ECONOMY VERSUS SAFETY - THE PROFESSIONAL'S DILEMMA

By Captain Tom Becker

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Working in aviation means teamwork. We, the pilots and you, the ATCOs are all part of this team, even though we are not physically in the same place. It is therefore important that we all have the same mental model of a situation all the time.

I would like to draw your attention to a particular flight hazard - one which you as an ATCO can help to prevent, thus making an important contribution to safety. I'm referring to ***Un-stabilized Approaches***, which often lead to Approach and Landing Accidents (like CFIT or runway overruns or short-comes).

I want to look at safety versus economic interests - or human & aircraft performance restrictions versus flow management; this usually concerns speed restrictions on the approach. Specifically, the often-heard clearance during the approach, "maintain 170/180kt to the outer marker," or "maintain high speed during the approach".

I guess you know that Approach and Landing Accidents (ALAs) are still one of the top killers in aviation. The Flight Safety Foundation has worked hard in this field for many years with the very positive result of creating safety gates to prevent ALAs. The one which has the greatest influence on our flight decks is the Stabilized Approach Concept*.

Put simply, this means that every flight MUST be stabilized on approach not later than 1000' AGL. It is not meant as a goal - it is a hard limit!

With a jet like the common B737 it requires you to start further configuring the aircraft from the intermediate flap setting no later than 2000' AGL, which means around 7NM on finals - and, depending on actual weather and the environmental situation, further speed reduction may be necessary.

Now, here comes the practical side and your influence: You are well aware that the outer marker or equivalent fix is usually located around 5 NM from the threshold, which in a pilot's terms means around 1500' AGL. This means that if you ask us to "maintain 170/180 to the marker", we cannot do it without rushing our work, and thus producing unnecessary risks for our flight.

Additional risks? - You might ask, "why?" Remember that most accidents in aviation occur in normal operation, not in non-normal situations such as an aircraft system failure; and it is always the human factor which has the greatest influence in an accident - either in causing or preventing it. Therefore it is recommended that we stick to the 1000' Gate in VMC conditions, too, even though the FSF say that a 500' AGL gate is OK in VMC Conditions.

But of course you cannot see this human factor aspect inside the cockpit from your working place - nor can I see yours. So I'll try to help you understand our needs on the flight deck in the hope that as a result you will not issue such clearances - or only with reluctance - in the future.

Our Stabilized Approach Concept does not only mean that the aircraft must be stabilized on finals at the correct speed and configuration; just as importantly, the flight crew themselves must also be mentally stabilized.

In ideal conditions (standard ILS approach in daylight/CAVOK without adverse wind conditions, landing on a dry runway without any special considerations and an alert crew working well together) it is manageable to fly at 170/180kt to the marker and complete the remaining cockpit activities (switch and lever settings, speed reduction, RT and checks) during the ~30 seconds remaining before the 1000' gate.

In a B737 you must start lowering the gear at 2000' AGL (~7NM finals) and configure your flaps further to one step before final landing flaps so that you can maintain this high speed on approach with high power set. Although this is not good for noise abatement, nor for fuel consumption, this is the only safe way of achieving your set goal of maintaining high speed to the marker and being fully stabilized by 1000' AGL.

But as you know, everyday operations are not always conducted in ideal con-

* *Flight Safety Foundation Approach and Landing Accident Reduction Tool - see www.flightsafety.org/home.html*

ditions. I'd like to explain to you the risks resulting from some commonly encountered cockpit conditions, which do not allow the procedure described above, but require a very much earlier stabilization on final approach.

1. FLYING A NON-PRECISION APPROACH

Unfortunately there are still non-precision approaches at some airfields, although this type of approach increases the risk of an accident by a factor of five.

