Safety first
The Airbus Safety magazine

Preventing Tailstrike During Go-around near the Ground

The focus of this article is go-around near the ground, sometimes called, “rejected landing”. This follows our previous article: “A Focus on the Landing Flare” article published September 2020 and “A Focus on the Takeoff Rotation” published January 2021. Those articles provided recommendations for avoiding tailstrikes when performing landing flare and takeoff rotation.

There is also a higher risk of tailstrike when a go-around is required near the ground. This article provides additional recommendations and observations for flight crews to help them avoid tailstrike events during this phase.

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CASE STUDY 1

Event Description

An A320 aircraft was performing an RNAV approach on a day with good weather conditions. The METAR indicated wind with a 10 kt headwind component and a negligible crosswind. The landing was intended to be done in CONF FULL. The VAPP was 137 kt. The First Officer, who was the PF, disconnected the autopilot at 930 ft RA and maintained the autothrust ON. At 500 ft, the approach was stabilized.

Nose down input and wind gradient at 80 ft

① At 80 ft RA, the PF applied ⅓ of full nose-down input **(fig.1)**. Simultaneously, the wind, which was about 5 kt headwind, suddenly changed to a 3 kt tailwind. The aircraft pitch reduced from +3.5° at 80 ft to ② +2.5° at 40 ft.

Go-around initiation during a light bounce

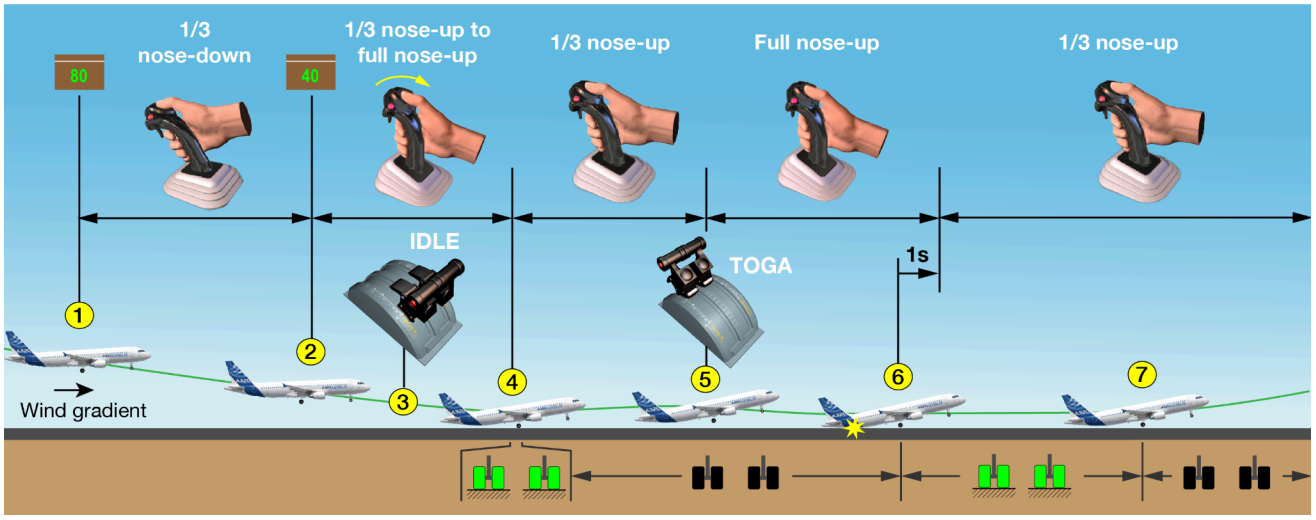
From 40 ft RA, the PF started the flare with a progressive nose-up input up to a full nose-up input in the last 10 ft. ③ Thrust levers were retarded to idle at 10 ft RA. The pitch increased from +2.5° up to ④ +9° up at touchdown.

The aircraft slightly bounced while the ground spoilers started to extend, and the PF maintained an average ⅓ nose-up input during 2 s. ⑤ The pitch reached +12° when the PF applied TOGA thrust and applied a full nose-up input.

