



LE GOUVERNEMENT
DU GRAND-DUCHÉ DE LUXEMBOURG
Administration des enquêtes techniques

Final Report

Collision with trees on final approach

Piper PA28-161 Cadet, LX-AIF

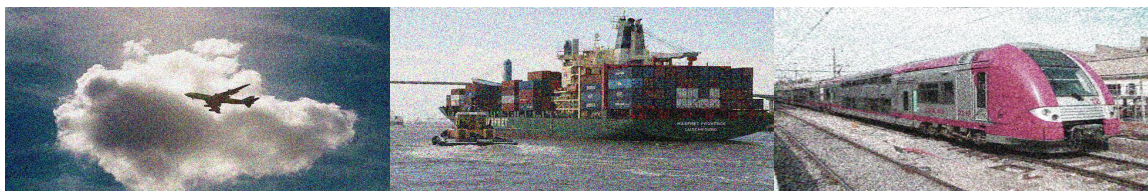
Noertrange (ELNT), Runway 26

14 April 2013

MAY 2015

ADMINISTRATION DES ENQUÊTES TECHNIQUES

AVIATION CIVILE – MARITIMES – FLUVIAL – CHEMINS DE FER



Ministry of Sustainable Development and Infrastructure
Department of Transport

Administration of Technical Investigations

Report N° AET-2015/AC-01

FINAL REPORT
Collision with trees on final approach
Piper PA28-161 Cadet, LX-AIF
Noertrange (ELNT), Runway 26
14 April 2013

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FOREWORD

In accordance with Annex 13 to the *Convention on International Civil Aviation*, Regulation (EU) No 996/2010 of the European Parliament and of the Council and Luxembourg law dated 30 April 2008 on technical investigations in relation to accidents and serious incidents which occurred in the domains of civil aviation, maritime transport and railways, it is not the purpose of the aircraft accident investigation to apportion blame or liability.

The sole objective of the safety investigation and the Final Report is the prevention of accidents and incidents.

Consequently, the use of this report for purposes other than accident prevention may lead to wrong interpretations.

Note: All time indications are in Coordinated Universal Time (UTC) unless specified otherwise.

Contents

Abbreviations	5
Synopsis.....	6
Summary	6
1. Factual information	7
1.1 History of flight	7
1.2 Injuries to persons	7
1.3 Damage to aircraft.....	8
1.4 Other damage.....	8
1.5 Personnel information	8
1.6 Aircraft information.....	9
1.7 Meteorological information.....	9
1.7.1 Meteorological Aerodrome Report (METAR)	9
1.7.2 Terminal Aerodrome Forecast (TAF)	9
1.8 Aids to navigation.....	10
1.9 Communication	10
1.10 Aerodrome information.....	10
1.11 Flight recorders	10
1.12 Wreckage and impact information	11
1.13 Medical and pathological information	11
1.14 Fire.....	11
1.15 Survival aspects	11
1.16 Tests and research.....	11
1.17 Organizational and management information	11
1.18 Additional information	12
1.18.1 On-site investigation	12
1.18.2 Pilot statements.....	12
1.18.3 ICAO Annex 14 provisions.....	12
1.18.4 Previous actions by DAC	12
1.18.5 Previous occurrence	13
1.19 Useful or effective investigations techniques	13
2. Analysis.....	14
2.1 Approach path penetration	14
2.2 Collision with trees	15
3. Conclusions.....	16
3.1 Findings	16
3.2 Other findings	16
3.3 Actions taken	16
3.4 Safety recommendations	16
4. Appendices	17
Appendix 4.1	17
ICAO Annex 14, Volume 1 - <i>Table 1-1 Aerodrome reference code</i>	17
Appendix 4.2.....	18
ICAO Annex 14, Volume 1 - <i>Obstacle limitation surfaces</i>	18
Appendix 4.3.....	19
ICAO Annex 14, Volume 1 - <i>Dimensions and slopes of obstacle limitation surfaces - Approach runways</i>	19

