BEA
Bureau d'Enquêtes et d'Analyses
pour la sécurité de l'aviation civile

www.bea.aero

@BEA_Aero

STUDY

Reduction in engine power at take-off

RÉPUBLIQUE
FRANÇAISE
Liberté
Égalité
Fraternité

September 2022

Some figures concerning reduction in engine power at take-off

Scope of statistics

Period	**2015 - 2019**
Aircraft categories	**Light single-engine aeroplane Microlight (fixed-wing)**
Organisation responsible for occurrence	**BEA (occurred in France or delegated to the BEA)**

Statistics

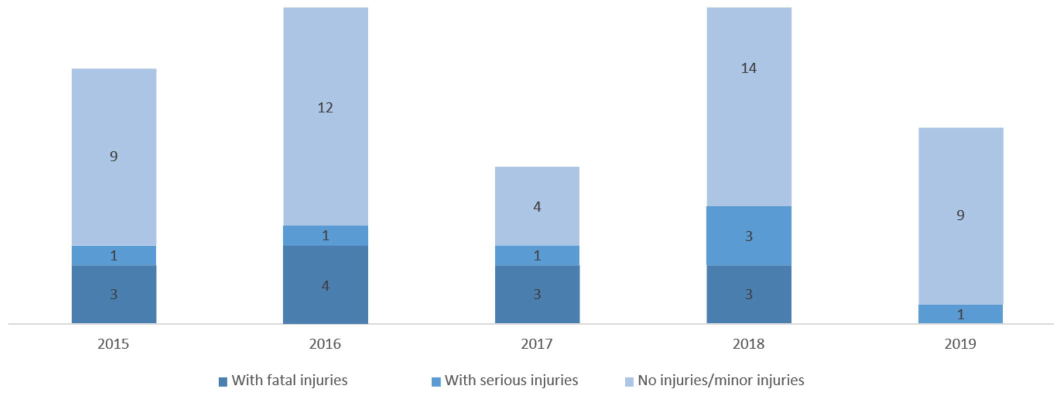

Figure 1: variation in the number of accidents related to this topic

	Number of accidents		Bodily injury	
	Total	***Of which fatal***	**Fatalities**	**Seriously injured**
Aeroplanes	30	*4*	8	9
Fixed-wing microlights	38	*9*	13	3
Total/topic	**68**	***13***	**21**	**12**
Contribution of this topic to the overall accident rate* **equivalent scope*	**8%**	***11%***	**12%**	**11%**

Figure 2: details of the accidents and their bodily injuries

Note: *these statistics include uninvestigated accidents for which the BEA was unable to validate the information collected.*

Study on reduction in engine power at take-off

KEY POINTS TO NOTE FROM THE STUDY

Thirty-one events studied

All 12 fatal accidents in the sample were the result of a loss of control in flight.

In total, 14 cases led to a loss of control in flight. At least 11 of these occurred during a significant heading change or even during an attempted turn-around.

Unlike the losses of control in flight, neither the four cases of collision with obstacles without loss of control, nor the two cases of a controlled landing on water led to fatal injuries.

Statistically, greater experience does not appear to positively influence the management of a reduction in engine power at take-off and its outcome.

All five accidents in the sample that occurred during dual-control instruction flights were fatal. In these five cases, a marked heading change was observed. The hypothesis of an attempted turn-around was assumed in three of these cases.

In at least two cases, the investigation showed that a turn was initiated despite the environment on the runway axis being clearly suitable for a forced landing.

In a third case, given the length of the remaining runway and the height of the aircraft at the time of the failure, landing straight ahead was probably possible even though there was a risk of a runway excursion and collision with the aerodrome perimeter fence.

Nine reductions in power can be associated with technical anomalies. They mainly concerned the carburetor and the ignition system.

Nine events appear to be more related to a pilot error in operating the aircraft. These are mainly fuel supply faults related to incorrect fuel tank selection before take-off.

Table of Contents

1 - DESCRIPTION OF THE SAMPLE

1.1 Scope of the study

Period	**2015 - 2019**
Aircraft categories	**Light single-engine aeroplane** **Microlight (fixed-wing)**
Organisation responsible for occurrence	**BEA (occurred in France or delegated to the BEA)**

1.2 Selection of the events

Within this scope, the BEA looked for cases of engine shut-down or reduction in engine power during take-off (on take-off run or initial climb), whatever the origin.

