Aeronautical Services And Procedures

1937 terminal building
Jersey Airport
Special Aeronautical Study

0 Document information

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	1.1	59 - 67	18.03.2020
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Contents

1 Executive summary

The task detailed in the present study is to determine the impact on flight operations and taxiway A of retaining the 1937 terminal building Jersey airport.

1.1 Specifications and Motivation for the Aeronautical Study

This “Special Aeronautical Study” follows the standard international practices as defined in the applicable UK and ICAO-documents (CAP 168, Annex 14, PANS OPS 8168 Vol I and Vol II, DOC9137, DOC9274 and DOC9905). These documents state that any penetrations of the Obstacle Limitation Surfaces have to be treated and evaluated accordingly if an exemption is to be made. A UK CAP 168, Pans-Ops and CRM analysis was completed and is an integral part of this "Special Aeronautical Study".

1.2 The company ASAP

The company ASAP has completed hundreds of "Special Aeronautical Studies" word wide since its inception in 1998. In many instances situations have arisen where a building/structure has been inside the ICAO Annex 14 obstacle limitation surfaces but shown not to be a hazard to flight operations at the airport concerned. As is standard international practice such buildings/structures have subsequently been approved by the local Civil Aviation Authority. Following are some examples of the airports that ASAP has obtained such an approval.

Country	Airport	Number of structures/studies
Turkey	Adana	560
Turkey	Batman	Area
Turkey	Eskisehir	Area
Ireland	Dublin	10
China	Hong Kong	Area
Scotland	Scatsta	17
United Arab Emirates	Dubai	110
United Arab Emirates	Al Bateen	35
United Arab Emirates	Sharjah	40

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Ireland – CAA
ICAO
Dubai – CAA
New Zealand – CAA
Slovakia – CAA

1.3 Results

1.3.1 CAP 168 surface assessment

- The 1937 terminal building penetrates the transitional surface as does the Control tower.
- Mitigating factors (see 3.1 Mitigating factors) may be applicable in this instance.

1.3.2 Instrument flight procedure assessment

- Retaining the 1937 terminal building will have **No** effect on the instrument flight procedures at Jersey airport which includes the ILS and all RNAV approach procedures, see 4.2 Overall summary of procedure results. The Decision Heights (DH) for all approaches would remain the same with or without the 1937 terminal building.

- As the 1937 terminal building has **No** effect on the minimum decision height for all approaches raising this minimum for no reason seems to be counter intuitive. The consequences of which would be more extra "fog" days which can be directly attributed to raising the DH for no reason and not in any way the 1937 terminal building.

- ILS Cat. II instrument flight procedures are not possible due to the actual physical layout of Jersey airport and not in any way because of the 1937 terminal building. See 4.5.3 runway 08 ILS Cat. II operations and runway 26 4.6.1 ILS Cat. II operations.

1.3.3 Taxiway A assessment

- The kink in taxiway Alpha has a long standing (over 5 years) restriction on its use in low visibility conditions due to its proximity to the runway.

- Only the northern wing of the 1937 terminal building would inhibit the straightening of this taxiway.

2 General

This document details the Special aeronautical study that was done concerning the impact of the retention of the 1937 terminal building on the flight procedures at Jersey airport (EGJJ).

2.1 Units

All heights used in this study are in metres and bearings are magnetic unless specified otherwise.

2.2 AIP data

The following information for Jersey airport was extracted from the UK AIP.

- Runway coordinates
- Navigational aids
- Instrument flight procedures
- Significant points

2.3 Software used for analysis

The UK CAP 168 Obstacle Limitation Surfaces and the ICAO Pans-Ops obstacle protection areas for all published flight procedures were created and evaluated using the ASAP PHX software Version 20

The ASAP PHX software is the system designed for creation and evaluation of the :

- CAP 168 Obstacle limitation surfaces
- Instrument flight procedures
- Obstacle protection areas associated with instrument flight procedures
- Analysis of the terrain and obstacles

The ASAP PHX software is used worldwide in over 35 countries in civil and military organisations providing air traffic services.

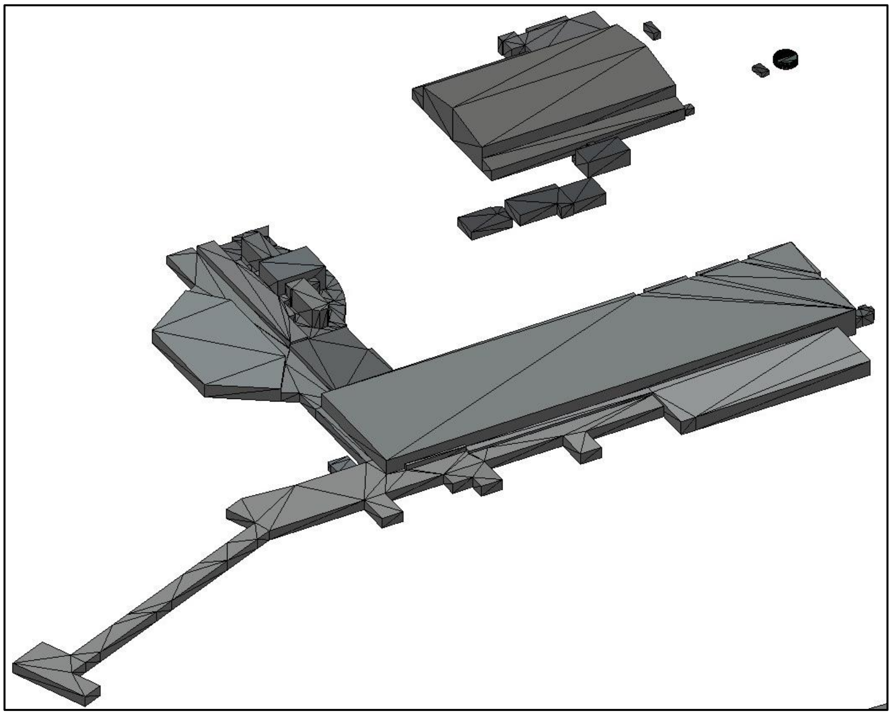
2.4 Abbreviations used

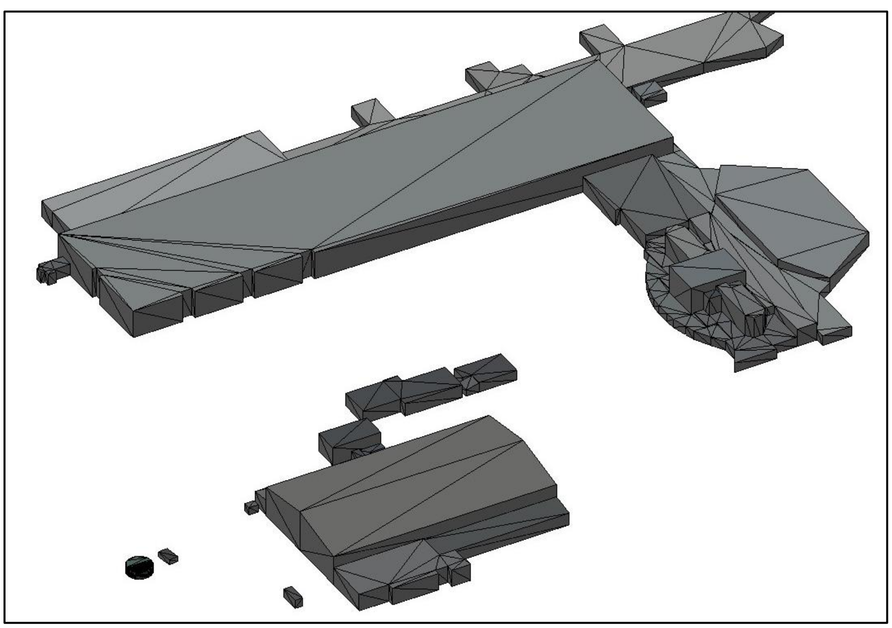
AIP	Aeronautical Information Publication
Alt	Altitude
AMSL	Above mean sea level
ARP	Aerodrome reference point
CAT	Category
DER	Departure end of runway
DME	Distance measuring equipment
ELEV	Elevation
ETP	Earliest turning point
FAF	Final approach fix
FT	Feet
GP	Glide Path
IAS	Indicated airspeed
ICAO	International Civil Aviation Organization
ILS	Instrument Landing System
ISA	International standard atmosphere
KT	Knots
LLZ	Localizer
LOC	Localizer
MAG	Magnetic
MAPt	Missed approach point

MNM	Minimum
MOC	Minimum obstacle clearance
MSA	Minimum sector altitude
NDB	Non-directional radio beacon
NM	Nautical Miles
OAS	Obstacle Assessment Surface
OCA/H	Obstacle clearance altitude/height
OPS	Operations
PANS	Procedures for Air Navigation Services
PDG	Procedure design gradient
RWY	Runway
SID	Standard instrument departure
SMM	Safety Management Manual
STAR	Standard instrument arrival
SOC	Start of climb point
TAS	True airspeed
THR	Threshold
VAR	Variation
VFR	Visual flight rules
WGS-84	World Geodetic System - 1984

2.5 Structure modelling

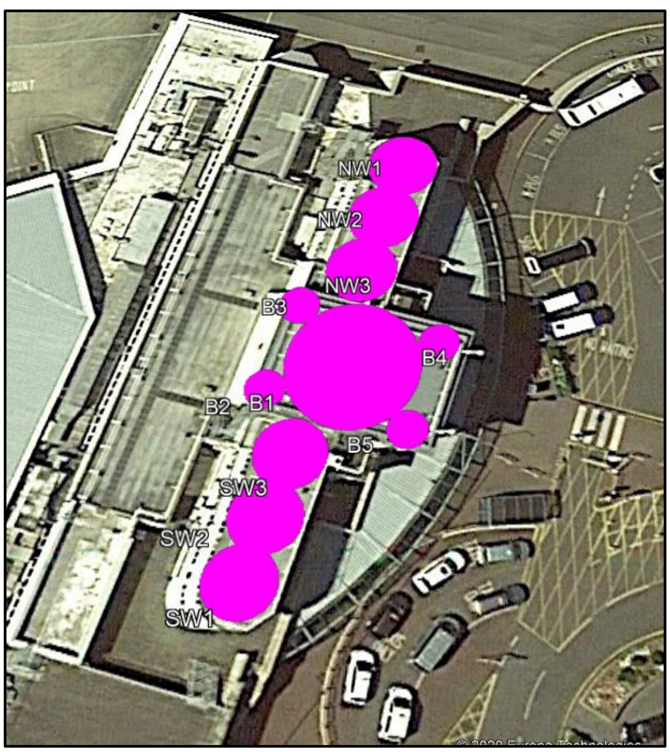
Using Digimap data a 3D model of the terminal was created in Autocad to be assessed by the ASAP procedure design software tool PHX.

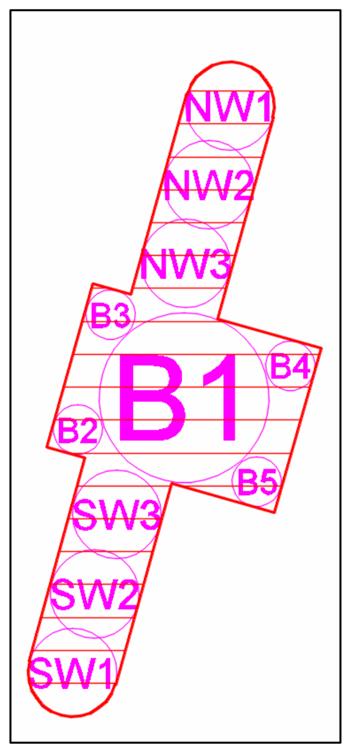




For the purposes of this study and to obtain quantifiable results the terminal building was divided into the following areas:

North **W**ing 1-3 (NW1-3),
South **W**ing 1-3 (SW1-3)
Terminal **B**uilding 1-5 (B1-5)





2.6 Runway information used (AIRAC 03/2020)

Designations RWY Number	True bearing	Dimensions of RWY	Surface of RWY/ SWY/ Strength (PCN)	THR co-ordinates/ THR Geoid undulation	THR elevation/ Highest elevation of TDZ of precision APP RWY	Slope of RWY/ SWY
1	2	3	4	5	6	7
08	082.75°	1706 x 45 M	RWY surface: Concrete and asphalt, Grooved PCN 37/R/A/W/T Concrete and PCN 30/F/A/X/T Grooved Asphalt	491225.44N 0021221.94W 161 FT	THR 271 FT	
26	262.76°	1706 x 45 M	RWY surface: Concrete and asphalt, Grooved PCN 37/R/A/W/T Concrete and PCN 30/F/A/X/T Grooved Asphalt	491231.80N 0021105.66W 161 FT	THR 272 FT	

SWY Dimensions	Clearway Dimensions	Strip Dimensions	RESA Dimensions, Overshoot / Undershoot	Location/description of arresting system	OFZ	Remarks
8	9	10	11	12	13	14
			298 x 150 M			RWY 08Threshold displaced by 61 M.
			90 x 90 M			RWY 26Threshold displaced by 91 M.

2.6.1 Declared distances (AIRAC 03/2020)

Runway designator	TORA	TODA	ASDA	LDA	Remarks
1	2	3	4	5	6
08	1706 M	1889 M	1706 M	1645 M	
26	1645 M	2469 M	1645 M	1554 M	TORA/TODA/ASDA declared for both Alpha 1 and Golf.
08	1300 M	1483 M	1300 M		Take-off from Intersection of Hold Delta.
26	1129 M	1693 M	1129 M		Take-off from Intersection of Hold Foxtrot.

2.6.2 Runway code

UK Cap168 - Licensing of Aerodromes, Chapter 3: Aerodrome physical characteristics states:
"Aerodrome (runway) reference code
3.5 To determine the extent of the lateral, longitudinal, and sloping planes of the airspace and ground surfaces surrounding each runway that should be kept free of obstacles, a reference code is established from table 3.1. This code comprises:
1. A number determined by selecting the higher value of declared TODA or ASDA.:

As is stated in the AIP "declared distances" the TODA value for runway 26 is 2469 M and runway 08 is 1889 M. When these values are compared with the following table in CAP 168 it results in a runway code 4 for both runways.

Code element one			Code element two	
Code number	The greater of TODA or ASDA	Code letter	Wing span	Outer main gear wheel span
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 1200 m	B	15 m up to but not including 24 m	4.5 m up to but not including 6 m
3	1200 m up to but not including 1800 m	C	24 m up to but not including 36 m	6 m up to but not including 9 m
4	1800 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

The TODA value is made up of the departure runway length of 1645m plus the Clearway. No clearways are listed in the AIP runway data entry. However clearway values for runway 08/26 are listed in the "Jersey Aerodrome Manual V2.0" with a value of 824 m for runway 26 and 183 m for runway 08 (1645+824=2469, 1706+183=1889).
Jersey Aerodrome Manual V2 states:

*"4.25.1 Taxiway strips are established at Jersey Airport as per the CAP 168 requirements for a code **C** aerodrome."*

Taxiway and runway Code 4C

2.7 Navigational aids used (AIRAC 03/2020)

Type of Aid CAT of ILS/MLS MAG Var/VOR Declination	Ident	Frequency	Hours of Operation	Position of transmitting antenna coordinates	Elevation of DME transmitting antenna	Remarks
1	2	3	4	5	6	7
ILS/LLZ 0.62°W (2019)	IJJ	110.900 MHz	HO	491233.68N 0021042.71W		(RWY 08) 457 M from THR 26.
ILS/GP	IJJ	330.800 MHz	HO	491230.14N 0021206.90W		3° ILS Ref Datum Hgt 52 FT.
ILS/LLZ 0.62°W (2019)	IDD	110.300 MHz	HO	491224.74N 0021229.91W		(RWY 26) 161 M from THR 08.
ILS/GP	IDD	335.000 MHz	HO	491233.95N 0021121.11W		3° ILS Ref Datum Hgt 52 FT.
VOR/DME 0.57°W (2019) 2.14°W (2011)	JSY	59X 112.200 MHz	H24	491315.97N 0020246.15W	264 FT	Located 5.5 NM from THR 26.
NDB (L) 0.62°W (2019)	JW	329.000 kHz	HO	491221.29N 0021311.73W		0.5 NM from THR 08 Range 25 NM.
ILS/DME	IDD	40X 110.300 MHz	HO	491233.78N 0021121.09W	288 FT	(RWY 26) DME freq paired with ILS I-DD only. Zero range is indicated at THR of Runway 26 only.
ILS/DME	IJJ	46X 110.900 MHz	HO	491229.97N 0021206.86W	288 FT	(RWY 08) On AD. DME freq paired with ILS I-JJ only. Zero range is indicated at THR of Runway 08 only.

