

Accident

Aircraft Type and Registration:	Piper PA-28R-200, G-EPTR	
No & Type of Engines:	1 Lycoming IO-360-C1C piston engine	
Year of Manufacture:	1972 (Serial no: 28R-7235090)	
Date & Time (UTC):	19 May 2023 at 1354 hrs	
Location:	Perth Airport	
Type of Flight:	Training	
Persons on Board:	Crew - 2	Passengers - None
Injuries:	Crew - None	Passengers - N/A
Nature of Damage:	Engine shock loaded, propeller bent, flaps damaged, scoring of underside of aircraft.	
Commander's Licence:	Commercial Pilot's Licence	
Commander's Age:	56 years	
Commander's Flying Experience:	6,388 hours (of which 6,104 were on type) Last 90 days - 52 hours Last 28 days - 27 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

Synopsis

Due to distractions the crew of G-EPTR did not lower the landing gear on the downwind leg or conduct the final checks on approach. As a result, the aircraft landed with the landing gear up causing damage to the propeller, aircraft and engine, although there were no injuries to either occupant. Neither pilot heard or saw the gear warnings, and the automatic extension system fitted to the aircraft had been disabled by the selector being in override, as was customary on the aircraft.

History of the flight

The crew of G-EPTR were conducting a training flight and had returned to the circuit having completed some general handling in the local area with the student as PF. On the sixth circuit, with the aircraft at the beginning of the downwind leg, both pilots became aware of an aircraft which had conducted a practice engine failure after takeoff. This aircraft was climbing out just outside of G-EPTR downwind. Both pilots continued to monitor the position of the other aircraft which was relatively close to them. With their attention out of the cockpit both pilots missed that the landing gear had not been selected down, which normally would have been completed at the beginning of the downwind leg. The resultant circuit was tighter than normal, and the aircraft was slightly high on final approach. The instructor was then 'pattering' the student on the approach and, again, both pilots missed the final check of the gear at this point.

As the tail skid of the aircraft made contact with the runway, the instructor realised immediately what the problem was but felt it was too late to go around. The aircraft came to a stop on the runway after approximately 100 m and there were no injuries to the occupants who were able to vacate the aircraft without assistance. The aircraft suffered damage to the propeller, flaps and underside with the engine being shock loaded.

Aircraft information

Landing gear down and locked positions are indicated by three green lights located under the selector switch mounted on the instrument panel to the left of the throttle quadrant. A yellow warning light, located at the top of the instrument panel, illuminates while the gear is in transit, or not in the full up or locked down position. When all the lights are out it indicates the gear is up. The positioning of the gear indicating lights means that an instructor in the right seat must lean over to see them.

When the aircraft was built, it was fitted with a backup landing gear extender which lowers the gear regardless of the gear selector position dependant on speed and engine power (propeller slipstream). This backup extension is designed to occur below approximately 105 mph with the throttle closed. The speed will vary from approximately 85 mph to 105 mph dependant on altitude and throttle position. A lever is fitted beside the emergency gear lowering lever, which, if latched in the override position, disables the backup gear extender meaning the gear position is controlled only with the selector switch regardless of speed or power. If the override lever is latched in place, a yellow warning light below the gear selector flashes to remind the pilot that the automatic gear system is disabled. In 1988, after litigation in the United States, the aircraft manufacturer issued a Service Bulletin¹ (SB) with two options for compliance, one of which was the complete removal of the system. The second means of compliance was for operators to include the SB in the aircraft's pilots operating handbook and for increased education on the function and operation of the system. The aircraft manufacturer considered compliance with the SB to be mandatory, and G-EPTR met with the second means of compliance. Due to the nature of the instructional flying undertaken on the aircraft, the system was nearly always selected to override.

The aircraft has an audible warning system for the landing gear which uses a microswitch in the throttle quadrant that activates a warning horn and the red landing gear unsafe light (positioned at the top of the instrument panel) under the following conditions:

- Gear up and power reduced below approximately 14 inches of Manifold Air Pressure (MAP).
- The backup gear extender has extended the landing gear and the gear selector is UP, except at full throttle.
- Gear selector switch UP while on the ground.

