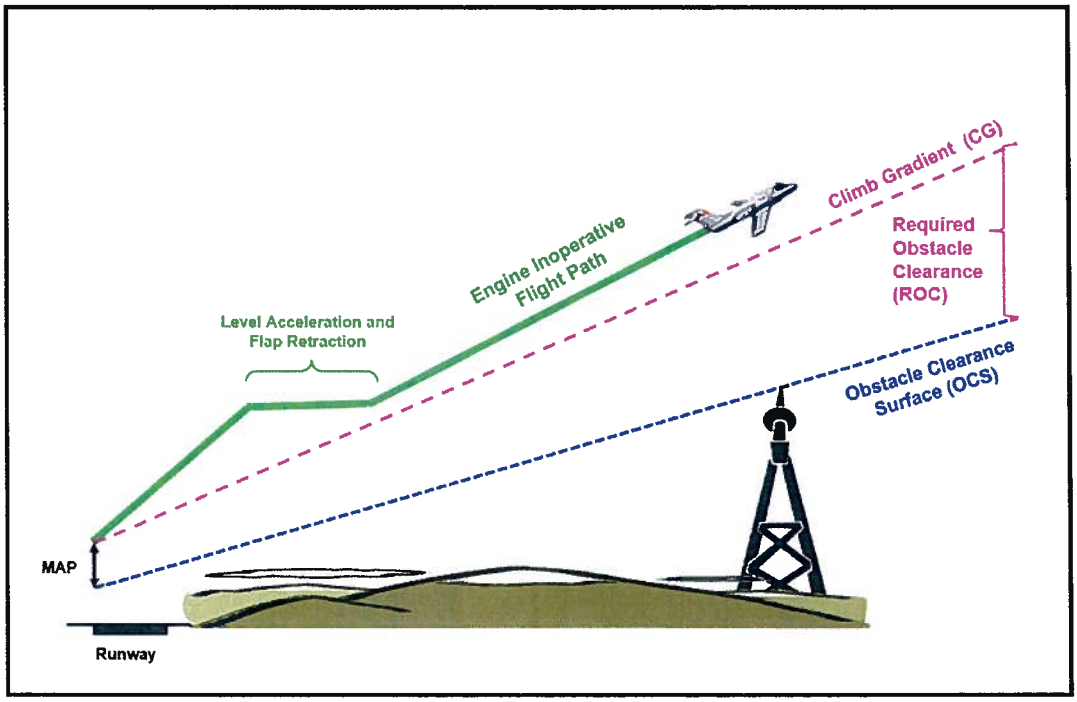
(b) **Flight path with one-engine (OEI) inoperative – CG requirement met:** With one-engine-inoperative, there is typically a period of level acceleration during which the flaps are retracted. During this level acceleration, the aircraft's actual climb gradient will be substantially less than the required climb gradient. This is permissible, as long as the aircraft's overall climb gradient meets or exceeds the required climb gradient, as shown in Figure D.5.

Figure D. 5 Overall OEI climb gradient must meet or exceed the required climb gradient



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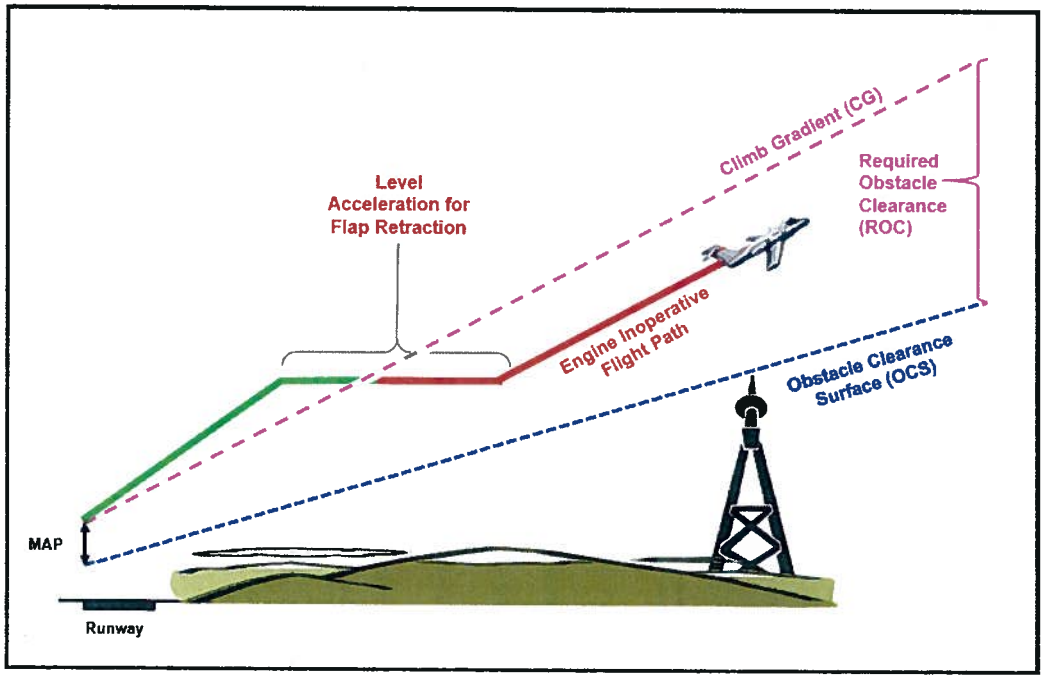
(c) **Flight path with one-engine-inoperative (OEI) – CG requirement NOT met:** The climb gradient capability of a multi-engine aeroplane (especially a twin engine aeroplane) is significantly degraded compared to its all-engine-operating capability. The engine-inoperative flight path may therefore not meet the required climb gradient unless the weight of the aircraft is significantly reduced or if the approach is conducted under less limiting environmental conditions, as shown in Figure D.6.

