Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

AVIATION INVESTIGATION REPORT
A07O0273

COLLISION WITH TREES ON APPROACH

UKRAINIAN CARGO AIRWAYS (UKS 702)
ILYUSHIN 76TD, UR-UCT
TRENTON, ONTARIO
04 OCTOBER 2007

Canada

The Transportation Safety Board of Canada (TSB) investigated this occurrence for the purpose of advancing transportation safety. It is not the function of the Board to assign fault or determine civil or criminal liability.

Aviation Investigation Report

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Summary

The Ukrainian Cargo Airways Ilyushin 76TD (registration UR-UCT, serial number 0063470089) operating as flight number UKS 702 departed Baku, Azerbaijan, destined for Trenton, Ontario, with an intermediate stop at Keflavik, Iceland. As the instrument landing system for Runway 24 at Trenton was unserviceable, the aircraft was cleared for the non-directional beacon approach to Runway 24. During the approach, the right main landing gear struck a group of trees approximately 70 feet high located on the approach centreline, 0.7 nautical miles from the runway threshold. The aircraft landed at approximately 0745 eastern daylight time with only minor damage. There were no injuries to the 15 crew members.

Ce rapport est également disponible en français.

Other Factual Information

The terminal aerodrome forecast (TAF) available to the flight crew prior to departure from Keflavik, Iceland, forecast the weather at Trenton to be: from 0400, wind 3 knots, visibility 6 statute miles (sm) in mist, sky clear, temporarily from 0400 to 0800 visibility 3 sm in mist.

Prior to commencing descent into Trenton, the aircraft was in visual meteorological conditions (VMC) with ground features and landmarks in sight. At approximately 0700 [1], the flight crew attempted to obtain the latest weather from the Trenton automatic terminal information service (ATIS). The message on the ATIS frequency stated that "all information will be issued by air traffic control (ATC)". At approximately 0704, while under control of the Montreal Area Control Centre, the flight crew contacted the Trenton control tower and obtained the latest altimeter setting, confirmed that Runway 24 was in use, and that the wind was calm. No other weather information was obtained during this exchange. At approximately 0712, the flight crew decided that a straight-in visual approach to Runway 24 would be conducted.

A briefing as to aircraft configuration and speed during the approach was completed. While the flight crew independently reviewed the approach plates prior to descent, no approach or missed approach briefing was done.

At approximately 0732, Trenton ATC inquired of the flight crew's approach intentions. The flight crew requested and was subsequently cleared for the non-directional beacon (NDB) Runway 24 approach. The captain was the pilot flying and was navigating with reference to outside visual cues. The first officer was monitoring the outside references and aircraft instruments. At approximately 0739, the Trenton terminal control unit relayed the following weather information to the flight crew: wind calm, visibility 2 ½ sm in mist, and sky clear. Shortly after, the airport was sighted. However, only the furthest portion of Runway 24 was visible because the initial portion was obscured by a low layer of fog. The precision approach path indicator (PAPI) lights were visible through the fog layer.

The aircraft crossed the Trenton final approach fix (FAF) at 2400 feet above sea level (asl), approximately 200 feet above the published minimum crossing altitude. At that time, the aircraft was on a descent profile of approximately 3.0 degrees to the runway, and established on the inbound track of 241° magnetic (M) (see Appendix A – NDB Runway 24 Approach – Vertical Profile and Appendix B – NDB Runway 24 Approach procedure). At approximately 3.5 nautical miles (nm) from the threshold and upon full flap extension, the approach angle of the aircraft increased. At 3.0 nm, the aircraft descended below the 3.0-degree approach path angle and continued its descent to below the minimum descent altitude (MDA) of 900 feet asl (618 feet above ground level (agl)).

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[1] All times are eastern daylight time (Coordinated Universal Time minus four hours) unless otherwise noted.