Of the events that met these criteria, the BEA retained, for a more detailed and qualitative analysis, a more restrictive sample of events than the ones covered by the exhaustive statistics presented above. These are the events that had been investigated or for which an investigation was underway at the time of selection, with, in the latter case, a level of information already considered sufficiently complete and reliable.

Note: *the decision to carry out an investigation is based on two main criteria:*

- ❒ *The obligation to carry out an investigation which applies globally to certified aircraft, thus excluding aircraft falling under Annex 1 to Regulation (EU) 018/1139*[1]*, such as historic aeroplanes, amateur-built aeroplanes and microlights;*
- ❒ *The BEA's investigation policy which covers, beyond the regulatory obligation, cases of fatal accidents involving aircraft falling under Annex 1 to Regulation (EU) 2018/1139.*

Thus, of the 68 accidents identified, the following were not included in the study:

- ❒ Thirty-three non-fatal accidents involving uncertified aircraft, which were not investigated (four historic or amateur-built aircraft and twenty-nine microlights);
- ❒ Five accidents investigated (four non-fatal aeroplane accidents and one fatal microlight accident) for which the progress of the investigation at the time of selection provided an insufficient level of information to feed the study.

One incident (not counted in the graphs in Figures 1 and 2) that was investigated was added to the study.

[1] Regulation of the European Parliament and of the Council of 04 July 2018 on common rules in the field of civil aviation and establishing a European Union Aviation Safety Agency. (https://eur-lex.europa.eu/eli/reg/2018/1139)

1.3 General information about the selected sample

31 events	
Occurrence class ▪ 30 accidents ▪ 1 incident	**Severity of injury** ▪ 12 fatal accidents (including 8 microlight accidents) ▪ 3 other accidents with serious injuries ▪ 16 other events with minor or no injuries
State of registration or identification ▪ France in 26 cases ▪ Foreign in the other 5 cases	**Aircraft category** ▪ 21 EASA-certified aeroplanes ▪ 2 uncertified aeroplanes ▪ 8 fixed-wing microlights
Type of flight ▪ 5 dual-control instruction flights (all fatal) ▪ 4 flights in a maintenance context (ferry flight, functional check flight, first flight after a lengthy downtime) ▪ 3 introductory or air experience flights ▪ 19 private flights (cross-country flights or local flights)	**Operator type** ▪ 18 owner pilots ▪ 13 flying clubs
Departure aerodrome ▪ 23 accidents departing from the aircraft's base aerodrome ▪ 8 from another aerodrome	**Flight phase** ▪ 27 take-off accidents ▪ 4 as a result of touch-and-goes (3 of which were fatal)

Figure 3: distribution of the selected events

2 - ADDITIONAL INFORMATION

2.1 Identified or probable origins of the reduction in power

<table>
<tr><td>F-HOAB
F-GGXF
HB-WXA
G-BHYA
F-GCUI
84-MP</td><td>6</td><td>Cases where the BEA observed specificities regarding the carburetor</td><td rowspan="5">Fuel supply fault (determined or probable)</td><td rowspan="9">Reduction in engine power at take-off</td></tr>
<tr><td>F-GZEU
F-GAHR
F-GBCR
F-BVMH
F-GFXE
34-AIQ</td><td>6</td><td>Cases related to incorrect fuel tank management/selection</td></tr>
<tr><td>F-BOJU
HB-YKY</td><td>2</td><td>Cases of observed fuel contamination</td></tr>
<tr><td>D-ESPE</td><td>1</td><td>Case of refuelling error</td></tr>
<tr><td>F-BLFP</td><td>1</td><td>Probable case of carburetor icing</td></tr>
<tr><td>46-DX</td><td>1</td><td>Case with ignition system fault</td><td>Probable ignition fault</td></tr>
<tr><td>F-HCAP</td><td>1</td><td>Case with a fault observed on the reduction gearbox</td><td>Transmission fault</td></tr>
<tr><td>F-ODSM
F-GDBK
F-GBAB
PH-COL
F-OJCA
F-BXTE</td><td>6</td><td>Cases where the BEA did not examine the engine</td><td rowspan="2">Origin of the reduction in engine power unknown</td></tr>
<tr><td>F-GBUP
F-HACV
74-AAA
21-AJN
17-TA
35-FF
988-AC</td><td>7</td><td>Cases where the engine examination was unable to determine the origin of the reduction in power</td></tr>
</table>

