



REASSESSMENT OF THE RESPONSES TO AVIATION SAFETY RECOMMENDATION A12-02

Stabilized constant descent angle (SCDA)

Background

The Beech A100 (registration C-GPBA, serial number B-215) operated by Exact Air Inc. as flight ET822 was on an instrument flight rules flight between Val-d'Or and Chicoutimi/Saint-Honoré, Quebec, with 2 pilots and 2 passengers on board. At 2240 Eastern Standard Time, the aircraft was cleared for an RNAV (GNSS) Runway 12 approach and switched to the aerodrome traffic frequency. At 2250, the international satellite system for search and rescue detected the aircraft's emergency locator transmitter signal. The aircraft was located at 0224 in a wooded area approximately 3 nautical miles from the threshold of Runway 12, on the approach centreline. Rescuers arrived on the scene at 0415. The 2 pilots were fatally injured, and the 2 passengers were seriously injured. The aircraft was destroyed on impact; there was no post crash fire.

The Board concluded its investigation and released report A09Q0203 on 02 May 2012.

Board Recommendation A12-02 (02 May 2012)

There are essentially 2 techniques for completing the final descent on a non-precision approach: step-down descent and final descent on a stabilized constant descent angle (SCDA).

The step-down descent technique involves flying an aircraft to a series of published minimum altitudes. This requires multiple changes in attitude and power to maintain a constant speed throughout the descent. The technique relies on prospective memory, which requires a heavier workload and more cognitive effort than a SCDA descent. Consequently, whether a crew is tired or not, they are more vulnerable to making errors inherent in the execution of the step-down approach.

The SCDA technique involves intercepting and maintaining an optimum descent angle to minimum descent altitude (MDA). The descent is therefore flown at a constant angle and constant rate of descent, requiring no configuration change. The task simplification associated with the SCDA technique reduces the cognitive effort required for the approach, thereby reducing the workload and, by extension, the risk of error.

The benefits of the SCDA technique have been demonstrated and validated by Transport Canada (TC) and several international organizations. However, the majority of operators in Canada do not use the SCDA technique for non-precision approaches.

The Flight Safety Foundation's approach and landing accident reduction (FSF ALAR) task force determined that the risk of approach and landing accidents (ALAs) was 5 times higher for non-

precision approaches than for precision approaches. Non-precision approaches make up 91% of all approaches published in the *Canada Air Pilot (CAP)*.

According to the International Civil Aviation Organization (ICAO) risk tolerability matrix, the risk involved when such an approach is performed by an air taxi in Canada is unacceptable, and strategies to control or mitigate such risks must be put in place. Since 16 July 2011, the European Union has required all operators to use the SCDA approach technique.

The use of the SCDA technique as an additional defence mechanism would help mitigate the risk of an ALA associated with non-precision approaches.

Therefore, the Board recommends that:

The Department of Transport require the use of the stabilized constant descent angle approach technique in the conduct of non-precision approaches by Canadian operators.

TSB Recommendation A12-02

Transport Canada's response to Recommendation A12-02 (23 July 2012)

In most situations, using stabilized constant descent angle (SCDA) procedures for the conduct of non-precision approaches enhances flight safety. The stabilized nature of this procedure reduces workload for the flight crew in an already busy segment of the flight; SCDA minimizes an aircraft's departure from an ideal flight path during an approach, thereby minimising the number and magnitude of any necessary corrective actions. At the same time, it is not appropriate in every situation. Much of this procedure is flown at an altitude well above the minimum safe altitude for the area. Depending on local conditions, these higher altitudes can force the aircraft into adverse traffic, wind, cloud, or icing conditions – conditions that could be avoided by flying an alternate procedure that would allow the flight to be conducted at a lower, safe altitude outside of adverse conditions.

Therefore, while there are situations where conducting a SCDA is appropriate, in other situations conducting a SCDA can increase risk factors associated with an instrument approach, flight crews must have the flexibility to use the safest available procedure when conducting an instrument approach. While TC agrees that operators should use the stabilized constant descent angle of approach in the conduct of non-precision approaches, where conditions permit, the Department does not plan to require this technique for every non-precision approach flown.