At 1.5 nm from the runway and at approximately 230 to 260 feet agl, the aircraft entered a layer of fog. At approximately one nm from the runway, while in fog, the aircraft descended through a radio height of 89 feet agl. Realizing it was low, a verbal call was made and the crew took measures to correct for the low-altitude state. Aircraft pitch was increased from zero to four degrees nose-up and the engine power was increased from 88 per cent to approximately 90 per cent. The radio altimeter height continued to decrease until it reached 33 feet agl, then it increased to 76 feet agl, where it remained constant for the next five seconds. Meanwhile, aircraft heading decreased from 244° M to 239° M, deviating left of the inbound approach course. At approximately 0.75 nm from the displaced threshold, the aircraft banked to the right and the heading increased to 251° M. After regaining the inbound approach course, a left bank was performed to realign with the extended runway centreline, after which the aircraft landed.

The flight crew was not aware that they had struck trees on the approach. However, during the post-flight aircraft inspection, branches were found on the landing gear. This was not reported to Trenton ATC. Approximately 40 minutes after landing, during a routine runway inspection by the Department of National Defence (DND), branches and foliage were found on the runway. Further inspection revealed more branches on the edge of the taxiway where the aircraft was parked and on the right main landing gear. Scrape marks were visible on the fuselage. The occurrence was reported to the TSB by the Directorate of Flight Safety (DFS) of DND. Neither the flight crew nor the company notified the TSB or DFS of the occurrence.

According to Ukrainian Cargo Airways (UCA) training procedures, the procedure for a visual approach entails the flight crew using a constant rate of descent from the FAF to the runway. Tables that reference groundspeed, descent rate, distance, and altitude outline the data to be used to obtain the appropriate rate of descent for an approach.

UCA procedures state that for descent, approach, and landing, the aircraft shall not descend below a relevant safe altitude, except when permanent visual contact with the ground is established and adequate clearance above all obstacles along the flight path is assured. Also, UCA's definition of a visual approach is a visual flight rules (VFR) approach and landing under direct visibility of landmarks.

Runway 24 at Trenton is 10 000 feet long, asphalt covered, and oriented to 243° M. Because its threshold is displaced 1000 feet, the landing distance available (LDA) is 9000 feet. It is equipped with 3000 feet of approach lighting, classified as a short simplified approach light (high intensity) system with runway alignment indicator lights. This incorporates 1600 feet of sequenced flashing strobe lights along the centreline of the approach light system. The runway is also equipped with a 3.0-degree PAPI visual glide slope indicator.

Aviation routine weather reports (METAR) describe the actual weather conditions at a specified location and time and are taken and issued on the hour. Special weather reports (SPECI) are issued between scheduled METAR transmissions whenever weather conditions fluctuate or are below specified criteria.

The METAR and SPECI reports for Trenton from 0600 to 0800 were as follows:

> 0600 METAR - Wind calm, visibility 4 sm in mist, sky clear, temperature 8°C, dew point 7°C, altimeter 30.14 inches of mercury.
>
> 0628 SPECI - Wind calm, visibility 2½ sm in mist, sky clear.
>
> 0633 SPECI - Wind calm, visibility 1 sm in mist, sky clear.
>
> 0700 METAR - Wind from 050°True (T) at 6 knots, visibility ¾ sm in mist, sky clear, temperature 7°C, dew point 7°C, altimeter 30.16 inches of mercury.
>
> 0709 SPECI - Wind from 040°T at 3 knots, visibility ½ sm in fog, sky clear.
>
> 0726 SPECI - Wind from 020°T at 3 knots, visibility 2 ½ sm in mist, sky clear.
>
> 0738 SPECI - Winds calm, visibility 5 sm in mist, sky clear.
>
> 0800 METAR - Wind from 030°T at 4 knots, visibility 7 sm, few clouds at 1000 feet, temperature 8°C, dew point 8°C, altimeter 30.19 inches of mercury.

The weather information relayed to UKS 702 just prior to landing corresponds with the 0726 SPECI report above. It is unknown if the flight crew obtained or was relayed any other weather reports prior to this update.

