Review of the the Imperial War Museums' report to Cambridgeshire County Council

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Introduction

This report has been produced in response to the Imperial War Museum's (IWM)Technical Report for Cambridgeshire County Council. This report highlights the issues with the IWM's technical report and provides comments to Cambridgeshire County Council (CCC). We have commented on relevant technical notes in their report and for ease of reference we have copied the relevant paragraph from the IWM's report. We have not commented on the historical background of the IWM or non-planning related matters or non-air safeguarding or non-air traffic safety issues.

Review

Page 3, para3:

> It is acknowledged that the height of the proposed chimney obstacle is below the statutory clearance surface currently required by the UK's Civil Aviation Authority for visual flight operations. However, one of our contentions is that regulatory requirements prescribe minimum clearances, and that these clearances would have been based on a sample of operating manuals/data for aircraft – and as such may not be entirely relevant to the realities of operating historic and vintage aircraft (many of which were manufactured without the production of operating manuals as we or the CAA would recognise them) within the context and environs of Duxford Aerodrome

It is significant that the IWM have confirmed that the chimney is below the OLS. Previously they had stated the chimney would breach surface limits and that was the reason they were objecting. Now they confirm it is below the surface limits, so by definition the proposed chimney is not a hazard in these terms*. It must be recognised that this chimney cannot be classed as a hazard to planes flying in 'normal' conditions.*

Previously, the IWM has claimed, on a number of occasions, on email and in meetings, that they had a Type 1 Survey. This is an additional area, which has a lower take-off surface, which at 25m the chimney would breach. However, following our freedom of information request to the CAA, we revealed that they do not in fact have a Type A survey. In these meetings it was stated that if we lowered the chimney to below the Type A height then they could not object.

It has been confirmed by SAS, the Council and now the IWM that the chimney is below the surface and therefore is not an obstacle or hazard as defined by the CAA.

Page 3, para 4:

> This report has been reviewed and endorsed by the Chairman of the General Aviation Safety Council; and Chairman of Duxford Aerodrome's Independent Flight Safety Committee.

The IWM cite what appear to be independent experts: The Chair of the General Aviation Council and the Chairman of Duxford Aerodrome's Independent Flight Safety Committee. This is in fact the same man, Rick Peacock Edwards, who we would argue should not be considered as an independent expert, but who is closely linked with IWM. We note that he is also not the author of this report.

Mr Peacock Edwards is chairman of The Historic Aircraft Association, which was set up to assist the CAA to allow historic aircraft to fly safey. Their website states:

> This group comprised a number of respected test pilots as well as several owners of historic aircraft. Its main purpose was to provide a depository of technical knowledge and expertise, available for use by the CAA.

It is assumed that the CAA, in establishing and maintaining the permit at the IWM, have a good knowledge of the historic aircraft.

Page 4, para 1:

> This report focuses on why the construction of a 25m (82.9 ft.) chimney would introduce a significant hazard to flying into and out of Duxford Aerodrome. Notwithstanding this obvious headline item, we request that this report should also be considered in the context of many previous successive (and entirely lawful) Vetspeed/Novus planning applications. Collectively, the perhaps unforeseen effect has been the incremental creation of what is even today something of a hazard to air and road traffic

Historic planning applications are not relevant. It does demonstrate that the erecting and movement of chimneys have not been an issue and has not raised any air safety concerns to date. The IWM have never raised any concerns regarding the existing chimney nor is it noted on any aerodrome flight information for pilots. So we can safely assume that 15m

high chimney is of little or no concern to the IWM or its pilots. There have been no reports of near misses.

Page 5, para 2:

> The last point is a key issue and is the driver for our concerns with regard to the safety implications of the Vetspeed site, and in particular the construction of a 25m (82.9 ft.) chimney. Additionally, there are issues of uncertain extent with regard to the heat and pollutant content of the chimney emissions.

The extent of the heat plume is well defined in the report by CERC 'Dispersion modelling impact on flight paths from Duxford aerodrome' and this has been taken into account by the ASA report who confirm this is not a safety issue.

Page 6, para 2:

> Duxford Aerodrome constantly reviews its risk management approach, both for general day to day operations and airshows. Given reference to the term 'significant hazard' we look here to quantify that term. In terms of 'significant' we define this (in line with standard English) as 'sufficiently great or important to be worthy of attention; noteworthy'.

The IWM's definition of significant seems to have been taken from Google and is not strictly relevant in it use here as assessment of hazards of any kind are worthy of attention. Other definitions which relate to a physical object are 'great' and 'very important'. Significant in this use means greater than average. It is understood that Planning Policy assumes there may be some impact on air traffic safety and it is assumed that an aerodrome may have to take some appropriate measures to manage and mitigate for this.