TC will continue to promote SCDA for non-precision approaches when situations warrant. Air operators operating aircraft that provide the flight crew with vertical guidance have, to a great extent, already adopted the SCDA technique. It is estimated, based on informal contact with air operators and association members that about 50% of aircraft operated under Part VII, Subpart 4 of the CARs and about 20% of aircraft operated under Part VII, Subpart 3 of the CARs are currently using SCDA techniques with vertical guidance as the normal procedure for non-precision approach. The increase in the use of SCDA with vertical guidance, over the years, seems to be consistent with the introduction of newer aircraft with vertical guidance capability or the retrofit of existing aircraft with more sophisticated instrumentation TC expects these

numbers to continue to increase as technology becomes more accessible. The introduction of SCDA supporting data into approach charts will eliminate the need for calculations by flight crews operating aircraft that cannot provide vertical guidance information. TC expects when this information is available, flight crews will adopt SCDA procedures. NAV CANADA has already decided to publish new approach charts depicting vertical profiles as required by ICAO Annex 4. The availability of this information will facilitate the use of SCDA without vertical guidance by flight crews during the planning of the approach. It is also expected that the implementation of TAWS regulation, which was published in the Canada Gazette Part II, July 4, 2012, will greatly reduce the risk of approach and landing accidents.

Several regulatory requirements are already in place for the handling of procedures such as SCDA. A standard for the conduct of SCDA is published in sections 723.41, 724.37 and 725.48 of the Commercial Air Services Standard (CASS). A training standard is published in subsections 723.98(32), 724.115(37) and 725.124(54) of the CASS. The CASS already contains a requirement for the company operations manual (COM) to contain information on “instrument approach procedures (including company approaches), and alternate aerodrome requirements”. The CASS also contains a requirement for the air operator to establish and maintain standard operating procedures (SOPs) on “approaches IMC, visual, VFR, and circling”.

Additional promotion has also already taken place in the form of an article in the Aviation Safety Letter in Issue 1/2011 entitled: “Why are Aircraft Flying at Minimum IFR Altitudes?” This article emphasizes the need to avoid minimum IFR altitudes on non-precision approach procedures and provides rules of thumb for a SCDA approach.

This promotional effort will continue through work with the industry associations such as Air Transport Association of Canada (ATAC) and the Helicopter Association of Canada (HAC) to encourage SCDA approaches and the use of the Flight Safety Foundation (FSF) Approach and Landing Accident Reduction (ALAR) Toolkit.

Revised response from Transport Canada to Recommendation A12-02 (21 December 2012)

Short-term action plan

The Commercial and Business Aviation Advisory Circular (CBAAC) No. 0238, entitled: Stabilized Constant Descent Angle Non-Precision Approach will be revised to address issues that may be preventing operators and pilots from using SCDA on NPA and to also clarify to TCCA inspectors the safety benefit of using SCDA. The revised Advisory Circular will need to take into account the CAP (*Canada Air Pilot*) approach procedure depiction changes that NAV CANADA will introduce next spring (2013) that will assist pilots in conducting a SCDA. The revision of the CBAAC No. 0238 should be available to the operators about one month before the changes in the CAP.

TCCA will revise the AIM (Aeronautical Information Manual) to address the CAP approach procedures depiction changes that NAV CANADA will introduce next spring (2013) to assist pilots in conducting a SCDA.

The existing text in the Flight Test Guide – Instrument Rating includes in Exercise 2 - IFR Operational Knowledge the requirement to have practical knowledge of approach charts. When SCDA profiles are depicted on charts in the CAP, pilot examiners will be able to question candidates on techniques or procedures to be followed in order to use such a profile. The inclusion of questions on these SCDA procedures and techniques during initial and recurrent instrument rating flight tests will be promoted via pilot examiner workshops that will be conducted from March to May 2013.

The existing text in the Flight Test Guide – Pilot Proficiency Check and Aircraft Type Rating includes in 'Exercise 15.-16. – Approach' a note by which a pilot may descend below MDA following a non-precision approach using a SCDA technique, under specific conditions from a regulatory exemption. The wording will be expanded in due course to include the promotion of checking SCDA techniques regardless of the use of an exemption that allow to go below MDA. These changes will be promoted via the ACP/AQP electronic bulletin board, ahead of the next revised publication of the applicable flight test guide, as well as via communication to that effect with Approved Check Pilot course providers, for proper consideration during initial and recurrent ACP courses. The next draft version is in the advance stage and should be ready in 2013. Translation and publication processes could add some delays.