Footnote

¹ https://s3.amazonaws.com/pipercrm/Solution/19551/SB_0866A.pdf [Accessed June 2023].

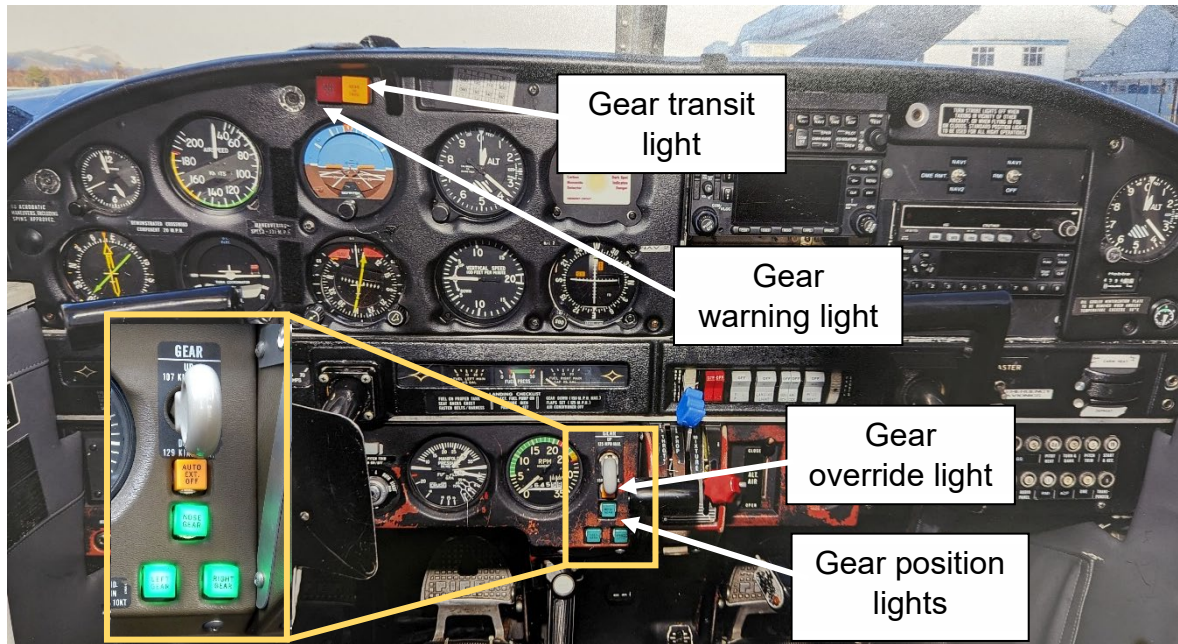


Figure 1

Cockpit layout of the aircraft type

The aircraft warning that would have been active on the accident approach was that triggered by the power being reduced below 14 inches of MAP. However, the instructor commented that this can come very late on G-EPTR because the MAP required on final is around 15 inches until the flare for landing.

The gear warning horn emits a 90 Hz beeping sound. Neither pilot recalls hearing the gear warning horn during the approach or seeing the red warning light. Neither the horn nor warning light was tested to confirm they were working. The override lever for the backup gear extension was latched in the override position and automatic gear extension was disabled.

Aerodrome information

Perth Airport has an Air Ground Communications Service (AGCS). AGCS radio station operators provide traffic and weather information to pilots operating on and in the vicinity of the aerodrome. Such traffic information is based primarily on reports made by other pilots. The student had done much of their previous flying at an airfield with a full air traffic control service. Both the instructor and the student commented that the circuit at Perth could be busy with many different aircraft types, requiring good lookout and awareness of other aircraft.

