Advisory Circular (AC)

Operation of Thrust Reversing Systems

File No.	5009-6-525	**AC No.**	525-005
RDIMS No.	528407-V3	**Issue No.**	01
Issuing Branch	Aircraft Certification	**Effective Date**	2004-12-01

1.0 INTRODUCTION

1.1 Purpose

The purpose of this Advisory Circular (AC) is to provide guidance for the airworthiness approval of the operation of thrust reversing systems in transport category aeroplanes. Like all advisory material, this AC is not mandatory and does not constitute a regulation. As a guidance document, its purpose is to outline a method of compliance with existing standards. The applicant may elect to follow an alternate method, which must be acceptable to Transport Canada as a means of complying with the requirements of the Sections referenced in paragraph 2. The term "s*hall*" used herein applies only to an applicant who chooses to follow this particular method without deviation.

1.2 Guidance Applicability

This document is applicable to all Transport Canada personnel, delegates and industry.

1.3 Description of Changes

This document, formerly AMA No. 525/3, is reissued as an AC. With the exception of minor editorial changes and updated references, the content is unaltered.

1.4 Termination

This document does not have a terminating action. It will however, be reviewed periodically for suitability of content.

2.0 REFERENCES

2.1 Reference Document

It is intended that the following reference material be used in conjunction with this document:

Chapter 525 of the Airworthiness Manual (AWM) — *Transport Category Aeroplanes*.

2.2 Cancelled Document

As of the effective date of this document, AMA No. 525/3 dated 24 August 1988 is cancelled.

3.0 BACKGROUND

Section 525.143 requires that the aeroplane be safely controllable and manoeuvrable during take-off and landing, and that it must be possible to make a smooth transition from one flight condition to any other flight condition without exceptional piloting skill, alertness, or strength under any probable operating condition, including configuration changes such as deployment or retraction of deceleration devices. Transport Canada interpretation of the requirements of 525.143 includes go-around following landing touch down and selection of reverse thrust. This operating condition is not specifically addressed by Section 525.933.

4.0 APPLICABILITY

This advisory material is applicable to turbojet thrust reversing systems (such as translating sleeves, buckets, etc.) and to turbine engine propeller reversing systems which enable propeller pitch settings below flight idle to be selected on the ground. This includes systems which have a ground idle or discing setting which produces negligible reverse thrust at zero forward speed.

5.0 ACCEPTABLE MEANS OF COMPLIANCE

Compliance may be shown by acceptable analysis or a combination of acceptable analysis and test, following the procedures of paragraphs 5(a) or 5(b) of this CC, as applicable. Analysis used in showing compliance should consider all appropriate factors and operating conditions and not be confined to showing that no hazard is involved with any proposed verification flight test.

(a) **Turbojet Engine Reversing Systems**

(i) The following manoeuvre sequence shall be considered:

1) Normal landing touchdown;

2) Deployment of thrust reversers;

3) Engine speed increase and development of reverse thrust;

4) Decision to go-around;

5) Stow thrust reversers;

6) Rapid application of full forward thrust;

7) Configuration changes as required; and

8) Take-off; or

9) Stop, if take-off is clearly not achievable.

Note:

In addition, the above sequence shall be considered with the application of full forward thrust before the thrust reversers are fully deployed.

(ii) The applicant shall demonstrate that there is no hazard such as:

1) becoming airborne with an unlocked thrust reverser;

2) one engine developing forward thrust and the other reverse thrust;

3) insufficient system capability to handle the peak system demands (e.g. hydraulic pressure);

4) power control anomalies which would allow the power levers to be pushed forward (i.e. apparent generation of forward thrust) before the thrust reversers were fully stowed and hence result in reverse thrust.

(b) **Turbine Engine Propeller Reversing Systems**

The following man oeuvre sequences shall be considered:

i) Application of take-off power from ground idle or discing:

1) Normal landing touchdown;

2) Selection of ground idle or discing, as applicable;

3) Decision to go-around;

4) Rapid application of full forward thrust;

5) Configuration changes as required; and

6) Take-off.

ii) Application of take-off power from full reverse thrust: because of the low aircraft speed resulting from turboprop reverse thrust, it is not usually necessary to consider a go-around from this condition.

iii) Rapid cancellation of reverse thrust:

1) Normal landing touchdown;

2) Selection of full reverse thrust; and

3) Rapid cancellation of reverse thrust.

iv) The applicant shall demonstrate that there is no hazard such as:

1) any asymmetric control problems resulting from the propellers developing differential thrust; or

2) uncontrollable pitching tendency at a critical weight/centre of gravity condition; or

3) propeller and/or engine control anomalies which could result in engine or propeller limits being exceeded.

6.0 AEROPLANE FLIGHT MANUAL (AFM)

An Aeroplane Flight Manual limitation prohibiting a go-around following reverse thrust operation may be required, but is not considered adequate, by itself, to demonstrate compliance with the reference regulations.

7.0 HEADQUARTERS CONTACT

For more information please contact:

Policy Standards Coordinator (AARDH/P)

Phone: (613) 990-3923
Facsimile: (613) 996-9178
E-mail: AARDH-P@tc.gc.ca

Original signed by Maher Khouzam

Maher Khouzam
Chief, Regulatory Standards
Aircraft Certification Branch