ATTACHMENT 5 HELICOPTER PERFORMANCE AND OPERATING LIMITATIONS

This attachment was established in accordance with Article 84, 233 of this AOR proper, and the ICAO Annex 6, Part III, Attachment A.

1. Definitions

Category A. With respect to helicopters, means a multi-engined helicopter designed with the international airworthiness standards approved and adopted by CAA, and capable of operations using take-off and landing data scheduled under a critical engine failure concept which assures adequate designated surface area and adequate performance capability for continued safe flight or safe rejected take-off.

Category B. With respect to helicopters, means a single engine or multi-engined helicopter which does not meet Category A standards. Category B helicopters have no guaranteed capability to continue safe flight in the event of an engine failure, and a forced landing is assumed.

2. General

2.1 Helicopters operating in performance Classes 1 and 2 should be certificated in Category A.

2.2 Helicopters operating in performance Class 3 should be certificated in either Category A or Category B (or equivalent).

2.3 Except as permitted by the appropriate authority:

2.3.1 Take-off or landing from/to heliports in a congested hostile environment should only be conducted in performance Class 1.

2.3.2 Operations in performance Class 2 should only be conducted with a safe forced landing capability during take-off and landing.

2.3.3 Operations in performance Class 3 should only be conducted in a non-hostile environment.

2.4 In order to permit variations from 2.3.1, 2.3.2 and 2.3.3, the Authority should undertake a risk assessment, considering factors such as:

2.4.1 the type of operation and the circumstances of the flight;

2.4.2 the area/terrain over which the flight is being conducted;

2.4.3 the probability of a critical power-unit failure and the consequence of such an event;

2.4.4 the procedures to maintain the reliability of the power-unit(s);

2.4.5 the training and operational procedures to mitigate the consequences of the critical power-unit failure.

2.4.6 installation and utilization of a usage monitoring system.

Note 1.— It is recognized that there may be instances in which a safe forced landing may not be possible due to environmental or other factors. Many States have already applied risk management and permitted variations to specific operations such as operations to helidecks where exposure to an engine failure is present without a safe forced landing. Permitting variations based on risk assessment is a normal part of the process of a State developing a code of performance. When operations without suitable areas for safe forced landings are being considered, all relevant factors should be evaluated. These may include the likelihood of the event, the possible consequences, any

mitigating measures as well as the potential benefits and costs of the operation. The specific process for conducting this evaluation is to be decided by the State. In any case, appropriate consideration of a safe forced landing should be either implicit or explicit to a performance code's construction. Accident history and other relevant safety data and analysis are crucial to the development of operational regulations in this area. The resulting requirements may take many forms, such as designation of approved operational areas, routes of flight and obstacle clearance requirements.

Note 2.— If there are routes with access to suitable forced landing areas, these should be used for flights into and out of the congested area. Where no such routes exist, evaluation of the operation could include consideration of mitigating factors such as the reliability of the propulsion system in the short periods when flight over a suitable forced landing area is not possible.

Example

Purpose and Scope

The following example provides *quantitative specifications* to illustrate a level of performance intended by the provisions of Section II, Chapter 3. A State may use this example as a basis for establishing its code of performance, but may introduce variations provided such variations meet the safety objectives of Section II, Chapter 3 and Attachment A.

Abbreviations Specific to Helicopter Operations

Abbreviations

D Maximum dimension of helicopter
DPBL Defined point before landing
DPATO Defined point after take-off
DR Distance travelled (helicopter)
FATO Final approach and take-off area
HFM Helicopter flight manual
LDP Landing decision point
LDAH Landing distance available (helicopter)
LDRH Landing distance required (helicopter)
R Rotor radius of helicopter
RTODR Rejected take-off distance required (helicopter)
TDP Take-off decision point
TLOF Touchdown and lift-off area
TODAH Take-off distance available (helicopter)
TODRH Take-off distance required (helicopter)
VTOSS Take-off safety speed

1. Definitions

1.1 Only applicable to operations in performance Class 1

Landing distance required (LDRH). The horizontal distance required to land and come to a full stop from a point 15 m (50 ft) above the landing surface.

Rejected take-off distance required (RTODR). The horizontal distance required from the start of the take-off to the point where the helicopter comes to a full stop following a power-unit failure and rejection of the take-off at the take-off decision point.

Take-off distance required (TODRH). The horizontal distance required from the start of the take-off to the point at which VTOSS, a selected height and a positive climb gradient are achieved, following failure of the critical power-unit being recognized at TDP, the remaining power-units operating within approved operating limits.

Note.— The selected height stated above is to be determined with reference to either:

1. the take-off surface.

2. a level defined by the highest obstacle in the take-off distance required.

1.2 Applicable to operations in all performance classes

D. The maximum dimension of the helicopter.

Distance DR. DR is the horizontal distance that the helicopter has travelled from the end of the take-off distance available.

Landing distance available (LDAH). The length of the final approach and take-off area plus any additional area declared available and suitable for helicopters to complete the landing manoeuvre from a defined height.

R. The rotor radius of the helicopter.

Take-off distance available (TODAH). The length of the final approach and take-off area plus the length of helicopter clearway (if provided) declared available and suitable for helicopters to complete the take-off.

Take-off flight path. The vertical and horizontal path, with the critical power-unit inoperative, from a specified point in the take-off to 300 m (1 000 ft) above the surface.

Touchdown and lift-off area (TLOF). A load bearing area on which a helicopter may touch down or lift off.

VTOSS. Take-off safety speed for helicopters certificated in Category A.

Vy **.** Best rate of climb speed.

2. General

2.1 Applicability

2.1.1 Helicopters with a passenger seating configuration of more than 19, or helicopters operating to or from a heliport in a congested hostile environment should be operating in performance Class 1.

2.1.2 Helicopters with a passenger seating configuration of 19 or less but more than 9 should be operating in performance Class 1 or 2, unless operating to or from a congested hostile environment in which case the helicopters should be operating in performance Class 1.

2.1.3 Helicopters with a passenger seating configuration of 9 or less should be operating in performance Class 1, 2 or 3, unless operating to or from a congested hostile environment in which case the helicopters should be operating in performance Class 1.

2.2 Significant performance factors

To determine the performance of the helicopter, account should be taken of at least the following factors:

2.2.1 mass of the helicopter.

2.2.2 elevation or pressure-altitude and temperature.

2.2.3 wind; for take-off and landing, accountability for wind should be no more than 50 per cent of any reported steady headwind component of 5 knots or more. Where take-off and landing with a tailwind component is permitted in the flight manual, not less than 150 per cent of any reported tailwind component should be allowed. Where precise wind measuring equipment enables accurate measurement of wind velocity over the point of take-off and landing, these values may be varied.

2.3 Operating conditions

2.3.1 For helicopters operating in performance Class 2 or 3 in any flight phase where a power-unit failure may cause the helicopter to force-land:

2.3.1.1 a minimum visibility should be defined by the operator, taking into account the characteristics of the helicopter, but should not be less than 800 m for helicopters operating in performance Class 3.