Human factors

Distractions are one of the most common causes of errors both inside and outside of aviation. The CAA Safety Sense Leaflet on Distractions and Interruptions in General Aviation states that:

*'Distraction and interruption are unavoidable aspects of flying that require consideration and mitigation. Many occurrences, serious incidents or accidents have been caused by apparently trivial distractions or interruptions, with examples including loss of control, collisions, aircraft configuration errors or airspace infringements. In most cases, the attention of the pilot or crew was diverted from the primary task of flying and navigating the aircraft.'*²

A common scenario described in the leaflet is one where the landing checklist is omitted due to the crew being distracted within the circuit by other traffic. This omission of the checklist can result in the aircraft landing without the gear extended or the gear not being retracted after takeoff. The leaflet suggests that to mitigate the risks pilots should consider when they will perform their checklist, perhaps completing it earlier than normal if the circuit is expected to be busy. A further check on approach should also be performed.

Aircraft accident reports often describe how pilots have not heard warning tones or callouts, or noticed warning lights, especially at times of high workload or stress. This selective attention is a common feature of humans and allows us to operate in a complex and dynamic world. The volume of information being sent to the brain from the senses is beyond the processing power we have. We have therefore evolved to prioritize the processing of that information according to the task that is being performed. The advantage of this selective attention is it allows our brain and its limited processing power to concentrate on one particular aspect of a task. The obvious disadvantage is that we fail to notice other stimuli trying to get our attention. Selective attention is not limited to hearing; we can also fail to notice warning lights or changes in our environment.

Analysis

The crew of G-EPTR landed at Perth Airport without lowering the landing gear. The landing checklist was omitted, probably due to the crew being distracted by other circuit traffic close to their position. Any additional check of the landing gear on final was also omitted, also probably as both crew members were distracted by the need for the instructor to provide guidance to the student during the approach. Distractions are one of the most common causes of errors and failing to lower the landing gear is one of the many scenarios discussed in the CAA Safety Sense Leaflet.

Neither pilot noticed either the warning tone or the red warning light which would have alerted them to the retracted landing gear. The tone and light were not tested so it is possible that they were not working at the time of the accident. However, humans have evolved to prioritize information coming from our senses so as not to overwhelm our brain,

Footnote

² https://www.caa.co.uk/media/lqnhlhxe/caa8230_safetysense_31_distraction_aw9.pdf [Accessed June 2023]

so it is also possible that the crew experienced selective attention when they did not hear or see the warning, as their focus was on other parts of the task at that moment. Due to the required power setting for the approach the alert may also have occurred so late in the approach that the aircraft was already in the final stages of landing meaning there was little chance to avoid the accident event if the crew had heard or seen the alert.

The set up of the lights in the cockpit also presented a challenge to the instructor in the right hand seat who needed to lean over to see them. While the instructor was very familiar with the type, this still represents an addition barrier to noticing the lights are not illuminated green on final.

The aircraft had been built with a backup gear extender which was designed to extend the gear, based on speed and engine power, in the event the pilot forgot, but this system had been disabled on the accident flight, as was normal practise for the operator on this aircraft. The manufacturer has recommended via a SB that either that the system be removed entirely or that further information on its performance be supplied to all pilots. The operator had decided to operate G-EPTR with the system selected to override rather than remove it entirely. While the system might well have prevented G-EPTR landing without the gear down, it was being operated in accordance with the manufacturer's guidance.

Conclusion

The aircraft landed with the landing gear up after the crew did not perform either the landing checklist or the check on final approach. This was probably because the crew were distracted, firstly due to other traffic in the circuit and afterwards because the instructor was providing guidance to the student on the final approach. The CAA have produced a Safety Sense Leaflet on distraction that includes the example of an aircraft landing gear up.

Neither pilot noticed the warning light or heard the warning horn, and this could be because it was either not working or because they were concentrating on other tasks. The warning might also have occurred too late to have avoided the accident.

The damage to the aircraft included to the propeller, flaps and the underside as well as shock loading to the engine but neither pilot was injured, and they were able to vacate the aircraft without assistance.