Version 3.0

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Flightpath Management (FPM)

Recommended Practice for Offshore Helicopter Operations

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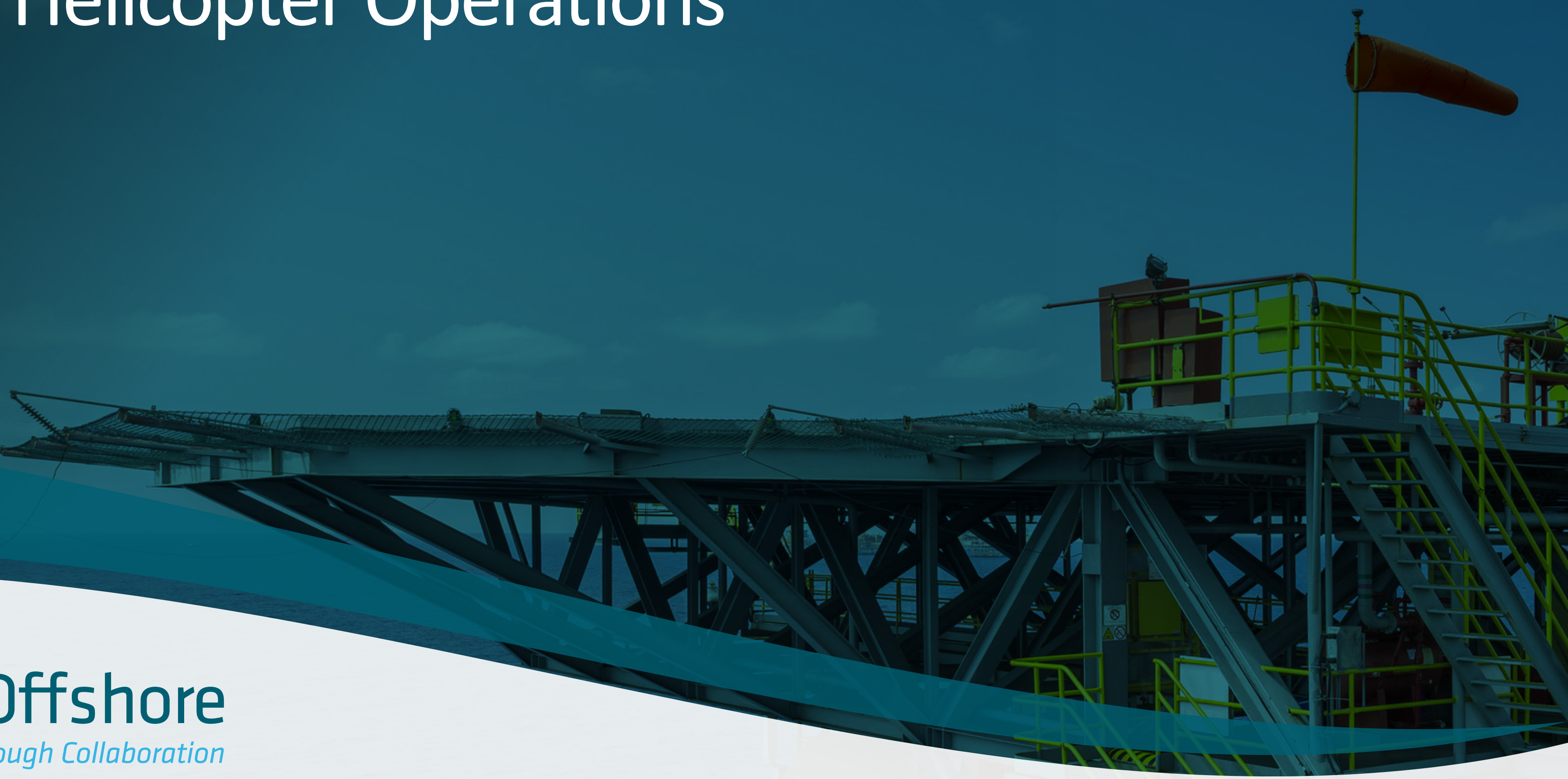

HeliOffshore

Safety Through Collaboration

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Collaboration empowers safety and is at the very heart of HeliOffshore. This Flightpath Management (FPM) Recommended Practice is a great example of how our industry – from designers and maintainers, to pilots and passengers – works together and learns from each other to ensure no lives are lost in offshore flight.

I would like to thank the HeliOffshore FPM Working Group, previous members of the Working Group, industry stakeholders and every HeliOffshore member who came together to deliver this guidance. Thank you for your commitment and contribution. Together, we will implement and sustain ever-higher levels of performance so those we are responsible for travel home safely every day.

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Section 1 Introduction

Section 1
Introduction

1.1 Introduction and background

Flight Path Management (FPM) is the planning, execution, and assurance of the guidance and control of aircraft trajectory and energy, in flight or on the ground[1]. Key elements of FPM are stabilised departures and approaches.

The Flight Safety Foundation (FSF) Approach and Landing Accident Reduction Task Force (ALAR) determined that non-stabilised approaches for fixed-wing aircraft were causal factors in 66 percent of 76 approach-related accidents that occurred between 1984 and 1997[2]. These accidents could be represented by two groups: the low and slow approach that resulted in a reduced ground clearance CFIT event and the fast and high approach that concluded with loss of control or runway excursions.

In a similar context, the 2022 HeliOffshore Safety Performance Report determined that offshore helicopter accidents involving controlled flight into terrain or surface (CFIT) and loss of control inflight (LOC-I) events resulted in 49 percent of all industry fatal accidents between 2013 and 2021. While flight path management encompasses all aspects of aircraft movement, approach path mismanagement issues have shown to be a significant contributor to CFIT and LOC-I. As such the trend has been to adopt stabilised approach principles in an attempt to eliminate offshore approach incidents.

The adoption and adaptation of fixed-wing principles has contributed to a safety enhancement of offshore helicopter approaches. However, in implementing approach criteria based simply upon airspeed (IAS), rate of descent (ROD) and angle of bank, the opportunity to directly consider the energy state of the aircraft on approach to a landing site has not been addressed.

The recommended practices in this document seek to expand the considerations appropriate to offshore helicopter operations by reviewing seven key elements fundamental to the conduct of a safe departure, stabilised approach, and go-around in the offshore environment.

These seven key elements are:

- Monitoring procedures
- Briefings
- Energy state management
- Use of automation
- Departure procedures
- Stabilised approaches
- Go-around management

Included in this guidance are references to IOGP Report 690 Offshore Helicopter Recommended Practices. Some extracts from that report are reproduced for ease of reference, but readers are advised to consult the IOGP Report 690 series which is closely related to the HeliOffshore Recommended Practices. Please note that references to IOGP Report 690 in this document are accurate as of October 2022.

Revision 3 of Flightpath Management Recommended Practice builds upon the previous edition and now includes guidance for departures. The other technical aspects, which are applicable for all phases of flight, are consolidated under 'General Guidance'.

1 FAA ACT ART Recommendation 20-1
https://www.faa.gov/sites/faa.gov/files/about/office_org/headquarters_offices/avs/ACT_ARC_Rec_20-1.pdf
2 Flight Safety Digest November 1998-February 1999
https://flightsafety.org/wp-content/uploads/2017/01/fsd_nov-feb99.pdf

Section 2 General Guidance

Section 2
General Guidance

2.1 General guidance introduction

This section aims to provide the necessary background to the main FPM concepts as well as outlining the key technical skills and knowledge that are required during all phases of flight and are important in achieving consistently safe outcomes.

2.1.1 Fixed-wing approach criteria

It is helpful to highlight the basic principles of the stabilised approach concept, first developed in the fixed-wing community. It serves to provide context and background to the helicopter-specific guidance discussed later in this document.

Although some variation exists among commercial fixed-wing operators, the fundamental principle of a stabilised approach focuses on 'approach gates' or a point in the approach by which certain criteria should be achieved. There are many similarities when comparing stabilised criteria between fixed-wing aircraft and helicopters. The purpose of the criteria is similar regardless of aircraft type, but to further illustrate the fixed-wing background, examples are listed below:

The principles stipulated by Airbus in their FOBN are indicative of widely accepted criteria to be achieved by certain heights on approach.

1. Aircraft on the correct lateral and vertical flight path
2. Small changes in heading and pitch to maintain flight path
3. Landing configuration
4. Thrust above idle and stable to maintain required speeds
5. Landing checklist complete
6. Flight parameters within limits

The flight parameter limitations are further expanded as follows:

1. Airspeed V_{app} +10/-5 kt
2. Vertical speed less than 1000 fpm, unless briefed
3. Pitch attitude +/- specified degrees (aircraft-dependent)
4. Approach aid deviation (G/S, LOC) within specified limits
5. Deviations from approach track (PBN limitations)
6. Unique procedures or abnormal conditions require specific briefings.

Deviation from these parameters outside of the specified gates requires an immediate go-around.

For instrument procedures the basic parameters for stabilisation remain the same, but specific boundaries for instrument approach navigation are encouraged for each instrument approach type:

a. CAT I ILS: within 1-dot deviation of glide path and localiser
b. RNAV: within ½-scale deflection of vertical and lateral scales and within RNP requirements
c. LOC/VOR: within 1-dot lateral deviation; and
d. Visual (to a runway): lined up with the runway centreline no later than 300 ft.

The fixed-wing principles further recommend that stabilised approach gates should be observed, and active communication calls made during approach in multi-pilot operations. The normal bracketing corrections used to maintain stabilised conditions may occasionally involve momentary overshoots due to atmospheric conditions; such overshoots are acceptable. Frequent or sustained overshoots are not.

Legacy guidance for the 1,000 ft gate required that a go-around be conducted if the flight was not fully stable in IMC. The new functional significance of the 1,000 ft mark is that it is the last suitable point along the approach to ensure that final landing configuration is selected and verified by the flight crew. The gear transition, deceleration to final approach speed, and power stabilisation should occur before the aircraft reaches the next gate at 500 ft AGL. It should be emphasised that initial configuration should occur before reaching the 1,000 ft gate; this gate is the last point at which final landing configuration should be selected and confirmed.

Previous guidance for the 500 ft gate required a go-around if the flight was not fully stable in VMC. The revised guidance retains the recommendation that the approach should be fully stable at this gate; however, the mandate to go-around has been removed. Although a go-around may be considered, not mandating this action reduces the overall number of potential go-arounds by allowing low-risk unstable approaches to continue while at a safe altitude. The 500 ft gate is a familiar demarcation for flight crew and is a suitable point in the approach to verify that all stable approach criteria have been met. Being stable at this point allows for subsequent developing instabilities to be compared against a state of constant energy reduction. Improved situational awareness at this gate is also achieved through procedural, active communication between flight crew.

The 300 ft gate establishes the boundary between higher altitudes where a stable approach is strongly recommended and the point where continuing an unstable descent erodes the margin of safety. It differentiates between approach stability and a go-around decision. The 300 ft AGL value is not intended to be absolute; it can be approximated to take advantage of aircraft generated callout systems. For example, it could be synchronised with the 100 ft to go call many operators use when approaching DA/MDA. Descending in an unstable state below the 300 ft gate should be a warning to flight crew that the level of risk is increasing, and action is required, whether the aircraft is unstable at this gate or becomes unstable below 300 ft.