Note: *In a situation where the required climb gradient cannot be achieved with one-engine-inoperative, the operator may develop an alternative procedure which will achieve a flight path that will safely clear all obstacles.*

Figure D. 6 Unacceptable situation where the aircraft does NOT meet the required climb gradient



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D.4 Aeroplane Climb Performance Capability

(1) Aeroplanes with all engines and systems operating are normally capable of meeting or exceeding the *standard* (200 ft/NM) missed approach climb gradient that is required by the IAPs.

(2) A number of factors can negatively influence an aeroplane's climb capability during the missed approach. These factors include:

(a) engine failure;

(b) equipment failure and MEL items;

(c) high atmospheric temperatures;

(d) high pressure altitude;

(e) icing conditions;

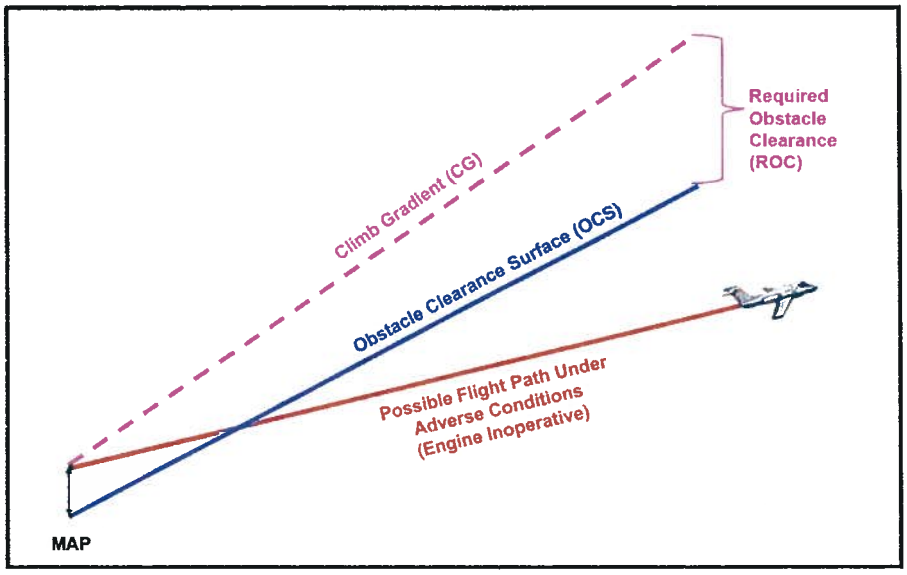
(f) degraded climb performance when a turn is required to avoid terrain and obstacles, and

(g) high gross weight.

(3) Consequently, under some conditions, an aeroplane's climb capability may prevent it from achieving the required climb gradient of the missed approach procedures. Moreover, reduced obstacle clearance margins and a possible collision with terrain or an obstacle may result if the aeroplane is unable to meet the required climb gradient for the published missed approach. (See Figure D.6)

(4) In particular, it should be understood that, under some conditions, an aeroplane with an inoperative engine may not have the capability to meet the required missed approach climb gradient. An engine failure is normally the most performance limiting case, as shown in Figure D.7.

Figure D. 7 Decreased aircraft climb capability with an inoperative engine



(5) In consideration of the above, air operators must ensure that the aircraft is able to maintain obstacle clearance, with one-engine-inoperative (normally the most limiting case), for the missed approach.

D.5 Aircraft Certification

(1) The climb performance capability of various aeroplanes can be broadly divided into two categories:

(a) Aircraft with certified engine-inoperative climb performance information; and

(b) Aircraft that do not have certified engine-inoperative climb performance information.

(2) The certification basis for the aeroplanes in these two categories is explained below.

D.5.1 Aircraft with Certified Engine-Inoperative Climb Performance Information

(1) Aircraft with certified engine-inoperative climb performance information possess Aircraft Flight Manual (AFM) performance information which satisfies the engine-inoperative take-off performance requirements. These requirements are specified in Sections 704.47 and 705.57 of the CARs – Net Take-off Flight Path, Section 604.49(a)(v) of the CARs – Take-off Minima, as well as the applicable provisions in the CASS for Take-off Minima Reported RVR 1,200 feet (1/4 mile) and Reported RVR 600 feet.

(2) Aeroplanes certified in accordance with any of the following standards have the required AFM performance information to meet the above-noted engine-inoperative take-off performance requirements:

(a) Chapter 523 of the Airworthiness Manual (AWM)—*Commuter Category Aeroplanes*;

(b) Chapter 525 of the AWM;

(c) Federal Aviation Administration (FAA), Federal Aviation Regulations (FAR) 23 Commuter Category at amendment 23-34 or later;

(d) FAA SFAR 41C and the performance requirements of International Civil Aviation Organization (ICAO) Annex 8; or

(e) FAA FAR 25.