In shallow fog or hazy conditions, entire approach and runway lighting systems may be visible from a considerable distance during the approach. However, this visual reference is likely to diminish rapidly during descent into the fog or haze layer. In some cases, it will reduce the visible length of the approach lights to a very small segment. [2] As a flight crew begins its descent through shallow fog, the visibility decreases until nearing the ground. Entering a fog layer can also create the illusion of a pitch-up attitude that may cause a pilot to respond with nose-down correction, which steepens the approach path. [3]

The operating flight crew during the incident flight consisted of one captain, one first officer, one flight engineer, one navigator, and one radio operator. The captain had approximately 7000 total flying hours including approximately 6700 on the IL-76; the first officer had approximately 3500 total flying hours including approximately 3000 on the IL-76. Both the captain and the first officer held airline transport pilot licenses (ATPL) issued by the State Administration of Ukraine for Aviation Safety Oversight, with type ratings for the IL-76.

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[2] Major S. Liang, M.D., "What Meets the Eye – Reality or Illusion?", Just for You - Human Factors (March 1985), Department of National Defence.

[3] Flight Safety Foundation (FSF), "FSF ALAR Briefing Note 5.3 -Visual Illusions," Flight safety Digest, November 2000

Both the first officer and the captain had flown into Trenton previously. The radio operator performed all communications with ATC in English and correctly translated and condensed any ATC clearances into Russian for the remaining crew members, without any apparent difficulty.

Two complete flight crews were on board; this is referred to as a double crew in the *UCA Operating Manual*. The first flight crew operated the aircraft on the Baku to Keflavik leg and the occurrence flight crew operated the aircraft on the Keflavik to Trenton leg. While the occurrence flight crew did not fly the aircraft for the entire portion of the flight, they were on board and accumulating time towards their daily duty period.

After the incident, separate resting quarters large enough for all flight crew members were not observed on the aircraft; however, mattresses were observed in the cargo area of the aircraft. The sleep patterns and rest locations of the flight crew during the incident flight could not be ascertained.

The aircraft departed Baku at approximately 0000 AZST [4] on 04 October 2007. The occurrence flight crew accumulated approximately 6.4 hours of flight time and 17.9 hours of total duty time prior to the occurrence. In the preceding two weeks, the flight crew assumed duties on a total of seven flights. The seven flights were operated on the Baku-Trenton-Baku route, which crosses nine time zones. The total duty time accumulated on each flight was similar to the total duty accumulated on the occurrence flight. A rest period was provided for the flight crew after arriving at their destination. The shortest rest period was approximately 25 hours, while the longest was approximately 42 hours. Prior to the seven flights operated within the two-week period, the captain had 11 days off duty, while the remainder of the flight crew had at least 16 days off duty.

The following chart outlines the duty hours and rest periods of the occurrence flight crew during the two weeks prior to the occurrence.

Flight	Total Duty (hour : minutes)	Rest Period (hour : minutes)	Route
Flight 1	16:34	42:29	Baku - Trenton
Flight 2	17:44	26:47	Trenton - Baku
Flight 3	18:05	35:50	Baku - Trenton
Flight 4	16:59	25:01	Trenton - Baku
Flight 5	18:09	32:58	Baku - Trenton
Flight 6	18:12	25:37	Trenton - Baku
Occurrence Flight	17:52		Baku - Trenton

[4] Azerbaijan summer time (Coordinated Universal Time plus five hours).

The daily duty limitations for flight crew members at UCA are 12 hours. However, for flights of longer duration, a double crew may be utilized. UCA procedures allow for a 60 per cent increase of a total duty period for flight crew members operating as double crews. The total allowable duty period may, therefore, be increased to 19.2 hours for flight crew members operating in a double-crew context. Prior to any flight duty, UCA procedures require an intact rest period with a duration of not less than the preceding duty period, or 12 hours, whichever is greater. In the case of trans-meridian flights [5], the duration of the total rest shall be at least 42 hours. The flight crew did not receive the required 42-hour rest period after completing five of the six previous flights.