Abbreviations

AET	Administration des Enquêtes Techniques – Safety Investigation Authority
AIP	Aeronautical Information Package
amsl	Above mean sea level
ARC	Airworthiness Review Certificate
ATC	Air Traffic Control
CAA	Civil Aviation Authority
CVR	Cockpit Voice Recorder
DAC	Direction de l'Aviation Civile – Luxembourg CAA
ELLX	ICAO Code for Luxembourg Airport
ELNT	ICAO Code for Noertrange Airfield
FDR	Flight Data Recorder
ICAO	International Civil Aviation Organisation
Kts	Knots
NM	Nautical Miles
PIC	Pilot In Command
PPL	Private Pilot License
RWY	Runway
THR	Runway Threshold
TWR	Aerodrome Control Tower
UTC	Coordinated Universal Time
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions

Synopsis

Date of accident

Sunday, 14 April 2013,
at approximately 14h:55min (UTC)

Aircraft

Piper PA28-161 Cadet,
registered LX-AIF,
Serial number 28-41173

Accident site

Noertrange (ELNT) aerodrome,
120m before threshold of runway 26

Owner

Aéro-Sport asbl.

Type of flight

Visual flight rules (VFR)

Persons on board: 3

1 pilot, 2 passengers

Summary

The aircraft was on a visual flight rules (VFR) flight from Luxembourg Airport (ELLX) to Noertrange Airfield (ELNT). On final approach to runway 26, the aircraft collided with tree tops located approximately 120m before the threshold. The pilot was able to land the aircraft without further incident. The accident occurred during daylight hours at approximately 14:55h (UTC). The pilot and both passengers were not injured. The aircraft sustained damage to the outboard sections of both wings and to the right-hand aileron. The pilot stated that they encountered strong turbulences on final approach.

1. Factual information

1.1 History of flight

The pilot and two passengers departed in a Piper PA 28 Cadet registered LX-AIF, on a visual flight rules (VFR) flight from Luxembourg Airport (ELLX) to Noertrange Airfield (ELNT). The plan was to stay a few hours in Noertrange and to fly back to ELLX in the evening. According to the weather report, visual meteorological conditions (VMC) prevailed that afternoon. The pilot filed a flight plan with the Luxembourg AIS unit before the flight.

At 14:27, the pilot first contacted Luxembourg Tower (TWR) for taxi instructions. Two minutes later, TWR instructed LX-AIF to taxi to holding point runway 24, intersection Foxtrot.

At 14:37, LX-AIF was cleared for take-off and instructed to report passing the VFR reporting point Alpha. Wind from 170° at 6 knots was also transmitted. LX-AIF took off from runway 24 and headed to VFR reporting point Alpha (R-295 LUX/7.7DME) at an altitude of approximately 2000 feet above mean sea level (amsl). LX-AIF appeared on the TWR controller's radar screen at 14:38.

At 14:42, LX-AIF reported passing Alpha and continued the flight to the north. There was no further communication between LX-AIF and Luxembourg TWR. The aircraft climbed to an altitude of approximately 2500 ft and headed directly to Noertrange airfield. A few minutes before landing, the pilot reported his position and his intentions on ELNT Info frequency 126.95 Mhz (« Noertrange Info »). It should be noted that there was other traffic that day and the local skydiving club was active in the area. After the pilot initiated the descent, LX-AIF disappeared from the TWR controller's radar screen a few miles East of Noertrange at 14:52.

At approximately 14:55, the aircraft collided with tree tops located approximately 120m before the threshold of runway 26, damaging the outboard leading edge sections of both wings and the right-hand aileron. Upon impact, the pilot immediately increased power and was able to land without further incident. While vacating the grass runway, the pilot noticed the damage to both wings. After leaving the aircraft, the pilot reported the occurrence to his aviation club.

The pilot stated in a post-accident interview that he encountered strong turbulences on final approach, which made the aircraft lose altitude and subsequently collide with tree tops.

1.2 Injuries to persons

<i>Injuries</i>	<i>Crew</i>	<i>Passengers</i>	<i>Others</i>
Fatal	0	0	0
Serious	0	0	0
Minor/None	1	2	0

1.3 Damage to aircraft

The outboard leading edge sections of both wings were substantially damaged on impact with the tree tops. The right-hand aileron also sustained damage.

Right wing



Left wing



1.4 Other damage

There was no other damage.

