

PROPOSAL TO AMEND PERMIT-TO-FLY CONDITIONS

A PAPER BY THE PFA

INTRODUCTION

The UK Air Navigation Order requires that single engine aircraft flying over the congested area of a city, town or settlement do so at a minimum of 1000 ft and at a height such that should the engine fail, the aircraft can be landed clear of the area. A similar regulation applies to the overflight of large assemblies of persons. These regulations ensure the safety of people and property on the ground.

Aircraft operated under a UK permit-to-fly are subject to an additional condition prohibiting the overflight of these areas at any height except to the extent necessary to take-off and land at a licensed airfield. This condition has, with amendments, been in being for many years but it is becoming increasingly difficult to implement and changes in legislation have introduced anomalies. Moreover, with 30 years of accident data available, it is now possible to make judgements about the risk applying to permit aircraft operations in relation to this condition. A review is timely as a number of current CofA aircraft are likely to be moved to permit-to-fly status in the near future. As the regulations currently stand, additional onerous restrictions will be applied on transfer.

AIM

The aim of this paper is to propose an amendment to the permit-to-fly condition pertaining to overflight of congested areas and assemblies of persons.

SCOPE

The condition applies to all UK CAA and UK EASA permit-to-fly aircraft, which includes those supervised by the PFA and BMAA as well as those handled by the CAA itself; the latter including former military aircraft operated under CAP 632. This paper analyses the issues as they relate to light single engine aircraft and then makes a comparison with airworthiness regimes and data on microlight and CAP 632 aircraft. Rotorcraft are not considered.

DISCUSSION

The permit condition does not directly affect the safety of aircraft or their occupants. It seeks to provide additional protection to concentrations of third parties on the ground from death or injury by aircraft that do not hold a certificate of airworthiness. This leads to 2 areas for analysis: the nature of the airworthiness that results from the various permit-to-fly regimes and the risk to third parties on the ground, both comparative and absolute.

THE AIRWORTHINESS REGIME – ALL AIRCRAFT

Aircraft with a Permit-to-fly rather than a Certificate of Airworthiness are designed, constructed and maintained in accordance with appropriate codes and practices which are approved and audited by the CAA. The permit-to-fly airworthiness regime is different from the certificate of airworthiness regime and is not appropriate for public transport aircraft operations, which must be of the highest standard. However, we should be clear that permit-to-fly aircraft are not experimental category aircraft, which in other countries, are allowed to operate without any airworthiness control or supervision and at the owner's risk. It may be that special restrictions would be necessary to manage the risk that experimental aircraft present but no such category currently exists in the UK although sub-115Kg microlights are in the process of deregulation. For regulated aircraft, the permit-to-fly airworthiness

regime represents an appropriate and practical standard for certain aircraft that do not hold a CofA; it ensures a consistent, repeatable and controlled level of safety.

RISK – SINGLE ENGINE AEROPLANES

Since 1960 there has been only 1 fatal accident to single engine aircraft involving third parties on the ground. This involved a Cessna 172 at an airshow killing 2 people and was caused by alcohol related mishandling; the airworthiness regime was not a factor¹. In the last 46 years, there has been no airworthiness related fatal accident involving third parties on the ground so any risk is so low as to be negligible. The way in which this negligible risk is distributed across the CofA and permit fleets can be determined by comparing airworthiness related accidents to each group.

Only accidents involving loss of control are relevant because in other circumstances, we could reasonably expect the pilot to fly the aeroplane clear of a built-up area in accordance with the ANO requirement for all aircraft to be able to land clear. Loss of control caused by pilot mishandling is not relevant, as it would apply equally to all aircraft. Only those accidents that have a root cause related to airworthiness are relevant in comparing the Permit-to-fly and C of A airworthiness regimes so structural failure events were chosen as a measure of this. In the 30-year period from 1976, there were 19 such accidents recorded by the CAA MORS database and these are detailed in Annex A. Accidents resulting from engine failures are excluded from the analysis because the same ANO land clear rule² applies to all aeroplanes and will provide equal protection to third parties; the certification standard of engines is not relevant to third-party risk.

Of the 19 accidents, 11 were caused by the pilot overstressing the aeroplane leading to wing failure. As the nature of the airworthiness regime was not relevant to these they are discounted. Of the remaining 8 accidents, one had an unknown cause and 7 involved some component failure in the root cause. Although none did so, these 7 aeroplanes could have caused death or injuries to third parties on the ground so they can be used to estimate the distribution of risk: four aircraft held a CofA and 3 held permits-to-fly suggesting that risk is evenly distributed. Without detailed knowledge of utilisation rates and flying patterns it is not possible to extract accurate probabilities of failure related to individual aeroplane fleets. However, it is possible to determine an accurate comparative risk factor from the viewpoint of a third party on the ground, which is the essence of the issue under consideration. Had no permit condition existed throughout the last 30 years, a third party on the ground would have been no more likely to be killed or injured by a permit aircraft than by a CofA aircraft. Thus we can conclude that the third party risk from the permit aircraft fleet is negligible, is no greater than that from that of the CofA aircraft fleet, and ANO Rule 5 provides universal protection by ensuring an aircraft can glide clear in the event of an engine or other failure. Therefore the permit condition could be removed from single-engine permit-to-fly aircraft without increasing third party risk.