Page 6, para 5:

> Apart from the risk of an aircraft simply flying directly into the proposed chimney stack because of its location, weather conditions and pilot factors - given that on average there is approximately one 'forced landing' in the surrounding area per annum (see section 4 'Safety Scenarios' for some causes/contributory factors) we would assert that the likelihood of occurrence would be either "Occasional (i.e. Likely to occur sometimes (has occurred infrequently); and/or Remote (i.e. Unlikely to occur but possible (has occurred rarely), with reference to CAA definitions.

The IWM state clearly that there is on average 1 forced landing per year in the surrounding area. We assume that by this they mean 1 forced landing per year by aircraft taking off from the IWM on either the grass or tarmac runway. We also assume that a force landing means the plane has actually left the runway and is not an aborted take-off as this would not pose any issues to the Vetspeed site. We would have expected to see the IWM log to support this claim. We have checked and there have been no reports of any forced landings on the Air

Accident Incident Boards (AAIB) website. We can only conclude that either forced landings are not being reported, or this is in fact not the case.

However, if it is true that 1 forced landing per year is taking place by planes taking off from Duxford IWM, that is alarming news and of great concern to those in the vicinity. It would be pertinent information not only to the operators of Vetspeed but also the Highways agency and the number of users on the A505 who could be at risk, as well as users of the M11 in even greater numbers, the residents of Duxford, Whitlesford and the individual houses around the airfield.

A forced landing, for any reason should be reported to the AAIB and it should be of serious concern to the management at the IWM, rather than something that seems to be taken as normal, and 'just what happens' at the IWM as part of their testing and training practice or everyday flying.

Please note that the Air Accidents Investigation Branch website, which records all air accidents, has no records on its data base of any forced landings. The relevant reported incidents we found on the AAIB website were:

- 2nd August 2006 – Dragon Rapid, tips forward when landing on grass runway
- 30th April 2015 – T-28A Trojan, front landing gear collapse on runway
- 10th July 2011 - P-51D Mustang, midair collision during air show
- 2nd August 2003 - L-39ZO Albatros, forced landing when on a low flight path during air show

The AAIB records show that there have been no forced landings during take-off from either runway.

This raises serious concerns over the ability/willingness of the IWM to report incidents, or is this report in fact making claims of forced landings to inflate the perceived increase in risk of any new development

In order for the claim of 'one forced landing per year' to be taken into account we would expect, at the very least, the IWM to have included Mandatory Occurrence Reports (MORs), Accident or Incident reports, AAIB reports and other documents in support of this statement.

We assume that the IWM's assessment of risk which takes 'likelihood of occurrence' into account has been based on 'one forced landing per year' and they therefore assume the likelihood is 'occasional' or 'remote' based on this assertion. If in fact, if there have no forced landings the likelihood of occurrence will be 'extremely improbable' based on the number of take-off's the aerodrome has had over its many years of operation. When the 'extremely improbable' likelihood is applied to the CAA's risk profile it is either acceptable for a Major Incident or Review if a Serious Incident. The risk can be mitigated by a Review, which has been carried out by SAS with following proposed mitigation methods:

1) The site is clearly defined and visible being adjacent to a main A road within the confines of a known site.

2) Although the stack is conspicuous by its construction the addition of suitable intensity Obstruction lighting can be added if IWM wish.
3) Promulgation (identification of the object) in Aeronautical Information Publication (AIP) and other pilot information documents.
4) The stack is not defined as an obstacle under Obstacle Limitation Surface review.
5) Continued use of the Aeronautical information Circular distribution for Air Show events detailing for e.g. “no run and breaks below 500ft” and that “The aerodrome authority reserves the right to close the aerodrome in adverse weather conditions being a cloud base below 600ftand or visibility less than 1500m.”

Therefore, if the reality is that there have been no forced landings during take-off from the grass runway then the risk is manageable using normal techniques that will not affect the everyday flights at the aerodrome. Vetspeed are willing and have offered to add additional safeguarding measures at no cost to the IWM.

If there are in fact 1 forced landing per year it brings the IWM safety and reporting procedures into question.

Page 7, para 2:

> Because of the prevailing wind direction in East Anglia, the great majority of take-offs and landings at Duxford are made in a south-westerly direction. This is fortuitous as the phase of flight in which a pilot has least time to react to any emergency, and if necessary position for a low circuit to land or an off-aerodrome landing, is during the initial climb directly after take-off. To the south-west the terrain remains relatively open and unspoilt other than for hedgerows and foliage (see Figure 4, page 18), which are at least relatively frangible if impacted by an aircraft. Conversely, to the north-east the Duxford surroundings have become significantly congested by the development not only of housing but also commercial properties for Volvo, Welch’s Transport, Holiday Inn Express and BP.

The IWM confirm, and it is understood, that the highest risk of engine failure and least time to react is during ‘initial climb and directly after take-off’. It is noted that this is when the engine is under full load with no ground contact and most susceptible to the shakes and vibrations when air-borne. It is assumed that ‘directly after take-off’ would be within the first 500m when the plane is still within the airfield site and 1000m and two fields away from Vetspeed.