Tailstrike during second touchdown

⑥ The aircraft touched down a second time during the engine spool-up and ground spoilers retraction. A tailstrike occurred with a pitch of +12.7° at a speed of 127 kt (VAPP - 10kt). The PF maintained the full nose-up input for 1 more second. The aircraft speed at that point was 122 kt (VAPP - 15 kt). The PF then partially released the nose-up input to ⅓ of full nose-up input. ⑦ The pitch reduced to +11° and the aircraft achieved lift-off when the speed reached 128 kt.

The PF continued the go-around maneuver and performed a successful second approach.



(fig.1) Illustration of the event: Case Study 1

Event Analysis

Light bounce due to high vertical speed and high pitch at touchdown

Both the wind gradient and PF input at 80 ft RA created a lift reduction that led the aircraft vertical speed to increase to -800 ft/min at 40 ft RA. The flare reduced the vertical speed, which was still -350 ft/min at the first touchdown. The energy returned through the main landing gear shock absorbers, combined with the lift provided by the high pitch at touchdown (+9°), caused the aircraft to bounce.

Continuous nose-up input during the bounce and full backstick input at the initiation of the go-around near the ground caused the tailstrike

The ground spoilers extension during the bounce reduced the lift, and caused the second touchdown. The continuous nose-up input of the PF after the first touchdown, in addition to the full nose-up input when TOGA was selected, led to the pitch increase from +9° to +12.7°, which caused the tailstrike on the second touchdown.

Image (above): A320 aircraft with a specific tail bumper fitted to protect the fuselage when performing Velocity Minimum Unstick (VMU) test

CASE STUDY 2

Event Description

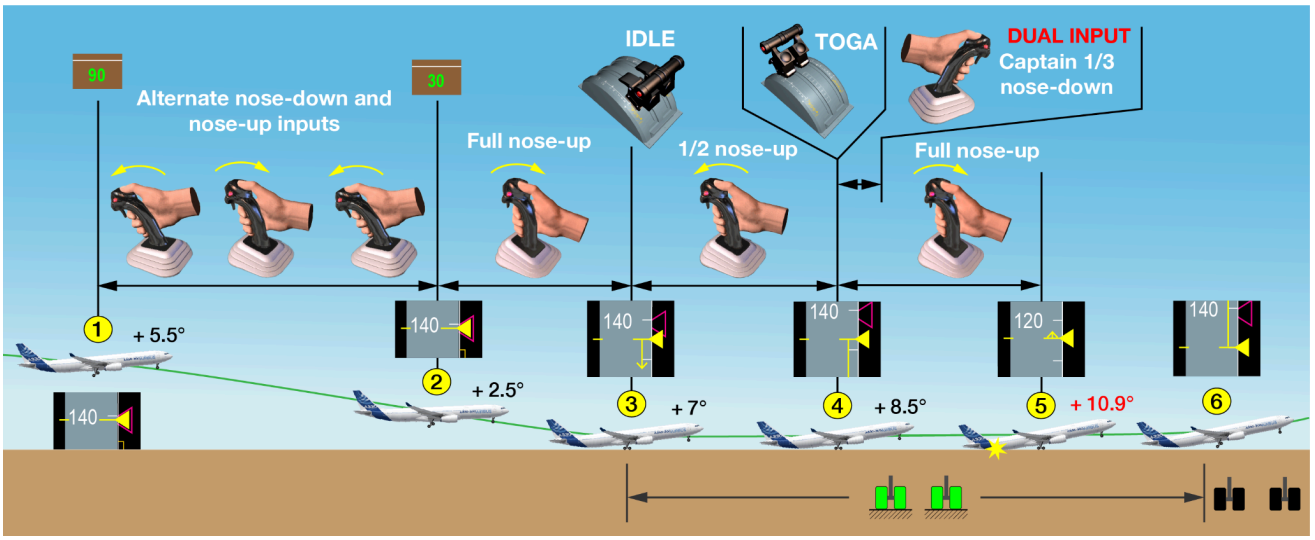
An A330 aircraft was performing an ILS approach with good visibility, but in gusty wind conditions. The intended landing configuration was CONF FULL.