Awareness of the increased need for action can be improved by reconsidering the definition of the aircraft's condition, from being in an unstable condition to being in a condition to go-around. This can prompt the flight crew to make the correct decision – to go-around. To further emphasise the point, the 1,000 ft to 300 ft window can be viewed as the stable approach zone, with the focus on ensuring the aircraft is fully stabilised. A gate of 300 ft AGL to execute a go-around provides adequate altitude margin for even the most extreme low-energy unstable approach.

2.1.1.1 Example of fixed-wing approach gates and calls

Gate	PM call	PF response
1,000 ft AGL	"1,000, configured/ not configured" or "Gear"	"Roger"
500 ft AGL	"500 stabilised/ not stabilised" or "Speed [parameter]"	"Roger" or "Correcting"
300 ft AGL	"300 stabilised or go-around"	"Roger" or "Going around"
100 ft to DA/ MDA	"100 to go stabilised" or "100 go-around"	"Roger" or "Going around"

2.2 Operator monitoring policy

The operator monitoring policy should include monitoring duties and responsibilities of all flight crew members. It should specify the following:

- The pilot monitoring plays an essential role in operational safety and, as such, these stand-alone skillsets must be recognised and continuously developed.
- The primary duty of the PM during the take-off is to monitor the flight profile, provide standard callouts to support the PF and select the aircraft systems as requested. The PM confirms the appropriate operation of aircraft systems and advises the PF of any abnormal conditions or deviations observed.
- Standardised flight profiles and standardised calls, which provide the framework for the PM duties and allow early detection of profile deviations.
- In the event a crew is unable to maintain a published profile for any reason, the PM must receive a thorough briefing of the PF's intentions to enable proper monitoring of agreed parameters.

The ability to follow stabilised criteria and procedures requires both pilots to work in unison and share the same situational awareness. This requires the use of detailed briefings, which include the go-around technique to be used, and a prescribed set of standard callouts that ensure both pilots are sharing the same mental picture at all times during the approach and the go-around.

Given that considerable variation exists between aircraft types operated offshore and between operator philosophies, it is not possible to detail every specific call, although a large number are generic and could be applied. This guidance therefore provides the basic principles that should be applied to Operations Manual procedures and examples of some current practices. Examples are provided in the annexes at the end of this document.

IOGP Report 690-2, Flight Procedures Section 30, specifies that:

"The Aircraft Operator has developed appropriate flight procedures.

Flight procedures (SOP or Operations Manual) are used by the flight crew in the performance of their duties, referencing the FCOM if available. SOPs include designated crew roles and responsibilities, use of checklists, automation policy, and crew monitoring procedures, including cross check of critical actions, mode settings, aircraft responses and deviation calls. The procedures are described concisely, with clear and detailed PF/ PM task assignments, so that flight crew will recognize and act on deviations from standards in a timely manner.

HFDM and/ or FOQA programs are used to monitor trends regarding these procedures. Flight crew make active use of CRM/TEM/ADM techniques to identify and manage flight risk."

2.2.1 Standard calls

Standard calls fall under the criteria of calls required throughout the normal flight regime to ensure an equivalent situational understanding between the two pilots. These calls do not fall under deviation calls addressed in Section 2.2.2. Standard calls should be embedded throughout an operator's Standard Operating Procedures and serve to ensure the flight crews are speaking a common language with anticipated callouts during various phases of flight. Non-standard callouts can lead to confusion resulting in delayed or incorrect actions.

All operators are encouraged to include standard calls as part of a continuous improvement process, using tools such as LOSA to ensure the continued validity of all cockpit procedures. Historically, cockpit callouts have increased as the result of events and reports but are rarely reduced as a result of automation usage. To maintain the credibility of such calls and in turn ensure their correct and continued usage, it is considered essential to keep calls to a minimum and only use them when a missed call or event would have a negative safety consequence.

IOGP Report 690-2, Flight Procedures, Section 31 specifies:

"Ensuring a safe flightpath with early identification of deviations and timely corrective action.

There is a sterile cockpit policy covering, as a minimum, restrictions on unnecessary conversation, restricting activities to essential operational matters during critical phases of flight, use of EFBs or PEDs, and paperwork, during flight below key altitudes, and during certain phases of flight or ground operations."

2.2.2 Deviation calls

It should be noted that the example deviation calls provided in the annexes are not exhaustive and refer predominantly to the approach phase. It is essential to ensure brevity where aircrew can concentrate on the task in hand and not focus on the calls as a script to be followed. Deviation calls should serve a safety purpose at all times and are most effective when a common understanding of the plan exists. This can only be facilitated by a suitable briefing. A deviation call requires active aircraft monitoring skills as well as intervention skills.

Deviation calls should therefore be based upon the following policy criteria:

- Standard Phraseology
- Actions on missed or omitted callouts
- Use of aircraft-generated callouts
- Consideration for common calls across aircraft types
- Recognising and responding to any deviations in a timely, appropriate, and effective manner

Note: HeliOffshore Pilot Monitoring Research
Extensive research has been recently carried out by Dr Steve Jarvis on behalf of HeliOffshore to analyse exactly how pilots monitor the flight instruments and particularly how this essential process is affected by an unexpected in-flight event. Furthermore, an easily trainable mitigation can be used to ensure the pilot flying maintains focus on the flight instruments and maintains good situational awareness. The Pilot Monitoring research paper and accompanying video were published in September 2022 and can be found on the HeliOffshore website.

2.3 Briefings

Effective briefings are essential. An operator's briefing policy should ensure briefings contain sufficient detail to ensure mutual understanding and agreement with the planned procedure and confirmation that each pilot understands their duties throughout.

2.3.1 Briefing scale

The standard briefing alleviates the requirement to recite the known or standardised elements of the profile. Operators should stipulate that it is imperative that any procedural element falling outside of the standard procedure is specifically briefed and acknowledged, such as adjustments to ATC clearances. Crews should also have the option of completing a full briefing at their discretion, comprising a recitation of the profile in addition to any non-standard elements.

2.3.2 Briefing scope

Briefings should be carried out prior to all departures and approaches. The depth of the briefing should account for recency of task and familiarity with the local environment. Operators should establish a policy in which briefings account for aircraft performance, monitoring obstacle clearance, environmental conditions, automation and any pertinent threats that may be present, particularly in a Degraded Visual Environment (DVE). When departing from offshore installations briefings should also account for any challenges presented by the Limited Obstacle Sector and other pertinent helideck limitations or conditions.

2.3.3 Interactive briefings

Briefing design should encourage interaction between the PM and PF, through effective listening and open communication. The goal is to create synergy between the crew, so an uninterrupted lecture style should be avoided. Briefs should be conducted during periods of low workload to maximize effective communication, while allowing the PF and PM to validate the contents of the brief through crosschecks and confirmations while in progress.

Interactive briefings (confirming agreement and understanding after each phase of the briefing) are more effective and productive than an uninterrupted lecture followed by: "Any questions?". Interactive briefings provide the crew the opportunity to communicate and to check and correct each other as necessary e.g., confirming the use of the correct departure and approach charts, confirming the correct setup of navaids for the assigned take-off and landing.

2.3.4 Summary points for briefings:

- Briefings should be adapted to the specific conditions of the flight, focusing on the elements that are relevant for the particular take-off, departure, cruise or approach and landing.
- Briefings should be interactive and allow for dialogue between the PF, PM and other crewmembers.
- Briefings should be conducted during low-workload periods.
- Briefings should be conducted even if the crew has completed the same flight many times in the past. Vary the briefing technique or emphasis when on familiar routes to promote thinking and to avoid doing things by habit.
- Briefings should cover procedures for unexpected events.
- Pilots should not fixate on one particular aspect of information in a briefing, as other important information may be missed.

2.4 Helicopter energy state

Energy state is the combination and availability of airspeed, altitude, thrust, and aerodynamic drag at any given time. Trajectory is the lateral and vertical flight path of an aircraft as it travels through a defined airspace[3]. A well-managed helicopter energy state is essential to ensure a safely flown departure or approach.

2.4.1 Energy state management

Helicopter Energy Management is the planning and control of airspeed or groundspeed (kinetic energy), altitude (potential energy), power (chemical energy), aerodynamic drag (landing gear and fuselage), and trajectory to achieve desired targets appropriate for the operational objectives.

Operators should establish procedures for efficient planning and execution of take-off and departure including monitoring and deviation actions to protect the flight from reaching an uncontrollable energy state.

Establishment of energy state criteria as part of an Approach Management policy, is considered an essential element and should be incorporated in Operations Manual guidance.

It should be noted that direction provided to aircrew in terms of energy state management will vary according to type , making it essential to develop procedures applicable to each aircraft model. The energy state boundary referred to above is a ‘hard’ warning envelope; specific criteria in terms of airspeed and rate of descent should be defined for each type to provide ‘soft’ boundaries within which the aircraft is considered to be on an acceptable flight path. Whilst power settings will vary according to aircraft type, operational circumstances and environmental conditions, operators should consider defining a minimum sustained power setting below which a stabilised approach is unlikely to be maintained in most circumstances and define the intervention that is required.

Significant focus has been placed on energy state management on approach, however, energy state management on departure presents a unique challenge as the departure is characterised by a low energy state environment. While on approach, the option to execute a go-around is available should an unsafe flight regime be suddenly encountered, there are few options available on departure should such a situation occur.

2.5 Automation

Automation and its safe usage have been the subject of much debate, with focus areas of mode confusion, training and the development of standard operating procedures to ensure equivalent situational awareness between pilots.

HeliOffshore has dedicated significant resources to both research and training videos to ensure the necessary understanding of both concept and operation of automation systems.

IOGP Report 690-2, Flight Operations Section 5 specifies:

“The Aircraft Operator has defined automation procedures. The automation procedures contain requirements for the appropriate use of automation to reduce cockpit workload and increase standardisation.

The automation procedures are defined for all phases of flight. Type-specific procedures for the use of automation are based on those published in the Flight Crew Operating Manual (FCOM).

The automation procedures detail methods to maintain flight proficiency in manual control, including those conditions under which automation systems are deselected and manual flight undertaken.

The Minimum Equipment List (MEL) or Minimum Departure Standard (MDS) has clear requirements for the AFCS to be serviceable for night or IFR flights.”

3 FAA ATC ARC Recommendation 19-4
https://www.faa.gov/about/office_org/headquarters_offices/avs/offices/afx/afs/afs200/afs280/act_arc/act_arc_reco/media/2019/ACT_ARC_Rec_19-4.pdf

2.5.1 Automation principles

HeliOffshore's Automation Guidance to support this information can be found in *Annex C – Automation Guiding Principles*. These guiding principles are offered to ensure effective use of automation. Standard Operating Procedures based on these principles should help to mitigate the risks of interacting with cockpit automation and improve safety performance in usage and monitoring.