Figure 4: identified or probable origins of the reduction in power

***Note:** this table does not list all the technical anomalies observed during the examinations performed, that may have caused engine shut-downs or reductions in power. For each event, only the proven or most likely origin is indicated.*

2.1.1 *Technical malfunctions*

Nine reductions in power can be associated with technical anomalies. They mainly concern the carburetor and the ignition system.

In some cases, it is possible to determine the origin of these technical anomalies more precisely, and in particular to distinguish those due to design, manufacturing or maintenance aspects.

HB-YKY	Design fault
F-HOAB	Manufacturing fault
F-HCAP	Maintenance fault
HB-WXA	Maintenance fault

2.1.2 Pilot error in operating aircraft

Nine events appear to be more related to a pilot error in operating the aircraft. These are mainly fuel supply faults related to incorrect fuel tank selection before take-off (refer to Figure 4).

2.1.3 Undetermined origin

For the 13 remaining cases, the reasons for the reduction in engine power were not determined, either because the technical examinations carried out were not conclusive, or because the BEA did not retain this type of examination as a priority line of investigation (refer to Figure. 4).

2.2 Nature and consequences of the reduction in engine power

2.2.1 Reduction in engine power: partial or total

On the basis of the technical findings or statements, the BEA divided the engine power reductions into two categories, partial or total. Fatal accidents were observed in both cases[2].

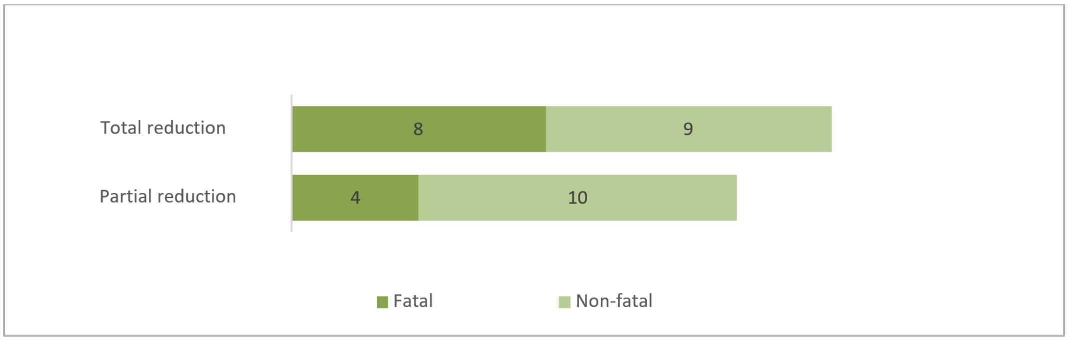

Figure 5: partial or total reduction: distribution of the number of cases

Estimating the reduction in power can be difficult, especially since the situation can evolve.

F-HACV	Momentary increase in engine power
F-GZEU	Momentary increase in engine power
F-ODSM	Accentuation of the reduction in engine power during the adapted runway circuit

Heading changes, or even attempted turn-arounds, were observed with both total and partial reductions in engine power.

[2] This observation differs from that made by Australia's investigation bureau (ATSB), which published a study in 2013 that focused on partial engine power reductions at take-off. The ATSB noted that the consequences were more serious in cases of partial reduction than in cases of total reduction. According to the ATSB, part of the reason for this difference is the greater complexity of these partial reduction situations, particularly because of the choices that the pilot may face. The ATSB also pointed out that training in engine failure at take-off did not generally cover this partial power reduction scenario.

