WYVERN GUIDANCE DOCUMENT

STABLE APPROACH GUIDANCE

REVISION 1, NOVEMBER 12, 2025

(Authors: Tom Huff, Jeffrey Zotter, Mario Jimenez, Todd Buczek)

TABLE OF CONTENTS

INTRODUCTION

A stable approach has been a central focus to reducing approach/landing accidents and rightly so; runway excursions continue to be the most prevalent of accident types (ICAO, 2024). The establishment of prescriptive parameters, more direct and unambiguous callouts by the Pilot Monitoring (PM), and non-attributional go-around policies have been adopted by many operators with success. However, the go-around rate from a grossly unstable approach remains unnecessarily low. In this guidance document, WYVERN does not redefine stable approach "gates," but rather provides recommendations to enhance approach philosophy and provide important considerations to aid decision-making and thus, to reduce approach/landing risk.

DISCUSSION

Contemporary stable approach criteria have been adopted or derived from industry safety working groups and promoted by regulatory agencies and steering committees. With the abundant advocacy for stable approaches and non-attributional go-arounds, one would expect that runway excursions and overruns would be rare. To address this issue, the Flight Safety Foundation (FSF) published its Approach and Landing Accident Reduction (ALAR) report in 2000 which included stable approach criteria (Flight Safety Foundation, ALAR, 2000). Among other more prescriptive parameters to define approach stability, the "gates" called for being stable at 1000AGL for IMC and 500AGL for VMC. In 2017 the FSF commissioned a more focused project, Go-Around Decision Making and Execution report (GADME), underpinned by extensive pilot surveying to capture beliefs, assumptions and psychological reasoning in the reluctance to execute a go-around (GADME, Blajev & Curtis, 2017).

One of the fundamental problems with past prescriptive criteria is that variance in pilot experience, aircraft familiarity and airmanship competence makes some parameters seem too conservative. However, one could argue that a competent and professional pilot should have no problem getting the aircraft in a proper [stable] state for an approach and landing. The reality is, we occasionally find ourselves outside of desired [necessary] conditions to safely continue an approach. This is where organizational culture, which extends to the flight deck, enhances prudent aeronautical decision-making and reinforcement of unwavering pilot professionalism.

THREATS TO A STABLE APPROACH

Besides the weather factors that easily come to mind such as wind gusts/shear, it's important to consider distraction, channelized attention, fixation and kinesthetic cues. Even exceptional pilots can experience a scan breakdown due to fatigue or other distraction. The lack of kinesthetic cues is a by-product of very quiet flight decks and approach path stability that can lead to insidious airspeed loss and undetected increases in rate of descent. Effective communication regarding anticipated hazards, verbalization of path deviations by the Pilot Flying (PF), and an engaged PM are highly effective mitigations.

STABLE APPROACH CRITERIA

An effective SMS program should incorporate stable approach parameters that should be monitored through a robust flight data monitoring program. The FSF 2017 GADME report contains what WYVERN feels has the most mature and defendable set of stable approach criteria, backed by a wide cross-section of aviation experts and survey data (See Appendix). Under the philosophy that "what gets measured, gets improved," establishing a set of stable approach criteria are necessary, but is just the start towards a cultural shift on the use of this data.

PERFORMANCE MONITORING AND TRENDING

Contemporary safety management incorporates Flight Data Monitoring (FDM) which provides rich data for analysis and trending. FDM program providers and the FAA's Aviation Safety Information Analysis and Sharing (ASIAS) program have expanded the parameters being analyzed to provide operators with even more insight into approach and landing quality. WYVERN's extensive experience in the administration of the WYVERN Flight Leader Program suggests that operators can be successful in shifting the paradigm from "big brother watching" to a valued tool that aircrews seek to review, increasing their own awareness of precision and discipline.

Recognizing that Quick Access Recorder (QAR) installations (with or without wireless data download capability) can be perceived as cost-prohibitive, highly capable systems that exploit portable EFB apps exist that can provide informative flight profile feedback. These can provide an effective means to initiate an FDM program and afford immediate opportunity for debriefing, even while away from home base.