1. The coupled/upper modes should only be selected once the aircraft is in a trimmed stable configuration after take-off, possibly defined by a minimum speed (for example, V_{mini}, V_{toss}, or V_y) and a minimum height. Similarly, guidance should describe when the coupled/upper modes should be decoupled during an approach. During DVE that may be as late as possible in the approach. Transition procedures should be clearly detailed in the Operations Manual.
2. All climbs should be performed in 4-axes, where possible according to helicopter type.
3. All descents should be performed in 4-axes.
4. Cruise should be flown in 3-axes as a minimum standard, utilising lateral modes for navigation and an altitude hold function. Operational guidance should describe the varying situations that support 3-axes versus 4-axes cruise coupling and any associated risks.

Note: Specific consideration should be given to automation training requirements to ensure comprehensive understanding of all protection modes and the consequences an OEI condition may have on degraded coupled modes.

2.5.2 Manual flight

The transition from coupled to manual flight, a daily and normal occurrence for helicopter operations, requires defined criteria to ensure a safe and standardised procedure.

The ability for pilots of modern aircraft to maintain manual flying currency has also been a recent topic of debate and warrants inclusion in this guidance material. The criteria under which manual currency practice can take place should be clearly defined in the appropriate section of each company's operations manuals. Example guidance is given below.

Criteria for manual flight

To address the potential degradation of manual flying skills due to use of automation, crews are encouraged to fly manually in VMC and IMC. No limits are placed on the frequency of manual flying, but it should only be conducted in the following circumstances:

a. In VMC:
   i. By day onshore and offshore at any time, including take-off, enroute, approach and landing.
   ii. By night onshore at any time, including take-off, enroute, approach and landing.

b. In IMC:
   i. By day or night while enroute at any time above MSA.
   ii. By day for onshore and offshore departures, and for onshore instrument approaches, provided conditions are at or better than 4,000 m visibility and cloud base not below 600 ft or not below 200 ft above DH/MDH, whichever is the higher.
   iii. By night for onshore departures, and for onshore instrument approaches, provided conditions are at or better than 5,000m visibility and cloud base not below 1,000 ft or not below 200 ft above DH/MDH, whichever is the higher.

c. Night offshore departures shall not be flown manually unless operating under the MEL.

In addition, cockpit workload should not be excessive, and the crew briefing shall be explicit in stating where the manual handling segment starts and ends. Night offshore let-downs, approaches, and circuits/patterns shall not be flown manually.

2.5.3 Automation fly through

As a general principle, once the automation is engaged, it should be left to do its job. Any attempt to 'help it along' may just 'confuse it' and can result in an unexpected aircraft state once the pilot releases the controls. If the rate of change of parameter is too slow using the normal control beep switches, it may be possible to press the appropriate trim release, fly to and set the new required datum (for example airspeed) then release the trim button again. Be wary of disengaging a single axis to make a change in the datum; far better to anticipate changes in sufficient time for the automation to make them on your behalf.

2.5.4 Automation serviceability

Automation serviceability and how it should be restricted to avoid potential approach profile mismanagement is complex as aircraft differ in design and concept of operation. It is therefore impossible to provide accurate guidance for each aircraft type but rather a set of guidance principles that should form the basis of changes to an Operator's Minimum Equipment List (MEL) not necessarily provided as part of a master MEL (MMEL). In essence, additional restrictions should be considered over and above those recommended by the manufacturer's MMEL where enhanced safety is required during the approach phase of flight.

Automation serviceability recommendations

1. Any item that restricts the functionality of the autopilot should restrict operations to day VMC only.
2. Inoperative collective axis trim will require the aircraft to be flown in 3-axes and will require enhanced monitoring and crew discussion. For climbs and descents, unless it conflicts with the design of the automation, it is strongly recommended that airspeed should always be coupled to the cyclic pitch axis and the vertical profile controlled manually on the collective. This is particularly important in the event a go-around is required. Both pilots must confirm the correct go-around power is set and the additional monitoring required by this non-standard configuration shall be covered in the approach briefing.
3. The MEL may make provision for system unserviceability to permit ferry flights or single flights back from offshore in other than day VMC conditions, to allow recovery of the aircraft to a maintenance base, provided such unserviceabilities are permitted by the MMEL.

CAUTION: Operations manuals should clearly detail modes and combinations of modes that present additional hazards due to mode confusion. Examples of these potentially dangerous practices include:

- Reducing collective pitch to reduce airspeed when the cyclic pitch axis is coupled to the vertical profile and not IAS
- The reduction of airspeed when coupled to a vertical mode without IAS engaged.

Section 3 Departure Guidance

Section 3
Departure Guidance

3.1 Departure guidance introduction

A recent review of operator incident reports revealed a concerning trend in departure related aircraft upset, particularly in reduced visibility. This guidance is geared towards departure procedures, with particular focus on Night and other DVE conditions. Helicopters have a unique issue where on certain types of departures, the pilot's acquisition and maintenance of external references becomes compromised with height gain. This can become exacerbated at night or in DVE and creates a fertile environment for Spatial Disorientation potentially resulting in loss of control on departure. It is therefore imperative that operators adopt standardised and robust procedures during the departure phases to mitigate against this loss of control risk. A key element is the adherence to standardised departure profiles as recommended by the OEMs.

3.2 Standardised departure profiles

Standardised departure profiles are at the core of a stabilised departure, particularly in reduced visibility. They should remain consistent with OEM guidance regardless of environmental conditions whenever possible. OEMs develop and publish departure profiles specific to each aircraft type; however, the underlying philosophy and technique of each remains largely consistent to satisfy any specific performance requirements.

IOGP Report 690-2, Flight Operations, Section 9 specifies that:

"All CAT operations to offshore destinations are carried out in PC1, PC2E, PC2DLE, or PC2.

Onshore take-offs, departures, approaches, and landings for the purpose of carrying passengers are conducted in accordance with PC1 criteria, unless specific circumstances dictate the use of PC2 criteria and then only when a safe forced landing can be assured in the event of a critical power unit loss.

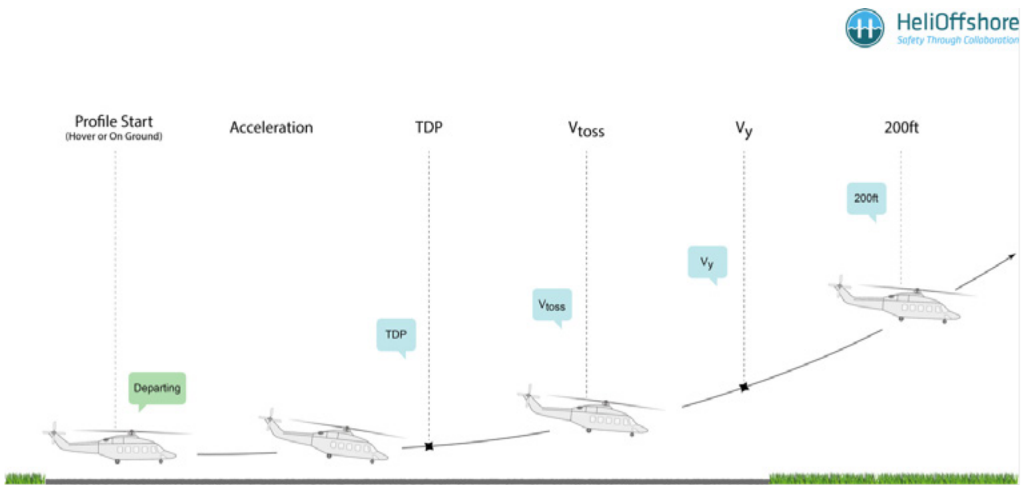
When performance planning for offshore take-offs, departures, approaches and landings, there is no exposure to deck edge strike or to a forced landing in the event of a critical power unit loss.

The RFM PC1/PC2/PC2DLE/PC2e flight profiles are used, both onshore and offshore, as appropriate. (It is acceptable to vary from flight profiles if published in the Operations Manual provided that the aircraft mass is in accordance with the approved performance data."

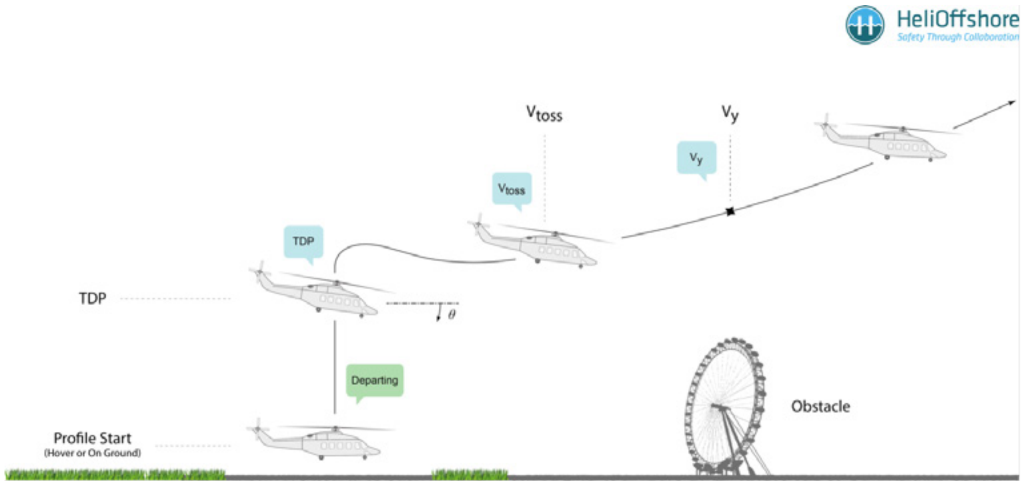
Four typical profiles are outlined below, with the diagrams presenting a visual representation of each. Clarification of key flight parameters and handling techniques is critical to facilitate the PM's task of monitoring the flight profile. These may include, but are not limited to:

- TDP
- Pitch attitude change at rotation – absolute or Δ (delta change)
- V_{toss}
- Power settings/margins
- Use of AFCS upper/coupled modes
- Use of Force Trim Release
- Standard Calls