The IWM report also states that there are suitable areas for forced landings to the south-west. It is noted that the development at the Vetspeed site will not infringe on these fields. It is also assumed that any pilot taking evasive action will steer away from Vetspeed and the adjacent A505 towards these fields.

Page 8, para 3:

> Defining the precise operational and performance capability of many historic and vintage aircraft is problematic as such data was not required to be codified for civil aircraft prior to 1949, and may never have been measured with precision for ex-military types. For the latter, adequate but not exhaustive information will be embedded in the bespoke Permit to Fly limitations which the CAA raise before allowing such aircraft to fly in the civil environment. Non-aviators might reasonably regard historic and vintage aircraft operation as analogous to classic car motoring, for which not every modern requirement may be practicable to meet. Adequately safe operation (with risks rendered ALARP, 'as low as reasonably practicable') is nonetheless obtained by applying a sensibly cautious approach to operation, and by allowing some margin of error as insurance against a worst case event

The IWM state that the historic aircraft do not have the same documentation as planes built after 1949 and that an acceptable level of risk is 'obtained by applying a sensibly cautious approach to operation, and by allowing some margin of error as insurance against a worst case event'. By this we assume that each pilot knows what the flying capabilities of his/her plane are, in particular at take-off, and that they then add a margin of error. We also assume that the historic aircraft are able to fly above the 3° slope set as the OLS discussed in these and the other reports. If they cannot fly at this angle, then they are flying outside of the permitted flying zones set by the CAA and the airfield. If this is the case, and historic aircraft are flying outside of the permitted areas, then this is done with the full knowledge of the pilot who has accepted those conditions. We would have expected to see examples of the Permit to Fly for these historic aircraft as part of the IWM's submission and more examples of historic aircrafts climb rate, not just the one twin engine example.

A permit to fly may be issued to aircraft that do not meet the International Civil Aviation Organisation (ICAO) certification standards required for the issue of a Certificate of Airworthiness (C of A) subject to satisfying certain requirements.

A national Permit to Fly is granted, in accordance with BCAR A3-7. Aircraft in this category are generally ex-military, amateur built, microlight, historic or without a valid Type Certificate. CAP 733 - "Permit to Fly Aircraft" is a comprehensive source of information regarding Permits to Fly and these are common permits that cover a large number of air worthy aircraft throughout the UK and are not just for historic aircraft.

The CAA in setting up and agreeing the airsafey at Duxford had access to the best knowledge base and the HAA would have played a role in advising them. We do not accept that the CAA would not have access to the right information on historic aircraft and the determination the minimum surface level or bespoke Permits with mitigation in place.

Page 8, para 4:

> The current proposal / planning application submitted by the developer, Novus Environmental, Royston, Ref: S/008/15/CW is to construct and introduce a new 25m (82.9ft) chimney in line with our grass runway, and just over 1 kilometre away

The report states that Vetspeed's proposal is 'just over 1km away'. This is misleading as the proposed chimney is actually 1560m from the end of the grass runway (O6L threshold).

Page 9, para 1:

> Plainly the higher chimney, and the breadth of the Vetspeed site in general is of greatest significance for departures from the grass runway. However, especially with slower aircraft types, it is not always the case that the runway heading will be tracked accurately during the initial climb. In crosswind conditions an aircraft must compensate for drift, like a ferry boat seeking to cross a flowing river, and the correction required will normally increase as height is gained and windspeed increases. The slower flying the aircraft, the greater the correction required. Given that the pilot's view directly forward from a climbing aircraft can be limited by the nose ahead, it is not unusual for the achieved flight path to deviate slightly left or right of the extended runway centreline.

The IWM confirm that 'slower aircraft types, it is not always the case that the runway heading will be tracked accurately during the initial climb.' This statement clearly shows that it is unlikely that historic, slower aircraft will track a direct straight line towards the chimney and that lateral drift is likely to occur. So the planes that IWM are most concerned about are likely to deviate away from the chimney and the centerline.

Page 10, para 1:

> It will be noted that we concentrate here on the case of aircraft taking off in a south-westerly direction, rather than landing to the north-east. This is because in visual flight conditions we assess the take-off and initial climb to entail much greater risk of emergency or error than a stable approach to land. In the take-off case the aircraft and engine performance is not yet proven on that particular flight, the nose is high and forward view obstructed, the pilot may be regaining familiarity having not flown recently, and a sudden failure will require decisive and correct action to change the aircraft pitch attitude, maintain flying speed and obtain a safe outcome.

We note again that 'the take-off and initial climb to entail much greater risk of emergency or error than a stable approach to land.'