2.3.1.2 the operator should verify that the surface below the intended flight path permits the pilot to execute a safe forced landing.

2.3.2 Performance Class 3 operations are not to be performed:

2.3.2.1 out of the sight of the surface.

2.3.2.2 at night.

2.3.2.3 when the cloud ceiling is less than 180 m (600 ft).

Note.— The text of 2.3 contains an interpretation of the principle of "appropriate consideration" *for a safe forced landing (contained in Section II, Chapter 3, 3.1.2). For States which take advantage of Section II, Chapter 3, 3.4, or which have risk assessed exposure and/or permitted night VFR operations, 2.3 should be replaced with an appropriately constructed alternative text.*

2.4 Obstacle accountability area

2.4.1 For the purpose of the obstacle clearance requirements in 4 below, an obstacle should be considered if its lateral distance from the nearest point on the surface below the intended flight path is not further than:

2.4.1.1 for VFR operations:

a) half of the minimum width of the FATO (or the equivalent term used in the helicopter flight manual) defined in the helicopter flight manual (or when no width is defined, 0.75 D), plus 0.25 times D (or 3 m, whichever is greater), plus:

1) 0.10 DR for VFR day operations

2) 0.15 DR for VFR night operations

2.4.1.2 for IFR operations:

a) 1.5 D (or 30 m, whichever is greater), plus:

1) 0.10 DR for IFR operations with accurate course guidance

2) 0.15 DR for IFR operations with standard course guidance

3) 0.30 DR for IFR operations without course guidance

2.4.1.3 for operations with initial take-off conducted visually and converted to IFR/IMC at a transition point, the criteria required in 2.4.1 a) apply up to the transition point then the criteria required in 2.4.1 b) apply after the transition point.

2.4.2 For a take-off using a backup take-off procedure (or with lateral transition), for the purpose of the obstacle clearance requirements in 4 below, an obstacle located below the backup flight path (lateral flight path) should be considered if its lateral distance from the nearest point on the surface below the intended flight path is not further than half of the minimum width of the FATO (or the equivalent term used in the helicopter flight manual) defined in the helicopter flight manual (when no width is defined, 0.75 D plus 0.25 times D, or 3 m, whichever is greater) plus:

2.4.2.1 0.10 distance travelled from the back edge of the FATO for VFR day operations.

2.4.2.2 0.15 distance travelled from the back edge of the FATO for VFR night operations.

2.4.3 Obstacles may be disregarded if they are situated beyond:

2.4.3.1 7 R for day operations if it is assured that navigational accuracy can be achieved by reference to suitable visual cues during the climb;

2.4.3.2 10 R for night operations if it is assured that navigational accuracy can be achieved by reference to suitable visual cues during the climb;

2.4.3.3 300 m if navigational accuracy can be achieved by appropriate navigation aids.

2.4.3.4 900 m in the other cases.

Note.— Standard course guidance includes ADF and VOR guidance. Accurate course guidance includes ILS, MLS, or other course guidance providing an equivalent navigational accuracy.

2.4.4 The transition point should not be located before the end of TODRH for helicopters operating in performance Class 1 and before the DPATO for helicopters operating in performance Class 2.

2.4.5 When considering the missed approach flight path, the divergence of the obstacle accountability area should only apply after the end of the take-off distance available.

2.5 Source of performance data

An operator should ensure that the approved performance data contained in the helicopter flight manual is used to determine compliance with this Example, supplemented as necessary with other data acceptable to the State of the Operator.

3. Operating area considerations

3.1 FATO

For operations in performance Class 1, the dimensions of the FATO should be at least equal to the dimensions specified in the helicopter flight manual.

Note.— A FATO that is smaller than the dimensions specified in the helicopter flight manual may be accepted if the helicopter is capable of a hover out of ground effect with one engine inoperative (HOGE OEI), and the conditions of 4.1 below can be met.

4. Limitations resulting from performance

4.1 Operations in performance Class 1

4.1.1 Take-off

4.1.1.1 The take-off mass of the helicopter should not exceed the maximum take-off mass specified in the flight manual for the procedure to be used and to achieve a rate of climb of 100 ft/min at 60 m (200 ft) and 150 ft/min at 300 m (1 000 ft) above the level of the heliport with the critical engine inoperative and the remaining power-units operating at an appropriate power rating, taking into account the parameters specified in 2.2 (Figure A-1).

4.1.1.2 Rejected take-off

The take-off mass should be such that the rejected take-off distance required does not exceed the rejected take-off distance available.

4.1.1.3 Take-off distance

The take-off mass should be such that the take-off distance required does not exceed the take-off distance available.

Note 1.— As an alternative, the requirement above may be disregarded provided that the helicopter with the critical power-unit failure recognized at TDP can, when continuing the take-off, clear all obstacles from the end of the take-off distance available to the end of the take-off distance required by a vertical margin of not less than 10.7 m (35 ft) (Figure A-2).

Note 2.— For elevated heliports, the airworthiness code provides appropriate clearance from the elevated heliport edge(Figure A-3).

4.1.1.4 Backup procedures (or procedures with lateral transition)

An operator should ensure that, with the critical power-unit inoperative, all obstacles below the backup flight path (the lateral flight path) are cleared by an adequate margin. Only the obstacles specified in 2.4.2 should be considered.

4.1.2 Take-off flight path

From the end of the take-off distance required with the critical power-unit inoperative:

4.1.2.1 The take-off mass should be such that the climb path provides a vertical clearance of not less than 10.7 m (35 ft)

for VFR operations and 10.7 m (35 ft) plus 0.01 DR for IFR operations above all obstacles located in the climb path. Only obstacles as specified in 2.4 should be considered.

4.1.2.2 Where a change of direction of more than 15 degrees is made, obstacle clearance requirements should be increased by 5 m (15 ft) from the point at which the turn is initiated. This turn should not be initiated before reaching a height of 60 m (200 ft) above the take-off surface, unless permitted as part of an approved procedure in the flight manual.

4.1.3 En route

The take-off mass is such that it is possible, in case of the critical power-unit failure occurring at any point of the flight path, to continue the flight to an appropriate landing site and achieve the minimum flight altitudes for the route to be flown.