TCCA is in the process of revising TP 308 to include the updated criteria to support ICAO General Assembly Resolution A36-23.

Medium-term action plan

Existing regulations concerning flight training do not lend themselves to affecting regulatory change in training requirements, such as including SCDA approach procedures and techniques. This has been recognized by TCCA as a hindrance to adopting any new technology and training methodology in this field. A new Subpart 407 is proposed that will allow and obligate training providers to react to new best practices that affect safety. The drafting of the new regulations is well underway and is receiving moderate attention by the Department of Justice. In the future, recommendations by the TSB such as implementing new procedures and techniques in ab-initio flight training programs can be responded to without additional regulatory change.

TCCA will conduct a performance measurement of revised CBAAC No. 0238 to determine the extent to which operators are adhering to the new guidelines. The focus will be on Air Taxi and Commuter Operations as well as regionally managed Airline Operations.

Long-term action plan

Review the state of the industry to determine whether further TCCA actions are required to address Approach and Landing Accident Reduction (ALAR).

Board assessment (17 January 2013)

Board Recommendation A12-02 proposes that Transport Canada require the use of the stabilized constant descent angle (SCDA) approach technique in the conduct of non-precision approaches by Canadian operators.

Transport Canada clearly recognizes the safety benefits of the SCDA approach technique in all but emergency circumstances and grants a reduced approach ban when a carrier meets certain operating conditions and uses this technique in reduced visibility conditions.

Further, TC is proposing measures to clarify, for its inspectors and in various publications, its favourable stance on the use of the SCDA approach technique. It also intends to promote use of the SCDA technique.

In 2013, NAV CANADA plans to change the design and depiction of the instrument approach charts published in *Canada Air Pilot*. These changes, which are in response to TSB Recommendation A12-01, will facilitate use of the SCDA technique, since the optimum descent path of 3 degrees will be clearly indicated on them.

TC expects that the depiction of the optimum descent path on instrument approach charts, combined with promotional efforts, will encourage Canadian operators to voluntarily adopt the SCDA technique to reduce ALA risks associated with non-precision approaches.

The TSB is encouraged by the measures TC proposes and if fully implemented will mitigate the risk of ALAs.

The TSB considers TC's response to be **Satisfactory Intent**.

Additional response to A12-02 (20 February 2013)

Part of the short term action plan stated:

"TCCA is in the process of revising TP 308 to include the updated criteria to support ICAO General Assembly Resolution A36-23." The TSB has requested Transport Canada to explain how the response quoted above is related to SCDA. The revision of the TP 308 does not support ICAO general Assembly Resolution A36-23 as mentioned above. This information was incorrectly incorporated in the response.

The reference to TP 308 should, instead, be read as follows:

"The Instrument Procedure Design Manual (TP 308) criteria currently permit the design of some RNAV Instrument Procedures incorporating SCDA in the design. Transport Canada is in the process of updating the manual to include new criteria permitting even more Required Navigation Performance (RNP) Instrument Procedures incorporating SCDA in the design."

Board response (15 May 2013)

The Board has determined that the information provided does not warrant a reassessment at this time.

Next TSB action

The Board will monitor Transport Canada's later responses closely to determine whether the objectives of Recommendation A12-02 will be reached.

Response from Transport Canada to Recommendation A12-02 (26 November 2013)

Transport Canada does not intend to require the use of the stabilized constant descent angle (SCDA) in order to allow pilots to deviate from the SCDA glideslope to avoid possible icing conditions and inclement weather.

Transport Canada has done the following in order to otherwise promote SCDA:

- Issued Advisory Circular 700-028 entitled “Vertical Path Control on Non-Precision Approaches” in April 2013, replacing the Commercial and Business Aviation Advisory Circular (CBAAC) No. 0238 entitled “Stabilized Constant Descent Angle Non-Precision Approaches”.
- Completed pilot examiner (PE) workshops, from coast to coast, for the PEs authorized to conduct instrument-rating initial and renewal flight tests. The workshops included a presentation of the constant descent final approach (CDFA) technique, recommended by the TSB, which was fully explained and discussed, along with examples of the planned issuance of the new format of the NAV CANADA *Canada Air Pilot* (CAP) approach charts.
- Revised the *Aeronautical Information Manual* (AIM) to address the CAP approach procedures depiction changes that NAV CANADA will introduce next spring to assist pilots in conducting an SCDA.