(3) Aeroplanes certified to the preceding standards will have performance information in the AFM for the computing of weights to satisfy the performance requirements related to engine-inoperative flight; these include:

(a) One-engine-inoperative take-off;

(b) One-engine-inoperative climb based on Weight, Altitude and Temperature (WAT);

(c) One-engine-inoperative obstacle clearance;

(d) Enroute climb (with one-engine-inoperative);

(e) Landing climb; and

(f) Approach climb (with one-engine-inoperative).

D.5.2 Aircraft that do not have Certified Engine-Inoperative Climb Performance Information

(1) Multi-engine aeroplanes certified in the Chapter 523 of the AWM / FAA FAR 23 Normal category or other categories not specified in section D.5.1 (2) of this AC, do not have the AFM performance information listed section D.5.1 (3) of this AC, or they may have only a limited subset of this information.

(2) Single-engine aeroplanes generally have limited AFM performance information and are, of course, unable to climb in the event of an engine failure.

D.5.3 Availability of All-Engine-Operating Climb Performance Information

(1) Although certified engine-inoperative climb performance information is required by the airworthiness standards described in Section D.5.1, there is no regulatory requirement for all-engine-operating performance information other than that specified for landing climb information:

(a) The manufacturer should be consulted respecting the availability of suitable all-engine-operating (AEO) climb information; and

(b) Where no manufacturer-produced AEO climb information is available, it is acceptable to assume that an aircraft which has the climb capability to achieve the required climb gradient with one-engine-inoperative, will also have the climb capability to fulfill this requirement with all engines operating.

D.6 Safety during the Missed Approach

(1) Although a relatively infrequent occurrence, there are circumstances which require a missed approach to be conducted.

(2) Missed approaches or rejected landings can occur due to a variety of circumstances such as:

(a) Unstabilized approaches;

(b) Unexpected environmental conditions (e.g., cross winds, turbulence);

(c) Aircraft related failures (e.g., gear unsafe);

(d) Air Traffic Service contingencies (e.g. vehicle or aircraft incursion on landing runway);

(e) Loss of visual reference;

(f) When a pilot finds the runway surface unsuitable (e.g., clutter, flocking birds);

(g) When the runway is blocked (airport vehicles or exiting aircraft ahead not clear); or

(h) A balked landing or missed approach for any other reason.

(3) It is essential that flight crews are always ready to abandon the approach and execute a missed approach whenever conditions warrant. This is especially important for situations where a specified climb gradient and/or obstacle clearance hazards are present.

(4) A multi-engine aircraft with certified engine-inoperative performance should be capable of safely executing a missed approach, with the aircraft in a normal configuration, or specified non-normal configurations (e.g., engine out, if applicable) – if the aeroplane's reduced climb gradient capability has been properly accounted for.

D.7 Addressing Climb Gradient Requirements and Aircraft Climb Performance Capability

(1) Operators strive to have the capability of operating at the highest possible weights; this allows them to maximize the payload that they can safely carry.

(2) To safely operate at the highest possible weights, operators must understand and address the IAP's climb gradient requirements, in relation to the aircraft's climb performance capability.

D.7.1 All-Engines-Operating

(1) Operators must ensure that their aircraft are able to achieve the required climb gradient, with all engines operating, when conforming to the published missed approach procedure specified on the published IAP, as required by subsection 602.127 (1) of the CARs – *Instrument Approaches.*

D.7.2 One-Engine-Inoperative

(1) When conducting an IAP with a climb gradient greater than 425 ft/NM, operators and the pilots-in-command (PICs), **must** ensure that, with the critical engine-inoperative, the aircraft's weight shall not be greater than that which will allow the aircraft to either:

(a) meet the climb gradient published for the subject instrument approach procedure, while following the published missed approach procedure; or

(b) achieve a flight path during the missed approach that will safely clear all obstacles.

(2) In some circumstances, operators and PICs **should** also ensure that their aircraft are able to achieve the required obstacle clearance, with a critical engine-inoperative, regardless of the published climb gradient. Details of those circumstances which require special consideration are provided in Appendix B of this AC.

(3) To achieve the highest possible weights and ensure an adequate climb capability, when accounting for a failure of the critical engine, operators have a number of options:

(a) Develop a special Engine-Out Missed Approach Procedure (EOMAP) where the climb gradient requirements are not met by following the published missed approach procedure. (See section D.8 of this AC for information regarding EOMAPs.); or