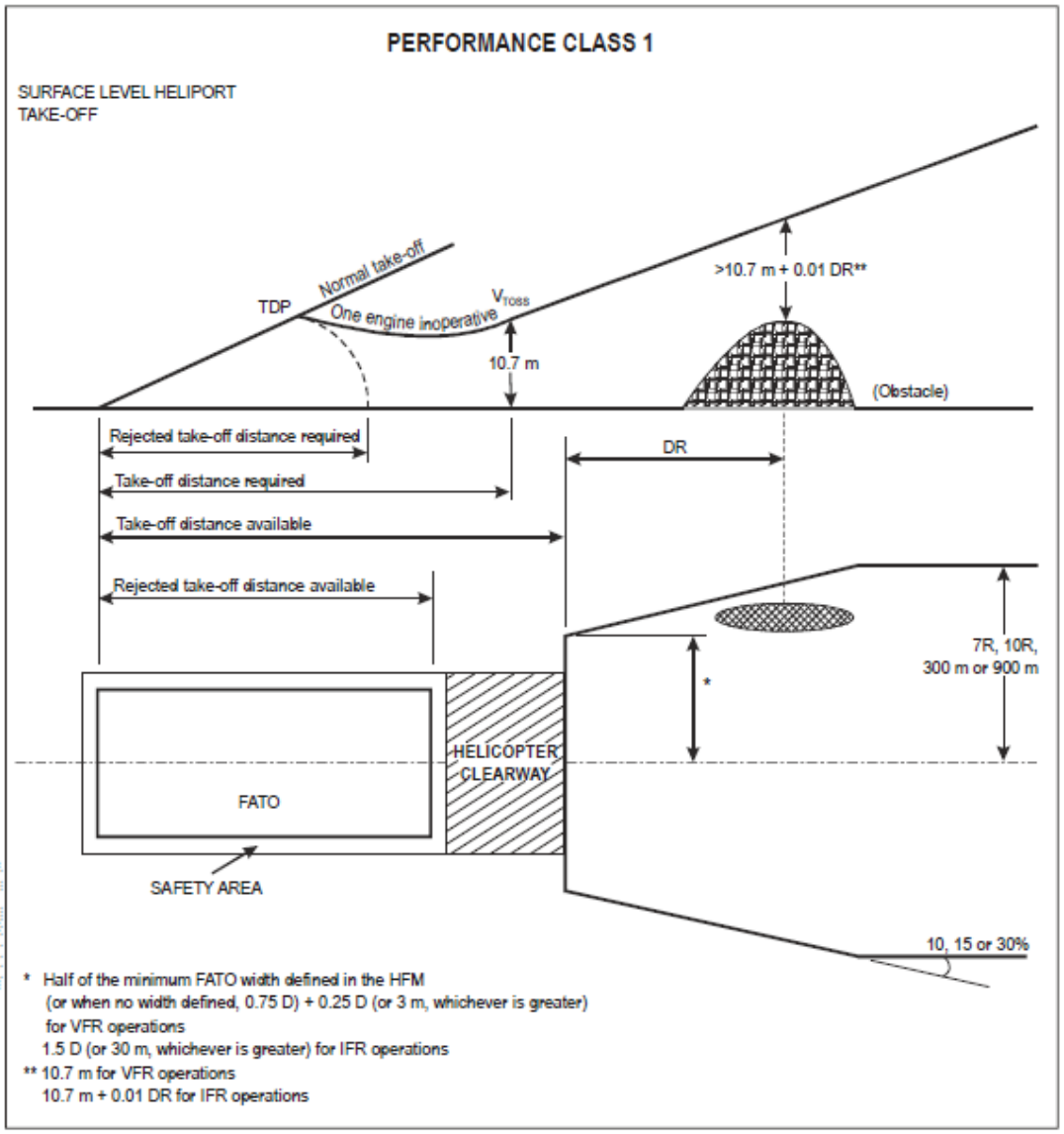


Figure A-1

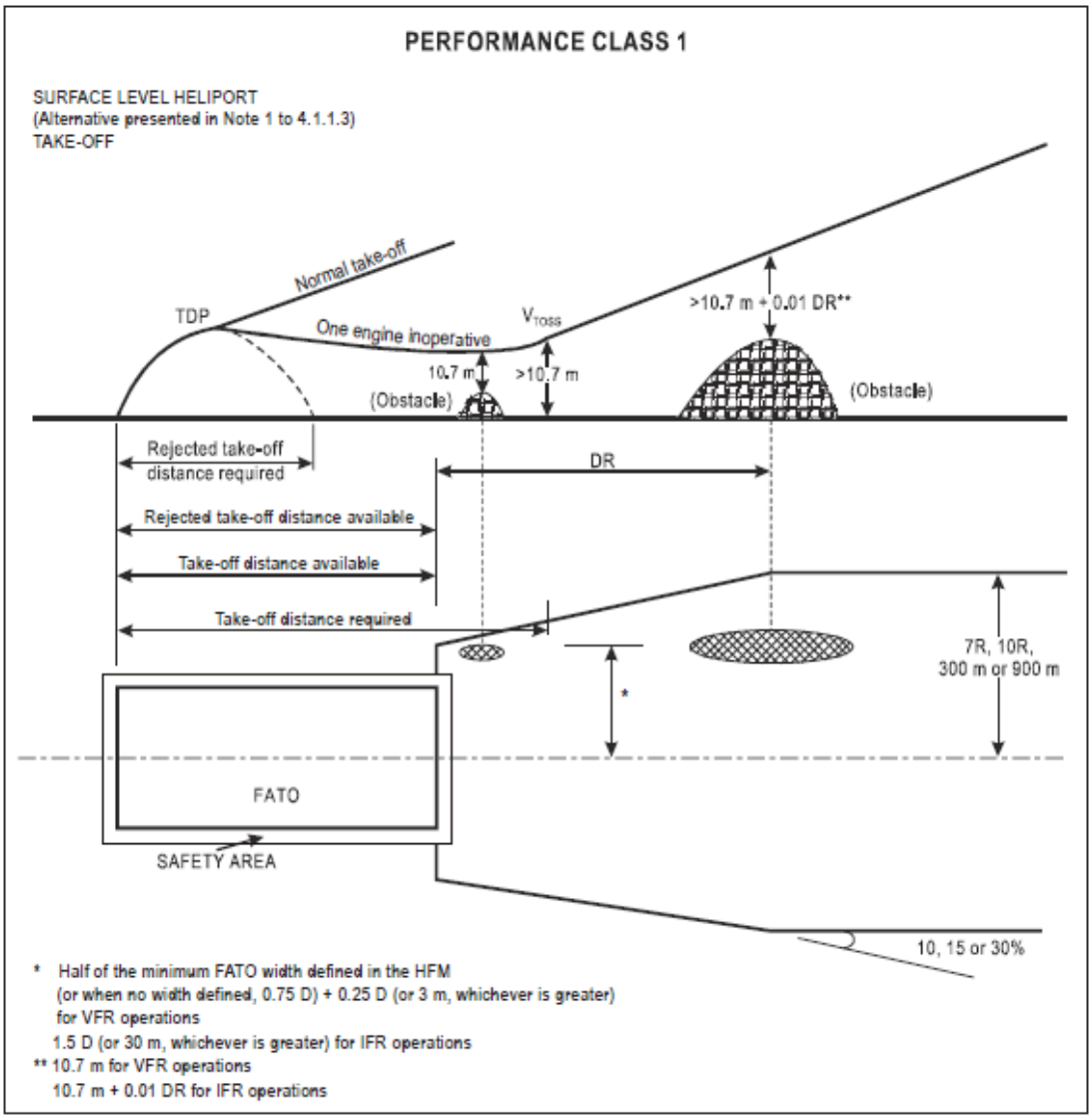

PERFORMANCE CLASS 1
SURFACE LEVEL HELIPORT
(Alternative presented in Note 1 to 4.1.1.3)
TAKE-OFF
Normal take-off
TDP
One engine inoperative
V_{TOSS}
>10.7 m + 0.01 DR**
10.7 m
>10.7 m
(Obstacle)
(Obstacle)
Rejected take-off distance required
DR
Rejected take-off distance available
Take-off distance available
Take-off distance required
7R, 10R, 300 m or 900 m
*
FATO
SAFETY AREA
10, 15 or 30%
* Half of the minimum FATO width defined in the HFM
(or when no width defined, 0.75 D) + 0.25 D (or 3 m, whichever is greater)
for VFR operations
1.5 D (or 30 m, whichever is greater) for IFR operations
** 10.7 m for VFR operations
10.7 m + 0.01 DR for IFR operations