The approach was stabilized at 500 ft RA. The First Officer, who was PF, disconnected the autopilot and kept the autothrust ON. The VAPP was 139 kt.

① From 90 ft RA, the PF alternated nose-down and nose-up inputs, leading to a nose-down tendency. The pitch reduced from +5.5° to ② +2.5° at 30 ft. The flare was initiated at 30 ft by application of a close to full nose-up input, which was partially released and then followed by another full nose-up input just prior to touchdown. ③ The thrust levers were retarded to IDLE simultaneously at the point of the hard touchdown. The pitch was +7° and the speed was 135 kt (VAPP - 4 kt) decreasing.

The PF maintained ½ full nose-up input for 2s and then ④ set the thrust levers to the TOGA detent combined with a full nose-up input. The Captain simultaneously applied ⅓ nose down input briefly, which led to a "DUAL INPUT" callout. The engines began spool up to TOGA thrust, but the speed was still decreasing and the pitch increasing due to the full nose-up inputs applied by the PF. ⑤ A tailstrike occurred and the pitch reached 10.9° at a speed of 116 kt (VAPP - 23 kt).

⑥ The aircraft then accelerated and lift-off was achieved at around 130 kt. The PF continued the go-around maneuver and performed a successful second approach.



(fig.2) Illustration of the event: Case Study 2

Event Analysis

Hard landing caused by a nose-down tendency at 30 ft and a late flare

The alternate nose-up and nose-down inputs, between 90 ft and 30 ft, led to a vertical speed increase from -550 ft/min at 90 ft up to -850 ft/min at 30 ft when the PF started the flare. This late flare, combined with the high vertical speed, led to the hard landing.

Continuous nose-up inputs after touchdown and full backstick order at low speed led to the tailstrike

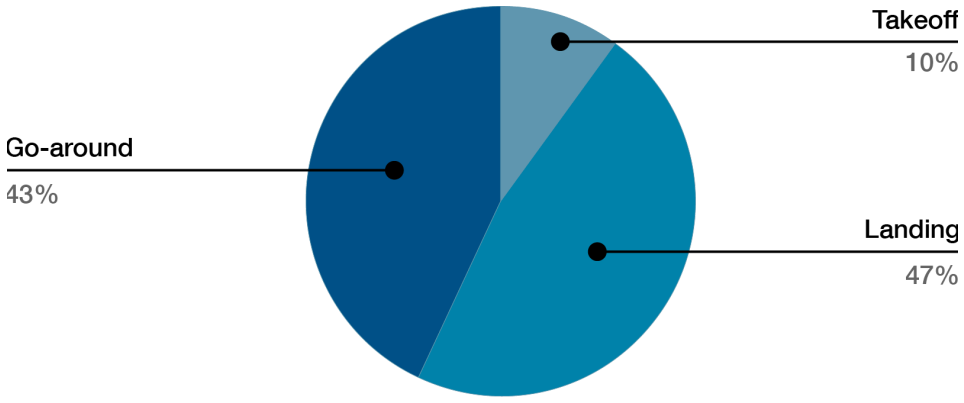
The PF maintained a nose-up input after touchdown, leading the pitch to increase from 7° to 8.5° when the go-around was initiated. The PF then applied full nose-up input simultaneously with the TOGA thrust selection while the aircraft speed was as low as 116 kt (VAPP -23 kt). This led to the tailstrike.

Dual input

The brief nose-down input performed by the Captain, without pressing the sidestick priority pushbutton when the go-around was initiated, was not sufficient to counteract the full nose-up demand by the First Officer.

OPERATIONAL CONSIDERATIONS

Between January 2022 and September 2024, 49 tailstrike events were reported to Airbus with 5 (10 %) during takeoff, 23 (47 %) during landing and 21 (43 %) during a go-around near the ground **(fig.3)**.