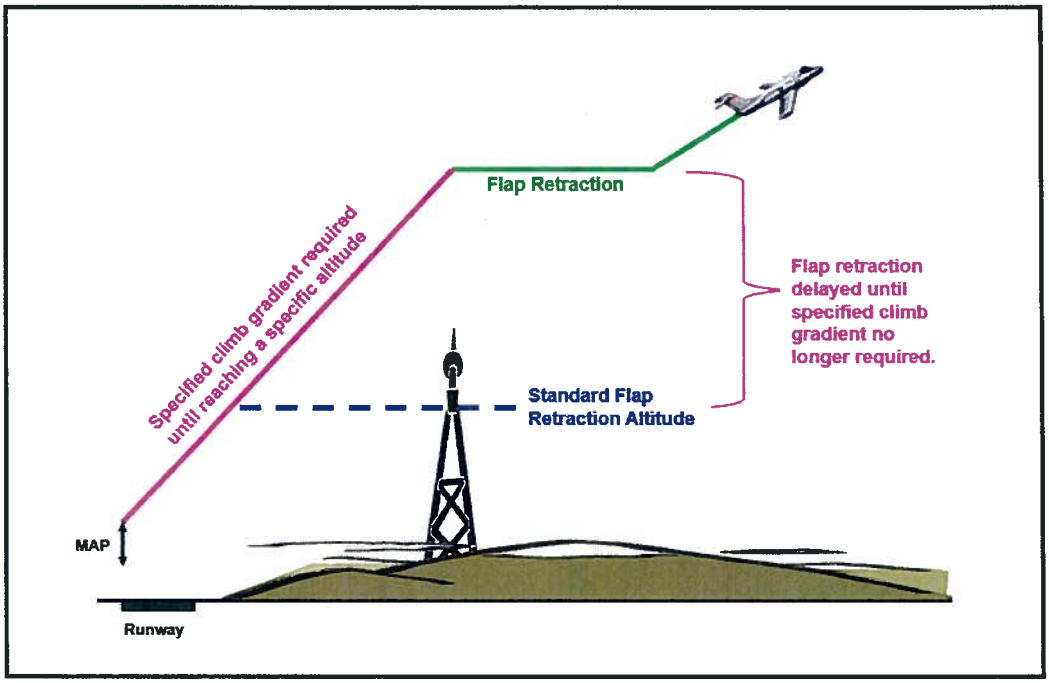
(b) Utilize a vertical flight path which would allow the aircraft to meet or exceed the published missed approach climb gradient, by climbing to a higher altitude prior to commencing the level acceleration segment for flap retraction. (See Figure D.8)

Note: *When choosing to utilize a vertical path described above, operators may employ a simplified method, whereby the aircraft's one-engine-inoperative climb gradient capability is verified to meet or exceed the climb gradient specified for the published missed approach procedure. This is acceptable providing:*

(i) The climb to flap retraction altitude and flap retraction can be achieved while respecting the time limit for take-off or go-around thrust. (This is typically 5 minutes, or in some cases 10 minutes, with an inoperative engine.), and

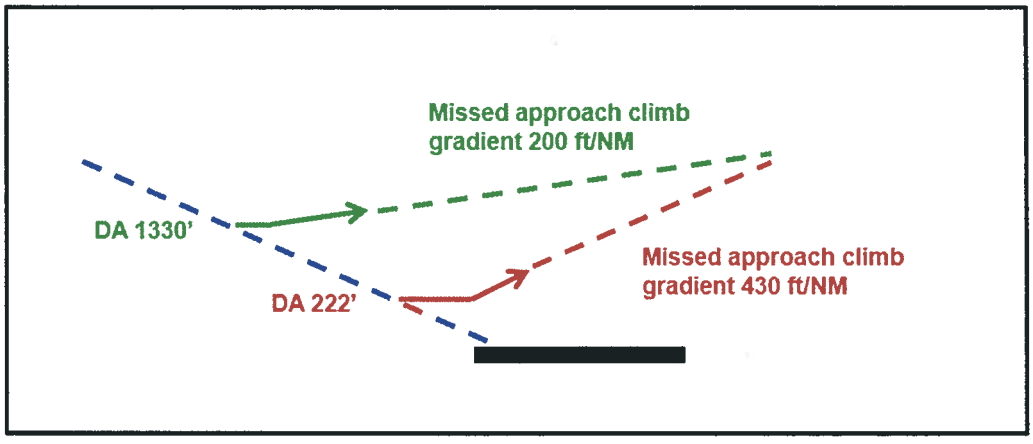
(ii) Because the aircraft's climb capability decreases with increasing altitude, the determination of the aircraft's climb gradient is made at the highest altitude where the specified climb gradient is required. Making this determination at a lower altitude would be invalid because the aircraft's climb gradient capability during the climb decreases as true airspeed increases and thrust decreases.

Figure D. 8 Obstacle clearance achieved by using a higher acceleration (flap retraction) altitude



(c) Commencing the missed approach from a higher altitude, will result in a less steep climb gradient. Raising the minimum altitudes (MDA, DA or DH) to reduce the missed approach climb gradient to a value that can be achieved at a typical landing weight for the particular route with an engine inoperative (Fig D.9). An appropriate procedure design approval may be necessary to depict alternate or multiple minima on an instrument approach procedure.

Figure D. 9 Commencing the missed approach from a higher DA/MDA/DH



(d) Dispatching the aircraft at a lighter weight, if possible.

(e) Dispatch the aircraft at another time, when environmental conditions (wind, temperature, pressure altitude) would permit the aircraft to achieve the required climb gradient, if possible.