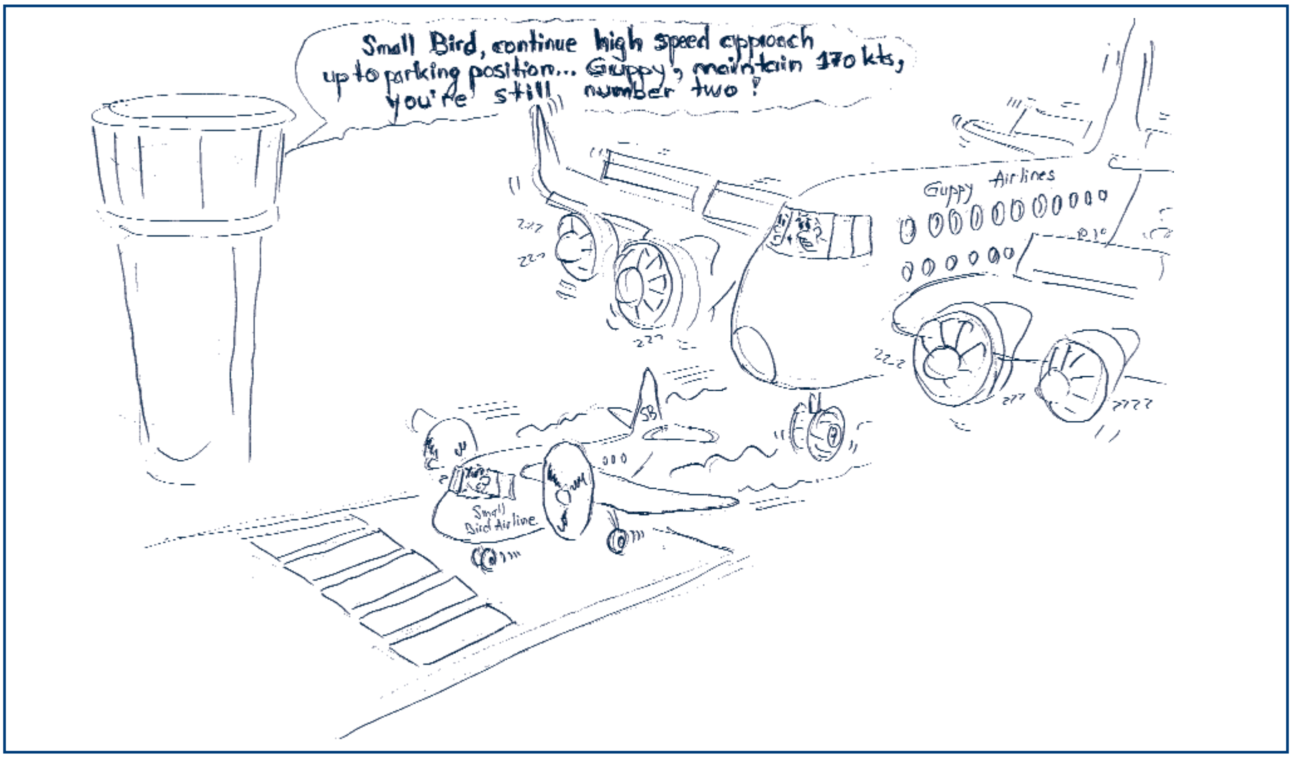
Of course it is quite true that every pilot should be able to fly such an approach. But a non-precision approach cannot be treated in the same way as a standard ILS approach. It should be treated as an abnormal procedure which requires a lot more situational awareness and working effort than a precision approach.

Once again it is the human factor that makes flying a non-precision approach critical.
On most airliners a pilot can use the autopilot to help him with such things as tracking. If you are lucky you can also use a lateral navigation mode, which enables the computer to fly the approach track without further attention from the flight crew. Otherwise you must constantly readjust the heading to keep on the final approach track. This is not a big thing in itself, but together with descending along the prescribed glide path it is much more stressful, especially if you do not start the approach in the final configuration and speed due to a requirement to maintain high speed as long as practicable.

In this case, you will have to counteract for ballooning during flap extension and vertical speed adjustment due to speed change. All this, together with bad weather and maybe manual flying, can turn an "easy" non-precision approach into a flight hazard. One unfortunate example in European airspace was the accident of a Crossair Jumbolino in ZRH in 2001.

Therefore, when using any kind of non-precision approach, please calculate your approach sequence so that every flight crew can start the approach in final configuration at the final approach speed.

Please do not ask us to "maintain high speed as long as practicable", either. There might be colleagues in the cockpit who want to help you with your flow management, but overestimate



their own crew performance and thus increase the risk of an unstable approach for themselves, resulting in a higher risk of an approach and landing accident.

2. VMC VERSUS IMC AND DAYLIGHT VERSUS NIGHT

Basically, on an instrument approach there is not much difference between flying in VMC and IMC, in daylight or at night. But in IMC there are some more considerations of situational awareness - such as icing, or weather assessment in the go-around area - that the flight crew has to deal with. For a good assessment you need mental capacity and time. If you have to rush your landing items because you are flying 170/180 to the marker you might not have this mental capacity when you need it. Night time itself always brings the risk of fatigue, which can diminish your mental capacity dramatically too.

3. TAILWIND & CROSSWIND

Often the wind aloft on final approach is not the same as on the runway. Therefore as a pilot you have to deal with a changing wind situation on the final approach which can also lead to windshear conditions. If, for example you encounter a negative windshear, you will have to react quickly by adding more power to regain speed. But if your throttles are at idle due to the fact that you are reducing speed, e.g. when configuring after passing the outer marker, the engines need time to spool up - time you may not have when encountering windshear. As you also know, thunderstorms, even when not on the final approach path but in the vicinity, or orographic causes may generate dangerous windshear potential. Early establishment in the final configuration and speed is the best countermeasure against these threats.

A tailwind component on finals may also make it very hard to lose speed, depending on your aircraft type and weight. It's as if somebody is pushing you from behind while you are trying to brake and bleed off speed. Although we have speed brakes installed, their effectiveness varies a lot between airplane types (e.g. on a B737 they are not nearly as effective as on an A310).