3 ICAO Annex 14 / CAP168 assessment

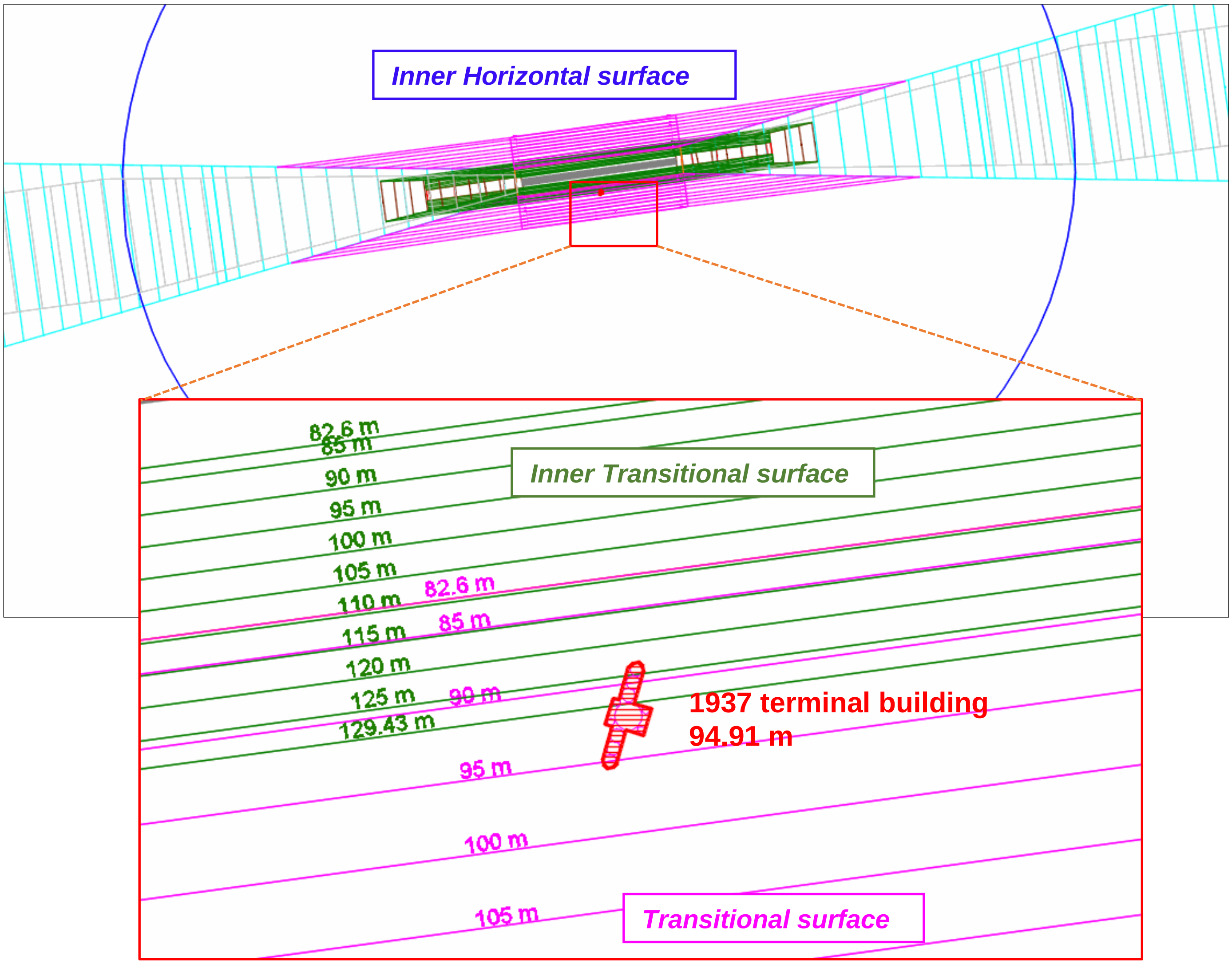
The purpose of the ICAO Annex 14 and UK CAP 168 surfaces is to define the volume of airspace that should ideally be kept free from obstacles to minimize the danger presented to an aircraft departing from or arriving at an airport.

The Obstacle Limitation Surfaces were constructed with the following parameters:

Runway	
Name	EGJJ 08
Code	4
Threshold 08	
Latitude	49°12'25.44"N
Longitude	002°12'21.94"W
Altitude	82.6 m (271 ft)
Threshold 26	
Latitude	49°12'31.80"N
Longitude	002°11'05.66"W
Altitude	82.91 m (272 ft)
Aerodrome	
Datum Elevation	ARP
Aerodrome Reference Point (ARP)	
ID	ARP
Latitude	49°12'28.77"N
Longitude	002°11'43.41"W
Altitude	84.43 m (277 ft)
Parameters	
Approach Type	Precision
Criteria	
Name	CAP 168
Approach Surface	
Length of Inner Edge	300 m
Distance From RWY	60 m
Divergence (each side)	15 %
First Section Length	3000 m
First Section Slope	2 %

Second Section Length	3600 m
Second Section Slope	2.5 %
Horizontal Section	8400 m
Total Length	15000 m
Inner Approach Surface	
Width	120 m
Distance From RWY	60 m
Length	1500 m
Slope	2 %
Inner Transitional Surface	
Slope	33.3 %
1:10 Surface	
Slope	10 %
Strip	
Width	150 m
Length	60 m
Inner Horizontal Surface	
Location	ARP
Height	45 m
Radius	4000 m
Take-off Surface	
Length of Inner Edge	180 m
Divergence (each side)	12.5 %
Final Width	1200 m
Length	15000 m
Slope	1.6 %
Transitional Surface	
Slope	14.3 %

As can be seen in the following diagram the 1937 terminal building was laterally situated inside the Obstacle Limitation Surfaces for runway 08/26. Specifically the Inner Transitional, the Inner Horizontal and the Transitional.



Following are the assessment results for the Inner Transitional, the Inner Horizontal and the Transitional Obstacle Limitation Surfaces

Checked Positions - Inner Transitional

ID	Altitude	Surface altitude	Difference	Penetrating
NW1	93.0	123.1	-30.0	No
NW2	93.0	125.0	-31.9	No
NW3	93.0	126.9	-33.8	No

Checked Positions – Inner Horizontal

ID	Altitude	Surface altitude	Difference	Penetrating
B4	94.9	127.6	-32.7	No
B1	94.9	127.6	-32.7	No
B2	94.9	127.6	-32.7	No
B3	94.9	127.6	-32.7	No

ID	Altitude	Surface altitude	Difference	Penetrating
B5	94.9	127.6	-32.7	No
SW3	93.0	127.6	-34.6	No
SW2	93.0	127.6	-34.6	No
SW1	93.0	127.6	-34.6	No
NW3	93.0	127.6	-34.6	No
NW2	93.0	127.6	-34.6	No
NW1	93.0	127.6	-34.6	No

As can be seen in the previous tables the 1937 terminal building was below both the Inner Transitional and the Inner Horizontal surfaces.

The control tower (CTWR) was also included in the Transitional surface assessment to show a comparison of results.

Checked Positions – Transitional

ID	Altitude	Surface altitude	Difference	Penetrating
NW1	93.0	87.2	5.8	Yes
B3	94.9	89.5	5.4	Yes
B1	94.9	89.8	5.1	Yes
NW2	93.0	88.0	5.0	Yes
B4	94.9	90.3	4.6	Yes
B2	94.9	90.7	4.2	Yes
NW3	93.0	88.8	4.2	Yes
B5	94.9	91.5	3.4	Yes
Control tower	121.3	119.5	1.8	Yes
SW3	93.0	91.4	1.6	Yes
SW2	93.0	92.3	0.8	Yes
SW1	93.0	93.1	0.0	No

It is interesting to note that even though the 1937 terminal building penetrates the Transitional surface so does the Control Tower.

3.1 Mitigating factors

ICAO Annex 14 — Aerodromes Volume I states:

4.2.21Recommendation.— Existing objects above an approach surface, a ***transitional surface****, the conical surface and inner horizontal surface should as far as practicable be removed except when, in the opinion of the appropriate authority, an object is shielded by an existing immovable object, or* ***after aeronautical study*** *it is determined that the object would not adversely affect the safety or significantly affect the regularity of operations of aeroplanes.*

This study will show that the 1937 terminal building does not adversely affect the safety of flight operations at Jersey airport.

4 Instrument flight procedure issues

The Instrument flight procedures for Jersey airport were obtained from the UK Aeronautical Information Publication (AIP -AIRAC 03/2020). The following pages detail the analysis of these procedures.

4.1 Non-precision approaches

The following table lists all the non-precision approaches in use at jersey airport and the lowest minimum in feet.

Approach	Lowest Minimum OCA in feet	
	Runway 08	Runway 26
Localiser only	590 ft	620 ft
VOR/DME	650 ft	670 ft
NDB	590 ft	670 ft
LNAV	621 ft	650 ft

All non-precision approaches must have a required ICAO minimum obstacle clearance (MOC) of 75 m above any obstacle. If an obstacle does not infringe this 75 m MOC then the approach is not affected by that specific obstacle. The approach with the lowest minimum (localiser only approach for runway 08) was checked in the following table and found not to be critical.

Segment	Final
Minimum segment altitude (Ft)	590
1937 terminal building altitude	94.91
MOC required	75
MOC achieved	84.9
Critical	**No**

Because the assessment of the lowest minimum of all the non-precision approaches was not critical this means that all of the other non-precision approaches with higher minimum OCA values are also not affected by the 1937 terminal building.

4.2 Visual segment

ICAO Pans-Ops document 8168 Part I — Section 4, Chapter 5, section
5.4.6Protection for the visual segment of the approach procedure

This section of Pans-Ops details specific criteria and protection areas (see following diagram) that need to be assessed to protect aircraft on the final visual segment of an instrument approach.

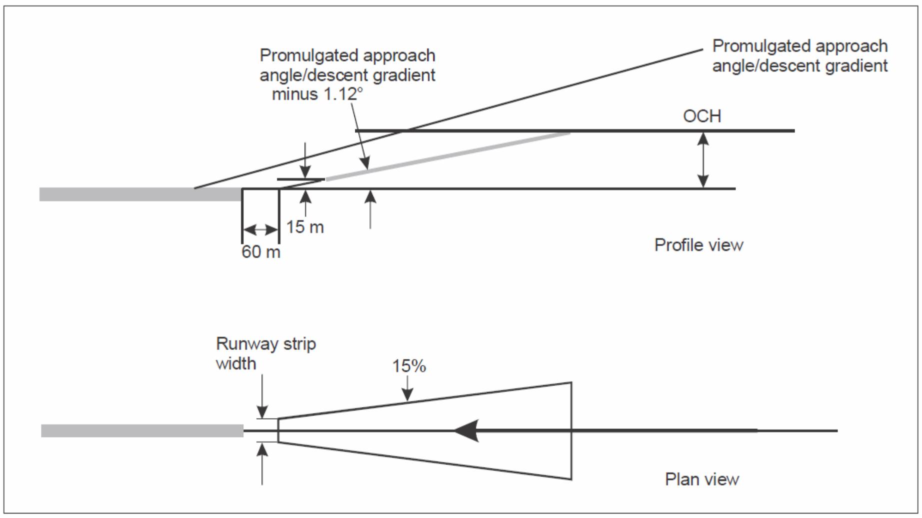


Figure I-4-5-6 b). Visual segment surface other approach procedures normal straight-in approach

The visual protection areas for both runway ends were constructed and as can be seen in the following picture the 1937 terminal building is well clear of these areas.

4.3 LNAV/VNAV approach procedures

4.3.1 RNAV (GNSS) LNAV/ VNAV Runway 08

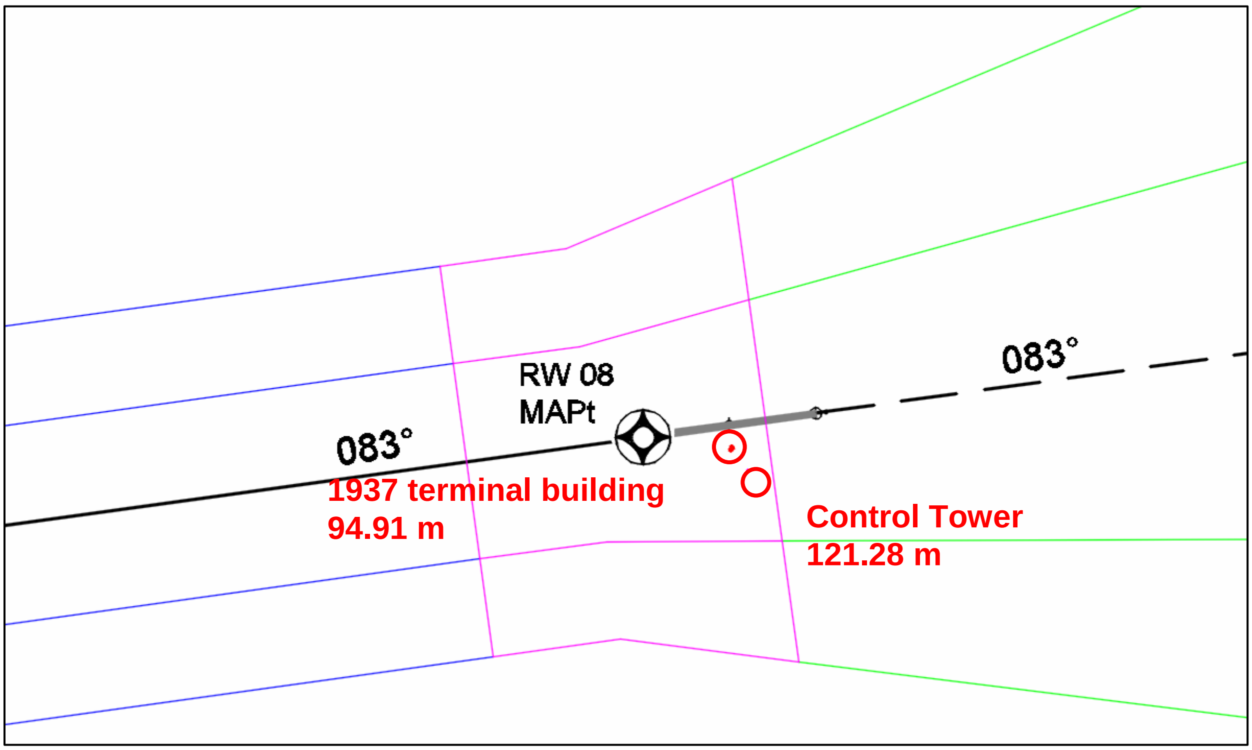
The VNAV approach to this runway was calculated using the following parameters:

Aerodrome	
Reference Point (ARP)	
Latitude	49°12'29.00"N
Longitude	002°11'44.00"W
Altitude	84.43 m (277 ft)
ISA	18 °C
Minimum Temperature	-15 °C
Runway	
LTP/FTP	
Latitude	49°12'25.44"N
Longitude	002°12'21.94"W
Altitude	82.6 m (271 ft)
Direction	082.7 °(T)
RDH	15 m
Parameters	
Intermediate Segment (OCA)	2000 ft
Intermediate Segment MOC	150 m
Vertical Path Angle [VPA]	3.0 °
LTP/FTP to FAWP Distance	5.28 nm
Aircraft Category	A
Max. IAS	100 kts
Max. IAS at LTP/FTP	90 kts
Height Loss	40 m
Temperature Correction	54.1 m
APV Segment Termination	+4nm
Missed Approach Point	LTP/FTP
MACG	2.5 %
Missed Approach MOC	30 m
Missed Approach Evaluation	Xz datum (std.)
Calculated Values	
X FAP	9769.53 m
Temperature Correction	54.1 m
Minimum VPA	2.68 °
X FAS [75 m]	1589.35 m
FAS Angle [75 m]	2.64 °
Xz	-900 m
Aircraft Category	B
Max. IAS	130 kts
Max. IAS at LTP/FTP	120 kts
Height Loss	43 m
Temperature Correction	54.1 m
APV Segment Termination	+4nm
Missed Approach Point	LTP/FTP
MACG	2.5 %
Missed Approach MOC	30 m
Missed Approach Evaluation	Xz datum (std.)
Calculated Values	
X FAP	9769.53 m
Temperature Correction	54.1 m
Minimum VPA	2.68 °
X FAS [75 m]	1589.35 m
FAS Angle [75 m]	2.64 °
Xz	-900 m
Aircraft Category	C
Max. IAS	160 kts
Max. IAS at LTP/FTP	140 kts
Height Loss	46 m
Temperature Correction	54.1 m
APV Segment Termination	+4nm
Missed Approach Point	LTP/FTP
MACG	2.5 %
Missed Approach MOC	30 m
Missed Approach Evaluation	Xz datum (std.)
Calculated Values	
X FAP	9769.53 m
Temperature Correction	54.1 m
Minimum VPA	2.68 °
X FAS [75 m]	1589.35 m
FAS Angle [75 m]	2.64 °
Xz	-1100 m
Aircraft Category	D
Max. IAS	185 kts
Max. IAS at LTP/FTP	165 kts
Height Loss	49 m
Temperature Correction	54.1 m
APV Segment Termination	+4nm
Missed Approach Point	LTP/FTP
MACG	2.5 %
Missed Approach MOC	30 m
Missed Approach Evaluation	Xz datum (std.)
Calculated Values	
X FAP	9769.53 m

Temperature Correction	54.1 m
Minimum VPA	2.68 °
X FAS [75 m]	1589.35 m

FAS Angle [75 m]	2.64 °
Xz	-1400 m

The control tower (CTWR) was also included in the precision approach assessment to show a comparison.



As can be seen in the previous diagram the 1937 terminal building and the control tower were situated inside the Horizontal surface.