D.7.3 Assessment of the Missed Approach Climb Gradient Required for a Published IAP in Comparison to the Performance Capability of the Aircraft

(1) The assessment of the missed approach climb gradient required for a published IAP, in comparison to the climb performance capability of the aircraft, is accomplished by:

(a) Comparing the climb gradient required for a published IAP missed approach procedure with the performance capability of the aircraft. For this comparison, it is assumed that all engines are operating normally and that the aircraft will fly the vertical flight path and ground track specified in the published missed approach procedure, as specified in Appendix A, Paragraph 1.5.1 of this AC; and

(b) Conducting an aerodrome analysis for the missed approach procedure. For this analysis, as specified in Appendix A, Paragraph 1.5.2 of this AC, it is assumed that critical engine is inoperative and that:

(i) the aircraft will fly the vertical flight path and ground track specified in the published missed approach; or

(ii) the aircraft will fly an alternative vertical flight path and/or ground track which will ensure adequate obstacle clearance.

Note: *This analysis may adapt the methodologies and techniques which have been developed to address the regulatory requirements for engine-inoperative obstacle clearance that are stipulated for takeoff. (See Appendix E of this AC for a list of these regulations.)*

(2) In order to assess the missed approach climb gradient required for a published IAP, in comparison to the performance capability of the aircraft AP, the following elements must be considered:

(a) The required climb gradient that the aircraft must achieve until reaching a suitable minimum IFR altitude.

(b) The vertical flight path to be followed. In the case of an engine failure (for suitable aircraft), the vertical flight path during the missed approach may correspond to the engine-inoperative vertical flight path utilized for takeoff;

(c) Obstacle clearance; it is understood that any climb gradient requirement, whether published or not, will be treated as a plane which must not be penetrated from above until reaching the stated height, rather than as a gradient which must be exceeded at all points in the path. (For additional information and an illustration, see Section D.3 as well as Figures D.4, D.5 and D.6 in this AC);

(d) The impact on climb performance caused by:

(i) temperature,

(ii) pressure altitude, and

(iii) Wind (positive effect of headwinds and negative effect of tailwinds; as well as the effect of crosswinds).

(e) The performance degradations caused by:

(i) engine failure,
(ii) equipment failure,
(iii) bank angle during turns, and/or
(iv) airframe icing.

(f) The lateral flight path which to be followed;

(g) The navigation requirements and the aeroplane's navigation capability;

(h) The flight crew Standard Operating Procedures (SOPs);

(i) Any operational considerations specific to approach procedure; and

(j) Any specific terrain and weather considerations.

D.8 Engine-Inoperative Missed Approach Procedures (EOMAP)

D.8.1 EOMAP – General

(1) EOMAPs provide flight crews with the necessary flight path guidance, specific routes and/or a specific climb profile, to be followed when conducting an engine-inoperative missed approach.

(2) An option to maximize landing weight, when significant obstacles are present along the normal missed approach route, is to use a special one-engine-inoperative routing – which varies from the missed approach routing in the published IAP.

(3) If there is a separate one-engine-inoperative missed approach procedure, then the obstacles along this track are used to determine the maximum approach weight for that runway. (The details of significant obstacles may also be included in the description of the procedure.)

(4) In the development of EOMAPs, air operators may:

(a) utilize manufacturer-designed software which has been developed for this purpose; or

(b) adapt the methodologies and techniques that are used to develop engine-inoperative departure paths (EODPs). These EODPs are developed of address the regulatory requirements that exist for take-off respecting engine-inoperative obstacle clearance.

(5) EODPs and EOMAPs are either developed by the air operator (utilizing software developed by the aircraft manufacturer) or by a third party service provider on the air operator's behalf.

(6) There are fundamental differences between the missed approach procedures in published IAPs and EOMAPs:

(a) The missed approach procedures in published IAPs are based on the assumption of normal aircraft performance, with all engine operation; and

(b) In contrast, EOMAPs are based upon engine-inoperative performance in relation to obstacle clearance.

(7) Air operators must ensure that their flight crews are made aware of the procedure to be followed to ensure obstacle clearance in the event of an engine-inoperative missed approach. Flight crews should know if, when conducting a missed approach with an inoperative engine, they should:

(a) Follow the missed approach procedure in the published IAP; or

(b) Follow a special EOMAP, which varies from the published IAP.

(8) Flight Crews must be aware of the authority of the pilot-in-command to deviate from a published missed approach procedure, or any ATC clearances and instructions, when necessary to remain clear of obstacles and/or terrain.

Note: *An engine failure during a missed approach is a non-normal condition, and therefore takes precedence over noise abatement, air traffic, SIDs, Departure Procedures, and other normal operating considerations.*

(9) Flight Crews must be aware of the authority of the pilot-in-command to declare an emergency and advise ATC of the deviation from a published missed approach procedure, or any ATC clearances and instructions, when necessary to remain clear of obstacles and/or terrain.

Note: *Declaring an emergency may assist the flight crew in coping with the degraded performance and increased workload associated with an engine failure while navigating to remain clear of obstacles and/or terrain.*

D.8.2 Design Considerations for Engine-Out Approach Procedures

(1) In developing an EOMAP, the aircraft system and navigational capability needs to be assessed to ensure that the aircraft can be flown to the required tolerance in IMC. Crew procedures must also be in place to adequately address this requirement.