Figure A-2

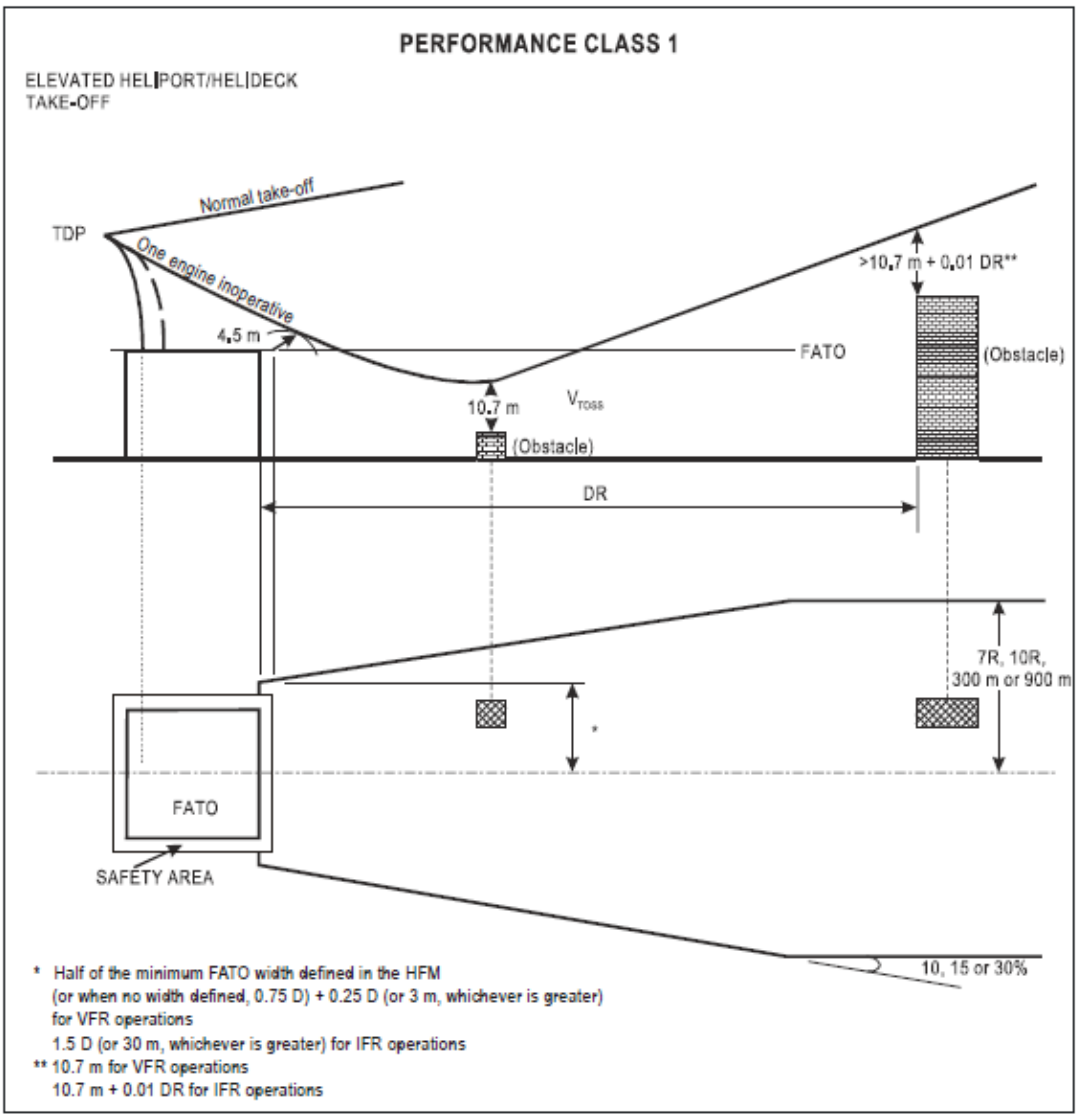


Figure A-3

4.1.4 Approach, landing and balked landing (Figures A-4 and A-5)

The estimated landing mass at the destination or alternate should be such that:

4.1.4.1 it does not exceed the maximum landing mass specified in the flight manual for the procedure to be used and to achieve a rate of climb of 100 ft/min at 60 m (200 ft) and 150 ft/min at 300 m (1 000 ft) above the level of the heliport with the critical engine inoperative and the remaining power-units operating at an appropriate power rating, taking into account the parameters specified in 2.2;

4.1.4.2 the landing distance required does not exceed the landing distance available unless the helicopter, with the critical power-unit failure recognized at LDP can, when landing, clear all obstacles in the approach path;

4.1.4.3 in case of the critical power-unit failure occurring at any point after the LDP, it is possible to land and stop within the FATO.

4.1.4.4 in the event of the critical power-unit failure being recognized at the LDP or at any point before the LDP, it is possible either to land and stop within the FATO or to overshoot, meeting the conditions of 4.1.2.1 and 4.1.2.2.

Note.— For elevated heliports, the airworthiness code provides appropriate clearance from the elevated heliport edge.

4.2 Operations in performance Class 2

4.2.1 *Take-off* (Figures A-6 and A-7)

The mass of the helicopter at take-off should not exceed the maximum take-off mass specified in the flight manual for the procedures to be used and to achieve a rate of climb of 150 ft/min at 300 m (1 000 ft) above the level of the heliport with the critical power-unit inoperative and the remaining power-units operating at an appropriate power rating, taking into account the parameters specified in 2.2.

4.2.2 Take-off flight path

From DPATO or, as an alternative, no later than 60 m (200 ft) above the take-off surface with the critical power-unit inoperative, the conditions of 4.1.2.1 and 4.1.2.2 should be met.

4.2.3 En route

The requirements of 4.1.3 should be met.

