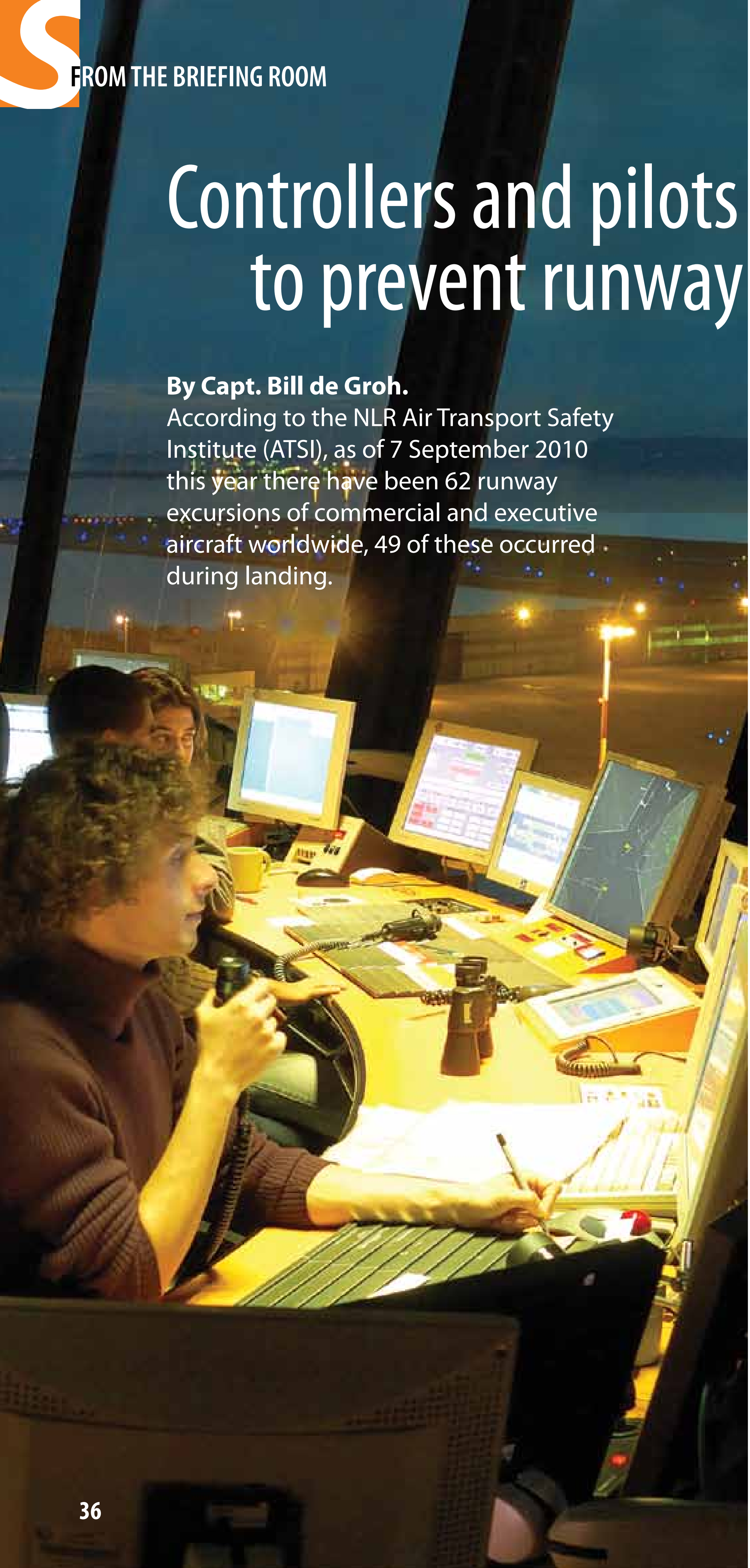
Controllers and pilots teaming up to prevent runway excursions



By Capt. Bill de Groh.

According to the NLR Air Transport Safety Institute (ATSI), as of 7 September 2010 this year there have been 62 runway excursions of commercial and executive aircraft worldwide, 49 of these occurred during landing.