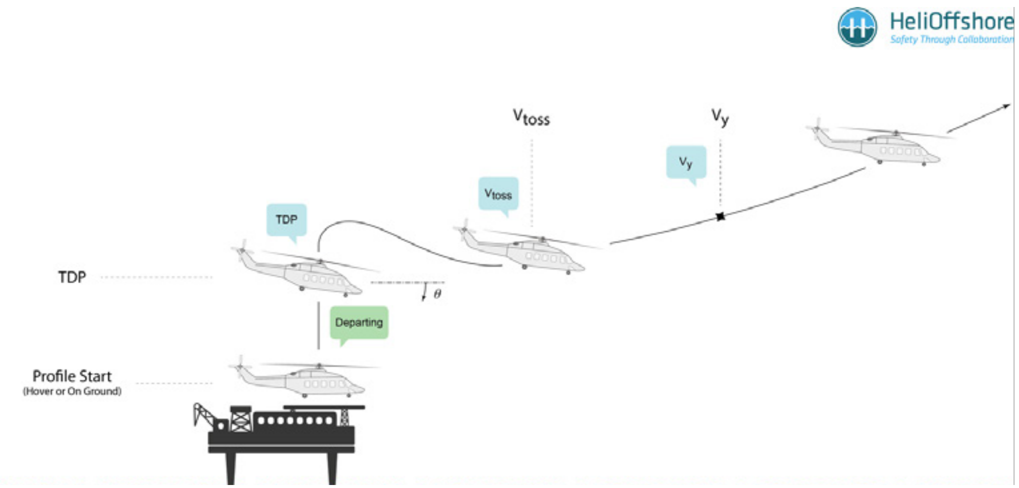
3.2.1.1 Example Clear Area Take-Off



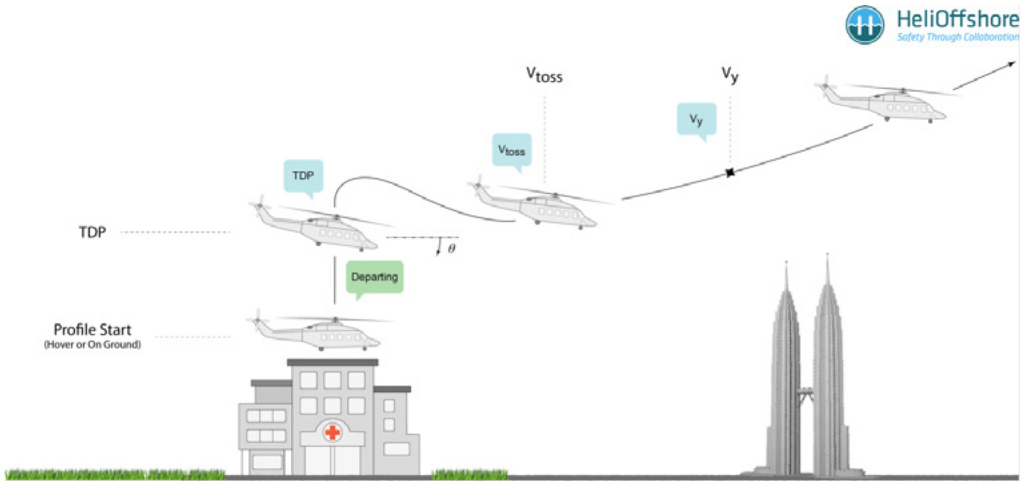
3.2.1.2 Example Vertical Ground Helipad Take-Off



3.2.1.3 Example Offshore Elevated Helideck Take-Off



3.2.1.4 Example Onshore Elevated Helipad Take-Off



3.2.2 Cockpit configuration and Energy State Monitoring

While standardising departure profiles helps satisfy prescribed performance requirements, establishing and publishing standard cockpit configurations for each profile aids Workload Management and Situational Awareness, benefiting both the PF and the PM while operating low level at low airspeeds. Standardised display configurations also help ensure the PM has the necessary information optimally presented to facilitate monitoring and any departure-specific SOPs.

In addition to the basic flight manoeuvre, operators should provide clear guidance tying their standard operating procedures (MCC, cockpit setup, monitoring calls etc.) to each departure profile.

3.2.3 Use of Force Trim Release (FTR)

The Force Trim systems in most helicopters are well integrated into the flight control and automation systems. How the force trim release is used, particularly during the departure phase is critical to safe outcomes. Pilot manipulation of force trim systems directly affects automation behaviour. For example, inadvertent or inappropriate engagement of the collective force trim release may cause a power reduction in a climb and a resultant descent which may be unnoticed by the crew. Therefore, operators should establish a policy in their operations manuals and training programs on appropriate use of force trim release during departure, in line with the OEM's philosophy on FTR use.

3.2.4 Rotation point

The point of rotation during the take-off phase should be guided by manufacturer philosophy. In low visibility environment, somatogravic illusion presents a significant threat that may lead to disorientation and loss of control. However, simply adhering to OEM recommended take off profiles does not eliminate the issue of disorientation. For example, some helicopters may have a lag in initial display of airspeed on departure. This phenomenon may cause crews to exceed the recommended pitch change and /or fixate on the airspeed indicator, leading to a degraded climb and eventual loss of control. Operators should consider including in their operations manuals standard phraseology to be used for pitch deviations. Operators should also include in their training programs, annual training to raise awareness on the effects of somatogravic illusions during departures in limited visibility.

In some cases, a departure will involve a crosswind component. This serves as an essential discussion point on aircraft performance (out of wind) as well as reference for deviation calls; any aircraft limitation relative to crosswind must be discussed and mitigated prior to take off once the desired departure heading is agreed. This is of specific importance for vertical “confined” departures such as offshore. From the rotation point – whether the flightpath is forward or sideways – the briefing should state the PF’s manoeuvre intentions to ensure a common situational awareness from TDP through to V_{toss}.

Note: For vertical helideck take-offs, the ideal TDP height is normally a fixed value, but conditions may dictate otherwise. It may not always be possible to comply with the OEM published profile, particularly if there are obstacles in the flight path such that sideways or even rearward movements are required during take-off. Furthermore, the PF may have to rotate (TDP) earlier than normal during night operations due to loss of visual references.

3.3 Departure gates

The departure phase presents a unique challenge where the aircraft energy state is at its lowest and therefore leaving limited options for the crew to correct any undesirable states. It is therefore critical to adopt manufacturer recommended departure profiles supported by adequate briefings and effective monitoring. Defining gates during the departure, in accordance with the standard profiles, provides an additional line of defence whereby briefing, monitoring and automation are integrated into the energy state and flight path management during this phase. The following sections outline recommended procedures based on the recommended gates:

a. On ground
b. Hover to TDP
c. TDP to V_{toss}

Note that gates are continuous – not all actions occur at the exact time the gate is met.

3.3.1 On ground

Effective planning and briefing prior to take-off have demonstrated to be a potent threat and error management tool; not only related to the departure phase but for the entire flight. Operators should include in their operating procedures the need for structured pre-departure briefings.

Operators who have adopted standardised profiles with well-defined crew duties may elect to carry out abbreviated “standard” departure briefings requiring only the dynamic components of the procedure to be verbalised. During a standardised departure, it is assumed both pilots understand their respective duties both in terms of achieving and maintaining published performance targets for the PF and providing monitoring support through standard callouts from the PM.

Operations Manuals should clearly document briefing requirements to include:

- Discussion on avoidance of, or mitigation against known threats on the departure.
- Take off profile management criteria to include power settings, attitude control and target airspeeds and altitudes
- Runway or Helipad to be used
- Initial Altitude
- Manoeuvring required to align with planned departure path
- Emergency Recovery – Runway/ approach, diversion plan or take-off alternate (if applicable)
- Use of Automation and configuration
- PM and PF roles on the departure

Note: If using any non-standard procedure, all applicable calls must be briefed.

3.3.2 Hover to TDP

A stable departure is largely dependent on a stable and predictable hover. The PM must always closely monitor for drift and any other deviations from the briefed departure plan.

During operations in DVE, crews should be aware of the possibility of Expectation Bias where the perceived departure path of the aircraft does not coincide with actual aircraft position and projected flight path. The following factors should be considered prior to entering a hover for departure.

Factor	Considerations
Stability of the hover	Hover height, drift, visual cues
Aircraft integrity and Configuration	All parameters within limits, Equipment set appropriately
Take Off Path	Obstacles, Effects of wind velocity and other environmental conditions on perceived aircraft position
Power Use	Required power for briefed profile, margin, application

Note: Operators are advised to ensure the aircraft weather radar is in a safe configuration when operating in close proximity to helideck crews.

3.3.3 TDP to V_{toss}

Operators should specify the following as a minimum with respect to the TDP Gate and the subsequent flightpath to V_{toss}. The procedures should provide guidance on monitoring of performance (energy state), automation and other pertinent criteria.

For a clear-area take-off, the TDP speed may be variable depending on aircraft mass, take-off distance available and atmospheric conditions. Most helicopter types operate with a fixed TDP with the option of adjusting to an exact value if required to meet the performance criteria. For a vertical take-off, the TDP is defined as height above the take-off surface. The TDP gate ends when the helicopter has reached V_{toss}.

Normal & Deviation Calls: For all take-off profiles, the SOP guidance should include calls relevant to the profile e.g., power setting, TDP, vertical speed, aircraft pitch attitude. Deviation calls from the briefed flight path as well as to the normal profile criteria including an undesired aircraft state with negative energy should be included e.g., an excessively high rate of descent with an aircraft pitch attitude below the profile criteria or a high climb rate with insufficient or decreasing speed.

Missed calls can also have a significant impact on the take-off profile, especially when taking off from helidecks and perhaps even increase the risk of impact with obstacles. The ability to successfully manage the flightpath relies on robust SOPs detailing limits, deviation calls and their expected responses.

Energy State & Performance: The energy state is communicated through normal calls from the PM who confirms that the PF is following SOP. Any negative change in the energy state should be announced by a deviation call from the PM followed by an action and a response from the PF to return to the desired flightpath and or parameters. For helideck take-offs, CFIT becomes a high-level threat if a negative energy state is not managed correctly within seconds.

Automation: The global helicopter fleet has a range of autopilot capabilities from fully automated helideck take-offs to all manual take-offs beyond V_{toss}. It is recommended SOPs include a detailed description of the preferred modes of operation, but the normal and deviation calls should match as much as possible to ensure consistency across both manual and coupled departures. Where available coupling should be utilised as early as possible during night and DVE departures to reduce crew workload and enhance monitoring of the energy state. Aircraft without this capability require a high degree of crew coordination to address the increased workload. Either way, the operator SOP should describe the crew coordination in detail.

Section 4 Approach and Go-around Guidance

Section 4
Approach and Go-around Guidance

4.1 Approach and go-around guidance introduction

The following Approach Path Management guidance has been developed following a review of operators' stabilised approach criteria and anticipated enhancements in aircraft and terrain warning systems. Rather than simply stipulating specific approach gates similar to fixed-wing stabilised approach criteria, this guidance takes into consideration a range of elements, each providing a specific barrier to helicopter-specific risks or hazards experienced during the approach phase.

4.1.2 Helicopter approach criteria

Stabilised approach procedures should be based on approach gates similar to those employed by fixed-wing operators which define when an approach is considered stabilised and actions to be taken if these parameters are not met.

IOGP Report 690-2, Flight Procedures, Section 32 specifies that:

"The Aircraft Operator has established and documented stabilised approach procedures.

Stabilised approach procedures are documented that define when to conduct a missed approach or abort a landing if deviation criteria for a stabilised approach are not met.

The procedures are written with reference to the HeliOffshore Flightpath Management Recommended Practices.

Stabilised approach procedures are specific to the aircraft type or use a TC Holder issued Flight Crew Operating Manual (FCOM).

Procedures are characterised by defined speeds, climb/descent rate, vertical flight-path and configuration, through a series of defined 'gates' as necessary.

Stabilised approach criteria confirm that:

1. The aircraft is on the correct flight path and only requires small changes in heading, attitude and power to remain on the correct flight path.

2. The aircraft is in the correct landing configuration and all briefings and checklists have been conducted.

3. The power setting is appropriate for the aircraft configuration, not below the manufacturer's minimum if specified in the Aircraft Flight Manual or FCOM.

4. Flight crew procedures include monitoring of the flight path and the requirement to announce deviations and subsequent actions using specified criteria.

Unique approach procedures or abnormal conditions that require a deviation from stabilised approach criteria require a special briefing.

Procedures are in place for no-fault, mandatory go-arounds if any approach not be stabilised, and pilots practice all-engine operating (AEO) go-arounds as part of their proficiency training."