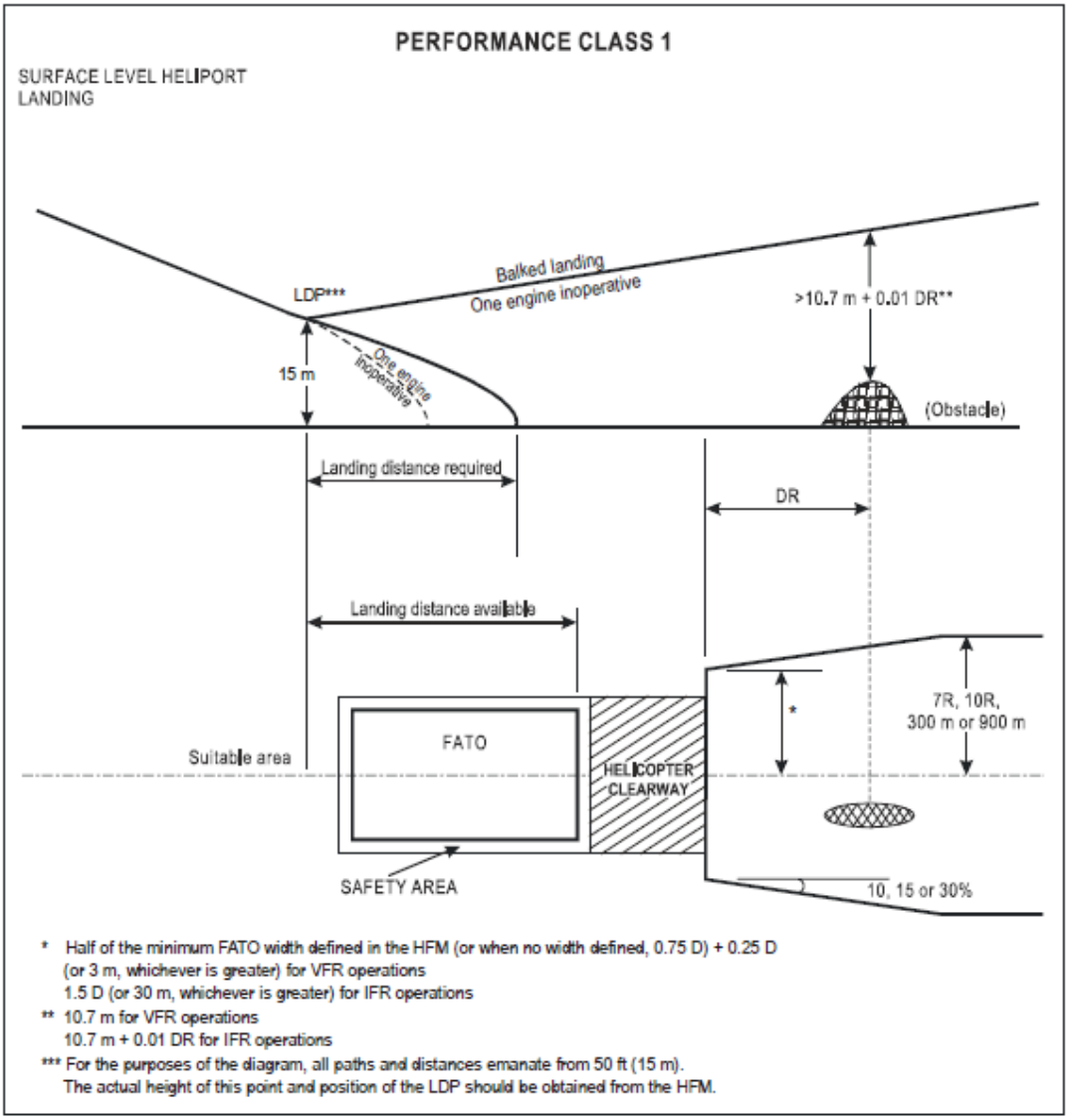
4.2.4 Approach, landing and balked landing (Figures A-8 and A-9)

The estimated landing mass at the destination or alternate should be such that:

4.2.4.1 it does not exceed the maximum landing mass specified in the flight manual for a rate of climb of 150 ft/min at 300 m (1 000 ft) above the level of the heliport with the critical power-unit inoperative and the remaining power units operating at an appropriate power rating, taking into account the parameters specified in 2.2;

4.2.4.2 it is possible, in case of the critical power-unit failure occurring at or before the DPBL, either to perform a safe forced landing or to overshoot, meeting the requirements of 4.1.2.1 and 4.1.2.2.

4.1.4.3 Only obstacles as specified in 2.4 should be considered.



* Half of the minimum FATO width defined in the HFM (or when no width defined, 0.75 D) + 0.25 D
(or 3 m, whichever is greater) for VFR operations
1.5 D (or 30 m, whichever is greater) for IFR operations

** 10.7 m for VFR operations
10.7 m + 0.01 DR for IFR operations

*** For the purposes of the diagram, all paths and distances emanate from 50 ft (15 m).
The actual height of this point and position of the LDP should be obtained from the HFM.