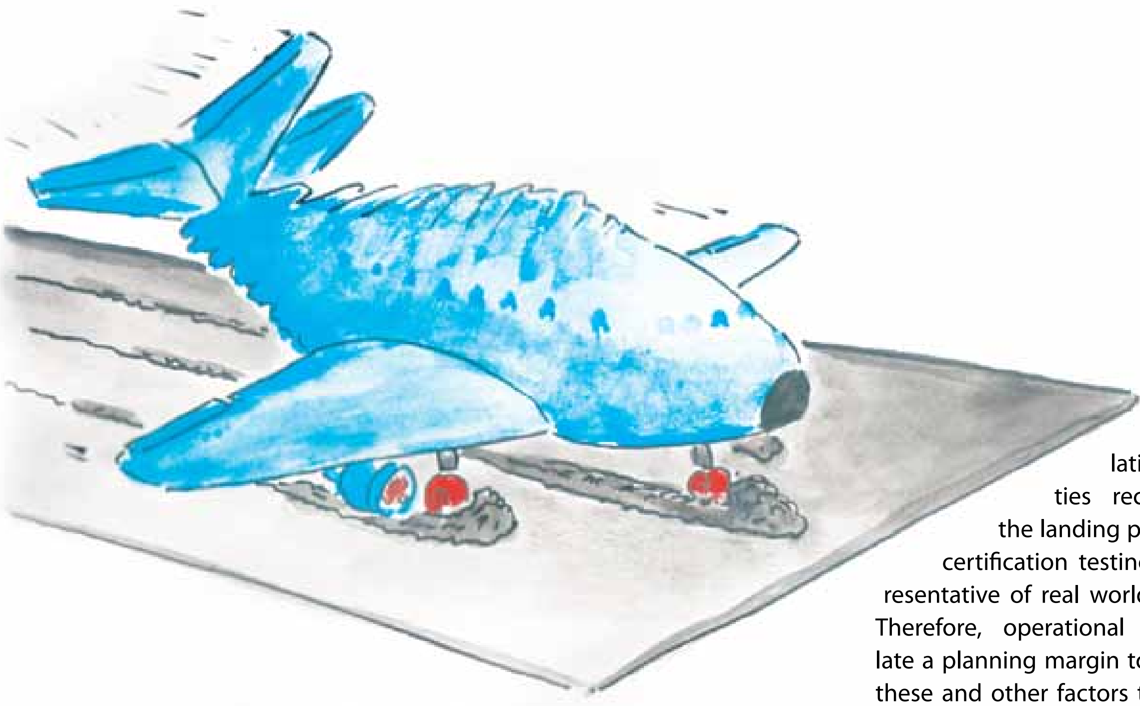
These 49 landing events were almost evenly divided between veer offs and overruns. Obviously, when an aircraft leaves the prepared surface on landing, the potential for injury and death exists.

As a current air line pilot and former aerospace engineer, a discussion of landing performance among pilots comes naturally. Although the aircraft commander is ultimately responsible for ensuring a safe landing, commercial air transport is a team effort, so can air traffic controllers assist the aircraft commander in this task? I believe the answer is yes.

First, it will be necessary to understand how the Airplane Flight Manual (AFM) landing performance information is determined by the aircraft manufacturer. That background will highlight the factors that affect landing distance which will then point to areas where controllers can assist the pilot.

Certified Versus Operational Landing Performance

The actual landing distance determined during certification testing is defined as the horizontal distance necessary to land and come to a complete stop from a point 15 m (50 ft) above the landing surface, assuming a level, smooth, dry, hard-surfaced runway. The distances determined are based on standard temperature, accounting for aircraft weight, wind, and altitude. The aircraft must be in the landing configuration using a stabilised approach, crossing the 15 m height at a specified speed. No credit for thrust reverse[1] is allowed and maximum manual wheel braking is used. The



Yhaa! ... Slam dunk!... Just like the old good time: come in fast, touch down hard and brake even harder! You see... carrier experience does helps sometimes!

distances thus obtained represent the maximum capability of the aircraft, sometimes referred to as the certified or unfactored, landing distance. Let's see how these requirements relate to real-world landings.

Notice there is no correction for non-standard temperatures. Temperature and pressure conspire to increase true airspeed for a given altitude, resulting in a longer landing distance. Many airports have sloping runways and landing down slope, of course, increases landing distance. The data determined is only for dry runways. A wet, smooth surfaced runway definitely will not behave as well as a wet, grooved runway. Neither runway is dry but a grooved runway provides better drainage and improved braking effectiveness when wet. The unfactored landing distance does not account for contaminated runways. This information can be found in "advisory data" which is generated by conservative calculation, not through certification testing. Not all authorities require their operators to use this advisory data.

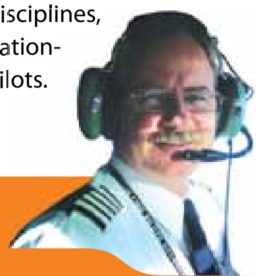
1- This includes use of reverse pitch in turboprop aircraft.

The unfactored landing distance comprises two segments; an air distance and a stopping distance. The air distance begins at 15 m over the landing surface and ends at touchdown. Aircraft certification authorities have accepted an air distance fixed at 305 m or a speed dependent value on average of 460 m. For available landing distances more than 2 400 m, the touchdown zone markings extend a minimum of 900 m. This means landing at the far end of the touchdown zone increases actual landing distance 440 to 595 m. This can happen if the aircraft has excessive height over the threshold and/or the pilot extends the flare to achieve a soft touchdown.