A tailwind on finals will also increase the required landing distance, especially on a wet runway. This might not be a problem on a long runway (e.g. >3000m) but on shorter runways it can be a big problem. This is because even if you touch down in the touchdown zone (TDZ) correctly, most of your braking will be on a slippery surface due to rubber debris from other aircraft in the TDZ, and most importantly, in the TDZ at the far end, which you will enter on a short runway.

In winter operations the runway can be extra slippery because of de-icing fluid, which is washed off our wings while departing at a speed of ~80 kt. So a tailwind on landing has to be avoided and a flight crew has to assess the situation and be able to discuss it in the crew in time during the final approach. You therefore once again need mental capacity and time, which you can only have if you are established early enough.

4. GUSTS

You will be aware that our Target Approach Speed - the final approach speed - depends upon the wind you give us with the landing clearance. We take our so-called Vref (value depends on weight and selected flap setting) as the basis and we have to add an increment, depending on the wind. For example, a steady headwind component (HWC) of 16 kt requires us to add half, i.e. 8 kt. If the wind information you provide is, e.g. HWC 16kt gusts 28, we have to take half of the steady wind (8kt) and add all the gusts (28-16=12 kt), which means altogether, 20kt added. On a B737-800 with a typical landing weight of ~63 tonnes, this means a speed of 163kt. Seems to be easy to calculate, but when flying in gusty weather conditions, manually and while doing checklist items, distracted by auto call-outs it can be nearly impossible. Tunnel vision and loss of situational awareness is often observed in our cockpits.

5. COCKPIT ATMOSPHERE AND FATIGUE

The working atmosphere in the cockpit is a factor that you as an ATCO really cannot assess. Although the voice you hear sounds positive, alert and competent it might not reflect the actual feeling on the flight deck. Unfortunately, problems of hierarchy and a poor working atmosphere - or even one that is too good - are still observed on our flight decks. This alone, or coupled with factors like illness or fatigue, increases the risk of errors which will not be detected and caught. Analysis of Approach and Landing Accidents showed that in many cases, necessary callouts for deviations and the necessary call for a go-around when becoming unstabilized were omitted due to bad CRM-behaviour and absence of teamwork on the flight deck.

Fatigue or illness itself reduces human performance immensely. In particular, it has been found that fatigue can reduce situational awareness. As it makes sense economically to keep our aircraft flying round the clock, we on the flight deck have to cope with the effects of fatigue. Although "napping" is usually possible on the flight deck during the cruise, it cannot compensate for a duty time of 12 hours or more, or a very early start in the night when you have to carry out an approach to a congested airport in unfavourable weather conditions. Therefore fatigue itself requires everyone to work as close to the safest standard as possible, requiring an early stabilization on approach, too.

Lastly, I have two options when you issue me with a clearance requesting high speed on the approach. Either:

1. I acknowledge your request by saying, "WILCO", and comply with it, or,

2. I say, "Sorry, unable due to flight safety," and start to stabilize my approach.

As a preventer of accidents and incidents, what would be your choice based on the information above?

Daily operation and our subjective feelings concerning the demands of our management may generate an atmosphere of time pressure for both of us. But as you might know, in the end it is always you, or me, or my colleagues in the cockpit who are the last line of defence to prevent a situation from becoming an incident or even an accident - not your CEO or mine. Our management will always say that flight safety is the paramount goal and not on-time performance or perfect flow management. Let's work this out together and try to avoid high speed approach clearances whenever we can.

Thank you for your help and for reading this article.

RECOMMENDED ELEMENTS OF A STABILIZED APPROACH

All flights must be stabilized by 1000 feet above airport elevation in IMC and 500 feet above airport elevation in VMC. An approach is stabilized when all of the following criteria are met:

1. The aircraft is on the correct flight path;
2. Only small changes in heading/pitch are necessary to maintain the correct flight path;
3. The airspeed is not more than VREF + 20 kts indicated speed and not less than VREF;
4. The aircraft is in the correct landing configuration;
5. Sink rate is no greater than 1000 feet/minute; if an approach requires a sink rate greater than 1000 feet/minute a special briefing should be conducted;
6. Power setting is appropriate for the aircraft configuration and is not below the minimum power for the approach as defined by the operating manual;
7. All briefings and checklists have been conducted;
8. Specific types of approach are stabilized if they also fulfil the following: ILS approaches must be flown within one dot of the glideslope and localizer; a Category II or III approach must be flown within the expanded localizer band; during a circling, approach wings should be level on final when the aircraft reaches 300 feet above airport elevation; and,
9. Unique approach conditions or abnormal conditions requiring a deviation from the above elements of a stabilized approach require a special briefing.

An approach that becomes unstabilized below 1000 feet above airport elevation in IMC or 500 feet above airport elevation in VMC requires an immediate go-around.

Source: Flight Safety Foundation Approach and Landing Accident Reduction (ALAR) Task Force