Figure A-4

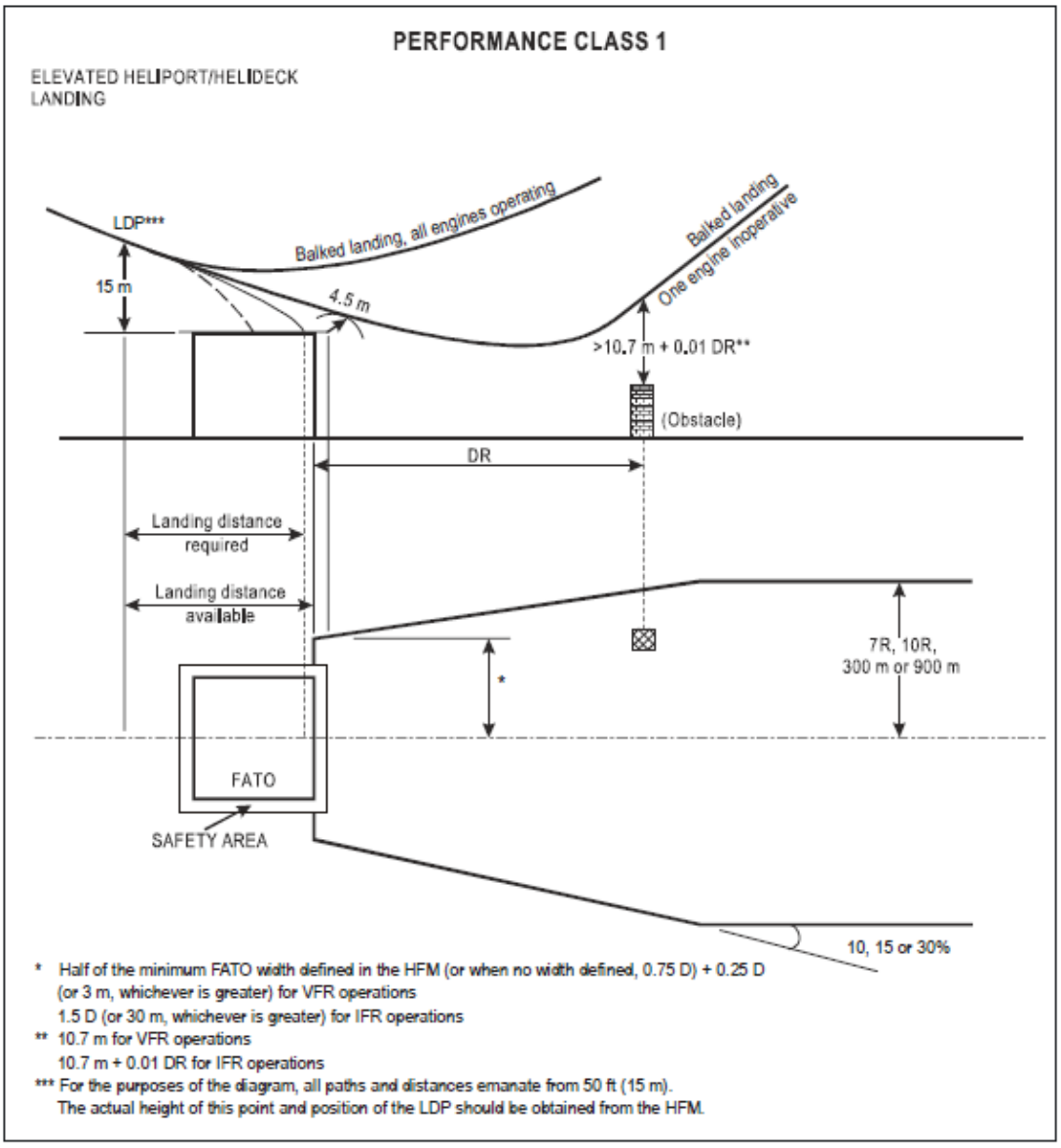

PERFORMANCE CLASS 1
ELEVATED HELIPORT/HELIDECK
LANDING
LDP***
Balked landing, all engines operating
Balked landing
One engine inoperative
15 m
4.5 m
>10.7 m + 0.01 DR**
(Obstacle)
DR
Landing distance
required
Landing distance
available
*
7R, 10R,
300 m or 900 m
FATO
SAFETY AREA
10, 15 or 30%
* Half of the minimum FATO width defined in the HFM (or when no width defined, 0.75 D) + 0.25 D
(or 3 m, whichever is greater) for VFR operations
1.5 D (or 30 m, whichever is greater) for IFR operations
** 10.7 m for VFR operations
10.7 m + 0.01 DR for IFR operations
*** For the purposes of the diagram, all paths and distances emanate from 50 ft (15 m).
The actual height of this point and position of the LDP should be obtained from the HFM.

Figure A-5

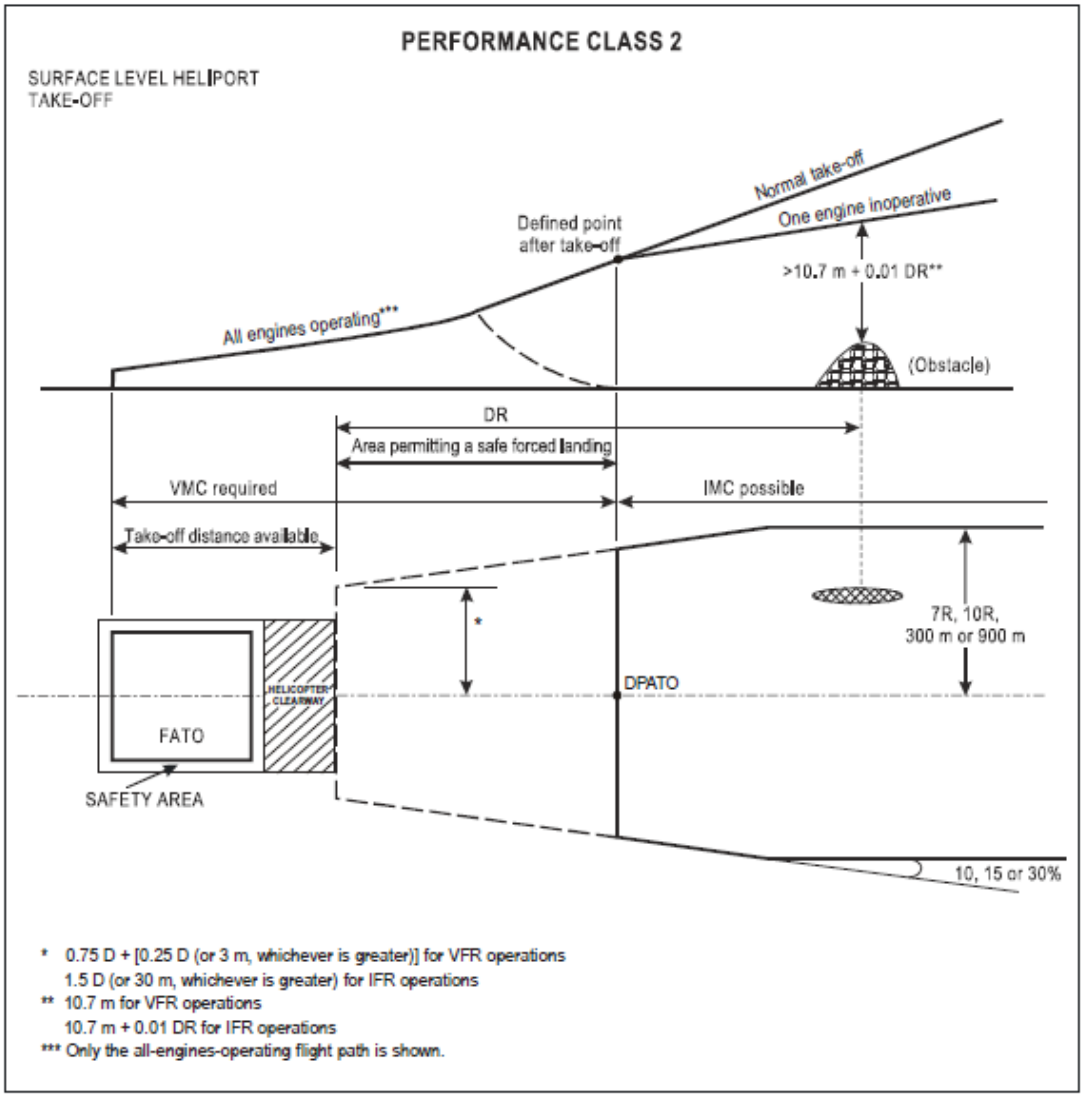

PERFORMANCE CLASS 2
SURFACE LEVEL HELIPORT
TAKE-OFF
Normal take-off
One engine inoperative
Defined point
after take-off
>10.7 m + 0.01 DR**
All engines operating***
(Obstacle)
DR
Area permitting a safe forced landing
VMC required
IMC possible
Take-off distance available
*
7R, 10R,
300 m or 900 m
DPATO
HELICOPTER CLEARWAY
FATO
SAFETY AREA
10, 15 or 30%
* 0.75 D + [0.25 D (or 3 m, whichever is greater)] for VFR operations
1.5 D (or 30 m, whichever is greater) for IFR operations
** 10.7 m for VFR operations
10.7 m + 0.01 DR for IFR operations
*** Only the all-engines-operating flight path is shown.