APV/Baro-VNAV Surfaces - Horizontal - Checked Obstacles – CAT A

ID	Alt.	MOC	Surf. alt.	Diff.	HL	MOCA req.(ft)	MOCA published (ft)	Controlling
CTWR	121.3	30.0	82.6	38.7	40.0	529.2	571	No
B5	94.9	30.0	82.6	12.3	40.0	442.7		No
B4	94.9	30.0	82.6	12.3	40.0	442.7		No
B3	94.9	30.0	82.6	12.3	40.0	442.7		No
B2	94.9	30.0	82.6	12.3	40.0	442.7		No
B1	94.9	30.0	82.6	12.3	40.0	442.7		No
SW3	93.0	30.0	82.6	10.4	40.0	436.5		No
SW2	93.0	30.0	82.6	10.4	40.0	436.5		No
SW1	93.0	30.0	82.6	10.4	40.0	436.5		No
NW3	93.0	30.0	82.6	10.4	40.0	436.5		No
NW2	93.0	30.0	82.6	10.4	40.0	436.5		No
NW1	93.0	30.0	82.6	10.4	40.0	436.5		No

Controlling Obstacle aircraft category A	
ID	Control Tower (CTWR)
Altitude	121.28 m (397.9 ft)
Surface	Horizontal
Results	
OCH	259 ft
OCA	530 ft

APV/Baro-VNAV Surfaces - Horizontal - Checked Obstacles – CAT B

ID	Alt.	MOC	Surf. alt.	Diff.	HL	MOCA req.(ft)	MOCA published (ft)	Controlling
CTWR	121.3	30.0	82.6	38.7	43.0	539.0	571	No
B5	94.9	30.0	82.6	12.3	43.0	452.5		No
B4	94.9	30.0	82.6	12.3	43.0	452.5		No
B3	94.9	30.0	82.6	12.3	43.0	452.5		No
B2	94.9	30.0	82.6	12.3	43.0	452.5		No
B1	94.9	30.0	82.6	12.3	43.0	452.5		No
SW3	93.0	30.0	82.6	10.4	43.0	446.4		No
SW2	93.0	30.0	82.6	10.4	43.0	446.4		No
SW1	93.0	30.0	82.6	10.4	43.0	446.4		No
NW3	93.0	30.0	82.6	10.4	43.0	446.4		No
NW2	93.0	30.0	82.6	10.4	43.0	446.4		No
NW1	93.0	30.0	82.6	10.4	43.0	446.4		No

Controlling Obstacle aircraft category B	
ID	Control Tower (CTWR)
Altitude	121.28 m (397.9 ft)
Surface	Horizontal
Results	
OCH	268 ft
OCA	539 ft

APV/Baro-VNAV Surfaces - Horizontal - Checked Obstacles – CAT C

ID	Alt.	MOC	Surf. alt.	Diff.	HL	MOCA req.(ft)	MOCA published (ft)	Controlling
CTWR	121.3	30.0	82.6	38.7	46.0	548.9	571	No
B5	94.9	30.0	82.6	12.3	46.0	462.4		No
B4	94.9	30.0	82.6	12.3	46.0	462.4		No
B3	94.9	30.0	82.6	12.3	46.0	462.4		No
B2	94.9	30.0	82.6	12.3	46.0	462.4		No
B1	94.9	30.0	82.6	12.3	46.0	462.4		No
SW3	93.0	30.0	82.6	10.4	46.0	456.2		No
SW2	93.0	30.0	82.6	10.4	46.0	456.2		No
SW1	93.0	30.0	82.6	10.4	46.0	456.2		No
NW3	93.0	30.0	82.6	10.4	46.0	456.2		No
NW2	93.0	30.0	82.6	10.4	46.0	456.2		No
NW1	93.0	30.0	82.6	10.4	46.0	456.2		No

Controlling Obstacle aircraft category C	
ID	Control Tower (CTWR)
Altitude	121.28 m (397.9 ft)
Surface	Horizontal
Results	
OCH	278 ft
OCA	549 ft

APV/Baro-VNAV Surfaces - Horizontal - Checked Obstacles – CAT D

ID	Alt.	MOC	Surf. alt.	Diff.	HL	MOCA req.(ft)	MOCA published (ft)	Controlling
CTWR	121.3	30.0	82.6	38.7	49.0	558.7	571	No
B5	94.9	30.0	82.6	12.3	49.0	472.2		No
B4	94.9	30.0	82.6	12.3	49.0	472.2		No
B3	94.9	30.0	82.6	12.3	49.0	472.2		No
B2	94.9	30.0	82.6	12.3	49.0	472.2		No
B1	94.9	30.0	82.6	12.3	49.0	472.2		No
SW3	93.0	30.0	82.6	10.4	49.0	466.1		No
SW2	93.0	30.0	82.6	10.4	49.0	466.1		No
SW1	93.0	30.0	82.6	10.4	49.0	466.1		No
NW3	93.0	30.0	82.6	10.4	49.0	466.1		No
NW2	93.0	30.0	82.6	10.4	49.0	466.1		No
NW1	93.0	30.0	82.6	10.4	49.0	466.1		No

Controlling Obstacle aircraft category D	
ID	Control Tower (CTWR)
Altitude	121.28 m (397.9 ft)
Surface	Horizontal
Results	
OCH	288 ft
OCA	559 ft

4.3.1.1 Conclusions – LNAV/VNAV runway 08

It is interesting to note that the controlling obstacle for all aircraft categories is the Control Tower not the 1937 terminal building.

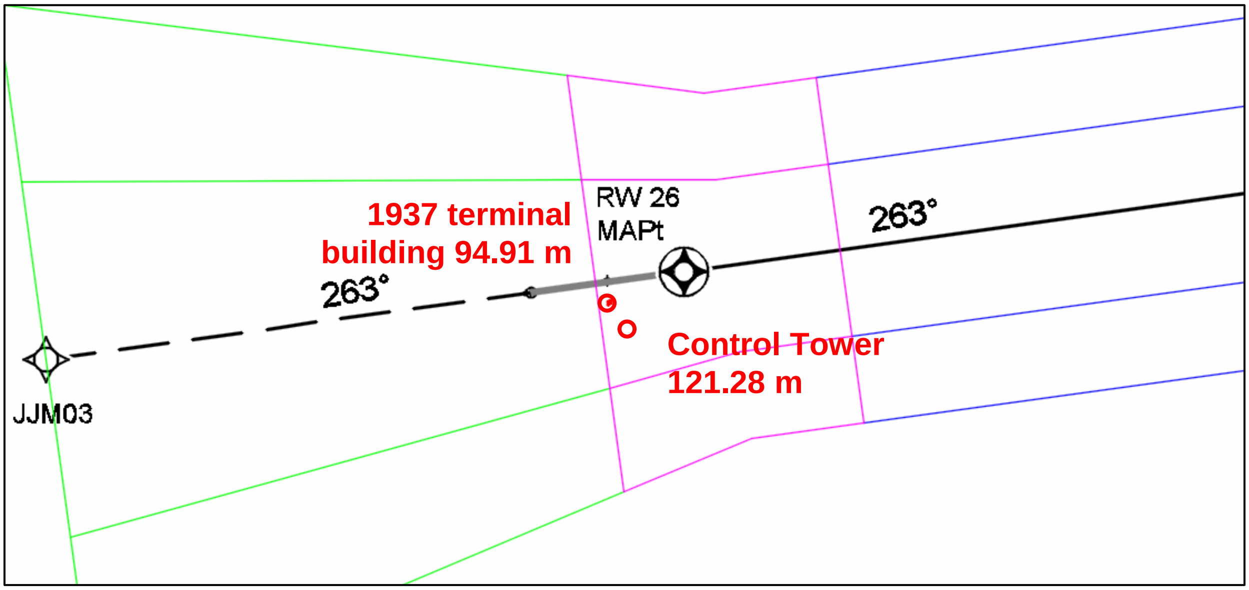
This means that removal or **not** of the 1937 terminal building will have **No** effect on the minimums for this approach.

4.3.1 RNAV (GNSS) LNAV/ VNAV Runway 26

The VNAV approach to this runway was calculated using the following parameters:

Reference Point (ARP)	
Latitude	49°12'29.00"N
Longitude	002°11'44.00"W
Altitude	84.43 m (277 ft)
ISA	18 °C
Minimum Temperature	-15 °C
Runway	
LTP/FTP	
Latitude	49°12'31.80"N
Longitude	002°11'05.66"W
Altitude	82.91 m (272 ft)
Direction	262.77 °(T)
RDH	15 m
Parameters	
Intermediate Segment (OCA)	2000 ft
Intermediate Segment MOC	150 m
Vertical Path Angle [VPA]	3.0 °
LTP/FTP to FAWP Distance	5.27 nm
Aircraft Category	A
Max. IAS	100 kts
Max. IAS at LTP/FTP	90 kts
Height Loss	40 m
Temperature Correction	54.1 m
APV Segment Termination	+3.5nm
Missed Approach Point	LTP/FTP
MACG	2.5 %
Missed Approach MOC	30 m
Missed Approach Evaluation	Xz datum (std.)
Calculated Values	
X FAP	9763.71 m
Temperature Correction	54.1 m
Minimum VPA	2.68 °
X FAS [75 m]	1589.35 m
FAS Angle [75 m]	2.64 °
Xz	-900 m
Aircraft Category	B
Max. IAS	130 kts
Max. IAS at LTP/FTP	120 kts
Height Loss	43 m
Temperature Correction	54.1 m
APV Segment Termination	+3.5nm
Missed Approach Point	LTP/FTP
MACG	2.5 %
Missed Approach MOC	30 m
Missed Approach Evaluation	Xz datum (std.)
Calculated Values	
X FAP	9763.71 m
Temperature Correction	54.1 m
Minimum VPA	2.68 °
X FAS [75 m]	1589.35 m
FAS Angle [75 m]	2.64 °
Xz	-900 m
Aircraft Category	C
Max. IAS	160 kts
Max. IAS at LTP/FTP	140 kts
Height Loss	46 m
Temperature Correction	54.1 m
APV Segment Termination	+3.5nm
Missed Approach Point	LTP/FTP
MACG	2.5 %
Missed Approach MOC	30 m
Missed Approach Evaluation	Xz datum (std.)
Calculated Values	
X FAP	9763.71 m
Temperature Correction	54.1 m
Minimum VPA	2.68 °
X FAS [75 m]	1589.35 m
FAS Angle [75 m]	2.64 °
Xz	-1100 m
Aircraft Category	D
Max. IAS	185 kts
Max. IAS at LTP/FTP	165 kts
Height Loss	49 m
Temperature Correction	54.1 m
APV Segment Termination	+3.5nm
Missed Approach Point	LTP/FTP
MACG	2.5 %
Missed Approach MOC	30 m
Missed Approach Evaluation	Xz datum (std.)
Calculated Values	
X FAP	9763.71 m
Temperature Correction	54.1 m
Minimum VPA	2.68 °
X FAS [75 m]	1589.35 m
FAS Angle [75 m]	2.64 °
Xz	-1400 m

The control tower (CTWR) was also included in the precision approach assessment to show a comparison.



As can be seen in the previous diagram the 1937 terminal building and the control tower were situated inside the Horizontal surface.

APV/Baro-VNAV Surfaces - Checked Obstacles - Horizontal – CAT A

ID	Alt.	MOC	Surf. alt.	Diff.	HL	MOCA required (ft)	MOCA published (ft)	Controlling
CTWR	121.3	30.0	82.9	38.4	40.0	529.2	580	No
B5	94.9	30.0	82.9	12.0	40.0	442.7		No
B4	94.9	30.0	82.9	12.0	40.0	442.7		No
B3	94.9	30.0	82.9	12.0	40.0	442.7		No
B2	94.9	30.0	82.9	12.0	40.0	442.7		No
B1	94.9	30.0	82.9	12.0	40.0	442.7		No
SW3	93.0	30.0	82.9	10.1	40.0	436.5		No
SW2	93.0	30.0	82.9	10.1	40.0	436.5		No
SW1	93.0	30.0	82.9	10.1	40.0	436.5		No
NW3	93.0	30.0	82.9	10.1	40.0	436.5		No
NW2	93.0	30.0	82.9	10.1	40.0	436.5		No
NW1	93.0	30.0	82.9	10.1	40.0	436.5		No

Controlling Obstacle aircraft category A	
ID	Control Tower (CTWR)
Altitude	121.28 m (397.9 ft)
Surface	Horizontal
Results	
OCH	258 ft
OCA	530 ft

APV/Baro-VNAV Surfaces - Checked Obstacles - Horizontal – CAT B

ID	Alt.	MOC	Surf. alt.	Diff.	HL	MOCA required (ft)	MOCA published (ft)	Controlling
CTWR	121.3	30.0	82.9	38.4	43.0	539.0	580	No
B5	94.9	30.0	82.9	12.0	43.0	452.5		No
B4	94.9	30.0	82.9	12.0	43.0	452.5		No
B3	94.9	30.0	82.9	12.0	43.0	452.5		No
B2	94.9	30.0	82.9	12.0	43.0	452.5		No
B1	94.9	30.0	82.9	12.0	43.0	452.5		No
SW3	93.0	30.0	82.9	10.1	43.0	446.4		No
SW2	93.0	30.0	82.9	10.1	43.0	446.4		No
SW1	93.0	30.0	82.9	10.1	43.0	446.4		No
NW3	93.0	30.0	82.9	10.1	43.0	446.4		No
NW2	93.0	30.0	82.9	10.1	43.0	446.4		No
NW1	93.0	30.0	82.9	10.1	43.0	446.4		No

Controlling Obstacle aircraft category B	
ID	Control Tower (CTWR)
Altitude	121.28 m (397.9 ft)
Surface	Horizontal
Results	
OCH	267 ft
OCA	539 ft

APV/Baro-VNAV Surfaces - Checked Obstacles - Horizontal – CAT C

ID	Alt.	MOC	Surf. alt.	Diff.	HL	MOCA required (ft)	MOCA published (ft)	Controlling
CTWR	121.3	30.0	82.9	38.4	46.0	548.9	580	No
B5	94.9	30.0	82.9	12.0	46.0	462.4		No
B4	94.9	30.0	82.9	12.0	46.0	462.4		No
B3	94.9	30.0	82.9	12.0	46.0	462.4		No
B2	94.9	30.0	82.9	12.0	46.0	462.4		No
B1	94.9	30.0	82.9	12.0	46.0	462.4		No
SW3	93.0	30.0	82.9	10.1	46.0	456.2		No
SW2	93.0	30.0	82.9	10.1	46.0	456.2		No
SW1	93.0	30.0	82.9	10.1	46.0	456.2		No
NW3	93.0	30.0	82.9	10.1	46.0	456.2		No

ID	Alt.	MOC	Surf. alt.	Diff.	HL	MOCA required (ft)	MOCA published (ft)	Controlling
NW2	93.0	30.0	82.9	10.1	46.0	456.2		No
NW1	93.0	30.0	82.9	10.1	46.0	456.2		No

Controlling Obstacle aircraft category C	
ID	Control Tower (CTWR)
Altitude	121.28 m (397.9 ft)
Surface	Horizontal
Results	
OCH	277 ft
OCA	549 ft

APV/Baro-VNAV Surfaces - Checked Obstacles - Horizontal – CAT D

ID	Alt.	MOC	Surf. alt.	Diff.	HL	MOCA required (ft)	MOCA published (ft)	Controlling
CTWR	121.3	30.0	82.9	38.4	49.0	558.7	580	No
B5	94.9	30.0	82.9	12.0	49.0	472.2		No
B4	94.9	30.0	82.9	12.0	49.0	472.2		No
B3	94.9	30.0	82.9	12.0	49.0	472.2		No
B2	94.9	30.0	82.9	12.0	49.0	472.2		No
B1	94.9	30.0	82.9	12.0	49.0	472.2		No
SW3	93.0	30.0	82.9	10.1	49.0	466.1		No
SW2	93.0	30.0	82.9	10.1	49.0	466.1		No
SW1	93.0	30.0	82.9	10.1	49.0	466.1		No
NW3	93.0	30.0	82.9	10.1	49.0	466.1		No
NW2	93.0	30.0	82.9	10.1	49.0	466.1		No
NW1	93.0	30.0	82.9	10.1	49.0	466.1		No

Controlling Obstacle aircraft category D	
ID	Control Tower (CTWR)
Altitude	121.28 m (397.9 ft)
Surface	Horizontal
Results	
OCH	287 ft
OCA	559 ft

4.3.1.1 Conclusions – LNAV/VNAV runway 26

It is interesting to note that the for all aircraft categories the Control Tower is more critical than the 1937 terminal building.

This means that removal or **not** of the 1937 terminal building will have **No** effect on the minimums for this approach.

4.4 Precision approach (ILS/LPV) assessment method

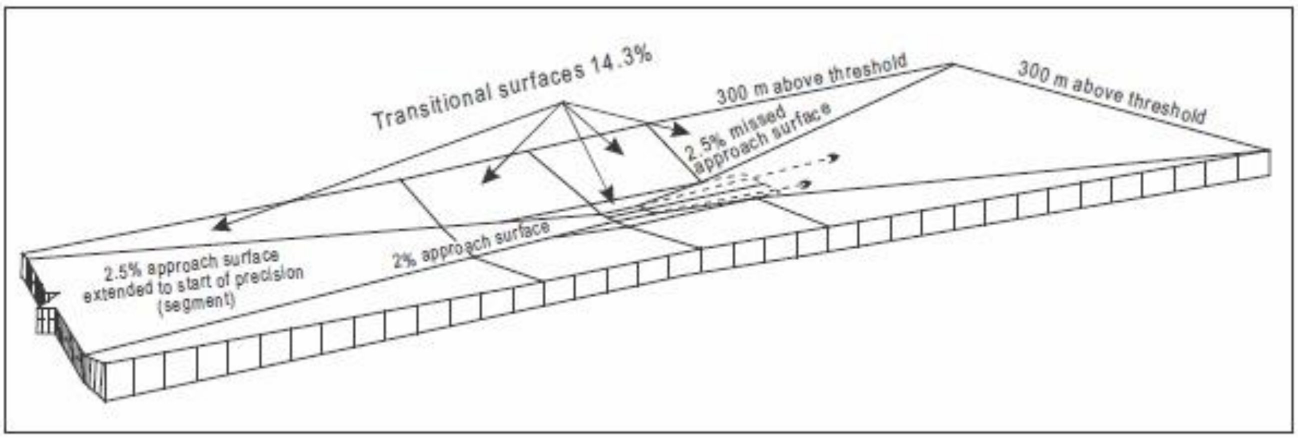
PANS-OPS (Document 8168), Volume 2, Part II - Section 1, Chapter 1, paragraph 1.1.5 - "*General*" states the following:

"Three methods of calculating OCA/H are presented, which involve progressive increases in the degree of sophistication in the treatment of obstacles."