Helicopter approaches should ideally be stabilised by 1000 ft above approach minima, but no later than 500 ft above approach minima in IMC; and by 500 ft above landing elevation in VMC, with the following two exceptions:

- Operations where the transit height is less than 500 ft above landing site elevation: The aircraft should be stabilised prior to descent below 300 ft above landing site elevation and before deceleration below 60 kt ground speed.
- Operations where the aircraft is consistently operating at a low height above the terrain such as seismic work involving external load operations into remote landing sites, requiring a site reconnaissance before landing: The stabilised approach criteria may require modification by the operator. Any changes to the standard criteria should be clearly documented in the relevant Operations Manuals.

A flight is stabilised when:

a. The aircraft is on the correct flight path and the correct navigational data has been confirmed as entered into the navigation system for final approach to the desired airport, heliport, helideck, or other landing site.
b. Only small changes in heading, track, and power are required to maintain the correct flight path. It is recognised that certain environmental conditions will require larger power changes than normal.
c. All briefings and checklists have been completed, except for the final landing check.
d. The aircraft is in the correct landing configuration. In addition to previously mentioned landing gear, approach speed, and power criteria, there may be other unique, aircraft-specific configuration requirements that should be addressed e.g., rotor speed selection.
e. The sustained rate of descent is no greater than 700 fpm upon arrival at the stabilised approach gate, or as recommended by the instrument procedure. If an approach requires a rate of descent greater than 700 fpm, this should be clearly briefed, with a focus on procedures to address the higher-than-normal rate of descent.
f. Once the final approach minimum is reached, confirmation of the correct airport, heliport, helideck, or landing site must be made.

Anytime an approach becomes 'unstabilised' (falls outside the parameters above) a go-around / missed approach should be executed immediately, unless the operator has established a limited number of deviation protocols that can be safely used to return to the stabilised profile.

Further expansion and summary of stabilised criteria can be found in Annex B – Recommended guidance points on stabilised approaches.

4.2 Approach path energy state

To date, stabilised approach criteria often consider minimum airspeed and maximum rates of descent (ROD) as the basis for their guidance. However, the concept of combining airspeed, rate of descent, aircraft pitch attitude, and collective position (power applied) to define an energy state has rarely been addressed. While an HTAWS mode expansion to warn flight crew of an impending low energy state is in development, these systems only provide warnings when a situation has already started to develop. It is therefore essential to establish flight practices and operator guidance to prevent the development of low energy state conditions.

4.2.1 Standardised approach profiles

The use of standard repeatable approach profiles, tailored for specific types where required, enhances the ability of crews to monitor and detect deviations.

HeliOffshore members provided three alternative examples of standardised offshore approaches. The first, developed for the AW139, makes use of a 5° profile that can easily be monitored by the PM, through the use of the FMS and a pseudo-glideslope indicator. It is not intended to be flown as an instrument style approach but rather provides enhanced monitoring tools to ensure a standardised approach is flown both day and night in VMC. The second example is more generic, providing guidance that could be applicable to multiple aircraft types. Both these styles of guidance are valid, and both require approaches to be flown in the same manner, to the same gates and airspeeds regardless of the landing site and regardless of day or night operations. Repeatability is the key to ensuring the aircraft achieves safe, predictable parameters at the LDP every time.

The third example highlights there can be significant difference between day VMC, night and DVE conditions. While approaches in day VMC can be largely based on a standard 'sight picture', a more formalised structure of gates and checkable parameters should be used for night and DVE approaches. These parameters should be simplified to reduce pilot workload and facilitate repeatability. However, there is no reason why all approaches, even in day VMC and in short sector 'shuttle' operations, should not comply with a set starting gate position (e.g., established on the final approach track at 0.5nm) where the established parameters for that specific approach must be achieved.

IOGP Report 690-2, Flight Procedures, Section 33 specifies that:

"The Aircraft Operator has established a procedure for flight crew to confirm the location of offshore destinations.

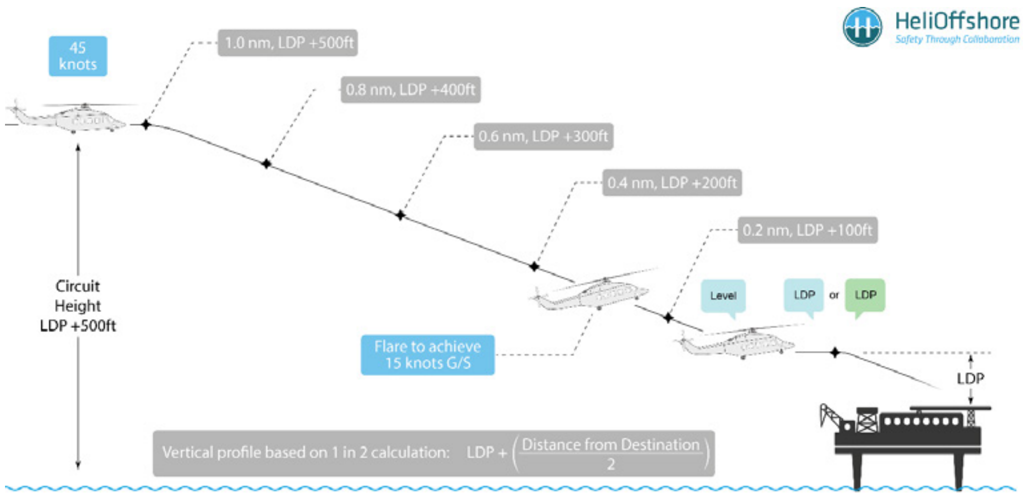
There is a process to identify the relative risk (high, medium, or low) of a wrong deck landing at a particular destination or vessel during flight planning. This process considers factors such as the location of mobile installations and vessels, proximity of adjacent decks, physical similarity of adjacent installations or vessels, similarity in naming conventions, etc.

Procedures are in place to review this risk during all pre-flight briefings and discuss in pre- landing briefings (unless the risk in that area is continuously low).

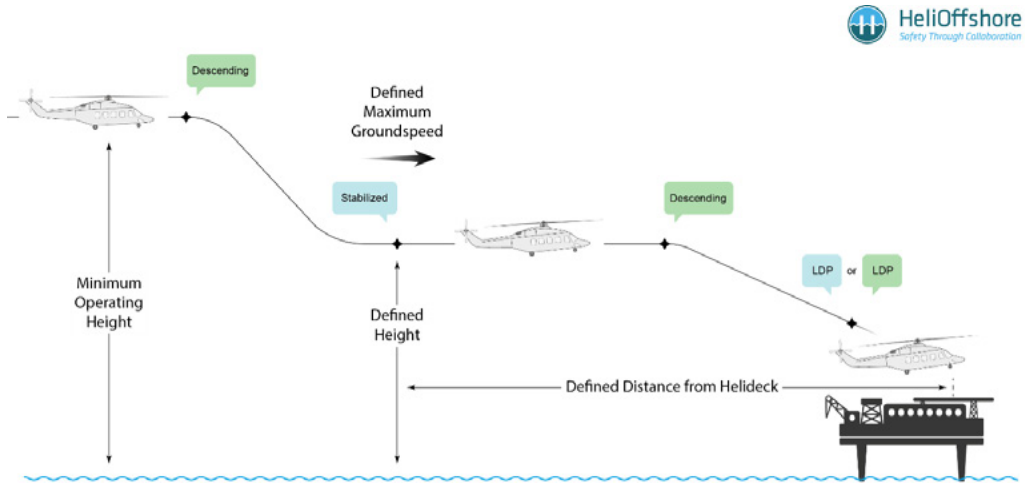
There are procedures in the operations manual/ normal checklists for verification of the destination position and facility name when approaching all vessels and installations."

Approaches to a moving helideck such as a survey vessel or FPSO require the crew to obtain an accurate position for their flight planning. However, it is sometimes possible that for environmental (wind change) or operational reasons the position of the vessel could change significantly. This could lead to a discrepancy between the expected location of the moving helideck and its new position by a significant distance. The orientation of the helideck could also be affected, potentially impacting the crew's planned approach. Therefore, it is imperative the crew receive an updated position report from the destination vessel prior to commencing the approach. Confirmation of the vessel's position can often be conducted by careful use of the weather radar.

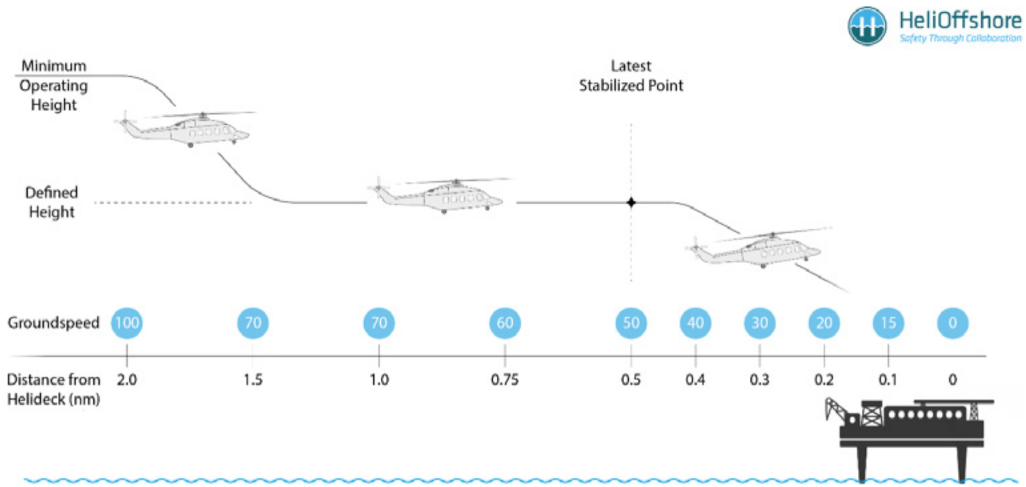
4.2.1.1 Example 1: Defined 5° profile



4.2.1.2 Example 2: Standardised approach criteria



4.2.1.3 Example 3: Day DVE or night offshore approach (not to scale)



4.2.2 Energy state monitoring

The energy state call out is considered critical in preventing CFIT or loss of control events in offshore helicopters. Again, it may not be possible to define these points generically as each aircraft's stability and power characteristics differ, but continuous monitoring gates can be established.

The need for a standard '500 to go' call (for an onshore approach) or a '0.5 NM' call for an offshore approach, defining the stabilised 'gate', warrants examination. Many of the events related to energy state have occurred below this 500 ft level or inside 0.5 NM, suggesting that a continuous monitoring of energy state is more valid than achieving a singular point in space where the aircraft is considered stable. The later in the approach that instability occurs, the more difficult it is to remedy. Operators should ensure their procedures reflect this requirement of continuous monitoring.

For offshore approaches, in DVE or at night, it is important to define criteria that require a go-around to be executed should the approach become unstable between the 0.5 NM gate and the committal point. These should normally include minimum power setting, minimum airspeed and maximum rate of descent. Any landing site that is similarly limited in physical dimension, such as a confined area, should be treated in the same way.