Figure A-6

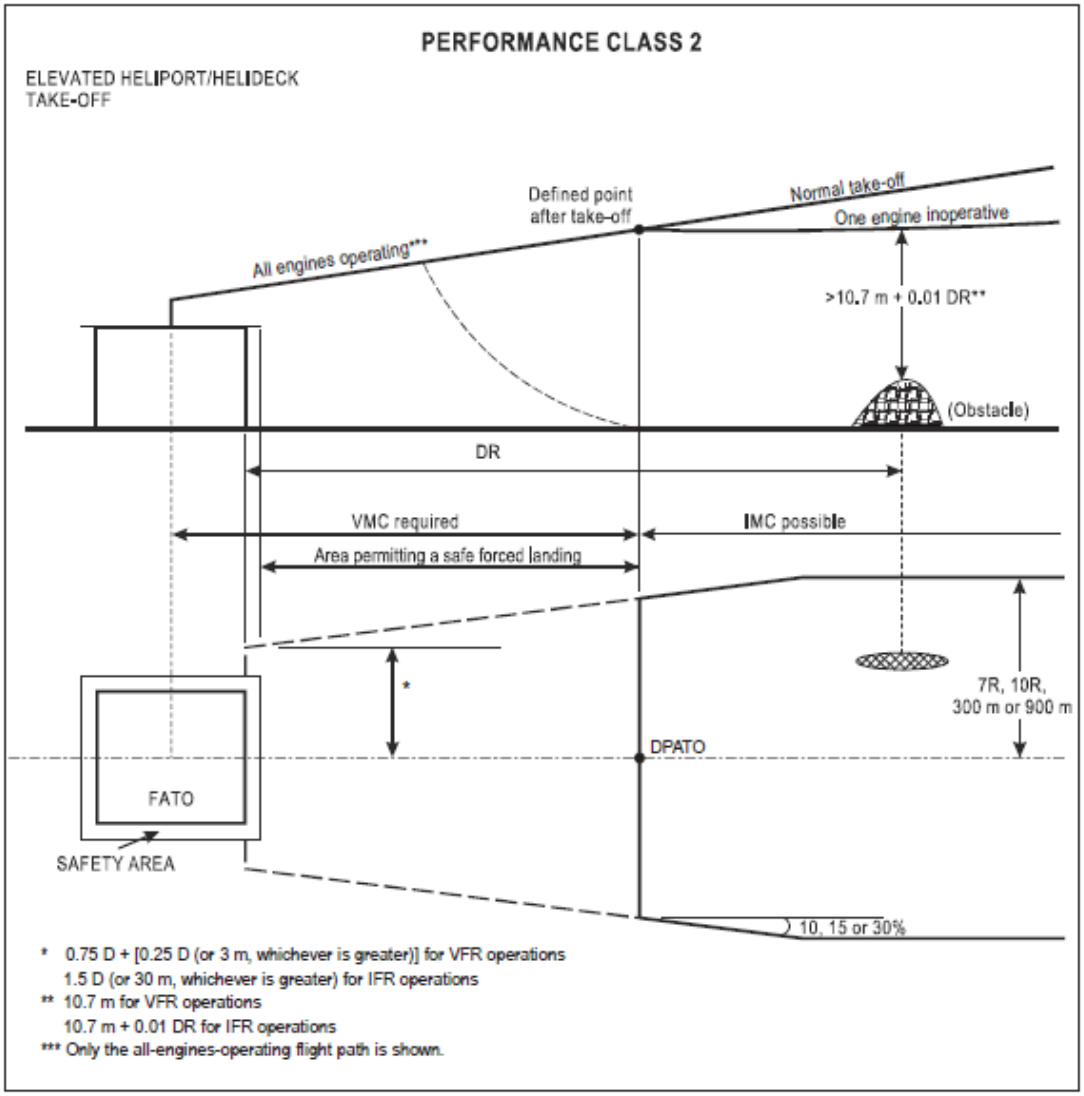

PERFORMANCE CLASS 2
ELEVATED HELIPORT/HELIDECK
TAKE-OFF
Defined point
after take-off
Normal take-off
One engine inoperative
All engines operating***
>10.7 m + 0.01 DR**
(Obstacle)
DR
VMC required
IMC possible
Area permitting a safe forced landing
*
7R, 10R,
300 m or 900 m
DPATO
FATO
SAFETY AREA
10, 15 or 30%
* 0.75 D + [0.25 D (or 3 m, whichever is greater)] for VFR operations
1.5 D (or 30 m, whichever is greater) for IFR operations
** 10.7 m for VFR operations
10.7 m + 0.01 DR for IFR operations
*** Only the all-engines-operating flight path is shown.