Transport Canada regulations regarding flight duty limitations are similar to UCA policy in that a flight can be operated for an extended period of time if provisions are made with respect to flight crew rest and the number of crew members required to operate the flight. The duty period of a flight crew can be extended up to 20 hours, provided certain conditions are met. The Transport Canada regulations do not address extra rest after the completion of trans-meridian flights.

Analysis

Prior to descending into Trenton, the aircraft was in VMC conditions; there were no clouds or weather in the general vicinity and the flight crew had the ground and landmarks in the surrounding area in sight. The flight crew did not obtain the latest weather conditions prior to descent; they were unaware of the low visibility conditions present at Trenton. Though cleared for an NDB Runway 24 approach, the flight crew expected the weather conditions would allow them to complete a visual approach and they planned accordingly. This was likely because they did not have any clues of the deteriorating weather. Furthermore, the flight crew's commitment to conducting a visual approach likely contributed to it not briefing for the approach or missed approach. When the visibility worsened, the crew were unprepared for a possible missed approach.

The aircraft entered the fog approximately 1.5 nm from the displaced threshold of the runway and 0.85 nm before the start of the approach lights. The visibility decreased as the aircraft continued to descend. The approach lights extend 4000 feet (0.65 nm) from the displaced threshold of Runway 24. After entering the fog, the aircraft descended to as low as 33 feet and deviated left of the desired track. The aircraft deviated off course for approximately six seconds prior to the crew initiating corrective action by banking to the right. This correction occurred at 0.75 nm from the displaced threshold, at a location that coincides with the beginning of the approach lights system, and near the tree strike location. This suggests that the flight crew lost visual reference with the ground at some point during the fog encounter but, as the approach lights came into view, the flight crew was able to manoeuvre the aircraft back onto the final approach course.

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5 UCA Limitations of Flight Duty Period and Total Duty Period: Transmeridian Flight is a flight related to crossing five and more time zones within a daily duty period.

After the low altitude call, the descent rate of the aircraft was arrested; however, a missed approach was not initiated. Had the aircraft transitioned into a missed approach the aircraft would have most likely been higher than 76 feet agl at the location of the impact with the trees.

The aircraft's descent profile resembled a 3.0-degree glide slope during the descent and initial stages of the approach. The 3.0-degree glide slope intersected the top of the fog bank at approximately 0.5 nm from the displaced threshold for Runway 24. In the latter stages of the approach, the aircraft deviated below the 3.0-degree slope, which caused the aircraft to be at a lower altitude prior to entering the fog. It could not be determined why the flight crew deviated from the 3.0-degree glide slope.

The flight schedule allowed for adequate recuperative rest. Even though the occurrence flight crew did not receive their 42-hour rest on several occasions after trans-meridian flights, the schedule could be carried out without inducing fatigue provided the crew took the available opportunities to rest.

The following TSB Engineering Laboratory report was completed:

LP 106/2007 – QAR/CVR Analysis

This report is available from the Transportation Safety Board of Canada upon request.

Findings as to Causes and Contributing Factors

1. The flight crew planned for a visual approach in spite of not obtaining the latest weather information prior to descent and being unaware of the actual weather conditions at Trenton.

2. The flight crew did not conduct a full approach briefing and were not prepared for a missed approach during the loss of visual reference.

3. The flight crew deviated from their company visual approach procedures and descended below a 3.0-degree glide slope.

4. After reaching minimum descent altitude (MDA), the flight crew continued to descend and entered a low-level fog bank resulting in a loss of visual reference and impact with trees.

Finding as to Risk

1. On several occasions prior to the occurrence flight, the crew did not receive the 42-hour rest period required by Ukrainian Cargo Airways' procedures after completing trans-meridian flights, potentially increasing the risk of operating while fatigued.