Note: *Ensuring the adequacy of navigational capability is particularly important for those EOMAPs that utilize less conservative obstacle clearance margins than those utilized for published instrument approach procedures.*

(2) To the maximum extent possible, EOMAPs should be designed to adhere to the normal missed approach procedures for the published IAP. Doing this will minimize complexity, reduce flight crew workload, and will also help to ensure predictability of the aircraft flight path for ATC.

(3) In order for an air operator to determine that a missed approach procedure maintains the necessary obstacle clearance with an inoperative engine, the air operator should consider that an engine failure might occur at any point during the missed approach.

(4) Consideration should be given to the possibility of an engine failure occurring after passing the point at which the one-engine-inoperative missed approach track diverges from the normal missed approach track of the published IAP. Judicious selection of this point would simplify the procedure and minimize the difficulty of this analysis. This is generally achieved by keeping the two tracks identical for as far as is practical.

(5) The EOMAP should be designed with simplicity in mind, because the flight crew will need to control the aircraft's flight path – and at the same time, action the engine failure procedure. Elaborate procedures involving numerous turns, conditional statements, speed restrictions, navigation radio selection and tuning, etc. should be avoided.

(6) In some rare cases, two or more special one-engine-inoperative tracks may be required to accommodate all the potential engine failure scenarios.

(7) The analysis of engine failure scenarios may require the use of other suitable performance information in addition to that provided in the AFM. (For additional information, see AC 700-016, Section 14.1)

(8) Any pertinent weather requirements or restrictions (Wind, OAT, QNH, Minimum Ceilings and Visibilities) should be published for the EOMAP.

(9) The EOMAP should identify, depict or provide information on significant obstacles and terrain.

(10) The EOMAP routing should be designed to avoid restricted or prohibited airspace.

(11) The EOMAP routing should be designed to avoid triggering any Terrain Awareness and Warning System (TAWS) alerts when the aircraft is flown along the EOMAP route within the specified tolerances. Should TAWS alerts be expected, the flight crew should be made aware of:

(a) where in the EODP the TAWS alerts may occur;

(b) which specific TAWS alerts may be expected; and

(c) what specific actions the flight crew should take in response to them.

(12) In designing an EOMAP, a risk assessment should be performed to identify and focus on the high-risk portion(s) of the missed approach procedure, which may include proximate terrain and obstacles, aircraft performance limitations, foreseeable winds and other weather phenomena, etc. Selecting a route away from significant terrain and/or providing a holding procedure (shuttle climb) to climb to a safe enroute altitude are methods to reduce the level of risk to an acceptable level.

D.8.3 Use of an EODP as an EOMAP

(1) In the absence of a specially designed EOMAP, the use of an EODP for an engine-inoperative missed approach is recognized as a reasonable means of helping to mitigate the hazards of obstacle clearance during a missed approach with an inoperative engine, provided the differences in the two procedures are understood and accounted for.

(3) When considering the use of an EODP for the missed approach, one must remember that the EODP would commence at the departure end of the runway and not necessarily from the missed approach point, which may be quite a distance from the arrival end of the runway. Moreover, the aircraft must have the navigational capability to:

(a) overfly the landing threshold;

(b) track the runway centerline; and

(c) overfly the runway end while maintaining the specified lateral obstacle clearance requirements.

D.8.4 Information Provided to Flight Operations Personnel

(1) Flight crews, flight dispatchers and other flight operations personnel must have the information necessary to perform their duties. This includes, but is not necessarily limited to, the following:

(a) The maximum allowable weight to commence the approach, which will ensure that the aircraft will be able to attain the required climb gradient, both with all engines operating and with an inoperative engine;

(b) The intended track in case of an engine failure. Some air operators have a standard policy of flying runway heading after an engine failure; while others routinely assume the all-engines-operating ground track of the published IAP unless specifically stated otherwise. In any case, the intended track should be apparent to the flight-crew, and failure at any point along the track should be taken into account;

(c) The speeds and bank angles to be flown; both with all engines operating and with an inoperative engine;

(d) The heights or altitudes to commence an acceleration segment and/or flap retraction and cleanup as well as thrust reduction;

(e) Where turns should be initiated. (Immediate turns should be specified with a minimum altitude for initiation of the turn or a readily identifiable location relative to the runway or navigational fix); and

(g) The location of any critical obstacles or terrain, may also be provided.

(2) The information described above may be presented as a general policy for all aerodromes with exceptions stated as applicable, or it may be specified for each individual aerodrome or instrument approach procedure.

(3) Air operators are reminded of the regulatory requirements that are described in Appendix E of this AC. These requirements should be considered when determining how the information in this AC will be disseminated.

(4) The development and implementation of unique missed procedures including EOMAPs should be coordinated with an air operator's flight operations department. Flight crews should receive instructions through an appropriate means regarding these procedures. Based on the complexity, these instructions could be in the form of flight operations bulletins, revisions to selected flight crew manuals, and/or approach charts. In addition, special ground and/or simulator training may be appropriate.

D 8.5 Validation Flights

(1) Consideration should be given to conducting simulator evaluation flights to confirm a flight crews' ability to fly an actual EOMAP and to uncover any potential problems associated with those procedures. Problems may occur if the EOMAP differs significantly from the all-engines operating procedures, or if terrain makes course guidance questionable at the one-engine-inoperative altitudes. Assessments should be made to ensure that EOMAP vertical and lateral flight paths are compatible with TAWS alerting envelopes.