1.5 Personnel information

	<i>Pilot</i>
Age	20
Nationality	Luxembourg
License type	PPL(A)
Total flight hours	105h:20
PIC flight hours	56h:00
Hours on PA 28	43h:57
Last 3 days	0h:40
Last 28 days	1h:40
Last 30 days	1h:40
Day of event	0h:40
Last medical check	14/09/2010
License delivered	26/02/2012

Prior to the occurrence flight, the pilot had performed a total of 10 landings at Noertrange (ELNT) aerodrome on two different aircraft types:

Landings ELNT	Dual	PIC
Piper PA28	1	3
Cessna C182	4	2

1.6 Aircraft information

Manufacturer	Piper
Aircraft designation	PA28-161 Cadet
Serial Nr.	2841173
Year of manufacture	1989
Certificate of Airworthiness	valid
<i>Date of issue</i>	12/10/2005
<i>Date of expiry (ARC)</i>	10/12/2013
Engine Type (number of)	Lycoming O-320-D3G (1)
Propeller/ Rotor Type (number of)	Sensenich 74DM6-0-60 (1)
Maximum Allowable Take-off Weight	1055kg
Flight hours	10134,5

The aircraft was certified, equipped, and maintained in accordance with existing regulations and approved procedures. The last maintenance inspection was on 19 March 2013 (I50 inspection).

1.7 Meteorological information

There is no aviation weather observation or forecast available for the Noertrange airfield. The closest aerodrome providing weather forecasts and observations is Luxembourg airport. Before landing at ELNT, the pilot checked the windsock situated close to the hangar in order to assess wind direction and approximate wind speed. According to his statement, the windsock indicated a wind speed of approximately 10-15 knots with the wind coming from approximately 190°.

The pilot stated that he consulted the available METAR and TAF weather bulletins during flight preparation.

1.7.1 Meteorological Aerodrome Report (METAR)

METAR from 14h20min: ELLX 141420z 15010KT 120v200 CAVOK 21/08 Q1022 NOSIG=

METAR from 14h50min: ELLX 141450z 17008KT 130v240 CAVOK 22/08 Q1022 NOSIG=

METAR from 15h20min: ELLX 141520z 17010KT 100v220 CAVOK 22/08 Q1021 NOSIG=

1.7.2 Terminal Aerodrome Forecast (TAF)

TAF ELLX 140500z 1406/1512 20007KT 9999 BKN040

BECMG 1408/1411 CAVOK

TEMPO 1411/1418 17013KT 9999 SCT035

BECMG 1418/1421 19005KT=

TAF ELLX 141100z 1412/1518 18010KT CAVOK

BECMG 1416/1418 18005KT

TEMPO 1512/1518 5000 SHRA -TSRA SCT025CB=

TAF ELLX 141700z 1418/1524 17008KT CAVOK

TEMPO 1512/1520 VRB15G25KT 4000 SHRA TSRA SCT015CB=

1.8 Aids to navigation

ELNT airfield does not have any navigational or approach aids.

The pilot used a tablet computer connected to an external Bluetooth GPS receiver (typ: *GNS 5870*) during the flight. However, the investigation found that the receiver didn't work properly and that most of the flight had not been recorded.

1.9 Communication

No problems with communications equipment were reported.

1.10 Aerodrome information

Noertrange (ELNT) aerodrome is an uncontrolled airfield located in the north of Luxembourg at latitude 49°58.9' N and longitude 005°55.1' E. It has a single grass runway which is 670m long and 30m wide, oriented 080°/260° magnetic. The elevation of the airfield is 1522ft (464m). Due to the forest located on the east side and surrounding part of the runway, turbulences are possible when landing on runway 26, as indicated on the Jeppesen chart ELNT 19-2: *'Heavy turbulence possible on RWY 26'*.

The provisions regarding the operation of Noertrange aerodrome are laid down in a Ministerial Regulation dated 6 June 2011. Article 3 states that it lies in the responsibility of the pilot to decide whether the aircraft performances and the airfield characteristics allow the safe use of the aerodrome. A similar remark can also be found on Jeppesen chart ELNT 19-2.

DAC states that Noertrange aerodrome is not certified by the authority on the basis of ICAO Annex 14. In fact, the application of Annex 14 provisions is limited by national law to Luxembourg Airport (ELLX) only. However, DAC concedes that as regards Noertrange airfield, it is their responsibility to supervise the application of the provisions defined in Annex 14 and in national regulations.