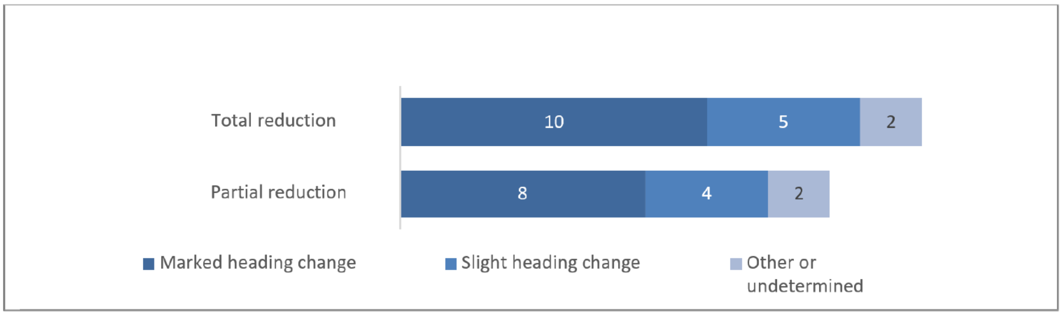

Figure 6: partial or total reduction: management of the path

2.2.2 Loss of control in flight

In the event of a reduction in engine power during the initial climb, depending on the aircraft, there may be little margin with respect to the stall speed or angle-of-attack. In particular, the latest generations of light and highly powered aircraft are particularly susceptible to loss of control during a sudden reduction in engine power during a steep climb(3). Reaction time is critical and the change in nose-down attitude required to reach a speed to maintain or regain control can sometimes be disorienting. In this already critical context, a turn has the effect of increasing the stall speed(4). Furthermore, during the turn, the pilot's focus on what is happening outside the aircraft, to the detriment of maintaining sufficient speed, can lead to the more or less rapid onset of loss of control.

All 12 fatal accidents in the sample were the result of a loss of control in flight (refer to Figure 7).

In total, 14 cases led to a loss of control in flight. At least 11 of these occurred during a significant heading change or even during an attempted turn-around (refer to Figure 7).

(3) Refer to article "*Réflexions sur la dangerosité d'une forte pente de montée au décollage*" (Reflections on the dangerous nature of a steep take-off climb), Michel Barry, Info-Pilote no.722, pages 56-58.

(4) https://securitedesvols.aero/images/affiches/technique-de-vol-affiche-evolution.pdf

Reduction in engine power at take-off	18 (10 fatal)	Cases where there was a marked heading change/ attempted turn-around	11 (10 fatal)	Losses of control in flight	F-GBUP HB-WXA F-HOAB F-BLFP 34-AIQ 35-FF 46-DX 84-MP 988-AC 17-TA F-GFXE
			2 (0 fatal)	Collisions with obstacles in controlled flight	F-ODSM F-GZEU
			2 (0 fatal)	Forced landings outside the aerodrome	F-HACV F-BVMH
			3 (0 fatal)	Landings on the reciprocal QFU	F-GBAB PH-COL F-HCAP
	9 (0 fatal)	Cases where the axis was held or there was a slight heading change	5 (0 fatal)	Forced landings outside the aerodrome	F-GDBK F-BOJU HB-YKY F-GAHR G-BHYA
			2 (0 fatal)	Collisions with obstacles in controlled flight	F-GCUI F-GBCR
			2 (0 fatal)	Water landings	D-ESPE F-OJCA
	3 (2 fatal)	Cases where the intention/ path could not be determined	3 (2 fatal)	Losses of control in flight	F-GGXF 21-AJN 74-AAA
	1 (0 fatal)	Aborted take-off	1 (0 fatal)	Runway excursion	F-BXTE

Figure 7: observed consequences for cases of reduction in engine power at take-off

In four cases, the read-out of recorded flight parameters made it possible to determine the height at which the reduction in engine power occurred; the maximum height reached in these cases was 186 ft. In 12 other cases, the height could be estimated, in particular on the basis of statements; it did not exceed 500 ft.

In its "Instructor's manual", the ENAC states that to perform a 180° turn with a 30° bank angle, the engine power reduced and a speed of 1.3 Vs, the loss of altitude can be in the order of 800 ft depending on the aircraft. It should be noted that a 180° turn brings the aircraft onto an axis parallel to the runway but not onto the runway.

Nearing the ground during these turns can cause pilots to increase the bank angle, use yaw control, and increase attitude in order to have the impression of reaching the aiming point considered.

Unlike the losses of control in flight, neither the four cases of collision with obstacles without loss of control, nor the two cases of a controlled landing on water led to fatal injuries.