Other Finding

1. The flight crew or the company did not notify the Transportation Safety Board or the Directorate of Flight Safety of the occurrence.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 22 July 2009

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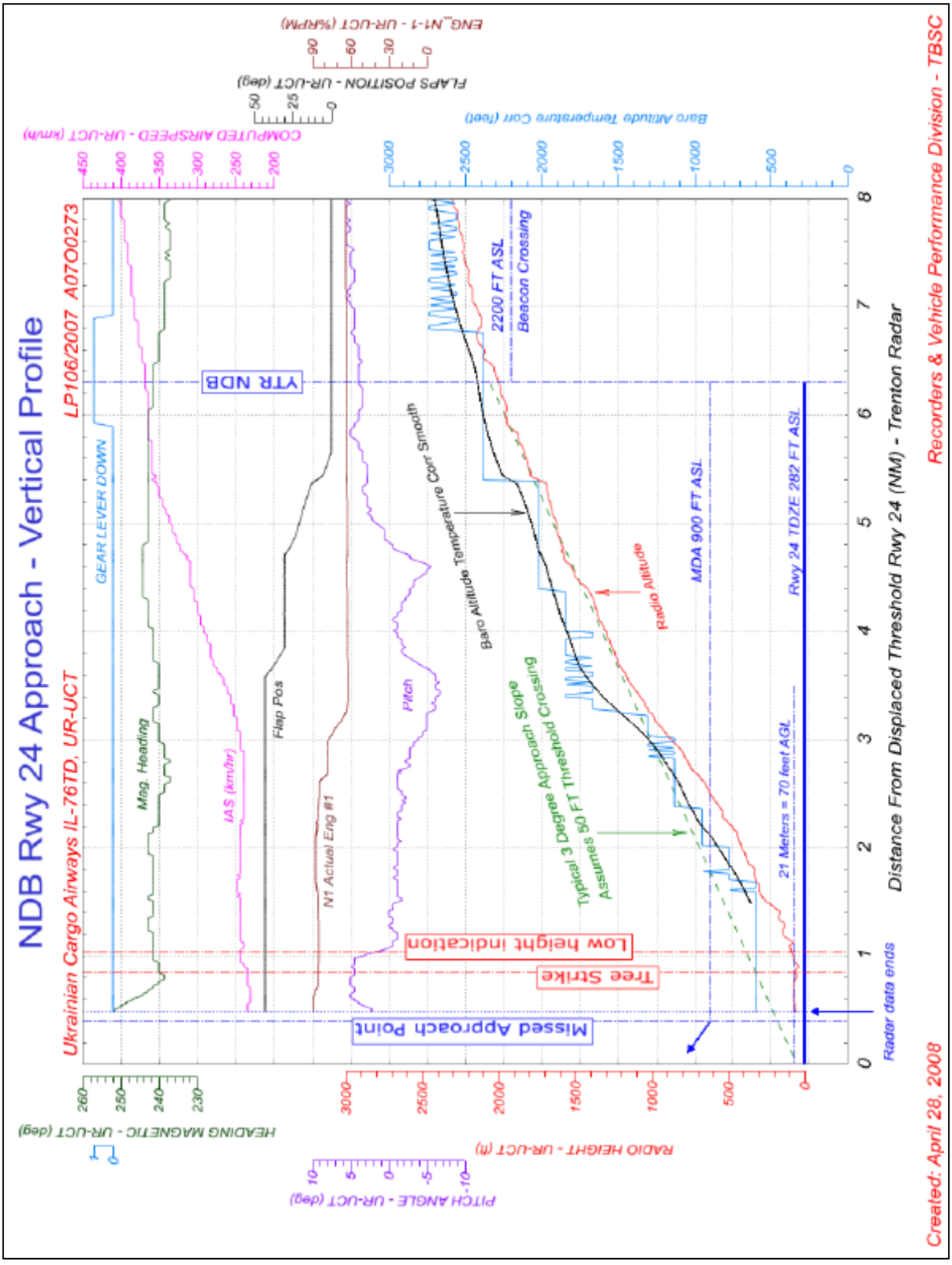