APPROACH PLANNING

Investigations from unstable approaches reveal insufficient planning and preparation were present well prior to the terminal area. Certainly, we can't plan for all contingencies, but it shouldn't keep us from covering anticipated routing, approach and landing factors. Weather should also be a central focus to building a mental model of the expected conditions and potential for ATC re-routes and/or runway changes that can lead to "getting behind the aircraft."

WYVERN recommends seizing opportunity **prior to top-of-descent** for the crew to have a detailed discussion on the arrival and landing. Close monitoring of top-of-descent point (and prompting ATC if necessary) is prudent to avoid "slam dunks" and rushed arrivals. To the maximum extent practicable, programming of the FMS early and proactively will allow the PM to better contribute to assessing progress rather than being heads-down. Gaining and maintaining situational awareness to position relative to the airport and approach fixes, and the desired aircraft energy state at appropriate checkpoints, will allow comfortable configuration changes and ample time for checklist completion. Further, this will allow the PM to assess approach stability and aid the PF in making corrections well ahead of incorporating scan outside for necessary landing cues. Simply, earlier planning and aircraft energy state management will make the stable approach gates more easily achievable, allowing more time to fly an approach with higher precision.

One of the challenges in achieving better descent/arrival management is that it takes more practical experience in the given aircraft, as typical simulator sessions (initials/recurrents) don't include extended descent planning. Rather, those sessions include multiple approaches to accomplish the multitude of training/checking objectives. This critical piece of airmanship and aircraft performance familiarization should be a focus in building the necessary experience in the given aircraft. Developing rule of thumb for descent and configuration changes, as well as recognizing optimum FMS/autoflight mode can aid in managing the arrival through progressively tighter "energy state" windows to the FAF. A word of caution: Avoiding the use of spoilers or air brakes to please the passengers can result in excess energy nearing the terminal area if not effectively managed.

NIGHT FLYING AND ADVERSE CONDITIONS

Flying an approach or go-around at night and/or IMC increases the risk of spatial disorientation and somatogravic illusion. Disciplined instrument scans and timely/directive callouts by the PM are critical. Transitioning to visual cues can be challenging due to lack of a defined horizon which can cause false perceptions of pitch and bank, leading to potentially dangerous control inputs. Optical illusions, such as the “black hole” effect where the runway appears to float in a void, can make pilots feel higher than they actually are, prompting early descent and risking controlled flight into terrain. Fatigue also becomes a critical factor, as night operations often coincide with the body’s natural circadian low and extended flight duty day, all compounding to reduce alertness and degrading reaction time. To mitigate these escalating factors, crews must maintain disciplined instrument scanning, plan descents precisely, trust glideslope monitoring systems, and be ready to execute a go-around if visual references are lost below decision altitude.

Acknowledging the additional challenges during night and adverse weather conditions, WYVERN recommends configuring earlier to ensure the approach is not rushed and importantly, that the PM is scanning parameters and not catching up with checklist completion or guidance panel insertions.

ADDITIONAL CONSIDERATIONS

WYVERN recommends the practice of utilizing a loaded and activated instrument approach with vertical guidance as a backup to any visual approach. Based on data analysis from a prominent FDM provider, unstable approaches markedly increase with decreasing distances to intercept final approach course. Although this is intuitive, the data suggests that crews are perhaps putting themselves at higher potential for an unstable approach by accepting a tight base to final (“to help ATC”) or just being overly aggressive. Therefore, WYVERN recommends intercepting final no closer than 5nm from the threshold, unless previously planned and briefed.

SAFE LANDING OUTCOMES

The objective of a stable approach is a safe landing. It is worth noting the impact to landing distance as a result of not flying the aircraft with precision during approach, roundout and flare in accordance with the aircraft manufacturer's guidance. 14 CFR Part 25 certified aircraft have landing distance performance derived from specific conditions. Therefore, it is imperative that these conditions are met by pilots during flight operations. Landing performance data assumes that the aircraft crosses the runway threshold (usually at 50ft) at Vref (1.3 Vso) and with any stipulated speed additives. Landing performance is also calculated with the assumption that the aircraft touches down within the touchdown zone. This area is defined as the first third of the runway available landing distance, not to exceed 3,000ft [FAA Pilot Controller Glossary]. Penalties exist for wet and contaminated runways for all 14 CFR Part 25 certified aircraft. Additional aircraft specific considerations are noted in landing performance AFM data, though many are not standardized by certification regulations.