RISK –MICROLIGHTS

Historic accidents rates for microlights are higher than for aeroplanes, particularly those related to the early years when there was little regulation and pilot training was minimal; however there has been no fatal microlight accident involving third parties on the ground. In the 30-year period under consideration there were 27 microlight accidents involving loss of control where structural failure was a cause; these are listed in Annex B. Of the 27 accidents, 24 occurred to weight shift machines and only 3 to conventional 3-axis microlights and of these only one occurred in the last 20 years. This compares favourably with the overall figures of 3 and 4 determined in the previous section for permit-to-fly and CofA aeroplanes respectively. Thus the risk presented by conventional 3-axis microlights is broadly similar to that from permit and CofA aircraft fleets, and ANO Rule 5 again provides protection by ensuring an aircraft can glide clear in the event of an engine or other failure. Therefore the permit condition could be removed from 3-axis microlights without increasing third party risk.

Because the specific data is not collected it is difficult to identify and discount those weight-shift microlight accidents caused by the pilot overstressing the aircraft; undoubtedly there are some. This makes it difficult to make a direct comparison with the figures for the aeroplanes set out in the last section. However, although the relevant 30-year microlight accident rate is 1.7 per year, this has reduced over time and over the last 10 years there have only been 2 accidents, reducing the rate to 0.2 per year. The 30-year rate for aeroplanes is 0.1 for permit-to-fly aircraft and 0.133 for CofA aircraft. Thus the weight-shift microlight accident rate is tending towards the rate for other aircraft types. This suggests that, going forward, the same considerations can be applied to weight-shift microlights and the permit condition could be removed from weight shift microlights without increasing third party risk.

RISK – CAP 632 AEROPLANES

Former military aircraft operated under CAP 632 rules were designed and built to robust military criteria and are now maintained and operated to conservative limitations overseen by the CAA. No CAP 632 aircraft has ever been involved in a fatal accident involving a third party on the ground and no structural failure/loss of control accidents have occurred in the last 30 years. Thus we can conclude that the third party risk from the CAP632 aircraft fleet is negligible, is no greater than that from that of the CofA aircraft fleet, and ANO Rule 5 provides protection by ensuring an aircraft can glide clear in the event of an engine or other failure. Therefore the permit condition could be removed from CAP 632 aircraft without increasing third party risk.

ANOMALIES

All aircraft are subject to an ANO regulation prohibiting overflight of congested areas below 1000ft but this is waived for Special VFR flights and when landing, taking off or practising approaches at licensed or government airfields. Permit-to-fly aircraft may not overfly congested areas at any height except when landing or taking off at licensed airfields. There is no relief for special VFR.

En-Route Navigation

In many parts of Britain, the built environment has spread lightly but extensively over what was once open country and the airspace in which VFR flight can be conducted has reduced as commercial-use controlled airspace has expanded. The nature of the terrain has changed significantly since the permit condition was first introduced and there are far more “congested” areas than hitherto. Small groups of dwellings and associated commercial and recreational areas are all considered to be “congested areas” within the meaning of the ANO and whilst the pilot of a CofA aircraft is free to cross these areas above 1000 ft provided the land clear rule is obeyed, the permit-to-fly aircraft pilot must avoid flying over them at any height. This makes it increasingly difficult to navigate in accordance with normal aviation practice. For example, a small village in open country must not be over-flown by a permit aircraft at any height. The village boundaries extend vertically upwards to infinity forming an invisible column that is prohibited to permit aircraft flight. In typical British countryside a patchwork of small villages and settlements spreads out between larger towns creating an invisible forest of columns of prohibited airspace which must be avoided. This is not an issue for larger towns and cities which are easily seen and which are in any case protected by the land-clear rule.

When flying close to the ground, these small and medium sized “congested” areas are easily seen and avoided but this is at the expense of accurate navigation, which relies on straight line flight on a known track and speed. With increasing emphasis on avoiding restricted areas and controlled airspace such routine manoeuvring is unhelpful and likely to lead to navigation error. Moreover, flying close to the ground is not to be encouraged for environmental and safety reasons. When flying above a few thousand feet it is not possible to avoid the prohibited airspace as there is no way to project the true

vertical from the “congested” area on the ground onto the plane of flight of the aircraft. When flying at tens of thousands of feet above the ground the condition is quite impossible to apply assiduously.

Moreover, when applied to small built-up areas, the permit condition does not provide the third-party protection intended. An aircraft travelling at speed and suffering a catastrophic failure immediately above a small congested area is quite likely to fall outside it. Equally an aircraft suffering such a failure outside the immediate boundaries of a congested area could well be carried by inertia and wind to fall inside it. The land clear rule provides universal protection to larger urban areas but the permit condition adds nothing to the protection of small congested areas.

Removal of the permit overflight restriction would enable permit aircraft to be operated in accordance with normal aviation practice, improving navigation and hence safety. As permit aircraft have been shown to be no less safe than CofA aircraft, the permit condition could be removed without increasing third party risk.

