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Gear-Up Landings, or...Let It All Hang Out

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GEAR-UP

LANDINGS

OR



let it all hang out.

illus tabs 8-11

by Maj Tim Brady

Did you ever fly with a pilot who, at some time in his past, had landed gear-up because of his own error? Watching him shoot an approach is a lesson in attentiveness as far as the landing gear is concerned. On final, be it an instrument approach or a VFR type, you can see his eyes dart to the gear handle and indicators with amazing regularity. He may even bounce a fist off the gear handle with about every tenth heartbeat. The path his eyes trace during his instrument crosscheck becomes somewhat misshapen to include the landing gear indicators. Barring mechanical problems, the chances are that he will never again land with 'em up and locked.

Come to think of it, have you ever known or heard of anyone who made that same mistake twice? The statistics aren't available but you can bet that it hasn't happened too many times. The grinding noise the machine makes somehow ingrains a lasting lesson in the lander. In that statement there is a solution to the problem but, unfortunately, such a lesson is a mite too expensive to be included in the UPT syllabus.

The numbers of pilot caused gear-up mishaps Air Force wide has remained relatively constant since 1969, as you'll note in the tabulation below.

BY YEAR

1965	11
1966	12
1967	10
1968	14
1969	8
1970	7
1971	7
1972	8
TOTAL (since 1965) 77	

BY AIRCRAFT

C-130	2	CH-3	1
U-3	6	T-29	1
B-57	5	F-84	7
C-133	2	A-1	6
C/KC-97	1	T-33	5
C-123	4	T/A-37	4
B-66	1	F-102	3
C-131	1	F-100	3
C-7	3	F-105	2
XC-142	1	U-2	1
O-2	9	F-4	2
C-47	1	T-38	2
OV-10	3	OU-22	1

BY SITUATION

Single Seat or Flown by Single Pilot	42	Multi-Crewed	35
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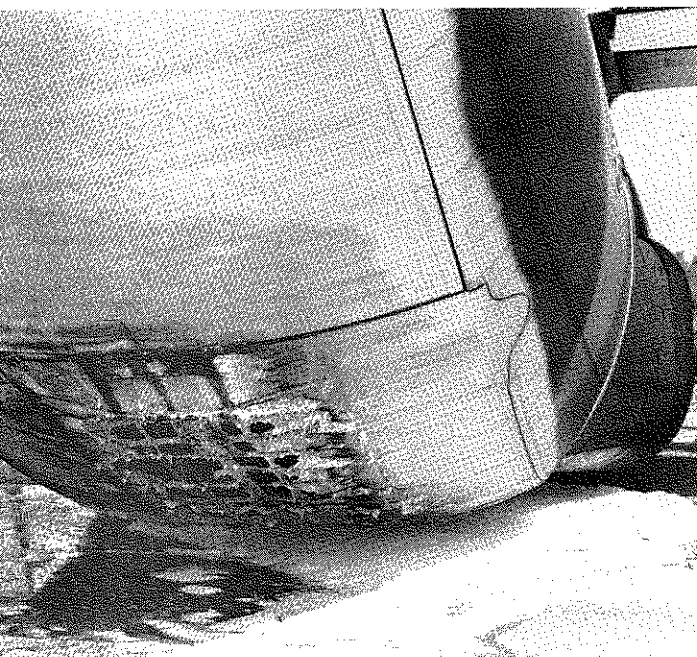
gear-up landings

The improvement in the average number of gear-up mishaps per year since 1969 compared with previous four years is notable, but eight per year is still a frustrating eight too many. This gear-up landing frustration was succinctly expressed by a commander in his indorsement to an accident report.

"... It is apparent that accident boards in the past have failed to prevent our accident (this was the 133rd gear-up landing in the past ten years) and I feel we're no closer to a solution today than we were ten years ago. Within a week of our unfortunate accident, a twin engine corporation aircraft with a highly qualified pilot landed gear-up at (commercial airfield). A regional commercial carrier based in (commercial airfield) also experienced a similar gear-up landing within the recent past. A new approach to this problem must be found. We know that in the past, blaming the pilot simply does not prevent the reoccurrence of gear-up landings. The Air Force must exercise leadership in the area and test the new resources available to resolve this problem. Unless this is done, we may reasonably expect that more and possibly costlier aircraft are going to land gear-up."

Less than two months after this commander made the statement, another Air Force aircraft landed gear-up.

In the past, horns, lights, buzzers, and aural tones in



the headset have been installed to warn the pilot that the gear was not down when it should have been but it's obvious these devices aren't doing the job for which they were designed. At least they didn't do it in 77 cases in the past eight years.

But of course we can't lay the blame on the warning devices. They're only supposed to work if an error has been committed. You make a mistake and the horn/light/buzzer tells you about it but only IF you observe the light or hear the horn or buzzer. There's the kicker. You must first perceive the warning device. It seems that in many cases, once the pilot has made up his mind that the gear is down and has channeled his attention to landing the aircraft, all the gear warning horns, lights, and buzzers in the world aren't going to sway him from his appointed duty.