(fig.3) Percentage of tailstrike events per flight phase

INFORMATION

For more information on tailstrike prevention during takeoff and landing, refer to the "A Focus on the Landing Flare" article published in September 2020, and "A Focus on the Takeoff Rotation" published later in January 2021.

Performing a Safe Go-around Near the Ground

The PF and the PM must carefully monitor the pitch during the maneuver

When going around close to the ground, both the PF and the PM must carefully monitor the pitch during the maneuver. The PM must make the "PITCH" callout when the pitch reaches the value provided in the standard callout chapter of the SOP.

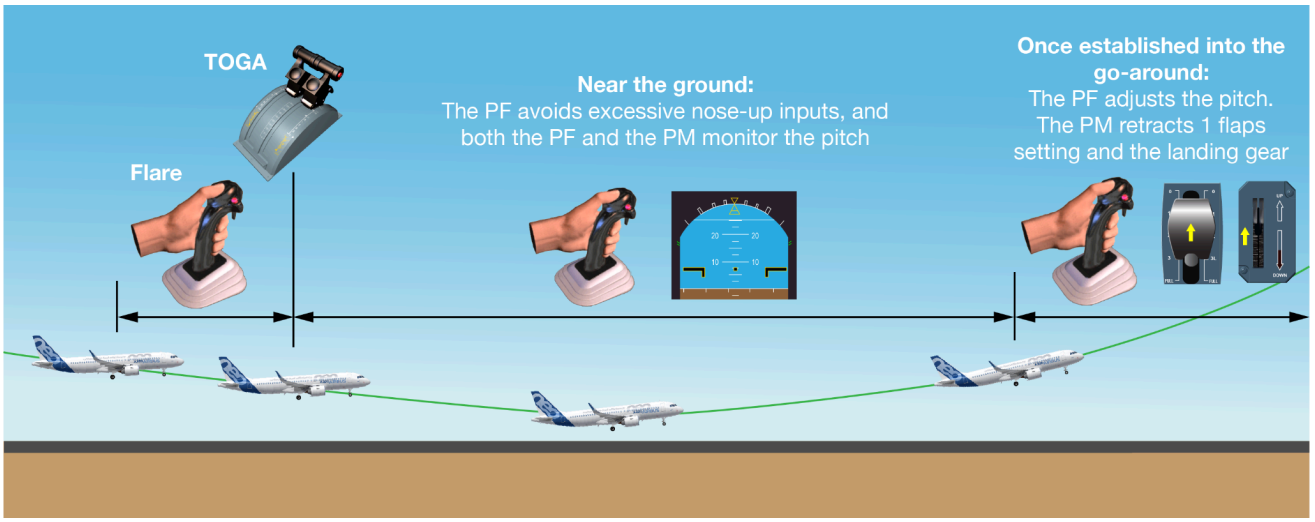
Avoid high rotation rate

The application of full back stick by the flight crew was reported in many of the tailstrikes during go-around near to the ground events. This was a common contributor to these events as this action led to a high rate of rotation.

When performing a go-around near the ground, the PF and PM must monitor the pitch and the PF must avoid excessive nose-up input **(fig.4)**.

Retract flaps and landing gear only when safely established into the go-around

During a go-around near the ground, the flight crew must delay the flaps and landing gear retraction until the aircraft is established on its go-around trajectory **(fig.4)**. Delaying the flaps retraction prevents the need for higher pitch in the early stage of the maneuver, when the aircraft is closer to the ground.