The image on this page also clearly shows the two rows of dense trees that border the IWM site and the next field. The trees which border the IWM are semi-mature hardwood trees at a distance of 575m from the end of the grass runway. These trees have never been pruned or topped. The trees along this boundary range from 8m to 14m high. If we take an average tree at only 10m high at a distance of 575m the angle from the end of the runway is 1.02° (the ground is effectively level) and there is only 20m clearance to the OLS surface at an angle of 3°. In comparison the proposed chimney at 1560m away and 25m high is an angle of 0.92deg from the end of the grass runway. This is a shallower angle than required to clear the trees which the IWM deem to be safe to do. It is also noted that the time of highest risk is directly after take-off, which we assume would be before the plane had cleared the trees at 550m from the end of the runway.

The IWM considers a single thin object 1560m away, and well below the lowest flying surface and which can be maneuvered around if needed a significant hazard; but the IWM do not consider a wide row of trees 575m away with only 20m clearance and no ability to turn to avoid a hazard. The only difference being that trees are not as hard (frangible) as a chimney if a plane were to collide with them. We do not agree with the IWM's conclusion that the chimney is significant hazard when compared with other existing hazards and how the IWM approach the risk assessment towards them.

It should be noted that there is a second row of mature trees before the Vetspeed site at approximately 1100m and a height of up to 20m which is an angle of approximately 1°from the grass runway.

We consider the IWM to be overstating the level of risk that this single object will bring. The airfield should be more than capable of accepting and managing this additional low risk with no impact to their activities.

Page 11, para 1:

> IWM Duxford acknowledges that the height of the proposed chimney is lower than the statutory clearance height currently required by the UK's Civil Aviation Authority. However our assertion is that those statutory clearance heights are not entirely relevant to the operational realities of operating historic and vintage aircraft within the context and environs of Duxford Aerodrome.

We accept the IWM statement and we have always stated that the chimney at 25m is below OLS, the CAA statutory minimum clearance height.

However, the IWM state that they are a special case due to flying historic aircraft and the 'statutory clearance heights are not entirely relevant to the operational realities of operating historic and vintage aircraft within the context and environs of Duxford Aerodrome'. This, again, raises serious safety concerns because as we have seen at the minimum take off angle of 3° there is only 20m clearance above the first row of trees. It is not clear from the IWM statement if they do fly below the 3°or if they are allowed (under Permit to Fly) to fly below these limits, and if they are under specific conditions of their bespoke Permits to Fly, then the pilots must be very aware of the risk they are taking.

So either the planes must take off at greater than 3°, or the individual pilots have agreed a lower angle and the CAA have approved this, and the pilot will be aware of the limitations and he/she will plan accordingly. Using the existing trees as an example, the pilots who do fly below the OLS are confident that they can climb at great than 1° and very close (10m only maybe) above the trees. It is hard to imagine that the same pilot would consider a single object 1550m away as a greater risk than this.

Page 12, para 1:

> For all Duxford aircraft, high temperature operations will require use of a markedly greater length of the runway in order to achieve the requisite air speed. The subsequent climb will also be shallower in these conditions, reducing clearance over any ground obstacles in the flight path.

It is noted that excessive heat can reduce engine output and reduce the rate of climb. No evidence is given to the actual magnitude of these effects. It is assumed that if the grass runway is used then the pilot is capable of clearing the trees at a 1° angle or greater. All the assessments assume that the planes use the whole length of the runway.

Page 12, para 3:

> Hot summer days – or local areas of elevated temperature downwind of an industrial exhaust – imply a reduction in air density which can be very significant for the efficiency of aircraft wings, propellers, and engines.

The only technical evidence presented by the IWM on this point is the performance of the de Havilland Rapide in a later section and the climb rate is given as 4.4° at 30°C. Which is a climb rate great than the minimum OLS and at high daily temperatures rarely seen in the UK.

CERCs plume assessment demonstrates that the heat from the chimney will be very rapidly dissipated and both SAS and ASA consider this relatively every small area of warm air would not affect the performance of an engine. The IWMs report does not give any factual evidence to oppose this. The assessment of two historic aircraft assume air temperature of 24°C and 30°C which are hot summer days.

The assessment of 'Temperature' does not provide any facts that demonstrate the proposed new development would add a significant risk to the aerodrome.

Page 12, para 4:

> In addition to the effects of temperature, weather conditions can also adversely affect aircraft in two key ways. Firstly, wind or temperature-induced turbulence may require considerable pilot attention to maintain a desired air speed and/or to track a desired path. Corollaries of this fact are a potential reduction in climb performance, due to drag caused by the deflected control surfaces, and diversion of pilot attention. Likely outcomes are a failure to make good the ideal departure track and a diversion of mental capacity and spatial awareness. Inadvertent drift into the emissions from the chimney stack, or into the chimney stack itself, are conceivable in these circumstances. The strength of the wind can 'buffer' aircraft, particularly small lighter aircraft, making manoeuvring the aircraft more difficult. This can take new or trainee pilots in particular by surprise, and if they do not or cannot take avoiding manoeuvres this could lead to aircraft drift directly into the emissions from the chimney stack, or the chimney stack

The IWM state that it is 'conceivable' that a pilot may drift and collide with the chimney due to adverse weather conditions. Again, no evidence for this is given and no calculations or historical evidence is given. We would suggest it is more conceivable that the pilot would collide with existing trees.