2.2.3 Pilot profiles and power reduction management

The pilots involved in the fatal accidents of the sample had varying degrees of experience; a similar distribution in experience can be seen in the full sample.

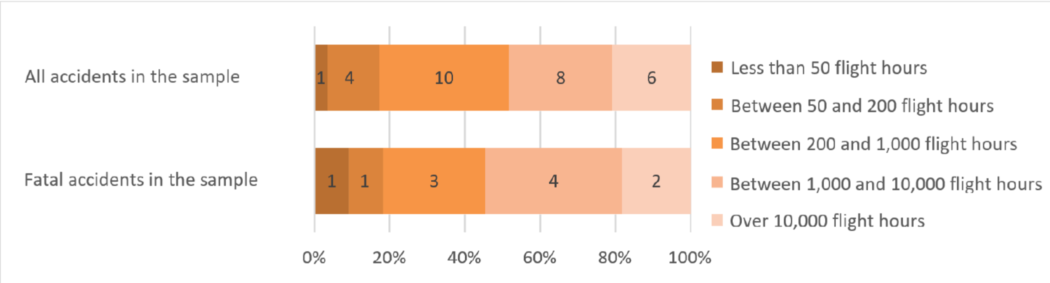

Figure 8: influence of pilot's experience (if determined)

Statistically, greater experience does not appear to positively influence the management of a reduction in engine power at take-off and its outcome (refer to Figure 8).

Beyond the number of flight hours, it is notable that:

All five accidents in the sample that occurred during dual-control instruction flights were fatal.

In these five cases, a marked heading change was observed. The hypothesis of an attempted turn-around was assumed in three of these cases.

2.2.4 Human Factors

Marked heading changes, or even attempted turn-arounds, were undertaken in 18 of the 31 cases studied (refer to Figure 7). In at least 10 of these 18 cases, the pilots may have been concerned about the consequences of holding the heading due to the presence of buildings, vegetation or water on the runway axis.

For all pilots, the startle effect and stress induced by the urgency of the situation are likely to influence their reactions.

In at least two cases, the investigation showed that a turn was initiated despite the environment on the runway axis being clearly suitable for a forced landing.

In a third case, given the length of the remaining runway and the height of the aircraft at the time of the failure, landing straight ahead was probably possible even though there was a risk of a runway excursion and collision with the aerodrome perimeter fence[5].

[5] The BEA observed that light aviation accidents falling under the "runway excursion" category do not generally result in serious bodily injury. However, it should be noted that the majority of these accidents occur on landing and not on take-off.

F-GBUP	Dual-control instruction; turn despite possibility of landing straight ahead
F-HOAB	Dual-control instruction; turn despite possibility of landing straight ahead
988-AC	Turn despite possibility of landing straight ahead

The finding regarding instructors seems to suggest that the judgement and technical abilities (two qualities that can be expected from instructors even more than from other pilots) are undermined by other factors.

In their day-to-day instruction, for training purposes, instructors may allow their students the possibility of recognising their mistakes by only taking over the controls when the situation deteriorates significantly. While they can rely on their manoeuvring skills to do this, this may result in a form of habituation and confidence that may lead them to instinctively seek an ideal outcome when faced with a reduction in engine power during take-off. In this context, the desire to prevent damage to the aircraft is a concern that may come into play.

2.3 Safety principles and examples of malfunctions

2.3.1 Maintaining aircraft airworthiness

In certified aviation, the certificate of airworthiness and the airworthiness review certificate ensure a first level of safety if they are valid. The underlying regulatory framework assumes that maintenance is performed by competent persons according to the procedures best suited to the specific features of the aircraft. The study of the selected events would suggest that anomalies appear when the nominal maintenance framework is not adhered to.

F-GGXF	Maintenance not carried out by approved organisation, no rating required

Aeroplane and engine manufacturers group their maintenance recommendations (frequency of inspections and procedures) in a maintenance manual. Maintenance organisations may adapt these recommendations according to their own experience and working methods.

HB-WXA	Deviation from manufacturer's maintenance recommendations

Exceptional measures for continuing airworthiness are necessary in certain specific situations. However, it is important to be aware of the limitations of this type of system, particularly with regard to the level of safety offered by the standard framework.