1.11 Flight recorders

The aircraft was not equipped with a flight data recorder (FDR) or cockpit voice recorder (CVR). Such equipment is not required by regulation in this category of aircraft.

1.12 Wreckage and impact information

The area of impact was located approximately 120m before the threshold of RWY 26. The pilot explained in an interview that during final approach, the aircraft suddenly lost altitude due to heavy local turbulences and descended below the top of some trees located on the approach path of runway 26. The actual altitude at which the impact occurred could not be determined.



1.13 Medical and pathological information

None

1.14 Fire

No fire.

1.15 Survival aspects

The accident was survivable, none of the occupants sustained injuries.

1.16 Tests and research

No tests or research were conducted.

1.17 Organizational and management information

None

1.18 Additional information

1.18.1 On-site investigation

The accident was notified to the AET on 15 April 2013. On 16 April 2013, both AET and DAC went on-site and inspected the damaged aircraft parked in a hangar next to the runway. DAC examined the accident site and concluded that the trees penetrating the approach path (obstacle limitation surface) of runway 26 compromise the safe operation of the aerodrome. The airfield was subsequently closed by the authority.

A few days after the occurrence, the trees penetrating the approach path were cut down and on 1 May 2013, the airfield was reopened by DAC.

1.18.2 Pilot statements

In an interview, the pilot stated that when arriving in the vicinity of Noertrange, he misidentified a meadow located north of the airfield as the runway. After he realized his mistake, he continued the flight to the northern circuit of Noertrange airfield for a full stop landing on runway 26. He flew the final approach on a steep flightpath angle with fully extended flaps (40°) at an indicated airspeed of approximately 70 kts.

1.18.3 ICAO Annex 14 provisions

ICAO Annex 14 Volume 1 '*Aerodrome Design and Operations*', which has been implemented into national legislation in May 2012, contains in Chapter 4 '*Obstacle restriction and removal*' the specifications and recommendations for the airspace around aerodromes to be maintained free from obstacles. The objective is to permit the intended airplane operations at the aerodromes to be conducted safely and to prevent the aerodromes from becoming unusable by the growth of obstacles around the aerodromes. A series of obstacle limitation surfaces define the limits to which objects may project into the airspace. The approach surface defines the part of airspace that should be kept free from obstacles to protect an airplane in the final phase of the approach-to-land manoeuvre.

The slope of the approach surface is defined in relation to the *aerodrome reference code* and whether the runway is used for visual, non-precision or precision approaches. The *aerodrome reference code* is selected on the basis of the *Aeroplane reference field length*¹, which in case of ELNT is less than 800m. Considering that Noertrange airfield is used for visual approaches only, it is to be classified under the *aerodrome reference code 1*. For this type of aerodrome, the approach slope is set at 5% (see Appendices).

1.18.4 Previous actions by DAC

It should be noted that DAC was aware of the trees penetrating the approach path to runway 26. In fact, after an inspection in 2012, DAC sent a letter to the airfield operator on 29 October 2012 and requested a corrective action plan for several findings. One of the findings was related to the trees penetrating the approach path. The letter also stated that if the trees could not be cut down, then the threshold of runway 26 should be displaced by at least 150m. Reducing the landing distance available from 670m to 520m would evidently have an operational impact on the airfield. The aerodrome operator did not reply to the letter from DAC.

¹**Aeroplane reference field length:** The minimum field length required for take-off at maximum certificated take-off mass, sea level, standard atmospheric conditions, still air and zero runway slope, as shown in the appropriate aeroplane flight manual prescribed by the certifying authority or equivalent data from the aeroplane manufacturer. Field length means balanced field length for aeroplanes, if applicable, or take-off distance in other cases.

1.18.5 Previous occurrence

On 29 July 2009, a Cessna 182Q Skylane operated by the local skydiving club overshot runway 26 and came to a stop about 150m behind the threshold in an adjoining field.

The trees penetrating the obstacle limitation surface defined as per ICAO Annex 14 could be identified as a contributing factor in the late touch-down and subsequent runway overrun.

1.19 Useful or effective investigations techniques

None

2. Analysis

2.1 Approach path penetration

Based on the ICAO Annex 14 provisions described in paragraph 1.18.3, the trees located on the approach path of runway 26 penetrated the defined obstacle limitation surfaces.