Figure A-7

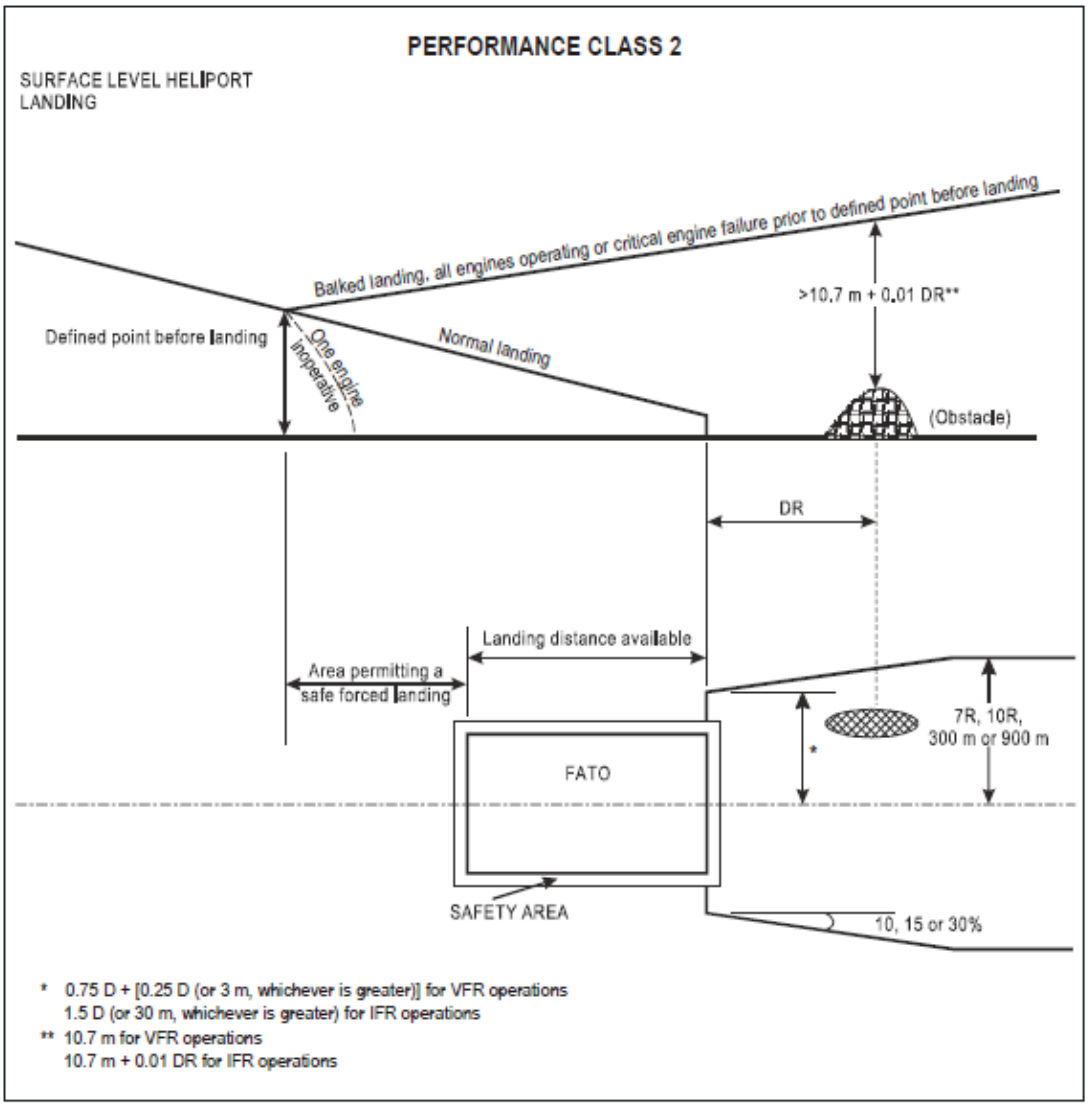

PERFORMANCE CLASS 2
SURFACE LEVEL HELIPORT
LANDING
Balked landing, all engines operating or critical engine failure prior to defined point before landing
>10.7 m + 0.01 DR**
Defined point before landing
One engine inoperative
Normal landing
(Obstacle)
DR
Landing distance available
Area permitting a safe forced landing
7R, 10R, 300 m or 900 m
*
FATO
SAFETY AREA
10, 15 or 30%
* 0.75 D + [0.25 D (or 3 m, whichever is greater)] for VFR operations
1.5 D (or 30 m, whichever is greater) for IFR operations
** 10.7 m for VFR operations
10.7 m + 0.01 DR for IFR operations

Figure A-8

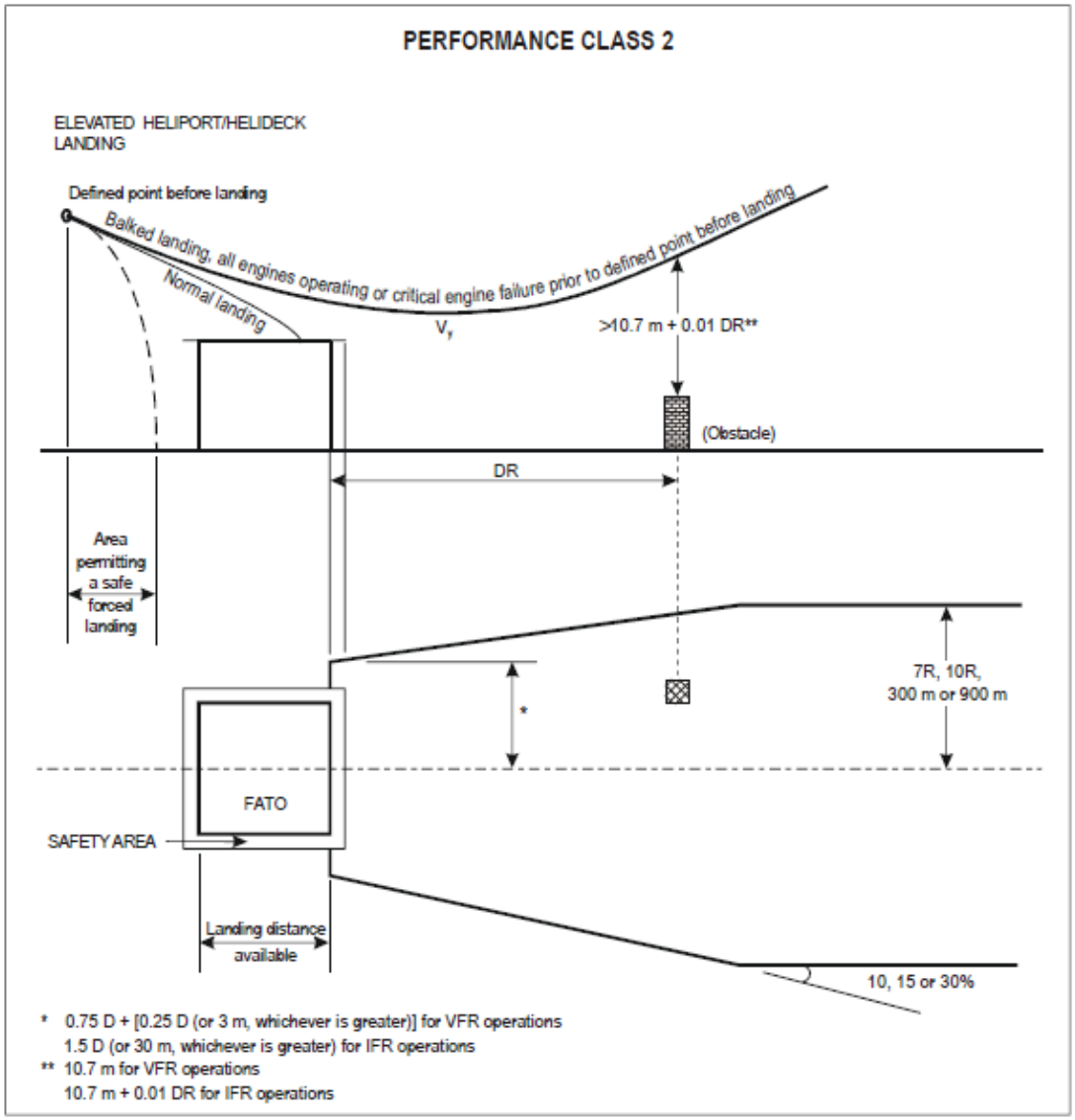


Figure A-9

4.3 Operations in performance Class 3

4.3.1 Take-off

The mass of the helicopter at take-off should not exceed the maximum take-off mass specified in the flight manual for a hover in ground effect with all power-units operating at take-off power, taking into account the parameters specified in 2.2. If conditions are such that a hover in ground effect is not likely to be established, the take-off mass should not exceed the maximum mass specified for a hover out of ground effect with all power-units operating at take-off power, taking into account the parameters specified in 2.2.

4.3.2 Initial climb

The take-off mass should be such that the climb path provides adequate vertical clearance above all obstacles located along the climb path, all engines operating.

4.3.3 En route

The take-off mass is such that it is possible to achieve the minimum flight altitudes for the route to be flown, all engines operating.

4.3.4 Approach and landing

The estimated landing mass at the destination or alternate should be such that:

4.3.4.1 it does not exceed the maximum landing mass specified in the flight manual for a hover in ground effect with all power-units operating at take-off power, taking into account the parameters specified in 2.2. If conditions are such that a hover in ground effect is not likely to be established, the take-off mass should not exceed the maximum mass specified for a hover out of ground effect with all power-units operating at take-off power, taking into account the parameters specified in 2.2;

4.3.4.2 it is possible to perform a balked landing, all engines operating, at any point of the flight path and clear all obstacles by an adequate vertical interval.