Factoring landing distance is required for 14 CFR Parts 91K, 135, and 121 flight operations. Adopting these factored distances is strongly encouraged for 14 CFR Part 91 operations as well. Providing a margin of error in determining landing distance, by using a factored distance, can greatly reduce the risk of a runway overrun. It is important to note that a factored landing distance is no replacement for meeting runway threshold crossing requirements. Factored landing distances are not intended to replace in-air calculations of landing performance due to a change in conditions (wind, runway contamination, etc.). Because AFM landing performance is calculated on such factors as "maximum wheel breaking", factored landing distance can provide a more realistic calculation for normal flight operations and provide reasonable safety margins.

Pilots must realize that continuing the approach to landing outside the computed landing performance calculations (AFM performance limitations and regulatory requirements) means these calculations are no longer valid. Also, if the pilot flies the approach too fast, crosses the threshold too high, lands too long, and applies the brakes too late invalidates the landing performance computations. Complacency, i.e. you've done this before so don't worry about the performance calculations (unprofessional), or misjudging runway remaining can result in a runway overrun. Consider that, for example, carrying an extra 10% on approach speed also adds around 20% to landing distance (FAA, 2023). This deviation has an unacceptable level of risk and therefore, the prudent response is a go-around.

GO-AROUNDS

The maneuver itself should not be feared but rather anticipated by including published missed approach procedures as well as the go-around procedural mechanics in the approach briefing. As it is likely that go-arounds are flown very infrequently except in simulator training, reviewing the muscle memory is good practice during the approach set-up. In many published go-around procedures, the first altitude target doesn't require the maximum climb capability of the aircraft. This is especially true if the go around is initiated at a higher altitude than minimums. Crews should be aware of the thrust commanded by selection of TOGA and reduce power as necessary if obstacle clearance on the missed approach is not a critical factor. Having the aircraft level off, then command a climb at specified speed, allows more comfortable configuration changes while satisfying level-off altitudes and speed constraints programmed in the FMS. Consider this technique and practice during flight training.

Some manufacturers have incorporated a "Soft Go-Around" capability to the autothrottle system which emulates what has been described previously. These aircraft manufacturers recognize that the all-engine operating maximum capability during go-arounds is excessive for most missed approach procedures and only increases workload as well as potential to bust a constraint or published missed approach altitude. Operators should consider incorporating a "soft go-around" procedure in their SOPs and training programs. However, the use of this procedure is situation dependent and based on the stimulus to execute the go-around, and full available power should be used without delay in situations dealing with windshear, terrain avoidance, obstacle clearance, engine power loss, etc.

CONCLUSION

The pursuit of aircraft handling mastery should be a continuous goal for any pilot, and unquestionably a cultural norm within any aircraft operator. Being critical of performance in achieving the desired aircraft state into the terminal area leading to a precise approach and well-controlled landing is a hallmark of a professional pilot. To summarize, WYVERN recommends:

- Incorporate stable approach criteria into SOPs that are aligned with those contained in the 2017 FSF GADME report (See Appendix).
- Include mandatory go-around for EGPWS alerts for glideslope and sink rate warnings.
- Resource and implement a robust Flight Data Monitoring (FDM) and Aviation Safety Action Program (ASAP) as critical components to organizational SMS. Identify a qualified gatekeeper and data analyst.
- Craft a non-attributional go-around policy or statement that is signed and promoted by the Accountable Executive and Director of Operations.
- Submit FDM data to ASIAS to demonstrate a positive safety culture and exploit the trend dashboards to assess known high unstable approach airports and other factors that could be used proactively in risk assessments.
- Leverage training providers and type-experienced aviators to refine descent techniques specific to aircraft. Consider generating Line-Oriented Flight Training (LOFT) scenarios to refine technique for descent optimization, approach configuration changes and missed approach execution.
- Promote more verbalization from PF about deviations and intentions, and timely input from PM to verify approach stability and safe landing assurance.
- Develop and practice a consistent approach briefing that includes the published missed approach procedure (or ATC directed missed approach instructions) in addition to a quick review of the go-around procedures that can aid “mind-imprinting” those critical steps that

are not frequently exercised outside of simulator training. These should especially cover any non-normal configurations or situations.