F-BOJU	Inaccuracies around the special dispensation process

In the uncertified category, continued airworthiness relies mainly on the rigour and good practices imposed by the owner pilots, by for example, developing and maintaining personal skills or using competent third parties, seeking advice from manufacturers, or following their recommendations.

35-FF	No monitoring of improvements implemented by the manufacturer or other users
74-AAA	Multiple and complex modifications

2.3.2 Instruction and training

Flight instruction is designed to develop and maintain pilot skills. Emergency situations such as uncommanded reductions in engine power at take-off are the subject of special training that must enable pilots to react quickly and appropriately.

The question arises as to the conditions in which emergency situation training should be carried out, so as to maintain an acceptable benefit/risk balance for the individuals and organisations concerned. The environment of the base aerodrome is a criterion that can lead to flying clubs or instructors imposing that training in engine power reductions at take-off be carried out at other aerodromes. In doing so, the instructor-student pair does not unnecessarily expose itself to an increased risk of actual failure in a hostile environment. Conversely, they will not be trained to deal with this situation in the environment in which they most often fly (nearly three quarters of the events in the sample occurred at take-off from the base aerodrome).

F-HOAB	No training at the base aerodrome, attempted turn-around and loss of control

Such an assessment is difficult and in any case subjective. As an indication, between 2010 and 2019, there were two accidents (one resulting in serious injury) as a result of an actual power reduction that occurred during an engine failure exercise at take-off.

In addition, some pilots experienced a partial failure. This situation may seem easier to manage, but it is not without danger. The pilot may be confronted with several problems: flying the aeroplane, analysing the malfunctions as well as identifying the available systems and the path to follow to land safely. The reaction to this type of failure will be all the more effective if the pilot has previously considered it during his training or in prior flights.

2.3.3 Preparation of flight

There are standard actions to be carried out when preparing a flight. Some of these can help to prevent reductions in engine power at take-off or to mitigate their consequences.

The calculation of the weight and balance is a safety principle that is not necessarily initially associated with the threat posed by a reduction in engine power at take-off.

However, it can contribute to maintaining a margin against stalling in dynamic circumstances in which performance is extremely critical.

F-GGXF	Take-off with slight excess load, loss of control following reduction in engine power
34-AIQ	Take-off with slight excess load, loss of control following reduction in engine power

Bleeding the fuel system is one of the first actions of the pre-flight inspection to be performed before moving the aircraft. Its purpose is to check that there is no contamination in the fuel system.

If there is water in the fuel system, due to condensation or infiltration, bleeding must drain this water off.

HB-YKY	Failure to bleed the fuel tank
F-BOJU	Misinterpretation of the results of bleeding a tank
D-ESPE	Fuel error when refuelling delegated to an agent, ineffective bleeding

Studying the aircraft's logbook should give the pilot an idea of the overall flying range and whether refuelling is necessary.

The consultation of the gauges on the instrument panel as well as manual gauging or even visual checking, when these operations are possible, must make it possible to confirm the calculations or to eliminate any doubts.

Lack of confidence in the instrument panel gauges should lead to a conservative action and should not be a reason to ignore a low fuel indication.

F-BVMH	No calculation of the fuel remaining after the previous flight
F-GAHR	Fuel gauge indication on the instrument panel disregarded due to lack of confidence
F-GBCR	Fuel gauge indication on the instrument panel disregarded due to lack of confidence

2.3.4 From engine start-up to alignment for take-off

The checklists to be completed prior to take-off contain a number of items that are important to prevent the threat posed by a reduction in engine power at take-off.

One of these items is the tank selection sequence when the aircraft has multiple tanks.

Careful compliance with these items is especially important when pilots are used to single-tank aircraft or aircraft with other tank or selector configurations.

F-GBCR	Inexperience in managing different tanks, checklists not used
F-GFXE	Haste, checklists not used
34-AIQ	Late selection of a tank before take-off

It is good practice to start the engine on the least full tank and then switch to the fullest tank for taxiing and ground tests, without changing again until take-off. This practice should allow time for a possible fuel supply cut-off to occur before take-off.

During this time, the engine tests may detect an anomaly that could worsen during take-off.