Figure 1 shows the approximate approach path penetration (red area) by the westernmost trees on the approach path to runway 26. The estimated maximum penetration was about 44.3 feet (13,5m).

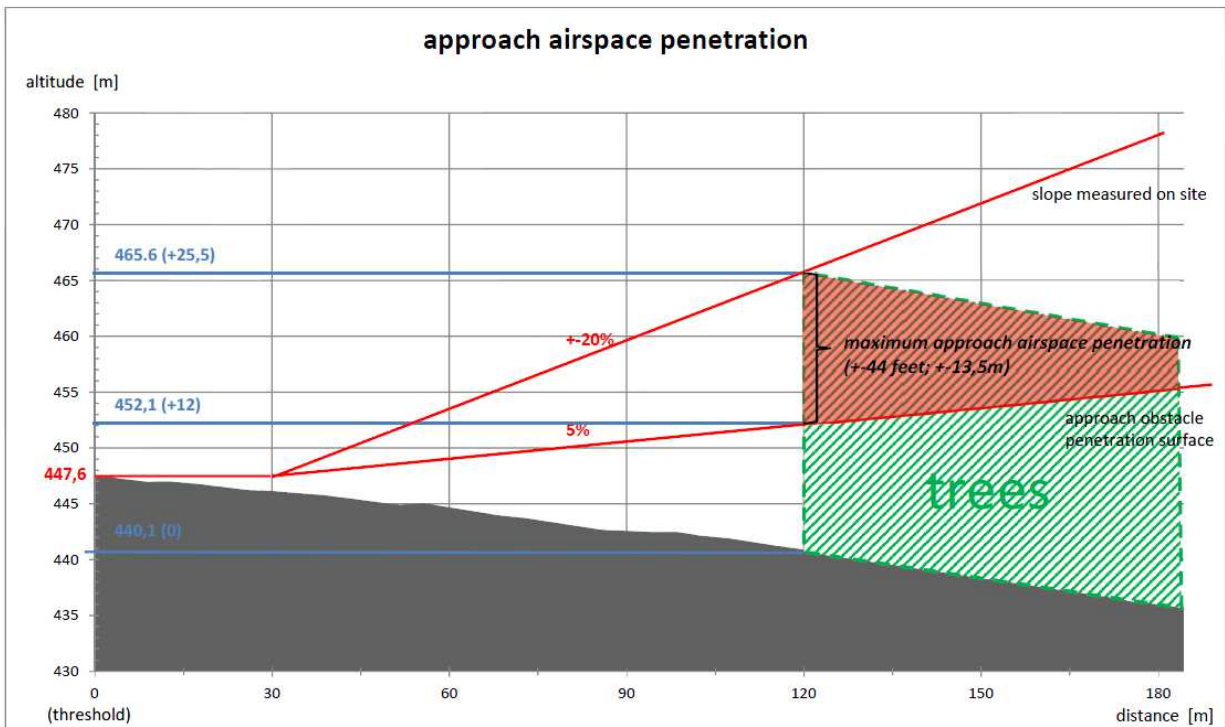


Figure1 : ELNT Approach airspace penetration in reference to chapter 4, Volume I of Annex 14 to the *Convention on International Civil Aviation*.

It should be noted that there was no mention about trees penetrating the approach path in the aerodrome documentation or on the charts, although the situation was known by DAC.

The pilot was familiar with Noertrange ELNT aerodrome. Before the occurrence flight, he was checked-out by an instructor after 2 flights to ELNT on 2 different aircraft types and 5 landings. After the check-out and before the occurrence, he performed 3 landings with a Piper PA28 and 2 landings with a Cessna C182 as PIC at Noertrange airfield.

The presence of trees penetrating the flight path may incite a pilot to fly an approach with reduced clearance to the tree tops in order to maximize the usable runway length on landing, thus trading-off height above the trees for an earlier touch-down.

2.2 Collision with trees

Based on the pilot's statement, the aircraft suddenly lost altitude on final approach over the trees due to heavy turbulences. At the time of the landing, wind at Luxembourg airport was reported from 170° at 10 knots, variable between 130° and 240° (METAR ELLX 141450z). Based on the windsock at ELNT, the pilot estimated the wind coming from 190° with 10 to 15kts.