4.4.1 Basic ILS surfaces

PANS-OPS (Document 8168), Volume 2, Part II - Section 1, Chapter 1, paragraph 1.1.5.2 "*First method*" states:

*"The **first** method involves a set of surfaces derived from the Annex 14 precision approach obstacle limitation surfaces and a missed approach surface..."*



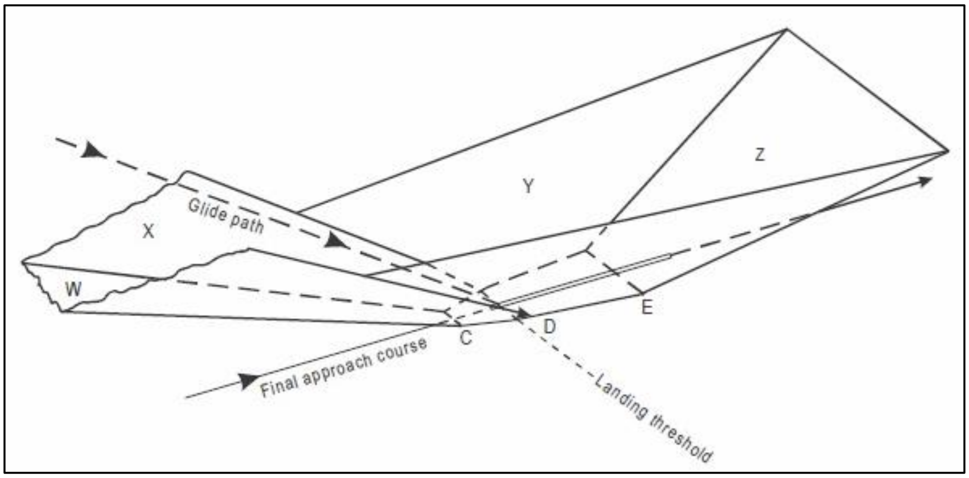
ILS Basic surfaces

Basic ILS surfaces is the simplest form of ILS protection and is rarely used.

4.4.2 Obstacle Assessment Surfaces (OAS)

PANS-OPS (Document 8168), Volume 2, Part II - Section 1, Chapter 1, paragraph 1.1.5.3 "*Second method*" states:

*"The **second** method involves a set of obstacle assessment surfaces (OAS) above the basic ILS surfaces..."*



The approach funnel (OAS))

The Airport Services manual (Document 9137), Part 6 - Control of Obstacles, Chapter 1 - Surfaces, paragraph 1.3.3 Obstacle assessment surfaces states:

"The obstacle assessment surfaces (OAS) establish a volume of airspace, inside which it is assumed the flight paths of aeroplanes making ILS approaches and subsequent missed approaches will be contained with sufficiently high probability.
....
The lateral boundaries of the funnel represent estimates of the maximum divergence of an aeroplane from the runway centre line during the approach and missed approach so that the probability of an aeroplane touching the funnel at any one point is $1:10^{-7}$ or less."

PANS-OPS (Document 8168), Volume 2, Part II - Section 1, Chapter 1, paragraph 1.4.8.4 Definition of obstacle assessment surfaces (OAS) states:

"1.4.8.4.1 The OAS consist of six sloping plane surfaces (denoted by letters W, X, Y, and Z) arranged symmetrically about the precision segment track, together with the horizontal plane which contains the threshold..."

"1.4.8.4.2 For each surface a set of constants (A, B and C) are obtained from the PANS-OPS OAS software for the operational range of localizer threshold distances and glide path angles. Separate sets of constants are specified for Category I and II."

4.4.3 Collision Risk Model (CRM)

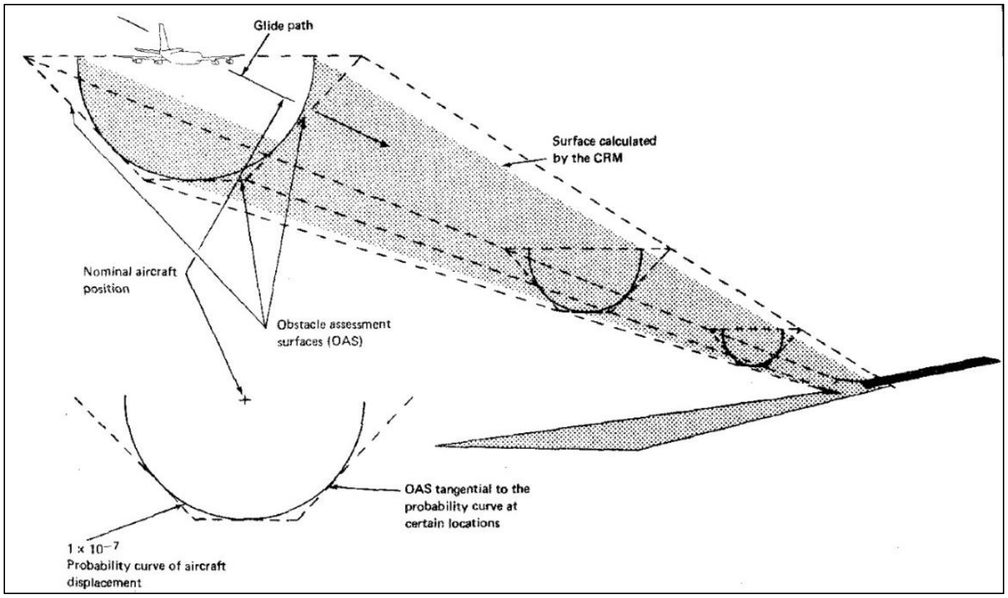
PANS-OPS (Document 8168), Volume 2, Part II - Section 1, Chapter 1, paragraph 1.1.5.4 "*Third method*" states:

*"The **third** method, using a collision risk model (CRM), is employed either as an alternative to the use of the OAS criteria (second method) or when the obstacle density below the OAS is considered to be excessive. The CRM accepts all objects as an input and assesses, for any specific OCA/H value, both the risk due to individual obstacles and the accumulated risk due to all the obstacles. It is intended to assist operational judgement in the choice of an OCA/H value."*

The Airport Services manual (Document 9137), Part 6 - Control of Obstacles, Chapter 1 - Surfaces, paragraph 1.5 Background of the Collision Risk Model states:

"1.5.1 ***The Collision Risk Model (CRM) is a computer programme that calculates the probability of collision with obstacles by an aeroplane on an ILS approach and subsequent missed approach.***

1.5.3 Although the OAS criteria are designed to achieve a specified target level of safety, they may result in a greater level of safety being imposed and consequently unnecessarily prevent operations to low minima or, alternatively, they may result in the safety of operations being degraded below the required standards.
The CRM has been developed in response to these problems. It will:
a) provide risk computations (separately for all obstacles and for individual obstacles0 to a specific set of conditions and runway environment; and
b) provide minimum acceptable OCA/H values for a specific set of conditions and runway environment.
1.5.4 The CRM may also be used to assist:
a) in aerodrome planning (in evaluating possible locations for new runways in a given geographical and obstacle environment);
b) in deciding whether or not an existing object should be removed; and
c) *in deciding whether or not a particular new construction would result in an operational penalty (i.e. in an increase in OCA/H)."*



The approach funnel (CRM)

The Airport Services manual (Document 9137), Part 6 - Control of Obstacles, Chapter 1 - Surfaces, paragraph 1.3.4 ILS Collision Risk Model (CRM) states:

"The approach funnel of the OAS was designed against an over-all risk budget of one accident in 10 million approaches (i.e. a target level of safety of 1 x 10^{-7} per approach). One consequence was that an operational judgement was required to assess the acceptable density of obstacles in the vicinity of the OAS, although they might be below the surface itself. In addition, the OAS were overprotective in certain areas, because they were relatively simple plane surfaces designed to enclose a complex shape and to allow easy manual application. As a consequence of these factors, a more sophisticated method of relating obstacle heights and locations to total risk and OCA/H was developed. This method was embodied in a computer programme called the Collision Risk Model (CRM). It enables a far more realistic assessment of the effects of obstacles, both individually and collectively."

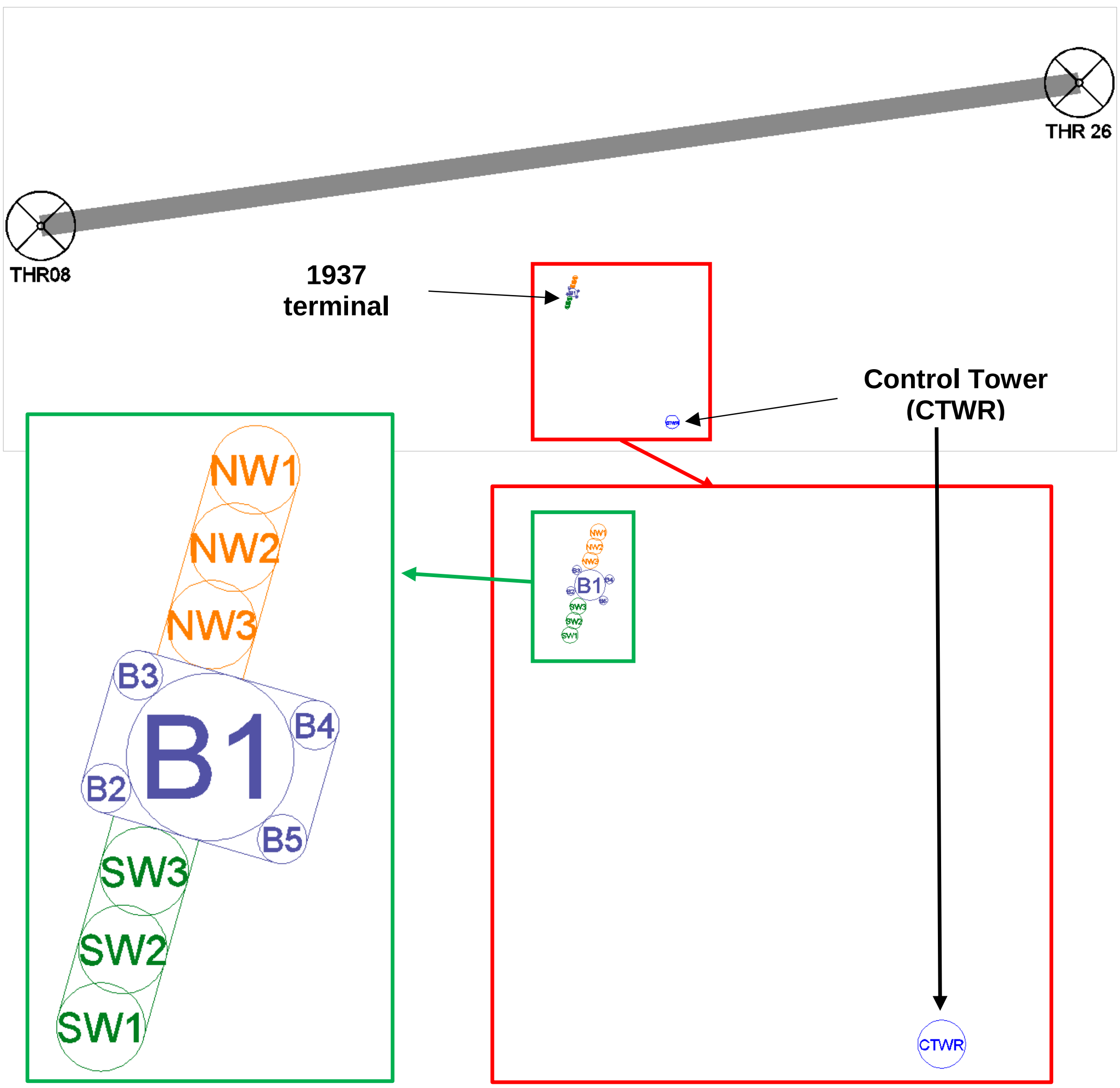
PANS-OPS (Document 8168), Volume 2, Part II - Section 1, Chapter 1, paragraph 1.1.4.1 states:

*"Where statistical calculations were involved, the OCA/H values were designed against an overall safety target of **1 × 10–7 (1 in 10 million)** per approach for risk of collision with obstacles."*

Any obstacle with a risk value greater than 1.0E-07 will affect the minimums for the approach. (See PANS-OPS, Volume II, Paragraph 2.1.4.7.3)

The assessment of the impact of the 1937 terminal building on the ILS approaches at Jersey airport was done using the two most comprehensive methods:

1. **Obstacle Assessment Surfaces (OAS)**
2. **Collision Risk Model (CRM)**



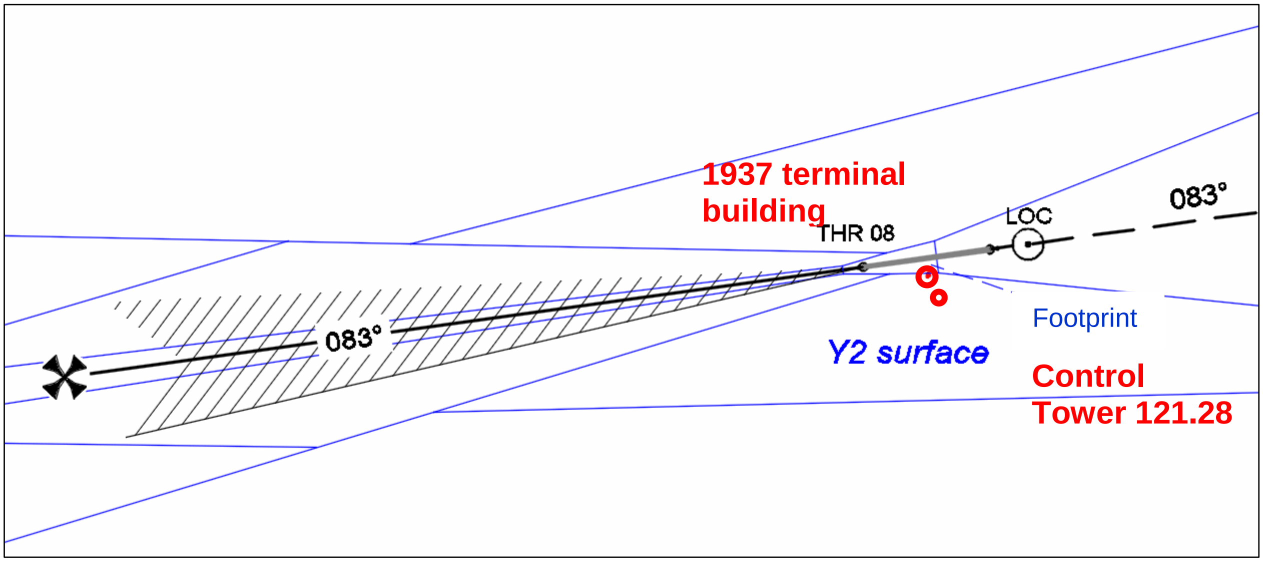
4.5 ILS/DME/NDB (L) Runway 08

The control tower (CTWR) was also included in the precision approach assessment to show a comparison.

4.5.1 Obstacle Assessment Surfaces (OAS) assessment

The ILS CAT I Obstacle Assessment Surfaces were calculated and constructed using the following parameters:

Threshold Position				
ID	THR 08			
X	49°12'25.44"N			
Y	002°12'21.94"W			
Altitude	82.6 m (271 ft)			
Parameters				
In-bound Track	082.64 °(T)			
Preceding	2000 ft			
Preceding	150 m			
Additional Parameters / Constants				
Category	ILS CAT I			
Glide Path Angle	3.0 °			
MA Climb	2.5 %			
RDH at	52 ft			
LOC Course	210 m			
LOC to THR	2023.82 m			
OAS Contour	300 m			
Aircraft				
Category	A	B	C	D
Height Loss	40 m	43 m	46 m	49 m
Wing Semi Span	30 m	30 m	32.5 m	32.5 m
Wheel Height	6 m	6 m	7 m	7 m
Constants				
W	0.028500		-7.16	
X	0.025662	0.169187	-14.65	
Y	0.021959	0.192610	-18.87	
Z	-0.025000		-22.50	



As can be seen in the previous diagram the 1937 terminal building was situated inside the Obstacle Assessment Surfaces (OAS) in the Y2 surface and the Footprint (FP) area. The Control tower was situated inside the Y2 surface.