As previously stated the airspace around Duxford requires aircraft to operate in a Visual flight rules (VFR) environment, basically clear of cloud with a flight visibility. This means the pilot must be able to operate the aircraft with visual reference to the ground, and by visually avoiding obstructions and other aircraft.

The MOD RA 2335 Flying Displays & Events requires a flight visibility of 3.7km and a cloud base of 1000ft above ground level. So providing the flying display flight crew brief contains information about the site, which they have to declare, it can be accounted for in the organizing of events.

Page 13, para 1:

> Secondly weather or into-sun conditions can sometimes make obstacles hard to see, just as when driving. This combined with the blind spots on some vintage and historic aircraft would mean that a 25m (82.9ft) chimney stack provides a correspondingly greater risk to such aircraft than at present. A chimney seen from the air against a background of terrain may become to all intents invisible.

In order to mitigate and reduce risk further Vetspeed have offered to install visual aids and other measure to ensure high levels of safety under visual flying.

Page 13, para 3:

> (1) In a marginal case the potentially elevated air temperature could have an adverse impact on engine, aircraft and propellers performance, albeit temporarily, reducing the rate of climb after take-off (slowing of their engines and dropping of altitude).

The worst case effect of emissions from the chimney has been fully assessed by CERC, ASA and SAS confirm that these would have a minimal, if any, impact on the planes or the pilot. There is no evidence supplied by the IWM to support their claims that would result in significant hazard.

Page 13, para 4:

> (2) Air turbulence generated by an upwind heat source could cause upset to lighter aeroplanes, requiring coarse control inputs for correction and which in turn create drag and reduce rate of climb. [Note: an established Gas Venting Station between Duxford and Ickleton is regarded as sufficiently hazardous to be marked on aeronautical charts]

The CERC report shows clearly that it is only on calm days that the plume will stay warm and rise in a column, so the IWM's assertion that there will be hot gasses causing turbulence for a significant distance down wind is incorrect and baseless. On days with wind speed of greater than a few knots the gasses are dispersed and cooled within a matter of meters from the chimney. The proposed process is nothing like a gas venting stack.

Page 13, para 5:

> (3) There was concern from some Duxford pilots as to possible health implications – noting that some aircraft do not have enclosed cockpits. [Odours from the existing chimneys are sometimes very noticeable even at ground level on Duxford Aerodrome]

The dispersion of emissions is the same as the heat, and happens very close to chimney. The emissions from the existing process is not the same as the proposed.

Page 15, para 6:

> With both engines running normally, and if lift-off from grass Rwy 24 occurred only at the extreme end of the licenced run, with approx. 1569m horizontal distance to the Vetspeed site, the Rapide aircraft would clear a 25m chimney by 95m vertically.

It is noted that the de Havilland Rapide under normal take off is clear of the chimney by 95m, which must be considered a safe distance.

Page 15, para 7:

> If on take-off from grass Rwy 24 the aircraft had achieved 36m height above the extreme end of the licenced run - which would be typical - and one engine then failed, and the aircraft continued straight ahead, the aircraft would descend on a gradient 2.31% downward to impact the Vetspeed site at ground level.

In case B of engine failure it is unclear when this would happen, if it was immediately after take-off, within say 250m then the aircraft would either land or hit the trees on the IWM site. If the engines fail after having cleared the trees at 550m from the end of the runway then it would make a slow descent, (with clear view of what is ahead), it may just clear the second line of trees before coming down at approximately 1500m away at the Vetspeed site or if it had drifted north on A505 or drifted south onto the memorial garden or neighbouring field.