While it could not be determined with certainty if weather conditions had an adverse effect on the approach path of the aircraft, turbulence was likely to be encountered in the prevailing wind conditions, especially when passing close to the tree tops. Wind coming from the south and passing uphill over the wooded area located at the south-east of the airfield is likely to produce turbulence, notably at tree top level. The effect of the eastern part of the runway acting as a forest clearing is also prone to generate turbulence.

A caution regarding the possibility of heavy turbulence when landing on runway 26 is indicated on the Jeppesen Chart 19-2, the Aeronautical Information Package (AIP) does not contain a mention on possible turbulence.

One of the effects of turbulence is that it suddenly changes the angle of attack and subsequently the lift and drag generated by the airfoils of an aircraft. Depending on the direction of the air acting upon the aircraft, the result can either be a sudden gain of altitude with subsequent loss of airspeed or vice-versa.

3. Conclusions

3.1 Findings

- The pilot was licensed and qualified for the flight in accordance with existing regulations.
- The aircraft was serviced and maintained in accordance with existing provisions.
- There was no indication of a malfunction adversely affecting aircraft performance prior to the event.
- The pilot was familiar with Noertrange (ELNT) aerodrome.
- Trees on the approach path to runway 26 penetrated the obstacle limitation surfaces (approach slope of 5 %) defined by ICAO Annex 14.
- Turbulence on final approach was possible in the prevailing wind conditions.
- The pilot had limited flight experience with a total time of 105hrs 20min, thereof 56hrs as PIC.

The accident occurred because the aircraft did not have sufficient altitude to clear the tree tops located on the approach path approximately 120m before the threshold of runway 26. Turbulence is likely to have contributed to a loss of altitude on final approach and the subsequent contact with the tree tops.

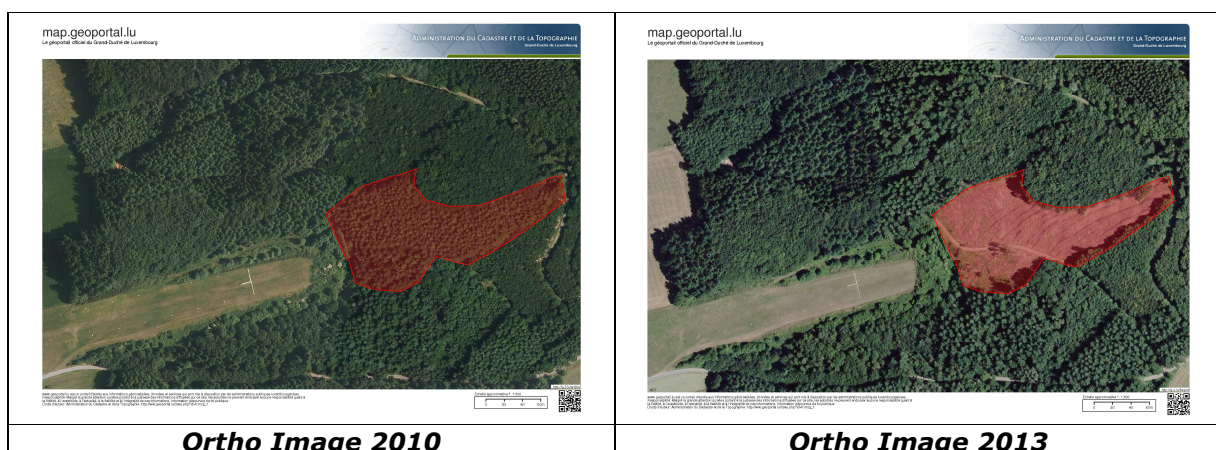
A contributing factor was that trees penetrated the obstacle limitation surface defined by ICAO Annex 14 for this type of airfield.

3.2 Other findings

The fact that no flight recording equipment is required on this category of aircraft limited the available information and narrowed the scope of the investigation.

3.3 Actions taken

Trees penetrating the obstacle limitation surface defined by ICAO Annex 14 for this type of airfield have been removed shortly after the occurrence, as can be seen on the ortho images below.



3.4 Safety recommendations

In view of the corrective action taken shortly after the occurrence, no safety recommendation has been issued.