Obstacle Assessment Surfaces (OAS) - Checked Obstacles – CAT A

ID	Alt.	Surface	Surface altitude	Difference	MOCA Required (ft)	MOCA Published (ft)	Controlling
B5	94.9	Y2	87.4	7.5	442.7	415	Yes
B4	94.9	Y2	85.7	9.2	442.7		Yes
B3	94.9	Y2	84.9	10.0	442.7		Yes
B2	94.9	Y2	86.6	8.4	442.7		Yes
B1	94.9	Y2	85.1	9.8	442.7		Yes
SW3	93.0	Y2	87.5	5.5	436.5		Yes
SW2	93.0	Y2	88.7	4.4	436.5		Yes
SW1	93.0	Y2	89.8	3.2	436.5		Yes
NW3	93.0	Y2	83.8	9.2	436.5		Yes
NW2	93.0	Y2	82.7	10.4	436.5		Yes
NW1	93.0	FP	82.6	10.4	436.5		Yes
CTWR	121.3	Y2	122.3	-1.0	N/A		No

Controlling Obstacle aircraft category A	
ID	B5
Altitude	94.91 m (311.38 ft)
Surface	Y2
Results	
OCH	172 ft
OCA	443 ft

Obstacle Assessment Surfaces (OAS) - Checked Obstacles – CAT B

ID	Alt.	Surface	Surface altitude	Difference	MOCA Required (ft)	MOCA Published (ft)	Controlling
B5	94.9	Y2	87.4	7.5	452.5	424	Yes
B4	94.9	Y2	85.7	9.2	452.5		Yes
B3	94.9	Y2	84.9	10.0	452.5		Yes
B2	94.9	Y2	86.6	8.4	452.5		Yes
B1	94.9	Y2	85.1	9.8	452.5		Yes
SW3	93.0	Y2	87.5	5.5	446.4		Yes
SW2	93.0	Y2	88.7	4.4	446.4		Yes
SW1	93.0	Y2	89.8	3.2	446.4		Yes
NW3	93.0	Y2	83.8	9.2	446.4		Yes
NW2	93.0	Y2	82.7	10.4	446.4		Yes
NW1	93.0	FP	82.6	10.4	446.4		Yes
CTWR	121.3	Y2	122.3	-1.0	N/A		No

Controlling Obstacle aircraft category B	
ID	B5
Altitude	94.91 m (311.38 ft)
Surface	Y2
Results	
OCH	182 ft
OCA	453 ft

Obstacle Assessment Surfaces (OAS) - Checked Obstacles – CAT C

ID	Alt.	Surface	Surface altitude	Difference	MOCA Required (ft)	MOCA Published (ft)	Controlling
CTWR	121.3	Y2	120.7	0.6	548.9	436	Yes
B5	94.9	Y2	85.8	9.1	462.4		Yes
B4	94.9	Y2	84.1	10.8	462.4		Yes
B3	94.9	Y2	83.3	11.7	462.4		Yes
B2	94.9	Y2	84.9	10.0	462.4		Yes
B1	94.9	Y2	83.5	11.4	462.4		Yes
SW3	93.0	Y2	85.9	7.2	456.2		Yes
SW2	93.0	Y2	87.0	6.0	456.2		Yes
SW1	93.0	Y2	88.2	4.8	456.2		Yes
NW3	93.0	FP	82.6	10.4	456.2		Yes
NW2	93.0	FP	82.6	10.4	456.2		Yes
NW1	93.0	FP	82.6	10.4	456.2		Yes

Controlling Obstacle aircraft category C	
ID	Control Tower (CTWR)
Altitude	121.28 m (397.9 ft)
Surface	Y2
Results	
OCH	278 ft
OCA	549 ft

Obstacle Assessment Surfaces (OAS) - Checked Obstacles – CAT D

ID	Alt.	Surface	Surface altitude	Difference	MOCA Required (ft)	MOCA Published (ft)	Controlling
CTWR	121.3	Y2	120.7	0.6	558.7	449	Yes
B5	94.9	Y2	85.8	9.1	472.2		Yes
B4	94.9	Y2	84.1	10.8	472.2		Yes
B3	94.9	Y2	83.3	11.7	472.2		Yes
B2	94.9	Y2	84.9	10.0	472.2		Yes
B1	94.9	Y2	83.5	11.4	472.2		Yes
SW3	93.0	Y2	85.9	7.2	466.1		Yes
SW2	93.0	Y2	87.0	6.0	466.1		Yes
SW1	93.0	Y2	88.2	4.8	466.1		Yes
NW3	93.0	FP	82.6	10.4	466.1		Yes
NW2	93.0	FP	82.6	10.4	466.1		Yes
NW1	93.0	FP	82.6	10.4	466.1		Yes

Controlling Obstacle aircraft category D	
ID	Control Tower (CTWR)
Altitude	121.28 m (397.9 ft)
Surface	Y2
Results	
OCH	288 ft
OCA	559 ft

4.5.1.1 Conclusions – OAS

As can be seen in the previous assessment tables the 1937 terminal building would be the controlling obstacle for category A and B aircraft on this approach. While the control tower would be the controlling obstacle for category C and D aircraft.

The minimums obtained were significantly higher than what is currently published in the AIP and so a more detailed assessment was done using the ICAO CRM statistical risk analysis program.

4.5.2 Collision risk model (CRM) assessment

A full ICAO CRM risk analysis was done and the full computer output is available upon request. Following is a summary of the results and the items in *Italics* were taken directly from the ICAO CRM output.

Aircraft category A

Risk order	Name	Risk
1	B3	*1.30E-10*
2	B1	*1.10E-10*
3	NW1	*9.90E-11*
4	B4	*9.30E-11*
5	B2	*9.00E-11*
6	NW2	*7.90E-11*

Risk order	Name	Risk
7	B5	*6.60E-11*
8	NW3	*6.30E-11*
9	CTWR	*4.10E-11*
10	SW3	*3.00E-11*
11	SW2	*2.40E-11*
12	SW1	*1.90E-11*

Summary

MINIMUM ACCEPTABLE OCA ABOVE SEA LEVEL ***407 FEET***
TOTAL RISK FOR THIS APPROACH *9.3E-08*
RISK OF HITTING THE GROUND PLANE *9.3E-08*

SPEED CAT.	*TOTAL RISK*	*HIGHEST RISK OBSTACLE*	
		DESCRIPTION	*RISK*
A	*9.3E-08*	*GROUND PLANE*	*9.3E-08*

Aircraft category B

Risk order	Name	Risk
1	B3	*2.40E-10*
2	B1	*2.00E-10*
3	NW1	*1.90E-10*
4	B4	*1.80E-10*
5	B2	*1.70E-10*
6	NW2	*1.50E-10*

Risk order	Name	Risk
7	B5	*1.30E-10*
8	NW3	*1.20E-10*
9	CTWR	*8.80E-11*
10	SW3	*6.00E-11*
11	SW2	*4.80E-11*
12	SW1	*3.80E-11*

Summary

MINIMUM ACCEPTABLE OCA ABOVE SEA LEVEL ***415 FEET***
TOTAL RISK FOR THIS APPROACH *8.8E-08*
RISK OF HITTING THE GROUND PLANE *8.7E-08*

SPEED CAT.	*TOTAL RISK*	*HIGHEST RISK OBSTACLE*	
		DESCRIPTION	*RISK*
B	*8.8E-08*	*GROUND PLANE*	*8.7E-08*

Aircraft category C

Risk order	Name	Risk
1	B3	*4.00E-10*
2	B1	*3.40E-10*
3	NW1	*3.00E-10*
4	B2	*2.90E-10*
5	B4	*2.90E-10*
6	NW2	*2.50E-10*

Risk order	Name	Risk
7	CTWR	*2.50E-10*
8	B5	*2.20E-10*
9	NW3	*2.00E-10*
10	SW3	*1.00E-10*
11	SW2	*8.40E-11*
12	SW1	*6.80E-11*

Summary

MINIMUM ACCEPTABLE OCA ABOVE SEA LEVEL ***425 FEET***
TOTAL RISK FOR THIS APPROACH *8.1E-08*
RISK OF HITTING THE GROUND PLANE *8.0E-08*

SPEED CAT.	*TOTAL RISK*	*HIGHEST RISK OBSTACLE*	
		DESCRIPTION	*RISK*
C	*8.1E-08*	*GROUND PLANE*	*8.0E-08*

Aircraft category D

Risk order	Name	Risk
1	B3	*1.10E-09*
2	B1	*9.80E-10*
3	NW1	*9.00E-10*
4	B4	*8.50E-10*
5	B2	*8.40E-10*
6	NW2	*7.40E-10*

Risk order	Name	Risk
7	B5	*6.30E-10*
8	NW3	*6.10E-10*
9	CTWR	*5.90E-10*
10	SW3	*3.20E-10*
11	SW2	*2.60E-10*
12	SW1	*2.10E-10*

Summary

MINIMUM ACCEPTABLE OCA ABOVE SEA LEVEL ***433 FEET***
TOTAL RISK FOR THIS APPROACH *7.9E-08*
RISK OF HITTING THE GROUND PLANE *7.6E-08*

SPEED CAT.	*TOTAL RISK*	*HIGHEST RISK OBSTACLE*	
		DESCRIPTION	*RISK*
D	*7.9E-08*	*GROUND PLANE*	*7.6E-08*

4.5.2.1 Conclusions – CRM

The overall highest risk value for the 1937 terminal building is 1.1E-09 which is significantly less than the ICAO target level of safety of 1 x **10-7**.

The obstacle with highest risk in all aircraft categories is the "*GROUND PLANE*" which is the runway itself. This means that the 1937 terminal building does not represent a risk of collision more than that of an aircraft flying into the runway itself.

It is interesting to note that the control tower has a similar risk value as the 1937 terminal building.

When the ICAO CRM was run with all obstacles included the following results were obtained.

SPEED CAT.	***TYPE OF REPORT***	***OCA FEET***	***TOTAL RISK***	***HIGHEST RISK OBSTACLE***		
				IDENT	***DESCRIPTION***	***RISK***
A	*MINIMUM OCA*	***415***	*8.8E-08*		*9_GP_Aerial*	*3.7E-08*
B	*MINIMUM OCA*	***424***	*9.7E-08*		*9_GP_Aerial*	*5.1E-08*
C	*MINIMUM OCA*	***436***	*9.5E-08*		*9_GP_Aerial*	*5.8E-08*
C	*MINIMUM OCA*	***449***	*9.3E-08*		*9_GP_Aerial*	*6.7E-08*

The minimum descent values (OCA) obtained by the CRM are exactly the same as the current minimums which shows that the GP antenna was the critical obstacle that determined the current minimums.

This means that the removal or **not** of the 1937 terminal building will have **No** impact on the ILS approach to runway 08.

4.5.3 ILS Cat. II operations

Attention is drawn to a study (Jersey Airport ILS Cat. II Operations, Ref: CL-4937-RPT-001, Date: 18.01.2013) on the feasibility of Cat. II ILS operations that was prepared for Jersey Airport by Cyrrus Ltd.
This document was delivered to Jersey Airport and states the following results:

*“The radio altimeter operating area and **pre-threshold terrain** prevent aircraft making stabilised ILS approaches when the aircraft autopilot is coupled to the ILS. This effectively precludes consideration of Cat. II operations.*

No solution exists to solve this issue.”

These two statement preclude ILS Cat. II operations irrespective of the 1937 terminal building.

Even if these technical difficulties could in some way be overcome the 1937 terminal building would still not be a factor in determining the minimum descent altitudes. As shown previously the 1937 terminal building is not a factor in ILS Cat. I operations so consequently it would not be a factor in ILS Cat. II operations. This is because the ICAO ILS obstacle protection areas for Cat. II operations are intrinsically smaller than what is required for ILS Cat. I operations.

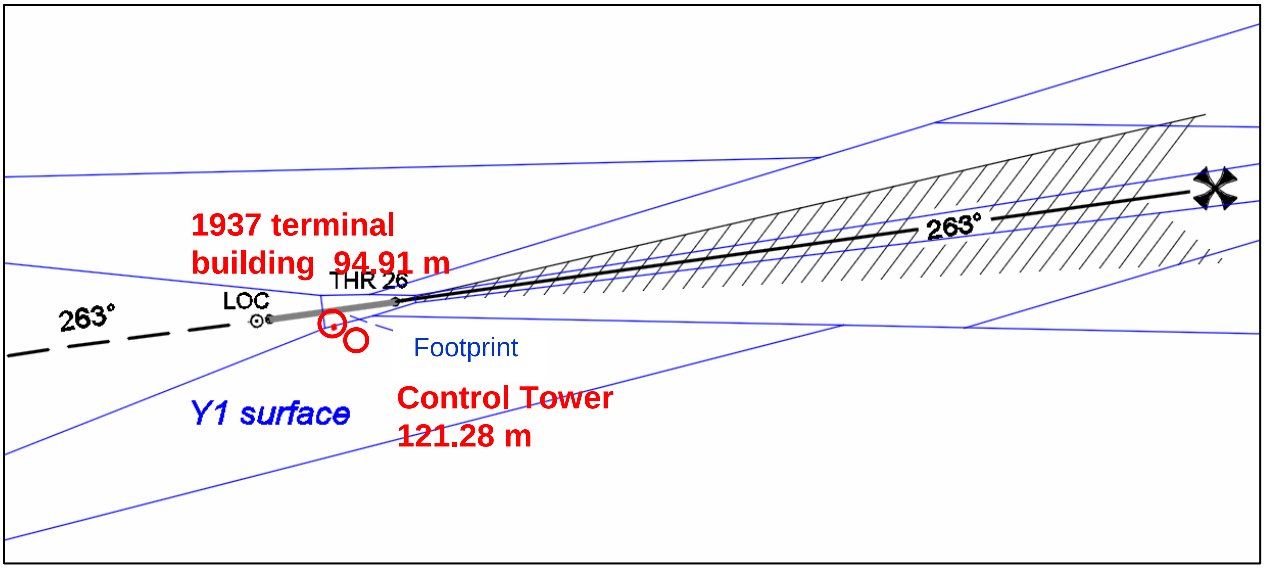
4.6 ILS/DME/VOR Runway 26

The control tower (CTWR) was also included in the precision approach assessment to show a comparison.

4.6.1 Obstacle Assessment Surfaces (OAS) assessment

The ILS CAT I Obstacle Assessment Surfaces were calculated and constructed using the following parameters:

Threshold Position				
ID	THR 26			
X	49°12'31.80"N			
Y	002°11'05.66"W			
Altitude	82.91 m (272 ft)			
Parameters				
In-bound Track	262.9 °(T)			
Preceding	2000 ft			
Preceding	150 m			
Additional Parameters / Constants				
Category	ILS CAT I			
Glide Path Angle	3.0 °			
MA Climb	2.5 %			
RDH at	52 ft			
LOC Course	210 m			
LOC to THR	2000 m			
OAS Contour	300 m			
Aircraft				
Category	A	B	C	D
Height Loss	40 m	43 m	46 m	49 m
Wing Semi Span	30 m	30 m	32.5 m	32.5 m
Wheel Height	6 m	6 m	7 m	7 m
Constants				
W	0.028500		-8.16	
X	0.025603	0.168800	-16.04	
Y	0.021902	0.192108	-20.44	
Z	-0.025000		-22.50	



As can be seen in the previous diagram the 1937 terminal building was situated inside the Obstacle Assessment Surfaces (OAS) in the Y1 surface and Footprint (FP) area. The Control tower was situated inside the Y1 surface.

Obstacle Assessment Surfaces (OAS) - Checked Obstacles – CAT A

ID	Alt.	Surf.	Surf. alt.	Diff.	MOCA Required (ft)	MOCA Published (ft)	Controlling
B5	94.9	Y1	87.5	7.4	442.7	434	Yes
B4	94.9	Y1	86.0	9.0	442.7		Yes
B3	94.9	Y1	84.6	10.3	442.7		Yes
B2	94.9	Y1	86.1	8.8	442.7		Yes
B1	94.9	Y1	85.1	9.9	442.7		Yes
SW3	93.0	Y1	87.1	5.9	436.5		Yes
SW2	93.0	Y1	88.2	4.9	436.5		Yes
SW1	93.0	Y1	89.2	3.8	436.5		Yes
NW3	93.0	Y1	83.8	9.2	436.5		Yes
NW2	93.0	FP	82.9	10.1	436.5		Yes
NW1	93.0	FP	82.9	10.1	436.5		Yes
CTWR	121.3	Y1	127.4	-6.1	N/A		No

Controlling Obstacle aircraft category A	
ID	B5
Latitude	49°12'21.76"N
Longitude	002°11'42.69"W
Altitude	94.91 m (311.38 ft)
Surface	Y1
Results	
OCH	171 ft
OCA	443 ft

Obstacle Assessment Surfaces (OAS) - Checked Obstacles – CAT B

ID	Alt.	Surf.	Surf. alt.	Diff.	MOCA Required (ft)	MOCA Published (ft)	Controlling
B5	94.9	Y1	87.5	7.4	452.5	442	Yes
B4	94.9	Y1	86.0	9.0	452.5		Yes
B3	94.9	Y1	84.6	10.3	452.5		Yes
B2	94.9	Y1	86.1	8.8	452.5		Yes
B1	94.9	Y1	85.1	9.9	452.5		Yes
SW3	93.0	Y1	87.1	5.9	446.4		Yes
SW2	93.0	Y1	88.2	4.9	446.4		Yes
SW1	93.0	Y1	89.2	3.8	446.4		Yes
NW3	93.0	Y1	83.8	9.2	446.4		Yes
NW2	93.0	FP	82.9	10.1	446.4		Yes
NW1	93.0	FP	82.9	10.1	446.4		Yes
CTWR	121.3	Y1	127.4	-6.1	N/A		No

Controlling Obstacle aircraft category B	
ID	B5
Latitude	49°12'21.76"N
Longitude	002°11'42.69"W
Altitude	94.91 m (311.38 ft)
Surface	Y1
Results	
OCH	181 ft
OCA	453 ft

Obstacle Assessment Surfaces (OAS) - Checked Obstacles – CAT C

ID	Alt.	Surf.	Surf. alt.	Diff.	MOCA Required (ft)	MOCA Published (ft)	Controlling
B5	94.9	Y1	85.9	9.0	462.4	450	Yes
B4	94.9	Y1	84.3	10.6	462.4		Yes
B3	94.9	Y1	83.0	12.0	462.4		Yes
B2	94.9	Y1	84.5	10.4	462.4		Yes
B1	94.9	Y1	83.4	11.5	462.4		Yes
SW3	93.0	Y1	85.5	7.5	456.2		Yes
SW2	93.0	Y1	86.5	6.5	456.2		Yes
SW1	93.0	Y1	87.6	5.5	456.2		Yes
NW3	93.0	FP	82.9	10.1	456.2		Yes
NW2	93.0	FP	82.9	10.1	456.2		Yes
NW1	93.0	FP	82.9	10.1	456.2		Yes
CTWR	121.3	Y1	125.8	-4.5	N/A		No

Controlling Obstacle aircraft category C	
ID	B5
Latitude	49°12'21.76"N
Longitude	002°11'42.69"W
Altitude	94.91 m (311.38 ft)
Surface	Y1
Results	
OCH	191 ft
OCA	463 ft

Obstacle Assessment Surfaces (OAS) - Checked Obstacles – CAT D

ID	Alt.	Surf.	Surf. alt.	Diff.	MOCA Required (ft)	MOCA Published (ft)	Controlling
B5	94.9	Y1	85.9	9.0	472.2	460	Yes
B4	94.9	Y1	84.3	10.6	472.2		Yes
B3	94.9	Y1	83.0	12.0	472.2		Yes
B2	94.9	Y1	84.5	10.4	472.2		Yes
B1	94.9	Y1	83.4	11.5	472.2		Yes
SW3	93.0	Y1	85.5	7.5	466.1		Yes
SW2	93.0	Y1	86.5	6.5	466.1		Yes
SW1	93.0	Y1	87.6	5.5	466.1		Yes
NW3	93.0	FP	82.9	10.1	466.1		Yes
NW2	93.0	FP	82.9	10.1	466.1		Yes
NW1	93.0	FP	82.9	10.1	466.1		Yes
CTWR	121.3	Y1	125.8	-4.5	N/A		No

Controlling Obstacle aircraft category D	
ID	B5
Latitude	49°12'21.76"N
Longitude	002°11'42.69"W
Altitude	94.91 m (311.38 ft)
Surface	Y1
Results	
OCH	201ft
OCA	473 ft

4.6.1.1 Conclusions – OAS

As can be seen in the previous assessment tables the corner of the 1937 terminal building would be the controlling obstacle for this approach.