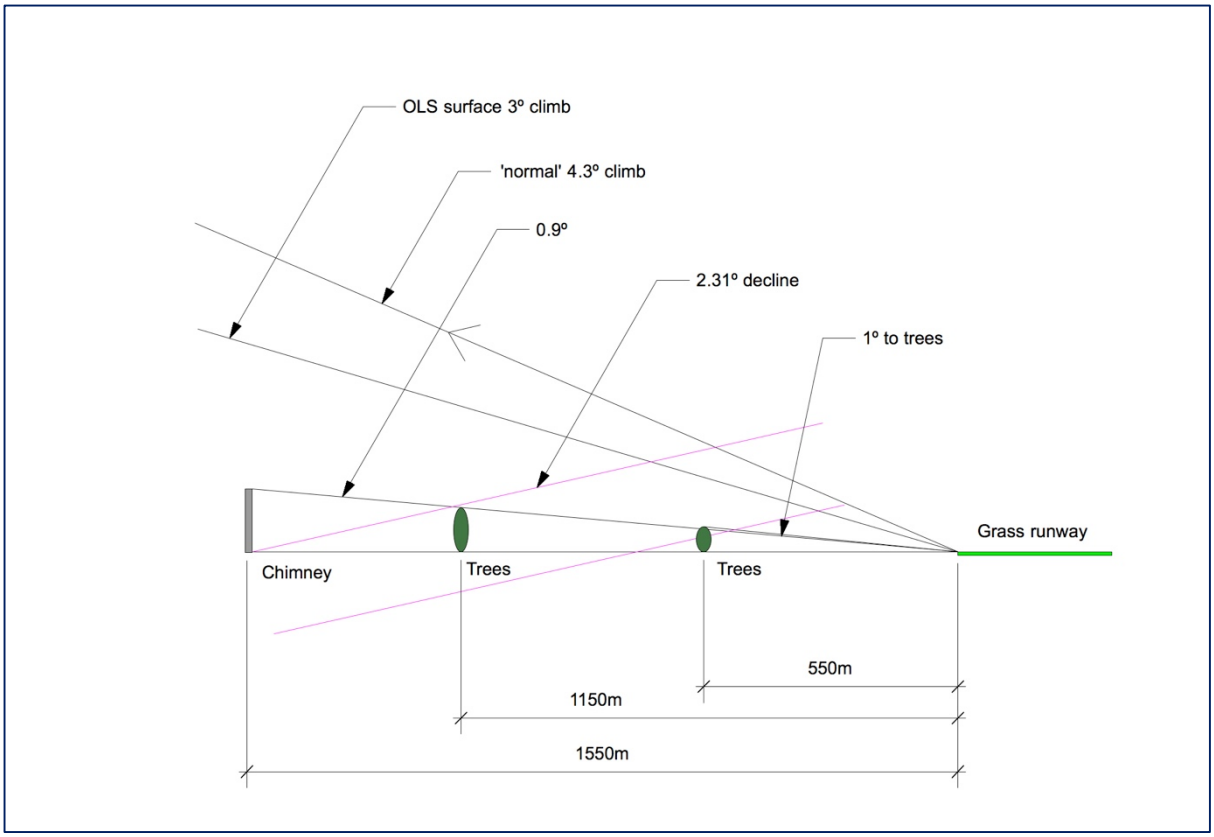

Figure showing relationship between various climb rates and clearance over existing trees.

This scenario makes two things very clear, if this plane or any other that cannot maintain an increase in its climb rate will come down at some point resulting in a forced landing and result in a major incident. If engine failure happens at a distance of 550m then the plane will crash land at the Vetspeed site, it will have hit the ground and not the chimney. So this statement and calculation by the IWM confirm that the proposed chimney is not the hazard as it will hit the ground. *The hazard seems to be flying planes that cannot maintain an increase in climb rate and the risk is not just to Vetspeed but the drivers on A505 which are also potentially on the crash line of the plane.*

We conclude that the IWM's scenarios do not conclusively confirm that the chimney is a 'significant hazard'.

Page 15, para 8:

> ***Case A*** is marginal in terms of obstacle clearance and peace of mind, but is permissible in regulatory terms for a take-off event.

The IWM state that 95m clearance above the chimney is 'marginal'. If so then what level of comfort does the 20m clearance above the trees provide them?

Page 16, para 1:

> CAA Air Display Permission would not allow a Rapide aircraft to fly this close to occupied buildings or to persons

The distance for airshows displays is not a suitable comparison and it is not clear if this is vertical or horizontal distances the IWM refer to.

Page 16, para 2:

> ***Case B*** indicates that an engine failure shortly after take-off is an extreme emergency situation for this aircraft type, especially at high take-off weights and in elevated ambient temperatures. The likely best outcome is a controlled descent to an off-airfield landing. Scope for turning either to left or right is limited as any such manoeuvre would increase the rate of descent. The continued availability of un-developed areas ahead of the take-off path is thus very much a matter of flight safety. Irrespective of the proposed taller chimney, the growing proportions of the Vetspeed operation have already impinged markedly on a pilot's emergency options to the south west of Duxford Airfield

No distance after take-off is given for this scenario. Our calculations show it is circa 550m after take-off giving 1000m to take action before reaching Vetspeed. Importantly the IWM confirm that the plane will come to land at ground level and not hit the chimney. The pilot would take evasive action to avoid the A505 in any case and the distance of 1000m is a reasonable distance to turn only the few degrees needed to avoid an obstacle on the ground.

The IWM are concerned over the 'footprint' of Vetspeed. Vetspeed have occupied this site for over 30 years, there have been chimneys on this site and the footprint of their operational site remains the same. The IWM's claim that the site as a whole posses a new risk seems unlikely and there is no evidence supplied in the form of obstacle identification to pilots, or any other documents identify it as a hazard.