F-OJCA	Haste, failure to perform engine tests
F-GBAB	Engine tests assumed to be unnecessary, having been performed for the previous flight

One of the items on the engine test checklist is to test the carburetor heating and, in doing so, detect any onset of icing. To test the effectiveness of the carburetor heating, the pilot sets the control to "hot" and will normally observe a reduction in power. An increase in power after a few moments is the result of the melting of ice formed before the test. If the carburettor heating control is not pulled out for long enough during this test, the ice that may have formed during taxiing will not completely melt and the threat remains unknown.

During this time, engine tests can detect an anomaly that could worsen during take-off.

F-BLFP	Little attention paid to the carburetor heating test

2.3.5 Take-off briefing

The take-off briefing covers the actions to be taken under normal conditions and those to be taken if a failure occurs during take-off. The information listed during the take-off briefing is stored in the short-term memory. This memory directly and rapidly provides the pilot with the information necessary for immediate action.

F-GBUP	Take-off briefing not performed, in instruction

The take-off briefing is a safety principle that makes sense if it is effectively adapted to the conditions of the day (runway in use, wind strength and direction, environment in the extension of the runway, division of tasks if several pilots are on board, etc.).

The relevance of the take-off briefing is therefore based on sufficiently precise flight preparation. Familiarity with an aerodrome should be an asset to be exploited (visual references for the run distance, knowledge of the environment, areas that can reasonably be reached or not depending on the height at which the failure occurs, etc.), all the more so if training in engine failure at take-off is not carried out there because of specific risks.

It should be noted that when several aerodrome circuits are carried out one after the other, in the form of touch-and-goes, the scope of the briefing given on the occasion of the first take-off may gradually diminish.

2.3.6 Failure management during take-off run

If the pilot detects abnormal parameters during the take-off run, he has the possibility of aborting the take-off and thus limiting the seriousness of bodily injuries.

If the anomaly is not detected by means of engine parameters, a significant increase in take-off distance may be a clue, when the pilots have reliable references (when the pilot is used to using a QFU from a particular taxiway).

988-AC	Failure to detect an abnormally long take-off distance
F-ODSM	Failure to detect an abnormally long take-off distance

2.3.7 Failure management in initial climb

As detailed in para. 2.2, the immediate application of a nose-down attitude and holding the axis in the event of an engine power failure must make it possible to preserve sufficient margins in relation to the stall speed.

3 - CONCLUSION

One main fact is established by the study of this sample: all fatal injuries were the result of a loss of control in flight. The occupants are generally exposed to more energy during an impact caused by a loss of control in flight than during a controlled collision with obstacles in flight and, of course, always more than during a hard landing and/or a landing on a rough surface or surface with obstacles.

These losses of control in flight most often occur when making a significant change to the heading, indeed when attempting to turn around, during which the stall speed increases significantly. These manoeuvres are undertaken by pilots with various backgrounds, all under stress and possibly in the presence of other factors, such as equipment issues.

This observation leads us to issue a reminder of the importance of maintaining sufficient speed, which must take precedence over any other concern (dealing with a failure, avoiding an obstacle, searching for a clear area, etc.).

From this point of view, it seems appropriate to promote take-off briefings that are as detailed as possible, rather than allowing generic briefings to continue, when such briefings actually take place. The relevance of these briefings to the conditions of the day and the location will depend on the information collected during flight preparation.

This flight preparation phase is also of particular interest from a prevention aspect. At least one-third of the events studied resulted from a pilot error in operating the aircraft.