4. Appendices

Appendix 4.1

ICAO Annex 14, Volume 1 - *Table 1-1 Aerodrome reference code*

Code element 1			Code element 2	
Code number (1)	Aeroplane reference field length (2)	Code letter (3)	Wingspan (4)	Outer main gear wheel span ^a (5)
1	Less than 800 m	A	Up to but not including 15 m	Up to but not including 4.5 m
2	800 m up to but not including 1 200 m	B	15 m up to but not including 24 m	4.5 m up to but not including 6 m
3	1 200 m up to but not including 1 800 m	C	24 m up to but not including 36 m	6 m up to but not including 9 m
4	1 800 m and over	D	36 m up to but not including 52 m	9 m up to but not including 14 m
		E	52 m up to but not including 65 m	9 m up to but not including 14 m
		F	65 m up to but not including 80 m	14 m up to but not including 16 m

a. Distance between the outside edges of the main gear wheels.

Appendix 4.2
ICAO Annex 14, Volume 1 - *Obstacle limitation surfaces*

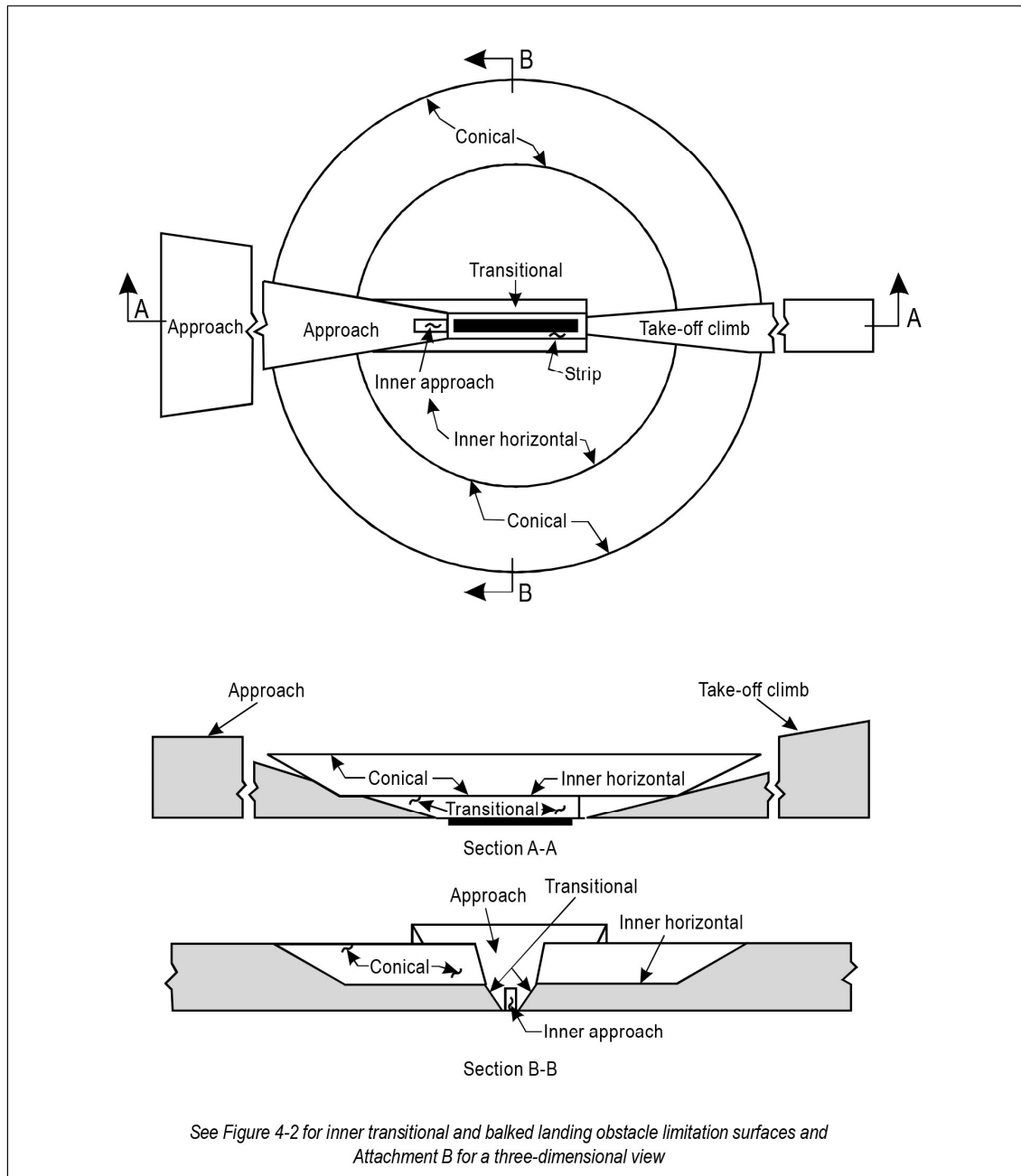


Figure 4-1. Obstacle limitation surfaces

Appendix 4.3

ICAO Annex 14, Volume 1 - *Dimensions and slopes of obstacle limitation surfaces - Approach runways*