However the minimums obtained are 10 ft higher than what is currently published in the AIP meaning that the 1937 terminal building must have been eliminated in the determination of the published minimums. So a more detailed assessment was done using the ICAO CRM statistical risk analysis program.

4.6.2 Collision risk model (CRM)

A full ICAO CRM risk analysis was done and the full computer output is available upon request. Following is a summary of the results and the items in *Italics* were taken directly from the ICAO CRM output.

Aircraft category A

Risk order	Name	Risk
1	B3	*1.10E-10*
2	B1	*9.90E-11*
3	NW1	*9.70E-11*
4	B4	*9.20E-11*
5	B2	*7.60E-11*
6	NW2	*7.50E-11*

Risk order	Name	Risk
7	B5	*6.30E-11*
8	NW3	*5.80E-11*
9	SW3	*2.60E-11*
10	SW2	*2.00E-11*
11	SW1	*1.50E-11*
12	CTWR	*2.30E-12*

Summary

MINIMUM ACCEPTABLE OCA ABOVE SEA LEVEL ***407 FEET***
TOTAL RISK FOR THIS APPROACH *9.3E-08*
RISK OF HITTING THE GROUND PLANE *9.3E-08*

SPEED CAT.	*TOTAL RISK*	*HIGHEST RISK OBSTACLE*	
		DESCRIPTION	*RISK*
A	*9.3E-08*	*GROUND PLANE*	*9.3E-08*

Aircraft category B

Risk order	Name	Risk
1	B3	*2.00E-10*
2	B1	*1.90E-10*
3	NW1	*1.80E-10*
4	B4	*1.70E-10*
5	NW2	*1.40E-10*
6	B2	*1.40E-10*

Risk order	Name	Risk
7	B5	*1.20E-10*
8	NW3	*1.10E-10*
9	SW3	*5.10E-11*
10	SW2	*4.00E-11*
11	SW1	*3.10E-11*
12	CTWR	*6.30E-12*

Summary

MINIMUM ACCEPTABLE OCA ABOVE SEA LEVEL ***415 FEET***
TOTAL RISK FOR THIS APPROACH *8.8E-08*
RISK OF HITTING THE GROUND PLANE *8.7E-08*

SPEED CAT.	*TOTAL RISK*	*HIGHEST RISK OBSTACLE*	
		DESCRIPTION	*RISK*
B	*8.8E-08*	*GROUND PLANE*	*8.7E-08*

Aircraft category C

Risk order	Name	Risk
1	B3	*3.40E-10*
2	B1	*3.10E-10*
3	B4	*2.90E-10*
4	NW1	*2.90E-10*
5	B2	*2.40E-10*
6	NW2	*2.30E-10*

Risk order	Name	Risk
7	B5	*2.10E-10*
8	NW3	*1.80E-10*
9	SW3	*8.60E-11*
10	SW2	*6.80E-11*
11	SW1	*5.40E-11*
12	CTWR	*2.90E-11*

Summary

MINIMUM ACCEPTABLE OCA ABOVE SEA LEVEL ***425 FEET***
TOTAL RISK FOR THIS APPROACH *8.1E-08*
RISK OF HITTING THE GROUND PLANE *8.0E-08*

SPEED CAT.	*TOTAL RISK*	*HIGHEST RISK OBSTACLE*	
		DESCRIPTION	*RISK*
C	*8.1E-08*	*GROUND PLANE*	*8.0E-08*

Aircraft category D

Risk order	Name	Risk
1	B3	*9.70E-10*
2	B1	*8.90E-10*
3	NW1	*8.80E-10*
4	B4	*8.50E-10*
5	NW2	*7.00E-10*
6	B2	*7.00E-10*

Risk order	Name	Risk
7	B5	*6.10E-10*
8	NW3	*5.50E-10*
9	SW3	*2.70E-10*
10	SW2	*2.10E-10*
11	SW1	*1.70E-10*
12	CTWR	*7.90E-11*

Summary

MINIMUM ACCEPTABLE OCA ABOVE SEA LEVEL	***433 FEET***
TOTAL RISK FOR THIS APPROACH	*7.8E-08*
RISK OF HITTING THE GROUND PLANE	*7.6E-08*

SPEED CAT.	*TOTAL RISK*	*HIGHEST RISK OBSTACLE*	
		DESCRIPTION	*RISK*
D	*7.8E-08*	*GROUND PLANE*	*7.6E-08*

4.6.2.1 Conclusions – CRM

The overall highest risk value for the 1937 terminal building is 9.7E-10 which is significantly less than the ICAO target level of safety of 1 x **10-7**.

The obstacle with highest risk in all aircraft categories is the "*GROUND PLANE*" which is the runway itself. This means that the 1937 terminal building does not represent a risk of collision that is more than that of an aircraft flying into the runway itself.

When the ICAO CRM was run with all obstacles included the following results were obtained.

SPEED CAT.	**TYPE OF REPORT**	**OCA FEET**	**TOTAL RISK**	**HIGHEST RISK OBSTACLE**		
				IDENT	**DESCRIPTION**	**RISK**
A	MINIMUM OCA	425	9.4E-08		Building	3.7E-08
B	MINIMUM OCA	434	8.9E-08		27_GP_Aerial	3.4E-08
C	MINIMUM OCA	446	8.7E-08		27_GP_Aerial	3.8E-08
D	MINIMUM OCA	458	8.7E-08		27_GP_Aerial	5.5E-08

The minimum descent values (OCA) obtained by the CRM are within a few feet of the current minimums.

However the current minimum descent values (OCA) are significantly higher than what they would be if the 1937 terminal building was a factor. This means that the 1937 terminal building is not the controlling obstacle for this approach

This means that the removal or **not** of the 1937 terminal building will have **No** impact on the ILS approach to runway 26.

4.6.1 ILS Cat. II operations

Attention is drawn to a study (Jersey Airport ILS Cat. II Operations, Ref: CL-4937-RPT-001, Date: 18.01.2013) on the feasibility of Cat. II ILS operations that was prepared for Jersey Airport by Cyrrus Ltd.
This document was delivered to Jersey Airport and states the following results:

"The limited distance between the ILS localiser and the runway threshold prevents compliance with CAP670 requirements and ICAO recommendations for Cat II operations.

There is no apparent safety argument on which to build a robust safety case for deviation from CAP requirements.

To ensure compliance, the distance between localiser 27 and the runway threshold would need to be increased by at least 200m.*"*

The previous statement in bold would mean that the New localiser position would have to be in a field outside the airport perimeter fence (see following picture). This fact seems to preclude ILS Cat. II operations.

Even if these technical difficulties could in some way be overcome the 1937 terminal building would still not be a factor in determining the minimum descent altitudes. As shown previously the 1937 terminal building is not a factor in ILS Cat. I operations so consequently it would not be a factor in ILS Cat. II operations.

4.7 LPV Runway 08

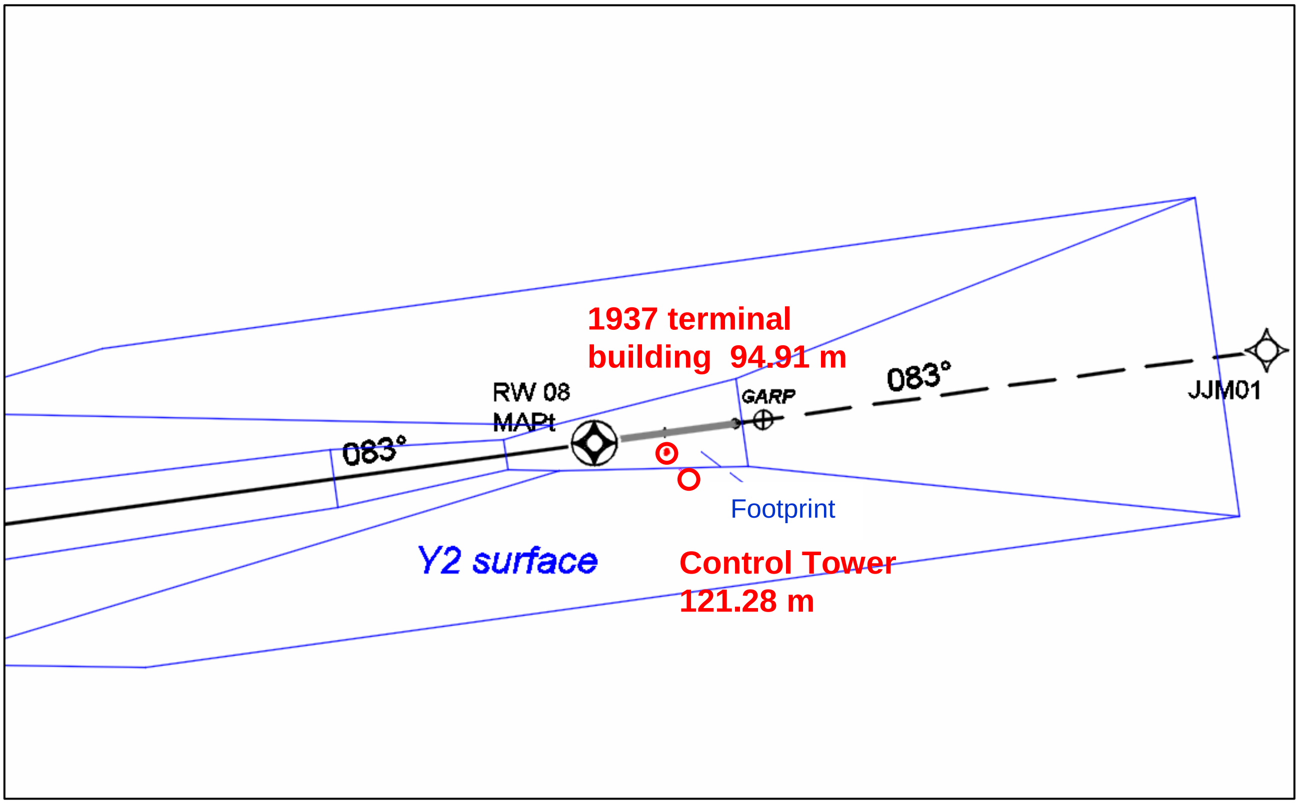
An RNAV approach with Localiser Performance and Vertical guidance (LPV) is a precision approach similar to an ILS approach. The ICAO obstacle protection areas and determination of the descent minima (OCA) is similar but not exactly the same as for an ILS approach.

4.7.1 Obstacle Assessment Surfaces (OAS) assessment

The LPV approach to this runway was calculated using the following parameters:

Threshold Position				
ID	THR 08			
Latitude	49°12'25.44"N			
Longitude	002°12'21.94"W			
Altitude	82.6 m (271 ft)			
Parameters				
In-bound Track	082.7 °(T)			
Preceding Segment Minimum (OCA)	2000 ft			
Preceding Segment MOC	150 m			
Additional Parameters / Constants				
Category	SBAS APV I			
Glide Path Angle	3.0 °			
MA Climb Gradient	2.5 %			
RDH at Threshold	52 ft			
LOC Course Width at THR	210 m			
GARP to LTP Distance	2000 m			
Aircraft				
Category	**A**	**B**	**C**	**D**
Height Loss	40 m	43 m	46 m	49 m
Wing Semi Span	30 m	30 m	32.5 m	32.5 m
Wheel Height	6 m	6 m	7 m	7 m
Constants				
W	0.028500		-7.16	
W'	0.039290		-38.12	
X	0.025603	0.168800	-52.62	
Y	0.021902	0.192108	-56.82	
Z	-0.025000		-40.63	

The control tower (CTWR) was also included in the precision approach assessment to show a comparison.



As can be seen in the previous diagram the 1937 terminal building was situated inside the Footprint (FP) and the Control Tower is inside the Y2 surface.

Obstacle Assessment Surfaces (OAS) - Checked Obstacles – CAT A

ID	**Alt.**	**Surf.**	**Surf. alt.**	**Diff.**	**MOCA required (ft)**	**MOCA published(ft)**	**Controlling**
CTWR	121.3	Y2	84.2	37.1	529.2	471	Yes
B5	94.9	FP	82.6	12.3	442.7		No
B4	94.9	FP	82.6	12.3	442.7		No
B3	94.9	FP	82.6	12.3	442.7		No
B2	94.9	FP	82.6	12.3	442.7		No
B1	94.9	FP	82.6	12.3	442.7		No
SW3	93.0	FP	82.6	10.4	436.5		No
SW2	93.0	FP	82.6	10.4	436.5		No
SW1	93.0	FP	82.6	10.4	436.5		No
NW3	93.0	FP	82.6	10.4	436.5		No
NW2	93.0	FP	82.6	10.4	436.5		No
NW1	93.0	FP	82.6	10.4	436.5		No

Controlling Obstacle aircraft category A	
ID	Control Tower (CTWR)
Altitude	121.28 m (397.9 ft)
Surface	Y2
Results	
OCH	259 ft
OCA	530 ft

Obstacle Assessment Surfaces (OAS) - Checked Obstacles – CAT B

ID	Alt.	Surf.	Surf. alt.	Diff.	MOCA required (ft)	MOCA published (ft)	Controlling
CTWR	121.3	Y2	84.2	37.1	539.0	471	Yes
B5	94.9	FP	82.6	12.3	452.5		No
B4	94.9	FP	82.6	12.3	452.5		No
B3	94.9	FP	82.6	12.3	452.5		No
B2	94.9	FP	82.6	12.3	452.5		No
B1	94.9	FP	82.6	12.3	452.5		No
SW3	93.0	FP	82.6	10.4	446.4		No
SW2	93.0	FP	82.6	10.4	446.4		No
SW1	93.0	FP	82.6	10.4	446.4		No
NW3	93.0	FP	82.6	10.4	446.4		No
NW2	93.0	FP	82.6	10.4	446.4		No
NW1	93.0	FP	82.6	10.4	446.4		No

Controlling Obstacle aircraft category B	
ID	Control Tower (CTWR)
Altitude	121.28 m (397.9 ft)
Surface	Y2
Results	
OCH	268 ft
OCA	539 ft

Obstacle Assessment Surfaces (OAS) - Checked Obstacles – CAT C

ID	Alt.	Surf.	Surf. alt.	Diff.	MOCA required (ft)	MOCA published (ft)	Controlling
CTWR	121.3	Y2	82.6	38.7	548.9	471	Yes
B5	94.9	FP	82.6	12.3	462.4		No
B4	94.9	FP	82.6	12.3	462.4		No
B3	94.9	FP	82.6	12.3	462.4		No
B2	94.9	FP	82.6	12.3	462.4		No
B1	94.9	FP	82.6	12.3	462.4		No
SW3	93.0	FP	82.6	10.4	456.2		No
SW2	93.0	FP	82.6	10.4	456.2		No
SW1	93.0	FP	82.6	10.4	456.2		No
NW3	93.0	FP	82.6	10.4	456.2		No
NW2	93.0	FP	82.6	10.4	456.2		No
NW1	93.0	FP	82.6	10.4	456.2		No

Controlling Obstacle aircraft category C	
ID	Control Tower (CTWR)
Altitude	121.28 m (397.9 ft)
Surface	Y2
Results	
OCH	278 ft
OCA	549 ft

Obstacle Assessment Surfaces (OAS) - Checked Obstacles – CAT D

ID	Alt.	Surf.	Surf. alt.	Diff.	MOCA required (ft)	MOCA published (ft)	Controlling
CTWR	121.3	Y2	82.6	38.7	558.7	471	Yes
B5	94.9	FP	82.6	12.3	472.2		Yes
B4	94.9	FP	82.6	12.3	472.2		Yes
B3	94.9	FP	82.6	12.3	472.2		Yes
B2	94.9	FP	82.6	12.3	472.2		Yes
B1	94.9	FP	82.6	12.3	472.2		Yes
SW3	93.0	FP	82.6	10.4	466.1		No
SW2	93.0	FP	82.6	10.4	466.1		No
SW1	93.0	FP	82.6	10.4	466.1		No
NW3	93.0	FP	82.6	10.4	466.1		No
NW2	93.0	FP	82.6	10.4	466.1		No
NW1	93.0	FP	82.6	10.4	466.1		No

Controlling Obstacle aircraft category D	
ID	Control Tower (CTWR)
Altitude	121.28 m (397.9 ft)
Surface	Y2
Results	
OCH	288 ft
OCA	559 ft

4.7.1.1 Conclusions – OAS

As can be seen in the previous assessment tables the 1937 terminal building is only a factor for category D aircraft on the approach.

In all cases the control tower was the most critical obstacle for this approach.

This means that the removal or **not** of the 1937 terminal building will have **No** impact on the LPV approach to runway 08 if the OAS method of determining the minimum OCA is used.

The minimums obtained were significantly higher than what is currently published in the AIP and so a more detailed assessment was done using the ICAO CRM statistical risk analysis program.

4.7.1 Collision risk model (CRM)

A full ICAO CRM risk analysis was done and the full computer output is available upon request. However as the parameters in this approach are the same as for the ILS assessment (see 4.5.2 Collision risk model (CRM) assessment) the results are exactly the same so they are not duplicated here.

The final CRM determined OCA values were raised to a height above the threshold of 200 ft because of the following.

