SAFETY INFORMATION LEAFLET DGAC N° 2022/03

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Operators involved	☐ Operators of Light Aviation ☐ ATO &DTO ☐ Aerodrome operators
Subject	Risk management associated with meteorological conditions of hot weather
Objective	The aim of this safety information is to draw pilots' attention to the threats posed by the operation of aircraft during extreme heat.
Context	Climate change has recently led to an increase in prolonged high temperature episodes in metropolitan France, with temperatures frequently above 35 °C and peaks of up to 40 °C. These episodes are also characterised by high night-time temperatures and a large part of the day spent at extreme values. In addition, these temperatures are standardised, measured under shelter, and the temperature on the ground or at 10 cm above the ground, due to sunshine, may well exceed 50 °C for several hours in a row during days of extreme heat, often associated with low cloudiness. In addition to the effect that heat has on organisms which are not accustomed to it (low opportunity to recover during nights, dehydration, eye fatigue by glare, difficult breathing, choking, etc.), all factors exacerbating fatigue, which significantly affect the human performance of pilots and all those operating aircraft, are also particularly affected. The take-off, climb and go-around performance of aircraft depends on many factors, including the altitude density1, which is highly dependent on rising temperatures. Moreover, the temperature under shelter is the temperature used to calculate performance, whereas on the ground or 10 cm from the ground it may be much higher as indicated above, often making this calculation optimistic. To take off at the prescribed specified speed, a true airspeed of 1 % higher per temperature increase of 5 °C above the standard atmosphere temperature, which increases the take-off distance. The climb performance will be significantly affected, together with that of the powerplant, which may even be limited by the maximum oil or cylinders temperature. When the effect of temperature is combined with those of altitude (+ 1 % TAS per 600 ft above mean sea level), as on airfields at altitude or in mountains, associated with aerology phenomena such as dynamic turbulence, orographic waves, slope brezze, thermal turbulence or windshear, the situation may become awckward even though performance may still look sufficient. Each aircraft category has its particularities which cannot be listed entirely here, such as the power limits of helicopters out of ground effect, the effects of sunshine under sailplanes' canopy, the effects of the temperature differential to outside air for hot air balloons, and of course the hypersensitivity at the aerology of some micro-lights. In addition, the effects of temperature and altitude, which might critically affect take-off and landing performance, are equally critical on the volume needed during maneuvering in mountainous environment, such as in incised valleys. Again, the higher true airspeed due to altitude and temperature leads to a significant increase in turn radius.

[1] *by definition, the pressure altitude in the standard atmosphere with the same density*

	Pilots will be tempted to squeeze on the safety margins to avoid collision with the terrain, at the risk of losing control of the aircraft. Sufficient anticipation and basic caution must enable you to avoid such a situation. Finally, heavy heat may also increase the risk of heat spikes of portable electronic equipment using lithium batteries.
Recommended actions	***Therefore, the DGAC recommends that:*** - pilots take into account the risk of high temperature on their organisms and their physical and cognitive ability to carry out the flight, especially for demanding and/or repetitive activities (sailplane towing, skydiving, etc.), with particular care to the well-being of passengers. - flight preparation shall pay particular attention to temperature, taking into account a local increase due to sunshine. - pilots take up comfortable safety margins each time as far as possible (e.g. full runway length, e.g. at take-off). - pilots do not fail to take into account close or remote obstacles in particular if the climb gradient is particularly affected - pilots include the possibility of rough aerology and difficulties to forecast it, as well as their effects, in particular the effect on the airspeed and trajectory when crossing an updraft then downdraft, this effect being agrravated on aircraft having a low wingload - where the flight preparation indicates that departure is possible, pilots should expect to experience a deterioration in the performance of the aeroplane, and refrain from over-responding to a low climb gradient by pitching up, to the risk of losing performance and placing themselves in the critical area back side of the power curve, which may lead to loss of control. - pilots do not hesitate to act upon the parameters within their reach: on loading, fuel on board and number of occupants, the choice of alternate destinations that are less sensitive to these phenomena, and are able to abandon a risky flight project, especially when they have passengers. - pilots assess threats related to these extreme conditions by applying threat and Error Management (TEM-Threat and Error Management) techniques - aerodrome operators and air traffic services are aware of the limitations described above and facilitate the specific requests of pilots to maintain their safety margins. - ATOs and DTOs ensure that pilots and instructors have taken into account these limitations in the training and briefings they provide.

This topic has been published on the CNFAS flight safety portal – DGAC
https://securitedesvols.aero/actualites/les-performances-se-degradent-avec-les-beaux-jours
Examples of investigations where hot weather contributed to the accident
https://bea.aero/fileadmin/uploads/tx_elydbrapports/BEA2018-0517.pdf
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https://bea.aero/fileadmin/uploads/tx_elydbrapports/BEA2019-0503.pdf
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Examples of investigations where poor aircraft performances contributed to the accident
https://bea.aero/fileadmin/user_upload/BEA2020-0412.pdf
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