4.2.3 Energy state call outs

Examples of approach minima for speed and power standards include:

1. During approach to a clear area (e.g., runway) the requirement to maintain a minimum of V_y until deceleration is necessary, in compliance with the landing procedure dictated by OEM, operator or regulator requirements.
2. During approach to a landing site of limited physical dimension (helideck/ confined area), the requirement to maintain a minimum of V_{toss} until the transition point is reached.
3. Specify a minimum power setting when operating below a certain speed, combined with prescribed calls to initiate a go-around (note this type of call may be aircraft-specific).

4.3 Approach briefing

Approach briefings can be considered in two parts; the details of the approach being flown be it visual or procedural, and the way the aircraft is to be flown. The following is recommended for approach briefings:

a. An approach briefing should be given for each landing. The briefing should be completed before the top of descent for an instrument approach and no later than the Before Landing checks for a visual approach. Where available, coupled modes should be used during the approach briefing to reduce workload. The briefing should be conducted by the appropriate crew member dictated in operational guidance for a given situation. Briefings should be fully interactive with each item briefed and confirmed during the briefing to ensure mutual understanding between pilots and to verify accurate settings. If either pilot has any misunderstanding, both pilots should resolve the issue during the briefing, to mitigate any misunderstandings during the actual approach.
b. It is recommended that operational guidance describes how the crew will prepare the cockpit in advance of the briefing (setting up of required approach aids, frequencies and so on). This minimises the chances of interruptions while further adjustments are made to system settings, reducing the possibility of essential steps being missed. During the briefing, the briefer points out the settings to verify the setup matches what is required in the procedure and is duplicated on both sides of the cockpit as applicable. This provides redundancy (dual confirmation), reducing the time required for the briefing.
c. Separate the section of the briefing that refers to aircraft management and ensure that both pilots understand the IAS, ROD, and anticipated power settings for the approach. Highlight the areas for the specific approach where particular focus may be required, such as higher rates of descent when a downwind component is present. It is accepted that heading changes may be required during the final stages of an offshore approach, especially if the approach track is not aligned with the wind due to obstacles in the approach path, requiring alignment into wind at a late stage. However, flight path (track) changes should always be minimised when possible.
d. Brief a go-around procedure including the aircraft management parameters such as speed, rate of climb, power, heading, and automation usage. All of this should be SOP requiring minimum briefing, but any non-standard items should be briefed in detail. Discuss the various possibilities that may lead to a go-around late in the approach. Some examples include, loss of visual references due to heavy rain showers, patchy fog, or last-minute problems at the landing site. This section of the briefing should also be interactive, and each pilot should articulate what is expected of their position during the go-around.

Note: In the context of approaches and automation, any variation to standard automation operating procedures should be briefed separately with particular attention drawn to the potential consequences and the required additional monitoring.

4.4 Monitoring procedures during approach

Monitoring procedures are essential during all phases of flight and have been covered in section 2.2, however approaches require discipline, focus and strict adherence to SOPs.

4.4.1 Deviation calls

Deviation calls during an approach should therefore be based upon the following criteria:

1. Pilots should make deviation calls as soon as a deviation is observed outside of defined limits to ensure the maximum time for correction before an unacceptable flight condition occurs.
2. The thresholds should be set at the point where a deviation is rare but equally at the point where a recovery is still possible with minimum intervention. These settings should also ensure the PM is not required to make constant calls for minor deviations such that PF becomes immune to PM's input and therefore fails to take action when it really becomes necessary.
3. Pilots should acknowledge all calls. Lack of acknowledgement may indicate early signs of incapacitation.
4. Any deviation call should be acted upon immediately, not simply acknowledged.
5. If the stabilised criteria are not re-established, the PM shall command a go-around and PF shall comply immediately. If stabilised criteria are not maintained during a go-around the PM may need to assume control.
6. Operators should develop a non-punitive go-around policy that views all go-arounds as a safe choice, regardless of reason. Examples could include ATC requirements; deteriorating meteorological conditions; or misjudgement of visual approach.

4.5 Approach-specific automation guidance

General guidance relating to the use of automation is contained in section 2.5, but there are some specific and important considerations that relate to approaches.

4.5.1 Offshore approach at night or in DVE

Whenever possible, a straight-in landing is preferred. If a circling approach is unavoidable, it should be flown coupled in 4-axes, with PF adjusting ALT, HDG and IAS through beep trims while maintaining visual cues until the LDP.

The use of automation for offshore approaches should be integrated into the specified approach profiles as described under energy state earlier in this guidance document.

Note: Certain aircraft types require the final stages of offshore approach profiles to be flown at speeds below the minimum coupled speed. This type of restriction requires manual flight on final approach and reinforces the need for standardised approach profiles.

Note: In some cases, it may be easier to manually fly the lateral profile rather than coupled to HDG; this is acceptable provided the vertical (altitude hold, radar altitude hold, or vertical speed) and IAS modes remain engaged.

4.5.2 Onshore approach

The variety of available onshore approaches and the range of automation available to conduct these various approach types makes the application of standardised criteria across multiple types difficult.

However, the application of the standard automation principles in section 2.5 and the energy state monitoring criteria in section 2.4 should aid the safe conduct of all types of onshore approaches.

4.6 Go-around management

While operations manuals should include a focus on the need to address go-around procedures in every approach briefing (see Section 4.3d), attention should also be drawn to the Human Factors barriers that may affect the decisions made with regard to a go-around.

An AEO go-around is a flight procedure that is often neglected in both preparation and training. Statistics, kindly provided by the LOSA Collaborative identify a strong tendency for fixed-wing crews to continue approaches despite deviations outside of company published stabilised approach criteria, suggesting a reluctance to execute a go-around. That reluctance tends to stem from a powerful desire to complete the landing. Historic culture supports landing at the planned destination as the only possible positive outcome. That desire can be coupled with other human factor pressures.

Factors that lead to a breakdown in procedural discipline include fatigue, company pressures, customer pressure, fuel state, deteriorating weather, and the powerful desire to land at the destination. That desire to land can also intervene during a go-around. Once the go-around is initiated, the crew must maintain commitment to a stabilised go-around, even if the landing area suddenly becomes visible after the go-around is stabilised. Procedural discipline is supported by strong policy and safety culture. Operators should develop a clear no-fault policy of supporting a crew's decision to perform a go-around regardless of the circumstances. A stabilised, successful go-around will always yield better results than an unstabilised approach.

Data gathered from 53 fixed-wing LOSA programs conducted from 2015 to 2020 indicate that 411 Unstable approaches, as defined by the specific companies and witnessed by observers, were continued to a landing. Of these approaches 55 percent were flown by the captain of the aircraft. Only 12 unstable approaches resulted in missed approaches being flown.

Observations have also suggested that missed approaches are often poorly managed, prompting a revision to the observation criteria and the acquisition of additional data. As more LOSA observations are gathered by the offshore helicopter industry it should become more apparent as to whether similar areas of concern exist.

It cannot be over emphasised, however, that a revision of procedures and dedicated training scenarios should be considered as part of the overall approach management system within all companies.

The considerations during the go-around of a large jet are complex due to aircraft configuration changes such as flaps and the associated speed restrictions. Likewise, for a helicopter at low speed with a high pitch-up attitude, at night, at 90 degrees offset to the destination, a go-around can be just as complex: the helicopter requires a substantial change in pitch attitude to accelerate to V_{toss}, while minimising height loss; the PF needs to transfer their scan rapidly from outside to inside; and the PM needs to monitor the attitude, power, and flight path very closely. Regardless of aircraft type and the technical requirements of a go-around, the overriding human factor issue is that crews are landing 'focused' and often mentally unprepared when a missed approach is required.

Furthermore, helicopter training has often focused on the need to train the go-around from instrument approaches with one engine inoperative (OEI) and rarely reflects an AEO go-around from an unstabilised approach. Operators should consider devoting training time to AEO go-arounds as a result of an unstabilised approach, loss of visual cues, or last-minute problems on the landing site.

Operations manuals should contain not only the instructions and appropriate calls to direct a go-around but also clear simple guidance on how to conduct the go-around. That guidance should include stabilised go-around criteria for the PF to execute and the PM to monitor, in line with the same philosophy as the approach criteria. This should include direction regarding flight path parameters and the correct use of automation modes including any combination of modes to be avoided. The guidance should address how the energy state and required reactions during a go-around will differ according to situation. A go-around conducted late in the approach at a low altitude with low airspeed is different to a procedural go-around conducted as part of a missed approach procedure. In the case of an instrument missed approach procedure, the aircraft energy state should already be stabilised at an airspeed and track that support an immediate transition to a climb with only a change to climb power. In this condition, stabilised go-around criteria should be set similar to the example shown.

4.6.1 Example 4: Stabilised missed approach criteria

A stabilised missed approach means the aircraft maintains a stabilised airspeed and climb rate, desired flight path and configuration during the initial stages of an IFR Missed Approach to 500 ft above landing surface. The following parameters constitute an unstabilised missed approach:

a) Excessive pitch, roll or yaw corrections.
b) Failure to maintain appropriate airspeed (V_y).
c) Failure to maintain a positive rate of climb of at least 500 fpm not to exceed RFM limitations.
d) Heading deviations greater than 10 degrees without appropriate correction unless in response to charted procedure.

Upon recognition of being outside the parameters of a stabilised Missed Approach, the PM shall make deviation calls (see Sections 2.2.2 and 4.4.1)

In the cases where the go-around is initiated late in the landing approach, flight path parameters should be re-established that support a favourable energy state. Guidance and training should support the application of take-off power, a pitch attitude that provides acceleration to V_{toss} and subsequently V_y, and a go-around track that avoids known obstacles. Once a positive rate of climb is obtained, along with an appropriate stable climb airspeed, the transition to the previously mentioned stabilised missed approach criteria should be utilised.

4.6.2 Example 5: Go-around from low energy state

IMC or DVE flights can be much more difficult at low airspeeds. Training should be conducted to prepare crews for the challenging task of maintaining flight path management under those conditions.

Many older automated systems are not available or are unreliable at low airspeeds, therefore manual recovery skills should be part of training programs. For the newer automated systems that function effectively at low airspeeds, the crew training should encompass understanding and practice of the automation in slow flight regimes.

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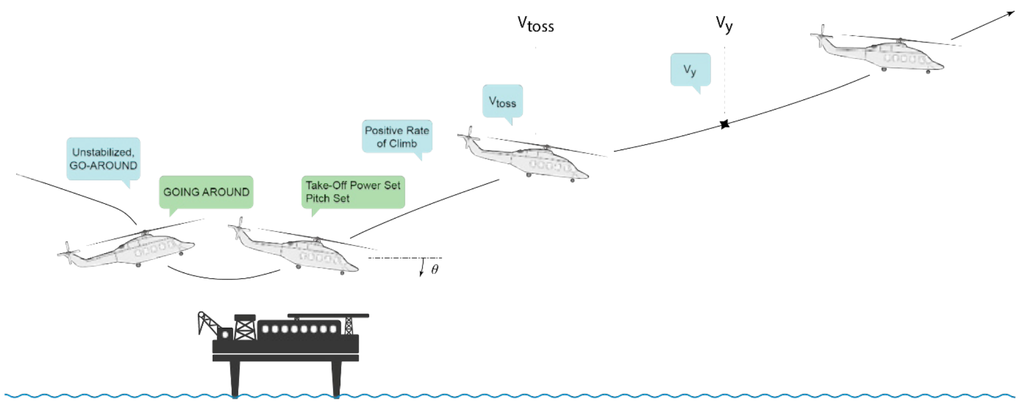


Section 5 Summary of Recommendations

Section 5
Summary of Recommendations

Operators should establish flight path guidance in their Operations Manuals, Training Manuals, and Checklists for critical phases of flight operations (inclusive of taxi, take-off, cruise, approach, go-around, and landing). As part of this flight path guidance, operators will develop procedures for the use of standardised departures and stabilised approach procedures for all flights (Sections 3 and 4).