Implementing stable approach criteria that are too conservative is counterproductive. Many operators that have achieved a positive safety culture with a focus on pilot professionalism report higher rates of stable approaches, tighter touchdown zone distance dispersion and speed control. At such operators, go-arounds remain rare but are not feared. Ultimately, they are considered a normal maneuver and certainly can be done without retribution.

WYVERN strongly believes that incorporating these recommendations can shift the philosophy of stable approaches to one that will inspire discipline and professionalism, and that will gain better favor among pilots.

The bottom line – if a safe landing outcome is ever in question, by either pilot – GO AROUND!

APPENDIX: STABLE APPROACH CRITERIA SUMMARY

An approach is fully stabilized when all the following criteria are met (Blajev & Curtis, p. 44):

Profile:

- Only small changes in heading/pitch are required to maintain the correct flight path profile.
- Specific types of approaches are stabilized if they fulfill the following:
  - CAT I ILS: within 1-dot deviation of glide path and localizer;
  - RNAV: within ½-scale deflection of vertical and lateral scales and within RNP requirements;
  - LOC/VOR: within 1-dot lateral deviation; and,
  - Visual: within 2.75 and 3.25 degrees of visual approach path indicators, and lined up with the runway centerline no later than 300 ft.

Configuration:

- Aircraft is in the landing configuration (gear and flaps set, speed brakes retracted).

Energy:

- Airspeed is stabilized within VREF +10 kt to VREF (without wind adjustments).
- Thrust is stabilized to maintain the target approach airspeed.
- Sink rate is no greater than 1,000 fpm.

General:

- The stabilized approach gates should be observed, and active communication calls made during each approach.
- Normal bracketing corrections in maintaining stabilized conditions occasionally involve momentary overshoots made necessary by atmospheric conditions; such overshoots are acceptable. Frequent or sustained overshoots are not.
- Unique approach procedures or abnormal conditions requiring a deviation from the above elements require a special briefing.

Approach Gate	Objective[1]	Example of Active Communication[2]
1,000 ft AGL Note: This can vary between 800 and 1,500 ft, depending on aircraft category type	The final landing configuration should be selected.	**PM: "1,000; Configured/Not configured" or "Flaps"** **PF: "Roger"**
500 feet AGL	The aircraft should be fully stable.	**PM: "500; Stabilized/Not stabilized" or "Speed [parameter]"** **PF: "Roger"**
300 feet AGL and below	Initiate a go-around without hesitation if unstable.	**PM: "300; Stabilized/Go around" or "[Condition to go around]"** **PF: "Continue/Go around"**

AGL = above ground level; CAT I = Category I; ILS = instrument landing system; LOC/VOR = localizer/VHF omnidirectional radio; PF = pilot flying; PM = pilot monitoring; RNAV = area navigation; RNP = required navigation performance; V_{REF} = reference landing speed

Notes:

1. Continuing past the related gate should only occur if meeting the objective of the next gate is achievable; otherwise, go around. Example: If the flight is not configured by 1,000 ft, it could continue if being fully stable by 500 ft is achievable.
2. If the call at the respective gate indicates an undesired state (e.g., "Not configured", or "Flaps"), that call should be repeated at an appropriate interval until the condition is corrected. Example: "Flaps"; "Flaps" repeated every 50 ft.

Figure 1. Approach Gates and Objectives. (Blajev & Curtis, p. 44)

REFERENCES

Blajev, T. and Curtis, W., "Go-Around Decision-Making and Execution Project," Final Report to Flight Safety Foundation, March 2017. https://flightsafety.org/wp-content/uploads/2017/03/Go-around-study_final.pdf

International Civil Aviation Organization. (2024). Runway Safety Program – Runway Safety Action Plan, 2nd Edition. https://www2023.icao.int/safety/RunwaySafety/Documents/GRSAP_Final_Edition02_2024-02-19.pdf

Federal Aviation Administration (FAA). (2023) AC 91-79B - Aircraft Landing Performance and Runway Excursion Mitigation. https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_91-79B_FAA.pdf

Flight Safety Foundation (FSF). (2000). Briefing Note 7.1 – Stabilized Approach, Approach-and-landing Accident Reduction Tool Kit, Flight Safety Digest, Aug-Nov. https://flightsafety.org/wp-content/uploads/2016/09/alar_bn7-1stablizedappr.pdf