Annex 14 — Aerodromes

Volume I

Table 4-1. Dimensions and slopes of obstacle limitation surfaces — Approach runways

APPROACH RUNWAYS										
Surface and dimensions ^a (1)	RUNWAY CLASSIFICATION									
	Non-instrument Code number				Non-precision approach Code number			Precision approach category I Code number		
	1 (2)	2 (3)	3 (4)	4 (5)	1,2 (6)	3 (7)	4 (8)	1,2 (9)	3,4 (10)	II or III 3,4 (11)
CONICAL										
Slope	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Height	35 m	55 m	75 m	100 m	60 m	75 m	100 m	60 m	100 m	100 m
INNER HORIZONTAL										
Height	45 m	45 m	45 m	45 m	45 m	45 m	45 m	45 m	45 m	45 m
Radius	2 000 m	2 500 m	4 000 m	4 000 m	3 500 m	4 000 m	4 000 m	3 500 m	4 000 m	4 000 m
INNER APPROACH										
Width	—	—	—	—	—	—	—	90 m	120 m ^e	120 m ^e
Distance from threshold	—	—	—	—	—	—	—	60 m	60 m	60 m
Length	—	—	—	—	—	—	—	900 m	900 m	900 m
Slope	—	—	—	—	—	—	—	2.5%	2%	2%
APPROACH										
Length of inner edge	60 m	80 m	150 m	150 m	150 m	300 m	300 m	150 m	300 m	300 m
Distance from threshold	30 m	60 m	60 m	60 m	60 m	60 m	60 m	60 m	60 m	60 m
Divergence (each side)	10%	10%	10%	10%	15%	15%	15%	15%	15%	15%
First section										
Length	1 600 m	2 500 m	3 000 m	3 000 m	2 500 m	3 000 m	3 000 m	3 000 m	3 000 m	3 000 m
Slope	5%	4%	3.33%	2.5%	3.33%	2%	2%	2.5%	2%	2%
Second section										
Length	—	—	—	—	—	3 600 m ^b	3 600 m ^b	12 000 m	3 600 m ^b	3 600 m ^b
Slope	—	—	—	—	—	2.5%	2.5%	3%	2.5%	2.5%
Horizontal section										
Length	—	—	—	—	—	8 400 m ^b	8 400 m ^b	—	8 400 m ^b	8 400 m ^b
Total length	—	—	—	—	—	15 000 m	15 000 m	15 000 m	15 000 m	15 000 m
TRANSITIONAL										
Slope	20%	20%	14.3%	14.3%	20%	14.3%	14.3%	14.3%	14.3%	14.3%
INNER TRANSITIONAL										
Slope	—	—	—	—	—	—	—	40%	33.3%	33.3%
BALKED LANDING SURFACE										
Length of inner edge	—	—	—	—	—	—	—	90 m	120 m ^c	120 m ^c
Distance from threshold	—	—	—	—	—	—	—	c	1 800 m ^d	1 800 m ^d
Divergence (each side)	—	—	—	—	—	—	—	10%	10%	10%
Slope	—	—	—	—	—	—	—	4%	3.33%	3.33%

a. All dimensions are measured horizontally unless specified otherwise.

b. Variable length (see 4.2.9 or 4.2.17).

c. Distance to the end of strip.

d. Or end of runway whichever is less.

e. Where the code letter is F (Column (3) of Table 1-1), the width is increased to 155 m. For information on code letter F aeroplanes equipped with digital avionics that provide steering commands to maintain an established track during the go-around manoeuvre, see Circular 301 — *New Larger Aeroplanes — Infringement of the Obstacle Free Zone: Operational Measures and Aeronautical Study*.