Guidance relating to energy state criteria, both during departure and for stabilised approach, is considered an essential element and as such should be incorporated in Operations Manuals (Sections 2.4 and 4.2).

Continuous monitoring of stabilised criteria through multiple 'gates' is more valid or relevant than achieving a single point in space where the aircraft is considered stable. Operators should ensure their procedures reflect this requirement (Section 2.2, 4.2.2 and 4.5).

Briefings should be given for each departure and approach (Section 2.3). Departure briefings should be completed on the ground while approach briefings should be completed before the top of descent for an instrument approach and no later than the before landing checks for a visual approach. Where available, the coupled modes should be used during airborne briefings to reduce workload. Briefings should be interactive to support engagement and focus of all crewmembers. Details should include the intended flight profile, parameter monitoring, specific threats to the departure or approach, how those threats will be managed, reference to any additional go-around or reject triggers, non-standard parameters, or unique landing site requirements. It is also essential to brief how the autopilot modes will be used in each situation (Sections 3.2, 3.3 and 4.3).

Operators should consider devoting training time to AEO go-arounds as a result of an unstabilised approach, loss of visual cues, or last-minute problems at the landing site. The go-around training should be initiated from varying levels of energy state, to include the more challenging low speed regimes (Section 4.6).

All operators are encouraged to include standard calls for normal operations and for deviations from normal flight profiles. Calls should be kept to a minimum, be logical and only used where a missed call or event would have a negative safety consequence (Section 2.2).

Operators should ensure that their operations manuals clearly detail procedures for the use of automation and, if OEM guidance (for example, FCOM) is unavailable, explain automation modes and combinations of modes that may present additional dangers due to mode confusion. Specific consideration should be given to automation training requirements to ensure all protection modes are fully understood (Section 2.5).

Operators are strongly encouraged to implement the Recommended Practices as outlined in this document. To enable effective implementation through a gap analysis with existing company operations manuals and policies, HeliOffshore provides an **Implementation Tool-Kit** which operation member representatives can access through their HeliOffshore Space accounts.

HeliOffshore intends to continuously review, develop and enhance these Recommended Practice documents and as such user feedback is greatly appreciated.

For feedback or details on how to access the Implementation Toolkit, please email info@helioffshore.org

Annex A Example briefings and callouts

Annex A
Example briefings and callouts

Example full instrument approach briefing:

Contents:

a. Plate number, name, and date
b. Follow the briefing strip order, i-viii if applicable but in any case, the following items are to be included:
   i. Approach type
   ii. Navigation aids (Radio and/or GPS setup and requirements)
   iii. If raw data or coupler/flight director will be used
   iv. Speeds
   v. Arrival: STAR arrival route
   vi. Procedural sector
   vii. FAT crossing altitudes and timing
   viii. Minima and weather
   ix. Runway elevation
   x. Actions at minima
   xi. Missed approach procedure including planned alternate and fuel requirements
   xii. Any airfield or heliport special briefings

Abbreviated IFR approach briefing:

a. ILS (or other approach) to runway XX at………
b. FAT is……º, DA/MDA is……ft, minimum RVR … metres
c. Runway elevation is …..
d. Commencement and continuation of approach
e. I will fly 4-axes coupled / 3-axes coupled/ raw data approach
f. My landing/your landing (subject to weather)
g. Go-around procedure will be…….

Example abbreviated offshore landing briefing:

1. Standard offshore landing, heading XX
2. Go-around to the right/direction XX
3. Review any turbulent arcs, obstructions or restricted landing arcs if applicable

Briefing

Pilot flying	Pilot monitoring
Plate 11-1, ILS Y dated 2 October 2019	I have the same
ILS to runway 03, ILS frequency 109.75, tuned and identified CVF my side	109.75 tuned and identified I-ABC my side
Final approach course 034 set my side	034 set my side
I will fly 4-axes coupled at 100 kt. No STAR, it will be radar vectors. Crossing altitude 1,340 ft at 4DME.	1,340 ft at 4DME
Weather is above minima, there is no approach ban. Elevation is 210 ft, bug set at 410 ft.	Bug set 410 ft
Assuming you are visual at minima I will continue to fly the approach fully coupled until I am happy with the visual references, then decouple and land	Understood
If we have to go around, standard missed approach procedure is straight ahead to 2,000 ft then start a left turn back to the NDB to hold at 3,000 ft	I will set ALTP to 3,000 ft once we start the descent. NDB is tuned and identified 397 DEF and set on the RMI.
We have enough fuel for two approaches before we need to divert to XXX	I agree

Example calls, onshore instrument approach:

Flight event	Pilot monitoring		Pilot flying	
It is recommended that the PF maintain reference to the instruments while PM looks for visual references and monitors the approach.				
	ACTIONS	**CALL OUT**	**ACTIONS**	**CALL OUT**
At first inward movement of localiser bar		**"Localiser alive"**		**"Checked"**
At first downward movement of glideslope pointer/bar		**"Glideslope alive"**		**"Checked"**
If flown coupled, at localiser/ glideslope capture		**"Localiser/ glideslope captured"**		**"Checked"**
FAP inbound	(note a)	**"FAP"**		**"Descending"**
500 ft above DA, stabilised approach		**"500 ft to go, stabilised"**		**"500 to go, stabilised"**
or		**or**		**or**
500 ft above DA, not stabilised		**"500 ft to go, not stabilised, go around"**		**"Going around"**
100 ft above DA		**"100 ft to go"**		**"100 to go"**
At or just before DA	If PM has required visual references	**"Visual"** or **"Visual, Runway, 11 o'clock"** or **"Visual, lights straight ahead"**	If PF has required visual references	**"Visual, Landing"**
	If not visual (note b.)	**"DA, Go around"**		**"Going around"**

Note:

a. Normal SOP calls and checks regarding FD selections, DAs, and bug settings are applicable during the approach

b. The "DA, Go around" call should be made in time to allow the go-around decision to be made at the minima

Example procedures for automation management and standard calls

Autopilot – Coupler/flight director modes
When available, it is recommended to operate the aircraft coupled, encouraging better overall management of aircraft systems, navigation, and passenger comfort. It is important to involve both pilots in the process at all times to maintain a closed loop. All mode selections and de-selections shall be announced, and confirmed by the other pilot. PF may make mode selections himself or may request the PM to make selections, in particular at times of high workload. All mode selections below 500 ft at night or in IMC should be made by the PM, on the PF's request, with the exception of modes that may be selected directly by buttons on the flight controls and full disengagement of the coupler/FD. While PM may adjust mode values at PF's request, PF may only adjust coupled mode values, provided it can be done using buttons on the flight controls; PF shall call the adjustments being made (for example, to IAS, HDG or ALT), so that PM is aware and can monitor.

Coupler/FD management
There are three steps. PF can start at step one or two depending on who is pressing the button on the coupler panel. PM will respond with the next step in line, and so forth. If the modes couple automatically, PF calls **"Captured"**.

When altitude change mode is used (ALTA/ALTP), both pilots shall confirm that the desired altitude is set with reference to the correct altimeter sub-scale setting. The pilot not selecting the altitude change mode shall then confirm that the correct vertical mode engages. Do not select the next desired altitude until clearance to climb or descend has been received, to avoid inadvertent altitude changes.

Deselection of a mode shall also be requested or announced. All decouple alerts shall be acknowledged, either with the procedure below, or if an unexpected alert is heard, with a clear statement of what has changed.

The three steps are command, action, and confirmation:

a. Command (request a mode, if required)
b. Action (mode selected or armed): Visually locate the mode select button in question, select the mode, and look for the expected mode annunciation and aircraft reaction
c. Confirmation (correct indication displayed on the Flight Mode Anunciator): Visually verify the correct mode annunciation and that the aircraft reacts accordingly

PF asks PM to couple a mode	
PF	**PM**
"Select altitude"	
	"Altitude selected"
"Altitude captured"	
PF couples a mode themself	
PF	**PM**
"Altitude selected"	
	"Altitude captured"

The helicopter is coupled in VS and reaches the acquired altitude	
PF	**PM**
"Altitude captured"	
	"Checked"
PF asks PM to arm localiser	
PF	**PM**
"Arm localiser"	
	"Localiser armed"
Pause	
"Localiser captured"	
	"Checked"
PF arms the localiser	
PF	**PM**
"Localiser armed"	
	"Checked"
Pause	
"Localiser captured"	
	"Checked"

Note: If there is a pause between a mode being armed and the mode capturing, the other pilot responds with "Checked". When manually flying the aircraft by command bars only, the same terminology is used, however, the PF should add the words **"Display Only"** after the word **"Captured"**. For example **"Localiser captured – display only"**.

Annex B Recommended guidance points on stabilised approaches

Annex B
Recommended guidance points on stabilised approaches

1. Stabilised approach:

The purpose of a stabilised approach is to ensure the helicopter is in the correct configuration, on the correct flight path, and within the correct parameters for the intended landing type (class 1 or 2, hover or running). The aim is to provide safe, repeatable, and consistent parameters at the LDP to minimise pilot workload and to provide a favorable energy state in support of safe approaches down to the termination point. The diversity of operations, environments, and OEM guidance makes a fully encompassing list of stabilised criteria difficult to produce. However, recommended guidance points in this annex can be applied to the majority of operations.

An approach is stabilised when the following criteria are met:

1. The helicopter is in the correct landing configuration, with the exception of speed limited selections for example, NR
2. The helicopter is on the correct (briefed and agreed) flight path within permitted tolerances and this can be maintained using angles of bank and rates of descent within stabilised limits. Normal limits should be defined by the Operator and may be, for example (these examples are not definitive):

- Speed fixed for an instrument approach (within ±10 kt of briefed speed), or appropriate to the distance to go for visual approaches.
- Rate of descent no greater than 700 fpm. If an approach requires a rate of descent greater than 700 fpm, this should be clearly briefed, with a focus on procedures that should be used to account for the higher-than-normal rate of descent.
- Steady power setting (except that when coupled in 4-axes / 3-cue, variations of power demanded by the AFCS to maintain the approach parameters, especially in turbulence, but are acceptable within the context of a stabilised approach). Additionally, some automation systems have an automatic approach deceleration mode, which would also be an acceptable AFCS commanded power change.
- Bank angle variations less than 20 degrees.
- Within half-scale localiser or glideslope deviation or 5 degrees of RMI bearing.

Approaches should be stabilised from defined gates (for example as described below):

1. Onshore instrument approaches should ideally be stabilised by 1,000 ft above approach minima, but no later than 500 ft above approach minima.
2. Onshore visual approach, from 500 ft above landing site elevation.
3. Onshore circling segment of any approach shall have wings level at 200 ft above airport elevation
4. Offshore approaches, from 0.5 NM from the installation if distance is used, or 300 ft above landing site elevation if based on altitude.
5. For low-level SAR and EMS operation, the helicopter shall be stabilised from the point of starting the final descent for landing and in any case before LDP +50 ft, as appropriate.