(2) It should be emphasized that the purpose of this simulator evaluation is not to prove the validity of the performance data or to demonstrate obstacle clearance.

(3) Any validation performed in a simulator, requires that the simulator be appropriately modeled and qualified.

(4) A validation flight can also be conducted in an aeroplane provided sufficient safety mitigations are provided to ensure that there is no degradation in required safety levels.

(5) Prior to conducting a validation flight in aeroplane, a risk-assessment should be conducted to ensure all potential hazards are identified and the appropriate mitigations are put in place.

(6) If an actual validation flight in an aircraft is required, it is recommended that a pre-validation flight be conducted in the simulator to simulate actual evaluation/validation conditions and procedures. It may also be possible that prior experience gained by another aircraft type and/or air operator may provide sufficient confirmation of the procedure.

(7) Validation flights in an aircraft should be conducted under day VMC. *Under NO circumstances should validation flights be conducted with passengers or non-essential personnel on board.*

(8) For the conduct of a validation flight in an aeroplane, ooperators and pilots need to observe and be thoroughly familiar with the safe training practices provided in numerous sources including, but not limited to those listed in Appendix B, Item No. 6, *Flight Training Conducted in an Aeroplane.*

(9) **WARNING:** Conservative judgement must be utilized to ensure that adequate safety margins are provided when conducting a validation flight in an aeroplane.

D.9 Distinctions and Special Conditions

D.9.1 Distinctions

(1) For the purposes of this AC, distinctions need to be made regarding the terms "a go-around, a missed approach, a rejected landing and a balked landing."

(a) **Go-Around**: A transition from an approach to a stabilized climb.

(b) **Missed Approach**: Means the procedure to be followed if, for any reason after conducting an instrument approach, a landing is not effected (CAR 101.01(1)).

(c) **Missed Approach Procedure:** The lateral and vertical flight path followed by an aircraft after the initiation of a go-around. Typically an aircraft conducting a "missed approach" follows the published missed approach segment of an instrument approach procedure, or follows alternative missed approach instructions (radar vectors) in order to return to landing, or divert to an alternate.

(d) **Rejected Landing**: A discontinued landing attempt. A rejected landing typically is initiated at low altitude but prior to touchdown and typically is initiated below DA(H) or MDA(H) of an IAP. A rejected landing may be initiated in either visual meteorological conditions (VMC) or instrument meteorological conditions (IMC). A rejected landing typically results in a missed approach. If related to the consideration of aircraft configuration(s) or performance, it is sometimes referred to as a Balked Landing.

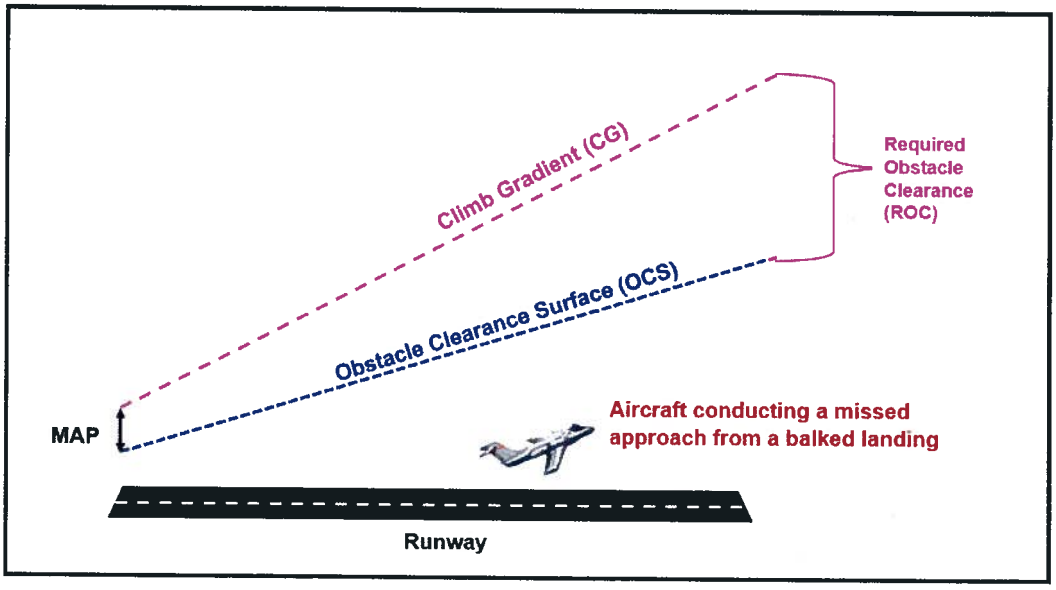
(e) **Balked Landing**: A discontinued landing attempt. The term is often used in conjunction with aircraft configuration or performance assessment, as in Balked landing climb gradient. Also see Rejected Landing.