(fig.4) Management of a go-around near the ground

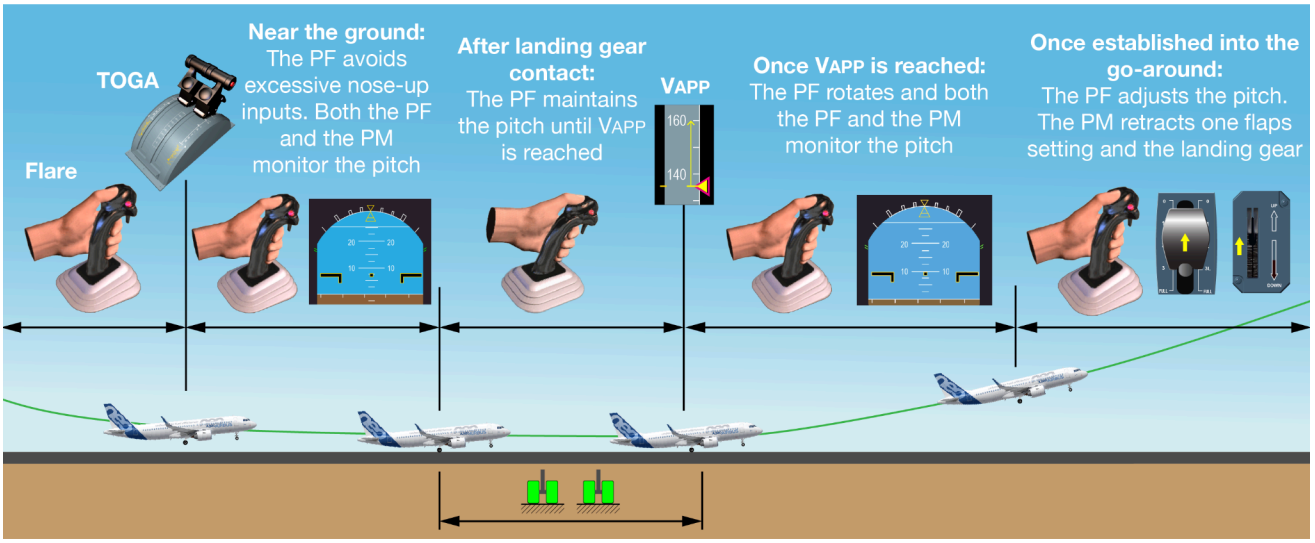
Landing gear contact with the ground may happen

If the go-around is initiated when the aircraft is very close to the ground, the landing gear may contact the runway. The PF should not try to avoid this contact by further increasing the pitch.

Manage the energy of the aircraft

In many reported cases of tailstrike during go-around, the high nose-up demand applied when the aircraft was on ground, and at low speed, led to the tailstrike.

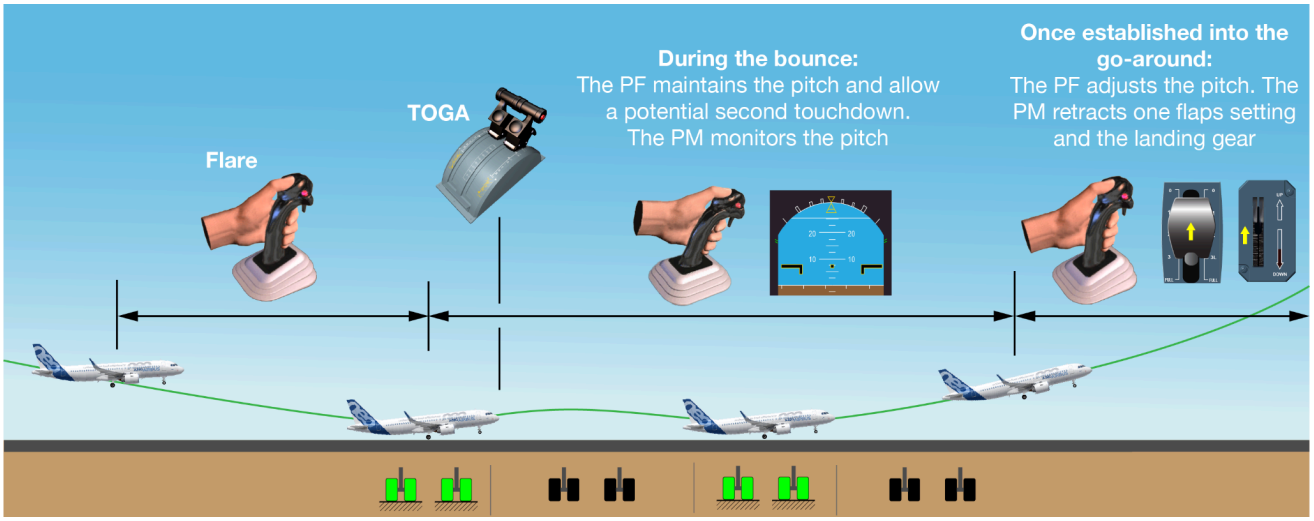
If engines are at idle when the go-around is initiated, they can take a few seconds to spool up. The flight crew should wait until the aircraft speed reaches at least V_{APP} to rotate the aircraft **(fig.5)**.