Page 17, para 1:

> Temperarure +24°C
> Nil Wind
> Weight 10,500 lbs
>
> The aircraft will accelerate and become airborne within 700m. A very shallow climb is then followed to allow airspeed to reach 130mph. This shallow climb is essential to allow airspeed to build whilst undercarriage is retracted and the propellers are changed to "coarse" pitch. The aircraft will get airborne at about 75mph and failure between 75 mph and 100mph would necessitate the aircraft being landed immediately ahead. Once 130 mph has been achieved the aircraft rate of climb can be increased.

The ARCA letter annexed states that good clearance is needed for both take-off and landing. It states that under normal conditions take off is at circa 700m, which is 190m before the end of the runway where worse case assumptions are made. It is also noted that the air temperature is +24°C, which is a hot summer's day (and rare in England). So we assume that these are all worse case scenarios.

For Case 1 the ARCA letter does not give any climb rates, the letter does not give any distances where certain events would take place by. If, as per Case 1 here, the aircraft has an engine failure at 75mph to 100mph, which is a relatively low speed which we assume is immediately after take-off, then the plane will still be within the aerodrome site and would land before hitting the first row of trees. The Vetspeed site at this point is over 1000m away.

Case 2
Engine failure between 100 mph and 130 mph.
An engine failure during this phase of flight is the worst, in that a rapid decision is required by the pilot to ascertain whether the aircraft will continue to fly in a controlled state or not. Many factors contribute to this.
Airspeed
Engine power on the remaining 'good' engine
Aircraft weight
Which engine has failed
Propellers in fine or coarse
It is likely that the aircraft will fly at a speed of 105mph, however the climb rate will be very low and may be negative to start with as the pilot tries to increase air speed using the remaining engine. External visibility maybe restricted at this time. The workload is very high and if a banked climb is chosen to increase the climb rate then the chances of seeing and then avoiding an obstacle such as a chimney is limited.

The aircraft tend to be flown on a curved approach to enable the pilot to see beyond the nose.

Case 2 again does not give any climb or descend rates, not even any indicative or approximate distances, so this event could be happening at long distances with plenty of time or the plane could be at such heights that it is well clear of the chimney. The pilot does state that the flight path is curved to give visibility and surely this will mean that when taking off from the grass runway the aircraft will be banking away from A505 and Vetspeed.

The risk of this event happening has not been assessed, the likelihood of this event happening has not been considered nor stated.

Examination of this letter does raise concerns for take-off in existing conditions with the high trees at 550m to the west and the M11 on the east side at 350m from the end of the runway. If there is a likelihood that this plane and others could have engine failure during take-off the risk should be quantified and understood already. There are existing hazards that the pilot has to recognise and take into account when flying his aircraft, so the idea that the pilot now considers a single object 1550m away a significant risk seems unlikely.

Pilots like these take these risks every day at the IWM and a single, narrow object 1500m away would seem small in comparison to a row of trees with 20m clearance at 550m away or a busy motorway at 350m away.

The risk tolerance table that is in appendix C is relevant when assessing the existing risks and the new chimney and the key issue is likelihood of occurrence. The public records show that there has never been a forced landing due to engine failure reported by the IWM. So we assume that the IWM and their pilots see the likelihood of engines failure as either Improbable or Extremely Improbable which makes taking off an acceptable risk or one that needs review prior to taking off.

Page 17, para 4:

> It has been indicated that the construction of a 82.9ft (25m) chimney would mean the Red Arrows would need to reassess whether they could continue to support airshows and displays at Duxford,

Aerobatic displays will take the new chimney into account but there is no evidence to show that it would actually stop an air display or even change the nature of the display.

Page 18, para 3:

> Duxford Aerodrome Rescue and Fire Fighting Service has not only provided support to local incidents not related to the aerodrome; but they attend and provide emergency support/service to incidents both inside the aerodrome and in the surrounding fields involving aircraft (related to forced landings) including the fields adjacent to the Vetspeed/Nous Environmental site.

There has been no evidence of forced landings near Vetspeed, this again is an alarming statement as it has not been reported to the AAIB or Vetspeed as a near miss.

Page 19, para 2:

> New?
> *Answer: Yes self-evidently. Although attached to an existing site and expanding operation, It would be new. It is not a like for like replacement. It is as we understand a brand new chimney and at 25m (82.9ft) it is 60% (10m/33.2ft) higher than the existing chimneys.*

The chimney would be below the OLS by a significant margin, to help mitigate the introduction of the chimney mitigation measure can be taken such as notifying pilots of its existence. This does not make it a 'significant hazard' it makes it a small and manageable risk.

Page 19, para 3:

> Significant?
> *Answer: Yes. It would be new; and it would be significantly higher than any other obstacle in the immediate vicinity, and 60% higher than the existing chimneys. Therefore it is and would be 'noteworthy'. Indeed with reference to ASA Ltd's report it would need to be flagged as an obstacle to aircraft coming into or out of Duxford Aerodrome; it would also need to be notified to the Royal Air Force Aerobatic Team (Red Arrows) as per Military Aviation Authority requirements highlight any obstruction in excess of 50ft above Aerodrome Level (Note the current chimney is slightly under this at 49ft 2.5inches (15m).*

The new chimney is well below the OLS, it is not a hazard under normal operations as the lowest climb rate gives significant clearance above the chimney. The only risk seen here is engine failure at take-off, which is extremely improbable to occur, and if it were to happen there are open fields in front and to the side of Vetspeed. The new chimney would be at such a distance away that the pilots would have time to maneuver before they reached Vetspeed. Even if they did reach Vetspeed they would be on the ground by then.