Special VFR

With the growth of commercial air traffic and the proliferation of controlled airspace, especially at regional airports, the use of special VFR clearances becomes increasingly important to the operation of all light aircraft and particularly so for permit-to-fly aircraft. Special VFR relieves all aircraft of the requirements of IFR and provides relief from “Rule 5” permitting flight below 1000ft over congested areas provided the “land clear” rule is obeyed. However, permit-to-fly aircraft remain constrained to avoid congested areas at any height. Permit-to-fly aircraft are also prohibited by another permit condition from flight in IMC so are unable to accept an IFR clearance to enter and transit controlled airspace, special VFR is the only option. Incumbent in the acceptance of a special VFR clearance is a requirement to comply with an ATC clearance. As the permit-to-fly condition related to congested areas remains in force, these aircraft are unable to accept ATC direction to fly over congested areas at any height, making acceptance of a special VFR clearance problematic. As permit aircraft have been shown to be no less safe than CofA aircraft, the permit condition could be removed without increasing third party risk.

Notified Routes

Routes exist within controlled airspace that are “notified for the purpose of rule 5” which allow CofA aircraft to fly over congested areas below 1000 ft whilst still complying with the “land clear” rule. These give routine access to airfields within controlled airspace and through busy control zones where issuing individual clearances is impractical. Over time, industrial and residential development has made it difficult to avoid these areas so the waiving of rule 5 is increasingly important. However, once again the permit-to-fly aircraft remains constrained by the congested area overflight condition and would be unable to follow a route over congested areas used by all other aircraft. As permit aircraft have been shown to be no less safe than CofA aircraft, the permit condition could be removed without increasing third party risk.

Unlicensed Airfields

At unlicensed airfields CofA aircraft are able to manoeuvre freely at 1000 ft and above but permit aircraft are constrained by the condition. There are numerous examples of this anomaly in the UK; Rochester and Farthing Corner and Cambridge and Little Shelford are two such. At a licensed airfield, all aircraft are able to fly a normal departure, circuit and approach as they all have relief from rule 5 and the permit-to-fly aircraft are relieved from the congested area condition. However, at an adjacent unlicensed landing strip, CofA aircraft can manoeuvre freely above 1000ft whilst permit aircraft must avoid overflight of the congested area; they cannot fly the same departure, arrival or circuit pattern, contrary to best safety practice. In both these cases, it is the same congested area that is over flown by

the same aircraft but different conditions apply depending on which runway is being used. However, the licence status of the runway or airfield has absolutely no bearing on the risk to third parties in congested areas. Moreover it has been shown that the risk to third parties from all categories of aircraft is negligible. This same logic can be extended to all licensed and unlicensed airfields in the UK demonstrating that permit-to-fly aircraft should not be subject to additional restrictions. With the prospect of many training airfields becoming unlicensed, it will be increasingly important that common operating standards be applied everywhere. As permit aircraft have been shown to be no less safe than CofA aircraft, the permit-to-fly condition could be removed without increasing third party risk.

CONCLUSION

The UK Air Navigation Order requires that single engine aircraft flying over a congested area or large assembly of persons do so at a minimum of 1000 ft and at a height such that should the engine fail, the aircraft can be landed clear of the area. Aircraft operated under a UK permit-to-fly are subject to an additional condition prohibiting the overflight of these areas at any height except to the extent necessary to take-off and land at a licensed airfield. Permit-to-fly aircraft are not unregulated or experimental aircraft; the permit-to-fly airworthiness regime represents an appropriate and practical standard for certain aircraft that do not hold a CofA. They are overseen and audited by the CAA to ensure a consistent, repeatable and controlled level of safety.

In the last 46 years, there has been no airworthiness related fatal accident involving third parties on the ground so any risk is so low as to be negligible. There have been 7 relevant accidents involving structural failure leading to loss of control, 4 involving CofA aircraft and 3 permit-to-fly aircraft suggesting that risk is evenly distributed. Had no permit condition existed throughout the last 30 years, a third party on the ground would have been no more likely to be killed or injured by a permit aircraft than by a CofA aircraft. Examination of 3-axis microlights and former military aircraft operated under CAP 362 produces similar results. Weight shift microlights had a high historic accident rate but in the last 10 years this has reduced significantly and is now close to that of other aircraft. Thus the third party risk from the whole permit aircraft fleet is negligible and is no greater than that from that of the CofA aircraft fleet so the permit condition could be removed without increasing third party risk. This would enable all single engine aircraft to operate to common standards and procedures when navigating, crossing controlled airspace and taking-off or landing, increasing safety in the increasingly busy and constrained airspace available in the UK

RECOMMENDATION

It is recommended that the UK permit-to-fly conditions related to the overflight of congested areas and assemblies of persons be deleted.

John Brady
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Annexes:

- A. Accident statistics – single engine aircraft
- B. Accident statistics – microlights and former military aircraft

¹ RAeS paper The Design, Development and Production of Light Aircraft in the UK - Appendix E

² CAP 393 Air Navigation, The Order and Regulations, Schedule 1 Section 3