In addition to the warning devices, we've developed handy things called checklists that tell us to put down the gear. But sometimes distractions enter the picture and force our attention away from the job at hand. For instance, if, as you're reading this article, a bomb goes off in the next stall, you're going to be distracted momentarily. When you get yourself all pulled together again, chances are you aren't going to remember the exact point you quit reading when the explosion occurred. And unless you force yourself back into the article and maybe re-read a couple of lines, you just might wind up skipping a few. If we make an analogous shift and transpose the john to the seat of an aircraft, the article to a checklist, and the bomb to an unexpected radio call, the formula for distraction is complete. And if, after distracted, we don't re-read a couple of lines, the gear may still be in the well when the landing slide is complete. It takes a conscious mental effort to overcome distractions and unless we force ourselves back into the real situation, that checklist is as worthless as last year's change to 60-16.

Then there's the old habit pattern substitution syndrome. Let's say that you've developed the habit pattern: reduce power in the pitch, roll out on downwind, get the gear, the flaps, and turn. A very definite and habitual number of steps. But throw a distraction in about the time you would be reaching for the gear handle, such as a beeper coming through too loud and clear. You reach down and flip the UHF selector switch off "both"...then lower the flaps and turn. You have substituted the UHF selector switch for the gear handle. While you've made the correct number of moves with your hands, and accomplished the correct number of steps, the gear is still tucked. Unless you retrace the steps, you may land gear-up.

Some hold that the more people in the cockpit, the less the chance of making a gear-up landing. If that were so, we would never hear statements like, "How could five

people in the cockpit miss the fact that the gear handle was UP before (and after) touchdown?" And, if you'll direct your attention to the tabulation, you'll note that multi-crewed aircraft have been landed gear-up almost as many times as single-seat aircraft or aircraft flown by a single pilot. So adding more people is not the answer. What, then, is the answer?

To find it, the Air Force Inspection and Safety Center has initiated a Required Operational Capability (ROC), stating as its objective: A device is needed that will effectively insure that aircraft are correctly configured for landing. This ROC was sent to all the major air commands for ideas and inputs and, at the present time, the complete package is being put together incorporating the inputs from the MAJCOMS to forward to the air staff.

In the ROC, several devices were discussed as possibilities:

AUTOMATIC LANDING GEAR

Wire the gear-down circuit to the approach or landing position of the wing flaps so that if the gear is not already down, it will be lowered automatically when the flap switch is put to the approach or landing position.

This device obviously, would not be appropriate for all aircraft; however, it might work on aircraft that have a flap position that is used only for landings. Another drawback to this device is that it removes the pilot from the decision loop and in doing so, transfers responsibility from the pilot.

RADIO ALTIMETER WARNING DEVICE

Incorporate a gear warning device into the radio altimeter which would provide a cockpit warning to the crew if the plane descended through a pre-selected height above the ground with the gear up.

This device carries with it the inherent disadvantage of all the warning devices of the past. Existing warning devices have not prevented gear-up landings. The ability of the pilot to set up a psychological barrier between what he is doing and what the warning device is warning has accounted for many gear-up landings. Adding another would not seem to solve the problem.

OTHER WARNING DEVICES

Select an item that the pilot must look at and cannot ignore during a landing approach and incorporate a gear warning device with it. Such as:

Masking the approach speed range of the airspeed indicator with a flag if the gear is up.

This might work for those airplanes which use the approach speed range only during the landing phase. But for those that take off at 100 knots, cruise at 100 knots,

and land at 100 knots...well. And for those aircraft which use the approach speed range for other things such as airdrops, etc....well.

Incorporating a gear warning device into the angle of attack indicator or Heads Up Display (HUD) in some aircraft. On the surface it sounds good, but it's still a warning device.

THE MIRAGE SYSTEM

Adopt the device presently installed on the French Mirage III aircraft used by the Australian Air Force. It consists of an audio frequency oscillator wired in series with the landing gear microswitches, the command radio transmitter, and a button on the instrument panel or other convenient location. If the gear is down and the button is pressed, the circuit is completed and a distinctive tone is transmitted over the aircraft radio. In operation, the tower operator withholds landing clearance until he hears this tone in response to, "Check Gear Down." In using the button and tone oscillator, the pilot may develop the habit of pressing the button in response to the tower radio transmission, "Check Gear Down," but the oscillator responds to fact: no gear, no tone.

This appears to be a good solution because of its simplicity and applicability to all aircraft. Pilots are already conditioned to not land without landing clearance and the addition of this device would merely change a verbal response to a button response.

You can see some of the disadvantages of this system. For instance, what if the tower is saturated and misses the tone transmission. Add to that a pilot who has developed a habit pattern of pressing the button rather than giving the response of "Gear Check," plus the gear in the up and locked position and zingo... gear-up landing.

Perhaps we can capitalize on the anticipated habit pattern the pilot will develop using a device of this kind by merely not exposing the button until the gear handle is down. If, in his concentration, the pilot automatically reaches for the button to respond to "Check Gear Down," he wouldn't find it. In all likelihood, his concentration would be broken and he would momentarily shift his attention to the landing gear. Might work!

These are just a few of the potential solutions to the gear-up problem; presumably, many more are being researched. And it may very well turn out that there is no single foolproof solution.

We, at TAC ATTACK, will endeavor to keep you informed as the developments unfold in this search for the best answer to the gear-up landing problem.

In shutting down this article, let's end it with an obvious statement.

THE LANDING GEAR IS STILL YOUR RESPONSIBILITY. ➔