Conclusion

The IWM's report does not provide any technical evidence that the new chimney would be a 'significant hazard' to air traffic safety. The report was not authored by an aviation expert and its conclusions have not been reached through suitable, standard or qualified means. What this report tries to do is to use limited information in support of a desired conclusion. Those who have been quoted or who have compiled this report are neither independent experts, nor unbiased.

The IWM claim that historic aircraft fly outside the CAA's surface limits for take-off of 3°, but the only evidence given in this report shows that they climb at 4.3°. Just because they do not have full CofA and need a Permit to Fly does not mean they cannot climb at greater than 3°.

The Permit to Fly helps ensure that the planes are well maintained and fit to fly and as such avoid any failures. There is no evidence of any forced landings due to engine failure.

The assertion by the IWM that there is one forced landing per year has driven the risk assessment and is misleading as it assumes the likelihood of an event happening is greater than in reality. The likelihood of a major or serious incident goes from remote (as assessed by the IWM) to extremely improbable and the risk becomes acceptable or to be reviewed. The level of severity has been derived using the European Strategic Safety Initiative - Guidance on Hazard Identification – March 2009.

Table 3; Risk Classification / Tolerability Table

		Probability of Occurrence (Likelihood)				
		Extremely improbable	Extremely remote	Remote	Reasonably probable	Frequent
		< 10-9 per hour	10-7 to 10-9 per hour	10-5 to 10-7 per hour	10-3 to 10-5 per hour	1 to 10-3 per hour
ESARR 4 Severity	Accidents	Review (Medium)	Unacceptable (High)	Unacceptable (High)	Unacceptable (High)	Unacceptable (High)
	Serious Incidents	Acceptable (Low)	Review (Medium)	Unacceptable (High)	Unacceptable (High)	Unacceptable (High)
	Major Incidents	Acceptable (Low)	Acceptable (Low)	Review (Medium)	Unacceptable (High)	Unacceptable (High)
	Significant Incidents	Acceptable (Low)	Acceptable (Low)	Acceptable (Low)	Review (Medium)	Unacceptable (High)
	No Effect Immediately	Acceptable (Low)	Acceptable (Low)	Acceptable (Low)	Acceptable (Low)	Review (Medium)

The IWM, despite a clear request, have not produced a technical report that can be checked or independently verified. The scant technical information that has been supplied with the report actually helps show that historic aircraft do fly above the OLS and if engine failure were to occur they would likely hit trees or land on fields long before reaching the Vetspeed site.

Pilots taking off in aircraft that cannot climb if an engine fails are currently satisfied that the likelihood of engine failure is so low that they will clear all hazards that are close to the aerodrome, notably mature trees and the M11. The proposed new chimney is significantly less of an obstacle than the existing trees.

We would like to confirm the report acknowledges the following:

1. The chimney is not an obstacle when tested against the permitted flying zones and OLS.
2. The chimney is not a hazard when using the hard runway for take-off and landing.
3. The chimney is not a hazard when airborne and 'normal' flying for any type of aircraft
4. The chimney is not a hazard when landing on the grass runway.
5. The chimney is not a hazard when normal take off procedures are followed and normal climb rates are maintained

We are concerned about several statements in this report and would request that evidence or further explanation should be provided concerning:

1. The number of movements stated as 25,000 and half on the grass runway.
2. 1 forced landing per year and needing emergency vehicle assistance.
3. 1 forced landing near Vetspeed.

The IWM report focusses on historical aircraft and their ability to avoid danger during take-off but no strict methodology has been followed to quantify the risk, the assessment has been more anecdotal than based in fact.

The report claims that the introduction of the new facility will 'close us down' but nowhere is this claim substantiated. Is the IWM claiming that the risk of collision is so high [if the chimney were to be built] that they could no longer fly, or are they currently flying outside the CAA's permitted fly zones and this will raise safety issues with existing operations.

This report does not state, nor is it assumed, that ANY aircraft flies outside of the aerodromes airspace, all planes must take-off, land and fly within the fly zones. If aircraft do fly below these fly zones then they are in breach the airport license. It is assumed that all planes at Duxford have either a Certificate of Airworthiness or have a Permit to Fly, and if so they should be able to climb within the surface limits. If not, the pilot must assess the risk and be confident it is safe to fly. We would ask to see the documentation that allows for this added risk, such as examples of these planes' Permits to Fly, especially ones that cannot achieve the 3° climb rate.