In addition, the Department is revising the existing text included in Exercise 15-16 in the *Flight Test Guide: Pilot Proficiency Check and Aircraft Type Rating*. The wording will be expanded to include performance criteria when assessing CDFA techniques during a pilot proficiency check. This change will be circulated via an Approved Check Pilot (ACP) Bulletin by the start of the second quarter of 2014.

No additional regulatory or advisory material is planned at this time.

Board assessment of response to A12-02 (02 April 2014)

Transport Canada does not intend to require the use of SCDA in order to allow pilots to deviate from the SCDA glideslope to avoid possible icing conditions and inclement weather.

The SCDA technique is used on final approach, below 3200 feet above the ground, during the last 3-5 minutes of the flight, on a descent path similar to that of a precision approach. The step-down technique brings the aircraft down to the minimum obstacle clearance altitude (Figure 1).

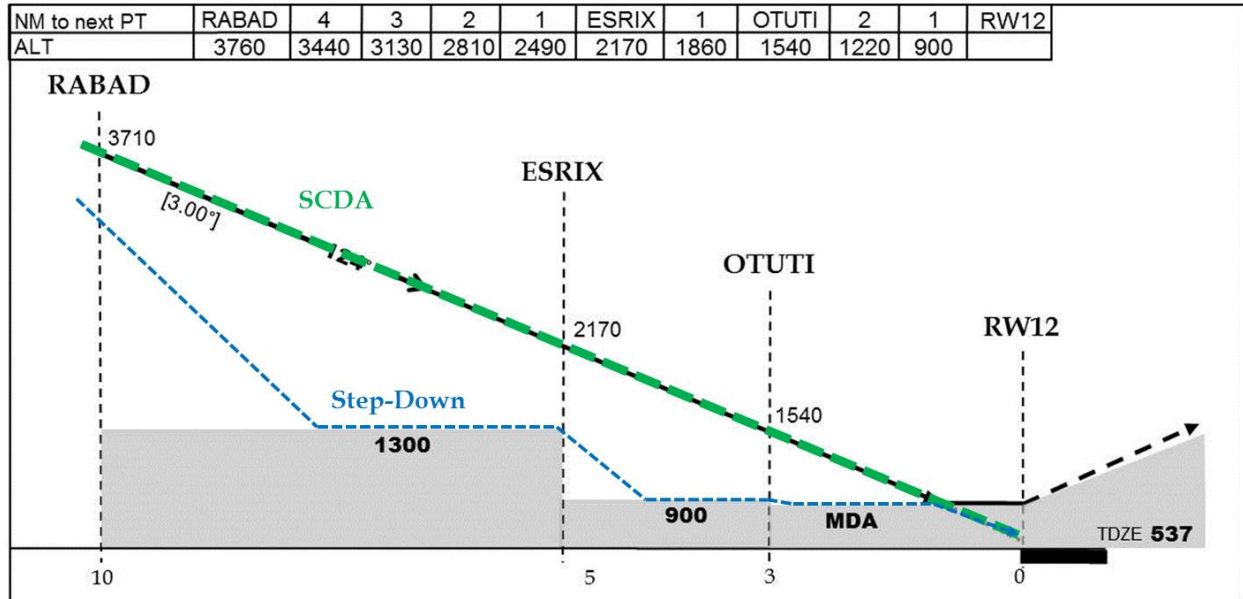


Figure 1. Stabilized constant descent angle (SCDA) versus step-down technique

The Board recognizes that in exceptional or emergency situations, the pilot always has the authority to deviate for the safety of the flight. However, the pilot must weigh the benefits of this premature descent against the increased risk of an approach and landing accident (ALA). Requiring Canadian operators to use the SCDA technique does not preclude the pilot from deviating below a precision or non-precision glideslope if it becomes the safest course of action.

As TC now requires the depiction of SCDA approaches, pilots will no longer routinely use the step-down technique. The Board considers the action taken on the approach plates to eliminate the safety deficiency and considers the response to this recommendation to be **Fully Satisfactory**.

Next TSB action

The deficiency file is assigned a **Closed** status.