APPENDIX

List of accidents studied

Date	Registration Identification	Injury level	Aircraft category and model	Brief description
09 May 2015	F-GDBK	None	SOCATA TB10	Reduction in engine power in initial climb, forced off-field landing, failure of front gear
21 May 2015	F-GBUP	Fatal	ROBIN DR400 - 140B	Engine shut-down during initial climb after a touch-and-go in instruction, loss of control in turn during a forced landing, fire
18 July 2015	34-AIQ	Fatal	Polaris FK14b	Engine shut-down during initial climb, attempted turn-around, stall, collision with ground, fire, in instruction
19 Aug 2015	F-GBAB	Minor	ROBIN DR400 - 120	Reduction in engine power during initial climb, turn-around, runway veer-off during emergency landing, ground loop
22 Aug 2015	F-GGXF	Minor	ROBIN – ATL	Loss of control after take-off, collision with trees
31 Aug 2015	D-ESPE	Minor	PIPER PA46 - 350P	Fuelling error, reduction in engine power in initial climb, landing on water
25 Sept 2015	21-AJN	Fatal	STORM	Engine shut-down during go-around, loss of control, collision with ground, fire
09 Nov 2015	F-BLFP	None	WASSMER WA40 - A	Reduction in engine power during initial climb, stall during forced landing, collision with surface of sea
12 Nov 2015	F-BOJU	None	CESSNA 182K	Reduction in engine power during initial climb, forced landing, collision with the aerodrome perimeter fence
01 Jan 2016	F-HCAP	None	ROBIN DR400 - 155CDI Ecoflyer	Reduction in engine power after take-off, turn-around, landing on runway
04 May 2016	HB-YKY	Minor	DYN-AÉRO MCR “Sportster”	Engine shut-down during initial climb, forced off-field landing

15 July 2016	35-FF	Fatal	RANS Coyote II S-6ES	Engine shut-down after take-off, asymmetrical stall, collision with ground, in instruction
20 July 2016	46-DX	Fatal	NICOLLIER HN700 Ménestrel	Loss of engine power after take-off, loss of control during forced landing, collision with ground
12 Aug 2016	84-MP	Fatal	DYN'AERO MCR01M	Loss of control in flight, collision with ground
17 Aug 2016	74-AAA	Fatal	APOLLO FOX	Engine shut-down during climb, loss of control in flight, collision with ground
31 Mar 2017	F-GAHR	None	ROBIN DR400 - 180	Engine shut-down during initial climb, forced landing in a field, in air experience flight
17 April 2017	PH-COL	None	LANCAIR 320	Engine malfunction, hard landing, failure of nose gear
05 July 2017	HB-WXA	Fatal	CZECH SPORT PS-28 Cruiser	Engine failure during initial climb,stall and spin, collision with ground, in instruction
28 Sept 2017	17-TA	Fatal	Gazaile 2	Loss of engine power in initial climb, turn-around, loss of control, collision with ground, fire
06 April 2018	F-GCUI	Serious	ROBIN DR400 - 160	Reduction in engine power during take-off, collision with a tree then the ground
09 June 2018	F-HACV	Serious	ROBIN DR400 - 120	Reduction in engine speed in initial climb, forced off-field landing, during an introductory flight
07 July 2018	F-GBCR	Minor	SOCATA MS 880 B Rallye Cluber	Fuel exhaustion during initial climb, collision with obstacles during forced landing
10 July 2018	F-GZEU	None	PIPER PA28 - 181	Inappropriate management of fuel selectors, fuel exhaustion after take-off, collision with vegetation during forced landing
16 July 2018	F-HOAB	Fatal	TECNAM P2002	Reduction in engine power in initial climb, turn-around, loss of control and collision with the ground, in instruction
17 July 2018	G-BHYA	None	CESSNA R182	Reduction in engine power at take-off, emergency landing, nose over onto back
28 July 2018	F-GFXE	Fatal	ROBIN DR400 - 180	Reduction in engine power in initial climb, left turn at low height, stall and collision with the ground, during an introductory flight

24 Aug 2018	F-BXTE	None	SOCATA RALLYE 150	Loss of engine power during the take-off run, runway overrun
25 Oct 2018	988-AC	Fatal	ZENAIR CH601	Reduction in power during take-off, attempted turn-around, stall in turn, collision with ground, during a flight after maintenance operations
31 Dec 2018	F-OJCA	Minor	BEECH - C23 "Sundowner"	Reduction in engine power in initial climb, forced landing near the shoreline, failure of front gear during landing
22 May 2019	F-BVMH	None	ROBIN DR400 - 160	Engine shut-down during take-off, fuel failure
19 June 2019	F-ODSM	Serious	PIPER PA-28	Reduction in power during take-off, collision with obstacles during a forced landing

Bureau d'Enquêtes et d'Analyses
pour la sécurité de l'aviation civile

10 rue de Paris
Zone Sud - Bâtiment 153
Aéroport du Bourget
93352 Le Bourget Cedex - France
T : +33 1 49 92 72 00 - F : +33 1 49 92 72 03
www.bea.aero