PANS-OPS, Vol. II, Part III – Section 3, Chapter 5, Paragraph 5.4.5.9.1 states:

"*The OCA/H is determined by accounting for all obstacles which penetrate the SBAS OAS surfaces applicable to the operation performance level being considered. The surfaces which apply to each operation type are:*

Type A, 3D operation: SBAS APV I OAS.
Type B, 3D operation: SBAS CAT I OAS."

Annex 6 — Operation of Aircraft Part I states:

"*4.2.8.3 Instrument approach operations shall be classified based on the designed lowest operating minima below which an approach operation shall only be continued with the required visual reference as follows:*

a) Type A: a minimum descent height or decision height at or above 75 m (250 ft); and

b) Type B: a decision height below 75 m (250 ft). Type B instrument approach operations are categorized as:

1) Category I (CAT I): a decision height not lower than 60 m (200 ft) and with either a visibility not less than 800 m or a runway visual range not less than 550 m;"

The previous statements mean that this LPV approach is classified as a Type B approach which requires a decision height not lower than 60 m (200 ft) which is the current minimum.

This means that the removal or **not** of the 1937 terminal building will have **No** impact on the LPV approach to runway 08.

4.1 LPV Runway 26

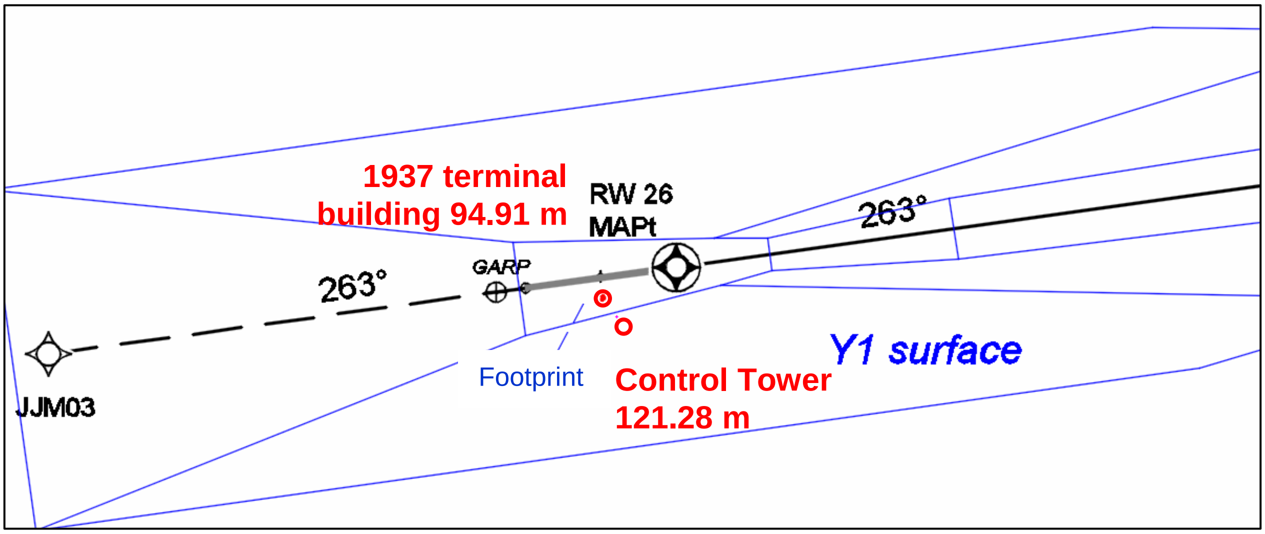
An RNAV approach with Localiser Performance and Vertical guidance (LPV) is a precision approach similar to an ILS approach. The ICAO obstacle protection areas and determination of the descent minima (OCA) is similar but not exactly the same as for an ILS approach.

4.1.1 Obstacle Assessment Surfaces (OAS) assessment

The LPV approach to this runway was calculated using the following parameters:

Threshold Position				
ID	THR 26			
Latitude	49°12'31.80"N			
Longitude	002°11'05.66"W			
Altitude	82.91 m (272 ft)			
Parameters				
In-bound Track	262.77 °(T)			
Preceding Segment Minimum (OCA)	2000 ft			
Preceding Segment MOC	150 m			
Additional Parameters / Constants				
Category	SBAS APV I			
Glide Path Angle	3.0 °			
MA Climb Gradient	2.5 %			
RDH at Threshold	52 ft			
LOC Course Width at THR	210 m			
GARP to LTP Distance	2000 m			
Aircraft				
Category	**A**	**B**	**C**	**D**
Height Loss	40 m	43 m	46 m	49 m
Wing Semi Span	30 m	30 m	32.5 m	32.5 m
Wheel Height	6 m	6 m	7 m	7 m
Constants				
W	0.028500		-7.16	
W'	0.039290		-38.12	
X	0.025603	0.168800	-52.62	
Y	0.021902	0.192108	-56.82	
Z	-0.025000		-40.63	

The control tower (CTWR) was also included in the precision approach assessment to show a comparison.



As can be seen in the previous diagram the 1937 terminal building was situated inside the Footprint (FP) and the Control Tower is inside the Y1 surface.

Obstacle Assessment Surfaces (OAS) - Checked Obstacles – CAT A

ID	Alt.	Surf.	Surf. alt.	Diff.	MOCA required (ft)	MOCA published (ft)	Controlling
CTWR	121.3	Y1	89.2	32.1	529.2	472	Yes
B5	94.9	FP	82.9	12.0	442.7		No
B4	94.9	FP	82.9	12.0	442.7		No
B3	94.9	FP	82.9	12.0	442.7		No
B2	94.9	FP	82.9	12.0	442.7		No
B1	94.9	FP	82.9	12.0	442.7		No
SW3	93.0	FP	82.9	10.1	436.5		No
SW2	93.0	FP	82.9	10.1	436.5		No
SW1	93.0	FP	82.9	10.1	436.5		No
NW3	93.0	FP	82.9	10.1	436.5		No
NW2	93.0	FP	82.9	10.1	436.5		No
NW1	93.0	FP	82.9	10.1	436.5		No

Controlling Obstacle aircraft category A	
ID	Control Tower (CTWR)
Altitude	121.28 m (397.9 ft)
Surface	Y1
Results	
OCH	259 ft
OCA	530 ft

Obstacle Assessment Surfaces (OAS) - Checked Obstacles – CAT B

ID	Alt.	Surf.	Surf. alt.	Diff.	MOCA required (ft)	MOCA published (ft)	Controlling
CTWR	121.3	Y1	89.2	32.1	539.0	472	Yes
B5	94.9	FP	82.9	12.0	452.5		No
B4	94.9	FP	82.9	12.0	452.5		No
B3	94.9	FP	82.9	12.0	452.5		No
B2	94.9	FP	82.9	12.0	452.5		No
B1	94.9	FP	82.9	12.0	452.5		No
SW3	93.0	FP	82.9	10.1	446.4		No
SW2	93.0	FP	82.9	10.1	446.4		No
SW1	93.0	FP	82.9	10.1	446.4		No
NW3	93.0	FP	82.9	10.1	446.4		No
NW2	93.0	FP	82.9	10.1	446.4		No
NW1	93.0	FP	82.9	10.1	446.4		No

Controlling Obstacle aircraft category B	
ID	Control Tower (CTWR)
Altitude	121.28 m (397.9 ft)
Surface	Y1
Results	
OCH	268 ft
OCA	539 ft

Obstacle Assessment Surfaces (OAS) - Checked Obstacles – CAT C

ID	Alt.	Surf.	Surf. alt.	Diff.	MOCA required (ft)	MOCA published (ft)	Controlling
CTWR	121.3	Y1	87.5	33.7	548.9	472	Yes
B5	94.9	FP	82.9	12.0	462.4		No
B4	94.9	FP	82.9	12.0	462.4		No
B3	94.9	FP	82.9	12.0	462.4		No
B2	94.9	FP	82.9	12.0	462.4		No
B1	94.9	FP	82.9	12.0	462.4		No
SW3	93.0	FP	82.9	10.1	456.2		No
SW2	93.0	FP	82.9	10.1	456.2		No
SW1	93.0	FP	82.9	10.1	456.2		No
NW3	93.0	FP	82.9	10.1	456.2		No
NW2	93.0	FP	82.9	10.1	456.2		No
NW1	93.0	FP	82.9	10.1	456.2		No

Controlling Obstacle aircraft category C	
ID	Control Tower (CTWR)
Altitude	121.28 m (397.9 ft)
Surface	Y1
Results	
OCH	278 ft
OCA	549 ft

Obstacle Assessment Surfaces (OAS) - Checked Obstacles – CAT D

ID	Alt.	Surf.	Surf. alt.	Diff.	MOCA required (ft)	MOCA published (ft)	Controlling
CTWR	121.3	Y1	87.5	33.7	558.7	472	Yes
B5	94.9	FP	82.9	12.0	472.2		Yes
B4	94.9	FP	82.9	12.0	472.2		Yes
B3	94.9	FP	82.9	12.0	472.2		Yes
B2	94.9	FP	82.9	12.0	472.2		Yes
B1	94.9	FP	82.9	12.0	472.2		Yes
SW3	93.0	FP	82.9	10.1	466.1		No
SW2	93.0	FP	82.9	10.1	466.1		No
SW1	93.0	FP	82.9	10.1	466.1		No
NW3	93.0	FP	82.9	10.1	466.1		No
NW2	93.0	FP	82.9	10.1	466.1		No
NW1	93.0	FP	82.9	10.1	466.1		No

Controlling Obstacle aircraft category D	
ID	Control Tower (CTWR)
Altitude	121.28 m (397.9 ft)
Surface	Y1
Results	
OCH	288 ft
OCA	559 ft

4.1.1.1 Conclusions – OAS

As can be seen in the previous assessment tables the 1937 terminal building is only a factor for category D aircraft on the approach.

In all cases the control tower was the most critical obstacle for this approach.

This means that the removal or **not** of the 1937 terminal building will have **No** impact on the LPV approach to runway 08 if the OAS method of determining the minimum OCA is used.

The minimums obtained were significantly higher than what is currently published in the AIP and so a more detailed assessment was done using the ICAO CRM statistical risk analysis program.

4.1.2 Collision risk model (CRM)

A full ICAO CRM risk analysis was done and the full computer output is available upon request. However as the parameters in this approach are the same as for the ILS assessment (see 4.6.2 Collision risk model (CRM)) the results are exactly the same so they are not duplicated here.

The final CRM determined OCA values were raised to a height above the threshold of 200 ft because of the following.

PANS-OPS, Vol. II, Part III – Section 3, Chapter 5, Paragraph 5.4.5.9.1 states:

"*The OCA/H is determined by accounting for all obstacles which penetrate the SBAS OAS surfaces applicable to the operation performance level being considered. The surfaces which apply to each operation type are:*

Type A, 3D operation: SBAS APV I OAS.
Type B, 3D operation: SBAS CAT I OAS."

Annex 6 — Operation of Aircraft Part I states:

"*4.2.8.3 Instrument approach operations shall be classified based on the designed lowest operating minima below which an approach operation shall only be continued with the required visual reference as follows:*

a) Type A: a minimum descent height or decision height at or above 75 m (250 ft); and

b) Type B: a decision height below 75 m (250 ft). Type B instrument approach operations are categorized as:

1) Category I (CAT I): a decision height not lower than 60 m (200 ft) and with either a visibility not less than 800 m or a runway visual range not less than 550 m;"

The previous statements mean that this LPV approach is classified as a Type B approach which requires a decision height not lower than 60 m (200 ft) which is the current minimum.

This means that the removal or **not** of the 1937 terminal building will have **No** impact on the LPV approach to runway 08.

4.2 Overall summary of procedure results

As has been shown in this section that the 1937 terminal building does not detrimentally affect the instrument flight procedures in use at the moment and future flight operations at Jersey airport.

Interviewed in the Jersey Evening Post, the Airport Director stated that she "*wants to move Jersey to Category Two*" and removal of the 1937 terminal building is required for this to occur. However as has been shown in this section (see 4.5.3 and 4.6.1) ILS category two operations are physically impossible and removing the 1937 terminal building will not change this fact.

The Airport Director also said: "*These improved visual cues (lighting) will mean that aircraft can come **lower** before the flight crew have to make a **decision** on whether they land or not in low visibility*".

There seems to be a misunderstanding here. An aircraft cannot proceed below the published "Decision height" without being already able to see the runway and be assured of a landing. Lighting may enable better recognition of the runway but the decision to land must have been made already prior to descending below the decision height.

A statement has been made that retaining the 1937 terminal would require "*raising the Decision Height for landing in inclement weather".*

The **published** "Decision height" is irrespective of the weather. The "Decision Height" ensures that aircraft in Instrument Metrological Conditions (IMC) have the ICAO specified minimum obstacle clearance above all obstacles or terrain and are safe from collision.

Raising the "Decision Height" would simply be putting safety buffers on top of safety buffers for no reason. This is especially relevant when this report has shown that the 1937 terminal building is less of a risk to flight operations that the existing control tower.

5 Taxiway A assessment

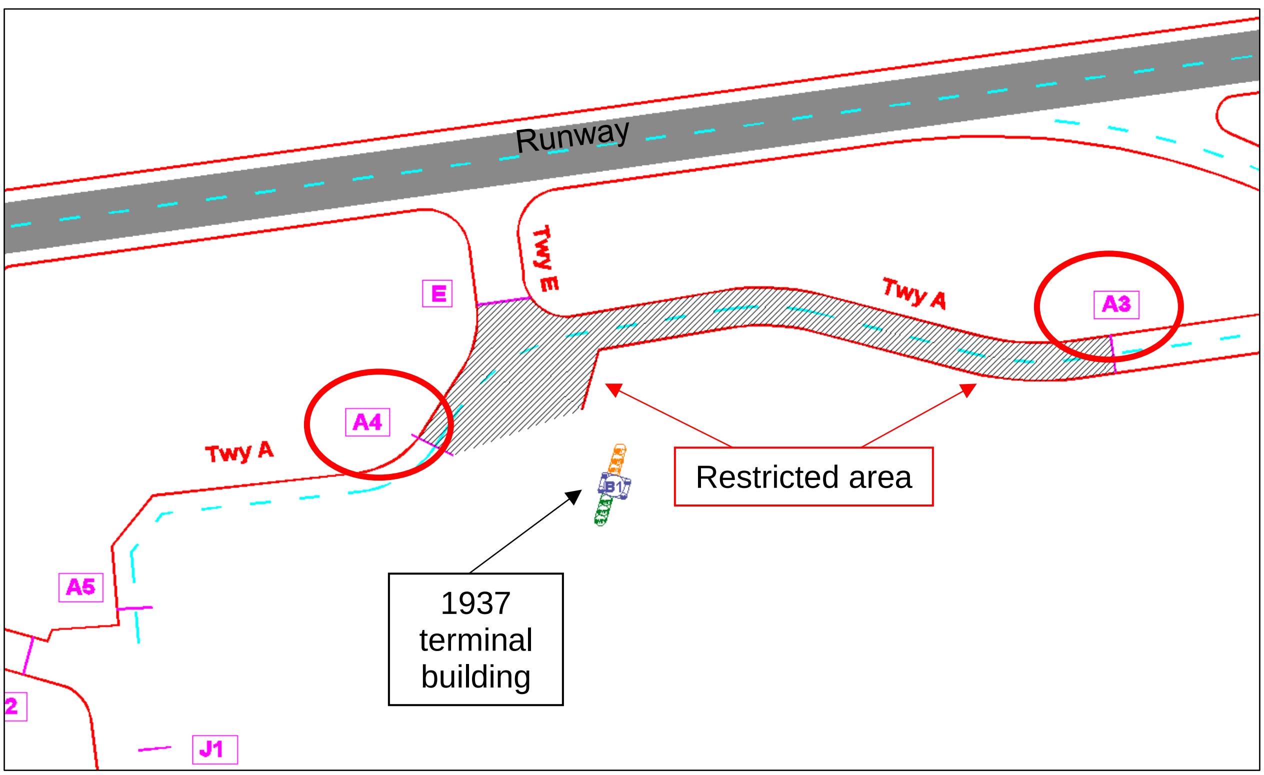
For a long period Jersey has had in place restrictions on taxying operations on Taxiway alpha as can be seen in the Jersey airport “Air Traffic Services MANUAL OF AIR TRAFFIC SERVICES PART II - 2010” which states:

“*vi. During all LVP (Low Visibility Procedures) conditions the portion of the ALPHA taxiway between **ALPHA 3** and **ALPHA 4** must be safeguarded from the runway.*

vii. During all LVP conditions no aircraft or vehicle must be permitted to pass between ALPHA 3 and ALPHA 4 if an aircraft is at or inside 4 miles on approach.

viii. During all LVP conditions no aircraft or vehicle must be permitted to pass between ALPHA 3 and ALPHA 4 if an aircraft has been cleared for take off.”