Note: *This AC does not specifically address the "Low Energy Landing Regime" – which is a specific set of conditions related to the balked landing. Additional information regarding the low-energy landing regime can be found in Commercial and Business Aviation Advisory Circular (CBAAC) No. 0141 – Notice to Pilots and Air Operators - Low-Energy Hazards/ Balked Landing/Go-Around (Dated 1998.05.13)*

(2) It should be understood that the OCS, ROC and resulting climb gradient for an IAP are based on the assumption that this missed approach is commenced from the MDA, DA or DH at the missed approach point.

(3) In contrast, a rejected landing (balked landing) is initiated from below the MDA, DA or DH; and from directly over the runway – which is some distance downrange from the missed approach point. Therefore, for a missed approach initiated from a rejected landing, the aircraft's flight path will initially be lower than the climb gradient for the IAP. (Figure D.10)

Figure D. 10 Rejected landings are conducted lower and further downrange than the MAP



D.9.2 "One-Way" Aerodromes or Other Special Situations

(1) Where obstacle clearance is determined by the air operator to be critical, such as for:

(a) Aerodromes in mountainous terrain that have runways that are used predominantly for landing in one direction and take-off in the opposite direction ("one way in" and "opposite way out"); or

(b) Runways at which the planned landing weight is greater than the allowable take-off weight.

(2) The air operator should provide the following guidance to the flight crew:

(a) the flight path that provides the best ground track for obstacle clearance; and

(b) the maximum weight(s) at which a missed approach or rejected landing can safely be accomplished under various conditions of temperature, wind, and aircraft configuration.

APPENDIX E – APPLICABLE REGULATIONS

E.1 Overview

(1) Some of *Canadian Aviation Regulations* (CARs) and *Commercial Air Service Standards* (CASS) that are applicable to **air operators** and **private operators** conducting instrument approach procedures (IAPs) with missed approach procedures (MAPs) that require climb gradients greater than 425 feet/NM are specified below.

(2) Air operators and private operators should also ensure that they comply with the appropriate foreign regulations when operating outside of Canadian airspace, and should consult the relevant civil aviation authority for guidance respecting these regulations.

CAUTION: *The regulations listed below are not necessarily complete and up to date; and they will not necessarily be updated. Air operators, private operators and pilots are responsible for compliance with all relevant provisions.*

E.2 Part VI, Subpart 2 of the CARs

SUBJECT	PROVISIONS in the CARs	PROVISIONS in the CASS
Pre-flight Information	Section 602.71	N/A
Instrument Approaches	Sections 602.127	N/A

E.3 Part VII, Subparts 1, 2, 3, 4 and 5 of the CARs

SUBJECT	PROVISIONS in the CARs	PROVISIONS in the CASS
Contents of an Air Operator Certificate	Subparagraphs 701.08(g)(i), 701.08(g)(vi), 702.08(g)(ii), 702.08(g)(xii), 703.08(g)(ii), 703.08(g)(x), 704.08(g)(ii) 704.08(g)(xi), 705.08(g)(ii) and 705.08(g)(xi)	Sections 722.08, 723.08, 724.08 and 725.08

Part VII, Subparts 1, 2, 3, 4 and 5 of the CARs - *Continued...*

SUBJECT	PROVISIONS in the CARs	PROVISIONS in the CASS
Company Operations Manual	Sections 702.82, 703.105, 704.121 and 705.135	Sections 722.82, 723.105, 724.121 and 725.135
Requirements relating to Company Operations Manual	Sections 702.81, 703.104, 704.120 and 705.134	N/A
Standard Operating Procedures (SOPs)	Sections 702.84, 703.107, 704.124 and 705.138	Sections 722.84, 723.107, 724.124 and 725.138
Flight Crew Member Qualifications	Sections 702.65, 703.88, 704.108 and 705.106	Sections 722.65, 723.88, 724.108 and 725.106
Qualifications of Operational Control Personnel / Flight Dispatcher Qualifications	Sections 703.89, 704.109 and 705.111	Sections 723.89, 724.109 and 725.111
Training Program (Pilots)	Sections 702.76, 703.98, 704.115 and 705.124 of the CARs	Sections 722.76, 723.98, 724.115 and 725.124 of the CASS
Training and Qualification Records	Subsections 702.77, 703.99, 704.117 and 705.127	N/A
Net Take-off Flight Path	Sections 704.47 and 705.57	Section 724.47
Safety Management System	Sections 107.01, 107.02, 107.03, 107.04 604.183, 604.202, 604.203, 705.151, 705.152 and 705.153.	N/A
Route and Aerodrome Qualifications	Section 705.111	Section 725.111

E.4 Part VI, Subpart 4 of the CARs

SUBJECT	PROVISIONS in the CARs
Other Activities Approved by the Minister	Section 604.47
Operations Manual - General Requirements	Subsection 604.197
Standard Operating Procedures (SOPs)	Paragraphs 604.197(1)(i), (j)and (p)
Flight Crew Member Qualifications	Paragraphs 604.143(1)(b) and (c)
Training Program	Section 604.166
Acquiring and Maintaining Competency	Section 604.167
Training Program Content and Training Facilities	Section 604.168
Instructor Qualifications and Training	Section 604.144
Flight Crew Members Ground Instruction	Subsection 604.169(1)
Flight Crew Members — Aircraft Operation Training	Subsection 604.170
Training and Qualification Records	Subsection 604.149 (1)