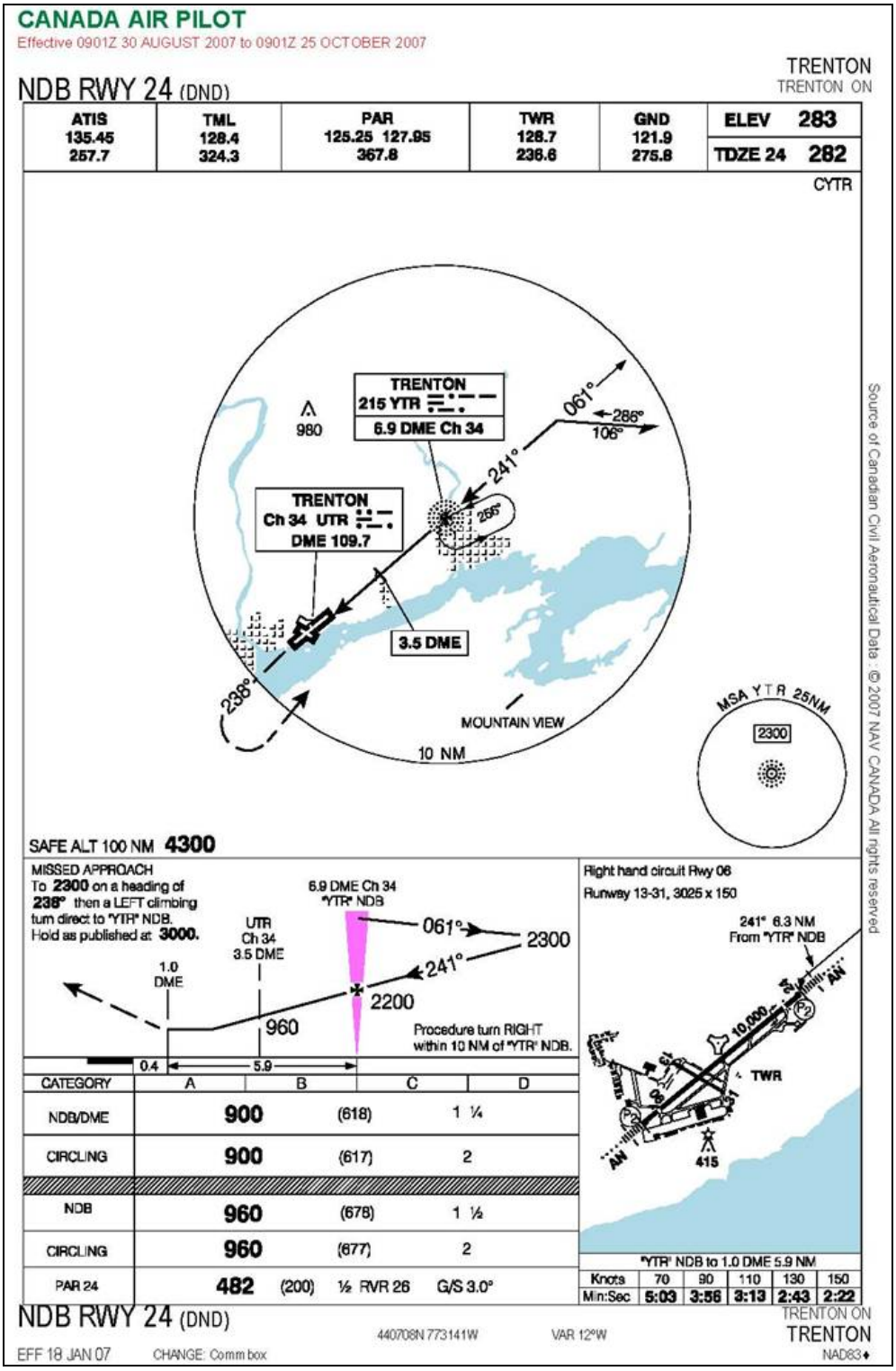
Appendix A - NDB Runway 24 Approach - Vertical Profile



NOT TO BE USED FOR NAVIGATION PURPOSES

Appendix B - NDB Runway 24 Approach at Trenton



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