See following diagram



5.1 Straightening of taxiway A

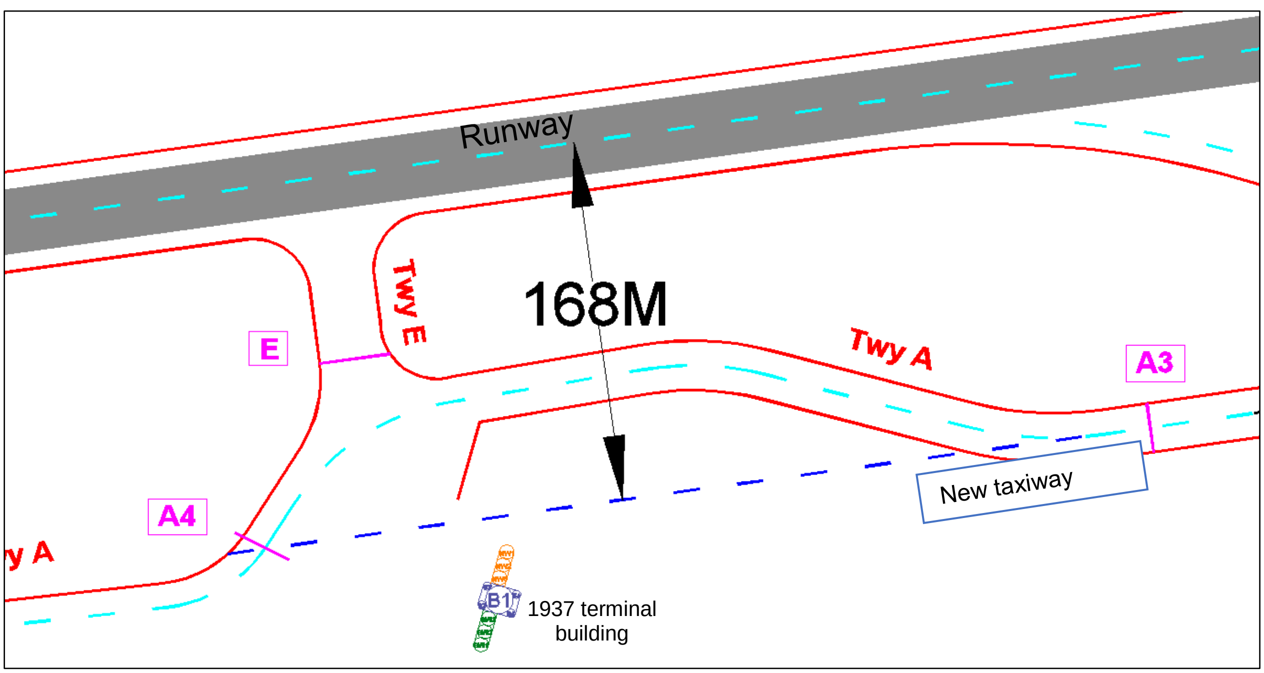
5.1.1 ICAO and UK CAP 168 requirements

To remove the restriction on operation of taxiway A during LVP periods, taxiway A will need to conform to UK CAP 168 Licensing of Aerodromes Chapter 3: Aerodrome physical characteristics – Taxiways. This document states the following:

3.102 The minimum distance between a taxiway and other aerodrome features should be as listed in table 3.4 if operational restrictions are to be avoided.

Table 3.4 Taxiway minimum separation distances (metres)

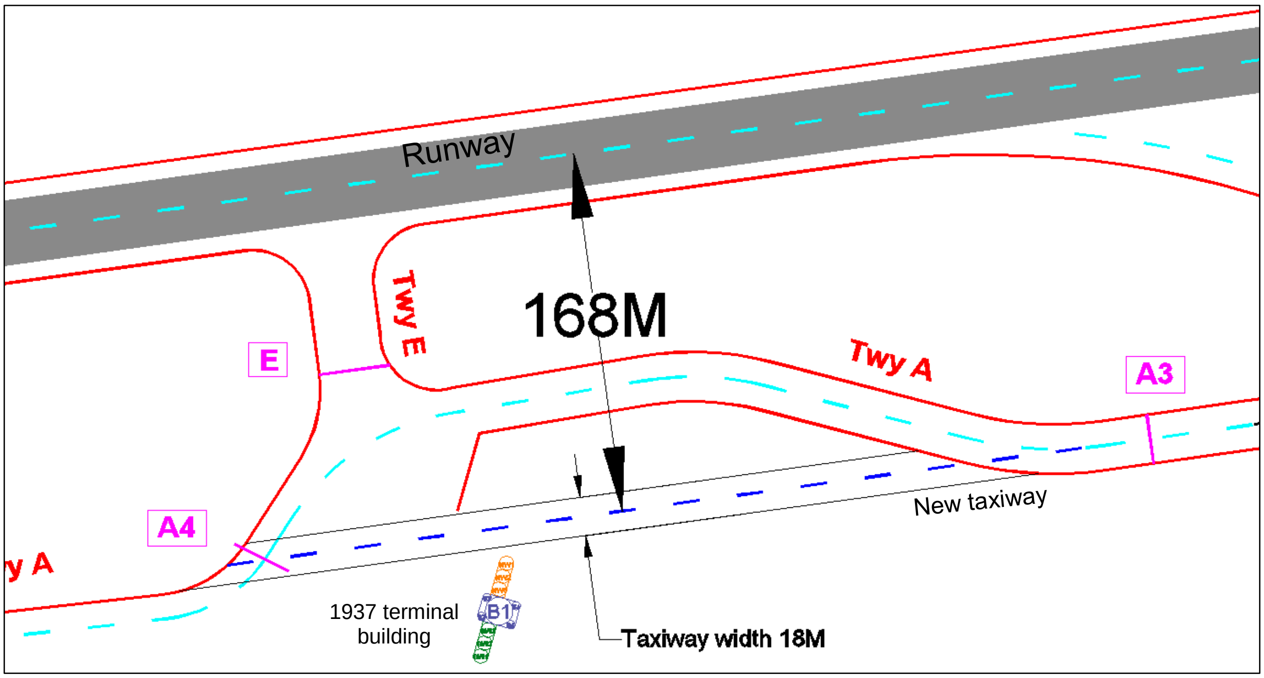
Code letter	Distance between taxiway centreline and runway centreline							
	Instrument runway code number				Non-instrument runway code number			
	1	2	3	4	1	2	3	4
A	82.5	82.5			37.5	47.5		
B	87	87			42	52		
C			168				93	
D			176	176			101	101
E				182.5				107.5
F				190				115



UK CAP 168 Licensing of Aerodromes Chapter 3: Aerodrome physical characteristics – Taxiways states:

3.88 A straight portion of a taxiway should have a width of not less than:

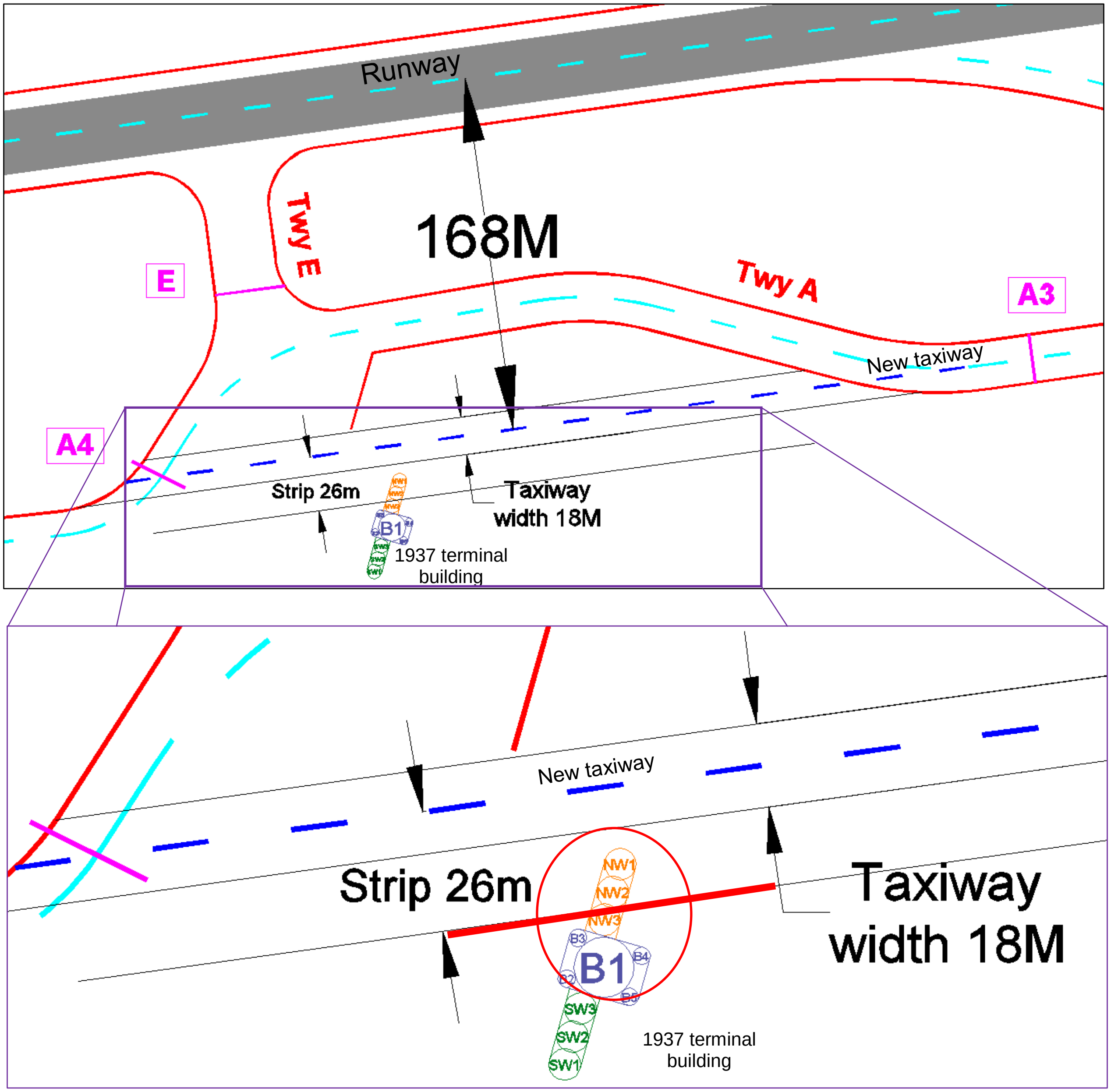
*4. **18 m** where the code letter is C and the taxiway is intended to be used by aeroplanes with a wheelbase of 18 m or greater;*



And

*3.93 A taxiway should be enclosed by a **strip** providing an area clear of objects which may endanger taxying aeroplanes and to reduce the risk of damage to an aircraft running off the taxiway. The strip should extend on each side of the taxiway centreline throughout the length of the taxiway for a distance of:*

*4. **26 m** where the code letter is C;*

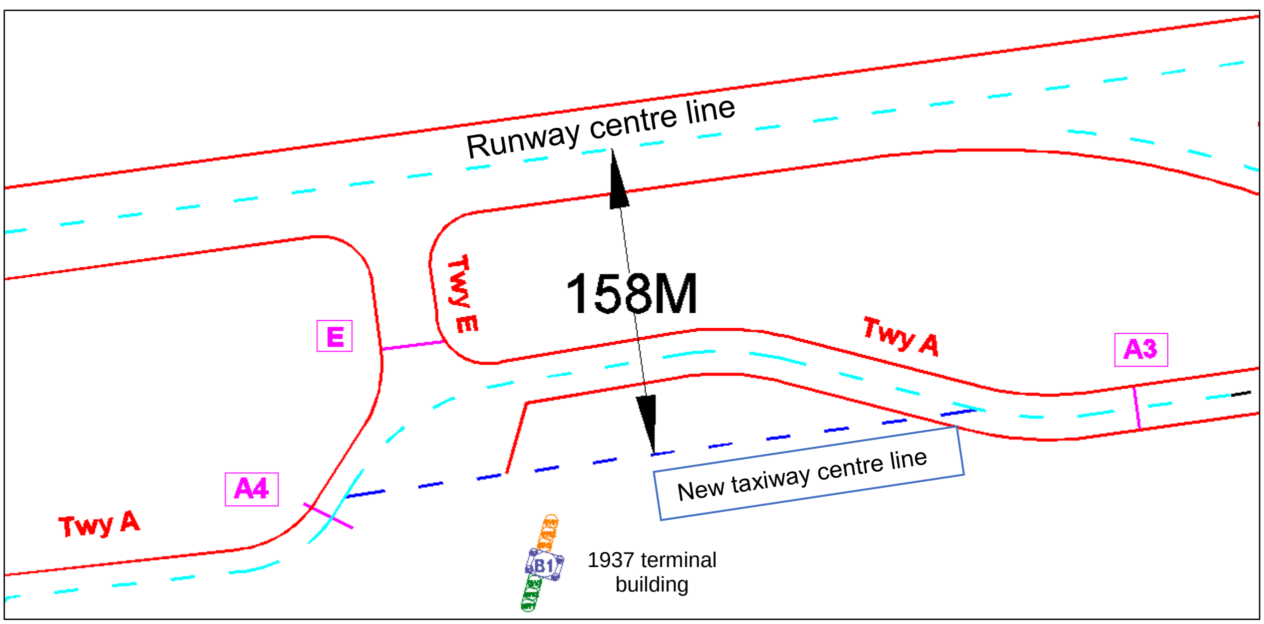

Runway
168M
Twy E
E
Twy A
A3
New taxiway
A4
Strip 26m
Taxiway
width 18M
B1
1937 terminal
building
New taxiway
Strip 26m
NW1
NW2
NW3
B3
B1
B4
B2
B5
SW3
SW2
SW1
Taxiway
width 18M
1937 terminal
building

5.1.2 EASA requirements

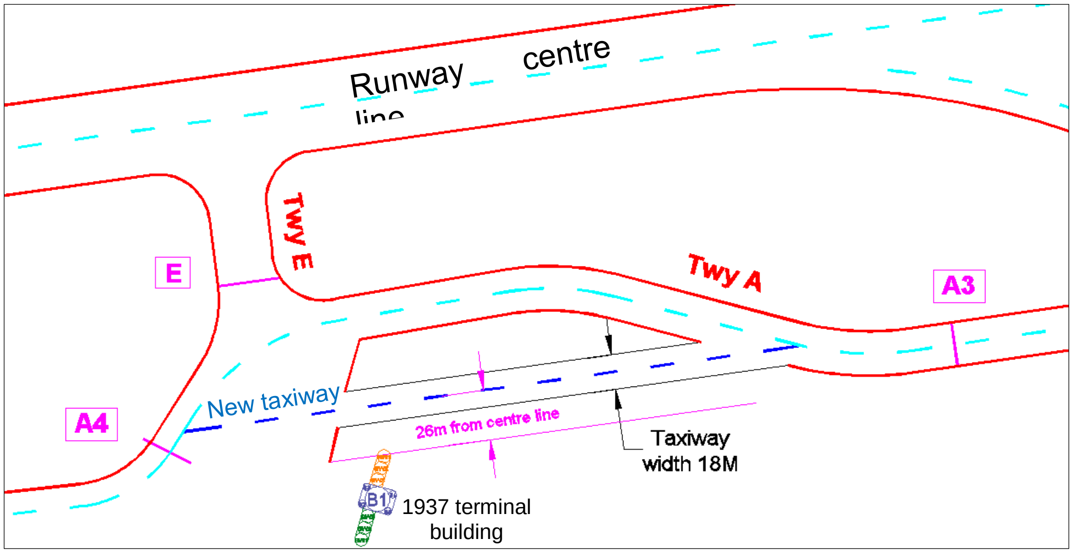
When EASA regulations are taken into account the following table is applicable

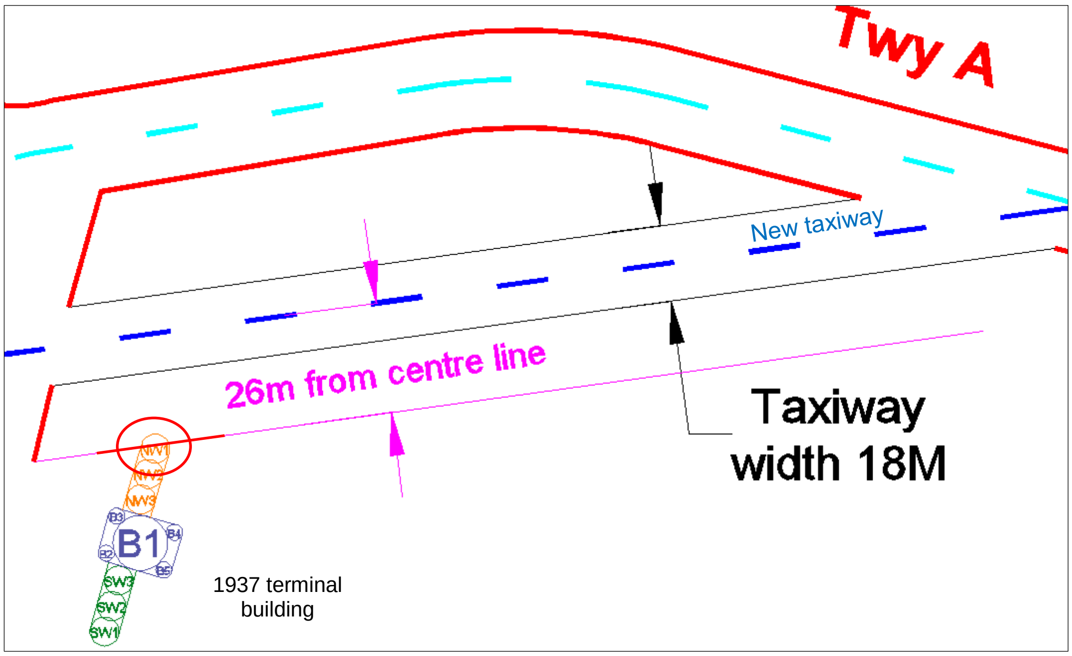
Table D-1 Taxiway minimum separation distances

Code letter	Distance between taxiway centreline and runway centreline *(metres)*								Taxiway, other than aircraft stand taxilane centre line to object (meters)
	Instrument runway code number				Non-instrument runway code number				
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**	
A	77.5	77.5	-	-	37.5	47.5	-	-	15.5
B	82	82	152	-	42	52	87	-	20
C	88	88	158	158	48	58	93	93	26
D	-	-	166	166	-	-	101	101	37
E	-	-	172.5	172.5	-	-	107.5	107.5	43.5
F	-	-	180	180	-	-	115	115	51



As is shown in the last column of *Table D-1* the taxiway centre line is to be 26m away from the Old terminal building. This can be seen in the following diagram.





5.2 Taxiway conclusion

As can be seen in the previous sections the Northern most Wing (NW1-3) of the Old Terminal building partly infringes the taxiway strip while the core of the Old Terminal building (B1-5) does not.

6 End of document