(fig.5) Management of energy after landing gear contact

Don’t try to avoid a second touchdown in the case of a go-around initiated during a bounce

If a go-around is initiated during a bounce, the PF should maintain the pitch, allowing a potential second touchdown to happen. Then the PF can further adjust the pitch, ask the PM to retract one flap setting and retract the landing gear when the aircraft is established on its go-around trajectory **(fig.6)**.



(fig.6) Management of a bounce during go-around

Only one flight crew flies at a time

Case study 2 shows that the PM may intend to take control in such dynamic situations. As per the FCTM chapter about the use of sidestick: only one flight crew flies at a time. If the PM intends to apply inputs using the sidestick, they must do the following actions:

- Clearly announce “**I have control**"
- **Press and maintain the sidestick priority pushbutton** in order to get full control of the Fly-By-Wire system.

The flight crew should keep in mind that sidestick inputs are algebraically added and the “**DUAL INPUT**” alert triggers if the priority pushbutton is not pressed and maintained.

In case study 2, the dual input of the PM on the Captain’s sidestick did not prevent the tailstrike. In other reported cases, the dual input from the PM in the same direction as the PF increased the inputs up to an equivalent of full nose-up, and the resulting increased rate of rotation contributed to the tailstrike.

Thrust reversers selection means full stop

It is important to recall the SOP that states **the flight crew must not initiate a go-around once the reversers have been selected**.

In several tailstrike events reported to Airbus, the go-around was initiated after the reversers selection. This contributed to the tailstrike due to the reduction of the aircraft speed before the go-around was initiated. The time taken for the thrust reversers to retract and lock also causes a delay of the engine spool-up to TOGA.

INFORMATION

For more information, refer to the "Thrust Reverser Selection is a Decision to Stop" article published in June 2023.

TRAINING CONSIDERATION

The Airbus Flight Crew Training Standards Manual (FCTS) recommends to train go-around near the ground in a simulator.

To create surprise effect and to have training conditions close to the conditions observed during in-service events, the instructor should order the go-around once thrust levers are set in idle position during the flare initiation.

INFORMATION

For more information on the management of go-arounds, including go-arounds near the ground, refer to the "Go-around: Some threats and mitigations" video available on the Airbus Worldwide Instructor News (WIN) website.

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Performing a Go-around near the ground is a very dynamic phase with a risk of tailstrike. If a go-around is initiated, the maneuver must be completed.

To ensure a safe go-around near the ground, the flight crew must avoid application of inputs that lead to a high rate of rotation, retract flaps, and retract the landing gear only when the aircraft is safely established in the go-around maneuver.

If the landing gear is in brief contact with the ground, this is acceptable. The PF should not try to avoid this contact by further increasing the pitch.

If the engines are already at idle when the go-around is initiated and the aircraft energy is low, the flight crew should wait until the aircraft speed reaches at least VAPP to rotate the aircraft.

Do not try to avoid the secondary touchdown in the case of a go-around initiated during a bounce. The PF should maintain the pitch, allowing a potential second touchdown to happen. Then the PF can further adjust the pitch, ask the PM to retract one flap setting and retract the landing gear when the aircraft is established on its go-around trajectory.

In all cases, it is important to recall that the SOP requires that a flight crew must not initiate a go-around once the reversers have been selected.

For further reading about avoiding tail strikes in other phases, you can read “A Focus on the Landing Flare” article published September 2020 and “A Focus on the Takeoff Rotation” published January 2021.

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