The second segment of the landing is the stopping distance which, of course, begins at touchdown. Not including a thrust reverse credit in the unfactored data is conservative, as long as the aircraft is equipped with an operative reverse thrust system. Remember the unfactored data uses maximum manual wheel braking, which is something few pilots do in normal operations; on a dry runway the deceleration rate is, indeed, alarming to pilots and passengers alike.

The regulating authorities recognise that the landing profile used in certification testing is not representative of real world operations. Therefore, operational rules stipulate a planning margin to account for these and other factors that are difficult to quantify at the time of departure. The Required Landing Distance (RLD) is the unfactored landing distance plus the appropriate margins applied. However, upon arriving at the destination, the actual conditions under which this planning was done, may have changed. Some operators provide operational landing distance information via ACARS, an onboard performance computer, or even paper tables. This information may be based on the same assumptions used in the certification data but including adjustments for pilot braking action and use of thrust reverse, with a minimum total margin of 15%. As you can see, landing distances are not as straight forward as they may seem.

Safe commercial air transport is a team effort involving many disciplines, not least of which is the relationship between ATM and pilots.



Bill de Groh

currently flies the EMB-145 for American Eagle Airlines and is a former aerospace engineer for McDonnell Douglas/Boeing. He is currently the Chairman of ALPA's Aircraft Design and Operations Group and Vice Chair – Operations for the IFALPA Aircraft Design and Operations Committee.

So, what can ATM personnel do to help ensure a runway excursion does not happen at their airport?

Threat Management

Two air traffic techniques immediately come to mind that can have an adverse effect on landing distance; high-speed approaches and the "slam dunk"[2]. One of the elements upon which landing distance is based is a stabilised approach. When speed assignments to the marker are issued to expedite traffic flow, then the threat of not achieving a stabilised approach is increased. There is one State's ATM organisation for which it is not uncommon for a pilot to receive a speed assignment of 180 knots, or I've even heard of 200 knots, to the marker. By accepting the high-speed approach, a pilot may be working against the edges of safety to get the aircraft configured, on path, and on speed by the threshold. Similarly, keeping the aircraft high and close-in to the airport for noise abatement, or for moving traffic below, can make achieving a stabilised approach a challenge. It can be difficult to go down and slow down, possibly resulting in excess height and/or speed over the threshold.

As far as approach speed assignments are concerned, there are times when spacing becomes tight between an aircraft that has just landed and the next on short final. The landing pilot may, but generally should not, receive instructions while rolling out to expedite exiting the runway. Given that instruction and knowledge of the proximity of the approaching aircraft may lead a crew to cut the corner of a taxiway resulting in a veer off, or take an exit that is closed due to construction. Don't be surprised when a flight crew declines such suggestions, as they may do for safety.

> There is one State's ATM organisation for which it is not uncommon for a pilot to receive a speed assignment of 180 knots, or I've even heard of 200 knots, to the marker

Maintaining use of a runway with a tailwind component for noise abatement or simply to avoid traffic issues with nearby airports, especially if the runway is other than dry, is definitely a risk factor. This technique played a role in the Southwest Airlines accident at Chicago's Midway airport.

Accurate runway surface condition reports greatly assist the pilot in determining whether to attempt the landing. When the runway is contaminated, it is also helpful to know where the preceding aircraft exited the runway. This information is useful when considering a runway exit plan, since unused portions of a contaminated runway are often much more slippery than the commonly used areas.

A delay in deployment of thrust reverse, spoilers and/or brakes obviously has an effect on the landing distance. These delays can happen due to distractions that occur when ATM issues initial taxi instructions even before the aircraft's nose wheel has touched down. We all understand the pressures placed on us with the increased tempo of operations, but all of us, pilots and controllers alike, must step back and not let those pressures cause us to rush.

At the end of the day, pilots and controllers are part of a vast team that works very hard to make commercial flight operations safe and efficient. Although pilots may decline a request for a high-speed approach or a tailwind landing, please understand that this is not intended to cause ATM difficulties but a consideration of all the elements discussed above. Controllers can do their part to reduce the risks of runway excursions by considering the effects of high-speed approach clearances, the "slam-dunk", preferential runways, and issuing taxi instruction on the rollout. As teammates, let's help each other out.

2- The "slam-dunk" is a type of basketball shot in which the player jumps up near the basket and powers the ball manually through the basket with one or both hands over the rim. In aviation a "slam-dunk" occurs when an aircraft is held high close-in to the airport by ATC and then cleared for a visual approach.