Just before reaching the gate, PM shall check that the required criteria are met; if they are, the PM shall call “Stabilised”. If any of the criteria are not met at the gate, PM will call “Not stabilised, go around”.

The stabilised approach is terminated for onshore instrument approaches at the MAP, when either a missed approach is initiated or the aircraft is manoeuvred to land, and terminated for visual approaches at LDP or the equivalent point for Class 2 landings. For ARAs, the visual segment after the MAP is flown as a stabilised visual approach up to the helideck descent point. All parameters should remain within the deviation limits.

2. Unstabilised approach:

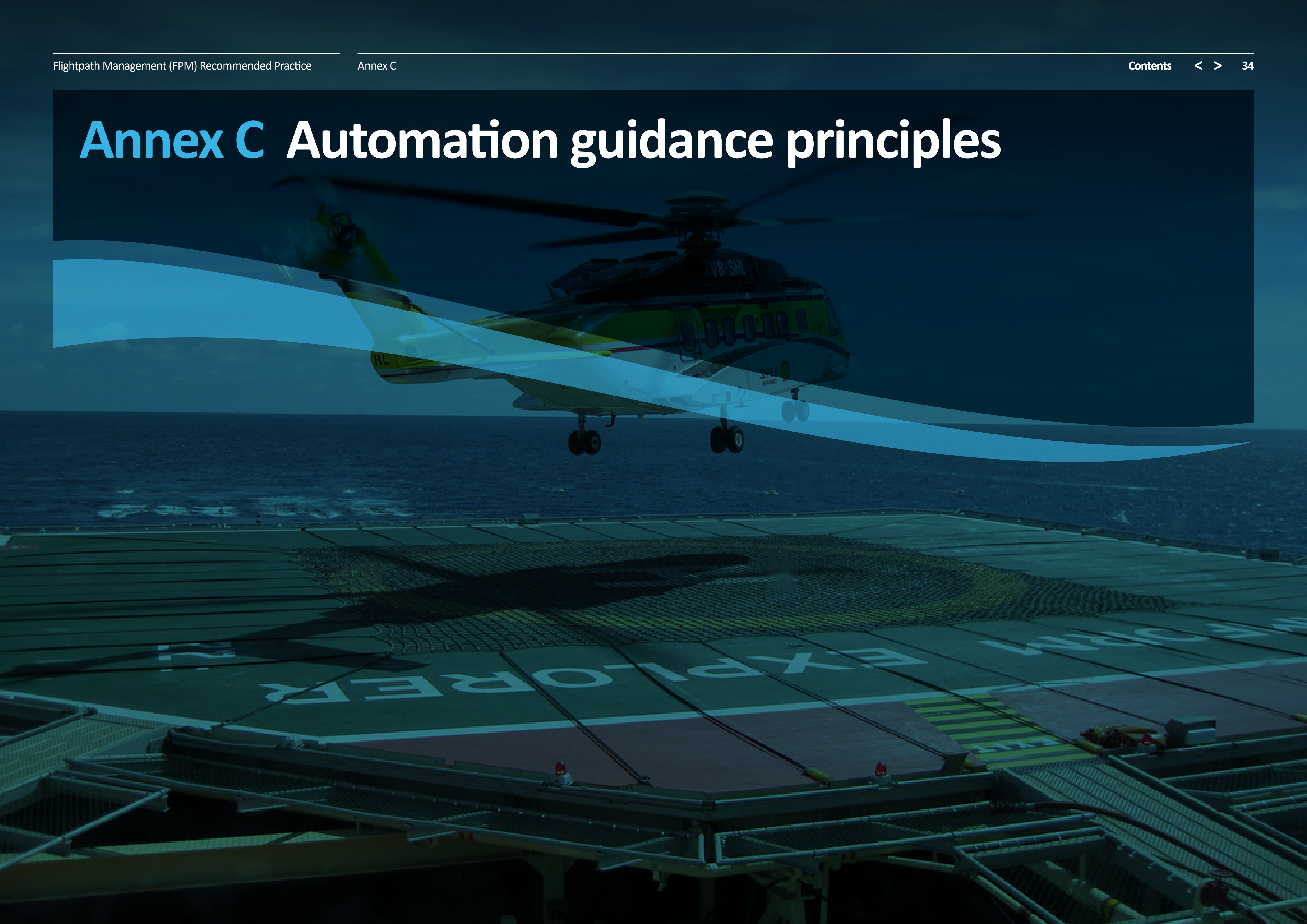
An approach is unstabilised if any of the following criteria are met by the defined gate, or after passage of the final gate (these examples are not definitive):

- Rate of descent above 700 fpm and not correcting.
- Speed significantly above or below the requirement (for example deviation greater than ±10 kt on an instrument approach and not correcting).
- Deviation of half scale or greater on localiser or glideslope or 5 degrees or greater on RMI bearing.
- Height below final approach height offshore before helideck descent point.
- Any TAWS/EGPWS alert.

3. Key considerations and threats for the go-around:

- Why was the go-around required? Aircraft problem, airfield/helideck problem or weather problem (for example loss of visual references, windshear)
- Was the go-around due to an unstable approach?
- What parameter was unstable?
- How will this affect the go-around? For example was the airspeed low or the rate of descent high? Both of these will cause piloting difficulties in converting to the required go-around profile.
- Was the aircraft coupled, and in what configuration (4-axes/3-cue or 3-axes/2-cue), or was it being flown manually?
- If the transition to the go-around involves a change of automation configuration, what needs to be managed closely? Does selection of “Go Around” mean that the roll mode drops out? Does the aircraft need to be re- trimmed to ensure that no unexpected attitude changes are introduced when the new mode(s) are selected?

Annex C Automation guidance principles



Annex C
Automation guidance principles

HeliOffshore Automation Guidance – V1.0 December 2016

These guiding principles are offered to ensure effective use of automation. Standard Operating Procedures based on these principles will help to mitigate the risks of interacting with cockpit automation and improve safety performance in usage and monitoring.

Know how and when to use your automation

- Understand when and how your AP is designed to protect the flight envelope.
- Understand the functional capabilities and authority of your AP.
- Clarify use of automated modes during in-flight crew briefings.

Follow your SOPs for autopilot mode selection and deselection

- Ensure the aircraft is properly trimmed and power applied with an appropriate attitude.
- Consider and manage AP usage in 3 stages: (1) pilot intention (2) mode selection, (3) aircraft reaction.
- Use clear and consistent language to announce, confirm and acknowledge AP mode changes and FMS programming updates.
- Communicate misunderstandings or knowledge gaps around mode display symbology.

Use the appropriate level of automation for the situation and be prepared to change as necessary

- Use the AP as an aid to flight; step up and down between levels of automation, as required.
- Be prepared to fly manually if it reduces workload.
- Avoid manual control inputs when AP is engaged.
- Use 4-axes coupling where possible for all climbs, descents and approaches.
- Select a target altitude when making significant level changes.

Be aware of autopilot functional limitations during mixed-mode and degraded operations

- Be clear which channels are controlled through the AP or manually by the PF
- Speed will always be a function of the helicopter’s attitude in pitch; be aware of undesired speed changes when IAS mode is not coupled or is degraded.

Take appropriate and timely action when deviations from the desired aircraft state are observed

- Integrate the AP mode indications into your routine scan as PF and PM.
- Clearly announce observed deviations from the intended flightpath and intervene as require

Annex D Abbreviations and definitions

Annex D
Abbreviations and definitions

AEO	All Engines Operative
ALT	Altitude hold mode (of an autopilot)
ALTP / ALTA	Altitude Pre-set/Altitude Acquire mode (of an autopilot)
AMG	IOGP Aircraft Management Guidelines
APV	Approach Procedure with Vertical guidance
CFIT	Controlled Flight Into Terrain
DA	Decision Altitude (on a precision approach or an approach procedure with vertical guidance)
DME	Distance Measuring Equipment (a ground-based navigation aid that permits an aircraft to determine range from it)
DVE	Degraded Visual Environment (conditions with visibility less than 4,000 m and/or when there is no distinct natural horizon). DVE includes offshore night.
FAF / FAP	Final Approach Fix/Point (the final defined fix or point on an instrument approach)
FAT	Final Approach Track
FCOM	Flight Crew Operating Manual (published by aircraft manufacturers)
FD	Flight Director
FSF	Flight Safety Foundation
FOBN	Flight Operations Briefing Note (published by Airbus)
fpm	feet per minute
ft	feet G/S Glideslope (of ILS)
HDG	Heading hold mode (of an autopilot)
(H)TAWS	(Helicopter) Terrain Awareness and Warning System
IAS	Indicated Air Speed hold mode (of an autopilot)
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions (flight in IMC must be performed by reference to instruments)
IOGP	International Oil and Gas Producers' Association
kt	Knots
LDP	Landing Decision Point (the latest point on the final approach where the decision to land or to go around may be made)
LOC	Localiser (of ILS)
LOC-I	Loss of Control – Inflight
LOSA	Line Oriented Safety Audit
MDA	Minimum Descent Altitude (on a non-precision or APV approach)
MDH	Minimum Descent Height (on a non-precision or APV approach)
MEL	Minimum Equipment List (produced by an operator and based on, but not less restrictive than, the MMEL, and approved by the operator's national regulatory authority)
MMEL	Master Minimum Equipment List (a list of equipment permitted to be inoperative, produced by the manufacturer and approved by the certifying regulatory authority (for example EASA or FAA)
MSA	Minimum Safe Altitude
NDB	Non Directional Beacon
OEI	One Engine Inoperative
PF	Pilot Flying
PM	Pilot Monitoring
ROC	Rate of Climb
ROD	Rate of Descent
RVR	Runway Visual Range
SOP	Standard Operating Procedures
Shuttling	VMC operations between offshore installations or vessels separated by short distances (typically less than 10 NM), normally supported by specific weather and operating criteria. Some operators make use of abbreviated checklists when shuttling to exclude aircraft configuration changes which are not required on shorter sectors.
STAR	Standard instrument arrival
V_{toss}	Take-off Safety Speed (the lowest speed ensuring continued climb performance of at least 100 ft per minute (fpm)with one engine inoperative and landing gear down, at 200 ft above the take-off surface; speed for best angle of climb)
V_{mini}	Minimum airspeed under IMC as recommended by the aircraft manufacturer.
V_y	Best rate of climb speed (speed ensuring continued climb performance of at least 150 fpm with one engine inoperative and landing gear up, at 1,000 ft above the take-off surface)
VMC	Visual Meteorological Conditions (flight in VMC may be performed using visual references)

FPM specialists are encouraged to participate in our online, secure collaboration tool: HeliOffshore Space.

Operator member representatives are encouraged to complete the gap analysis within the Implementation Toolkit, hosted in the HeliOffshore Space.

You can find out more about HeliOffshore, our safety plan, and the workstreams at **www.helioffshore.org**

This guidance will be updated regularly. If you have comments or suggested amendments, please email: **info@helioffshore.org**

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Safety Through Collaboration