OPERATIONS MANUAL

PART D

Training

SECTION 2

Air Race Handbook

Version 5.0

1. CHANGE LOG

Version	Changed/Removed/Added	Date
1	Initial Issue	Not known
2		Not Known
3	Change: Editorial Removed: Nil Added: • References To Safety Management System • Loss of Visual and Loss of RT Procedures	March 2018
4	Change: Moved to Operations Manual Removed: Nil Added: • Editorial and reference to SOPs • Example Pilot Assessment Form	March 2019
4.1	Change: • Editorial Removed: Nil Added: • Use of "GPS ON?" board or RT Call (8.2) • Overtaking in the turn diagram (8.7)	Nov 2019
5.0	Updated for 2022 rules and procedures agreed by committee since Nov 2019.	Jan 2022

Wording

The use of "shall" and "must" implies that the aspect concerned is mandatory, the use of "should" implies a non-mandatory recommendation, "may" indicates what is permitted and "will" indicates what is going to happen. Words of masculine gender should be taken as including the feminine gender, and vice versa, unless the context indicates otherwise.

Suggestions/errors. If you have any suggestions to improve this handbook or you notice any errors or discrepancies with the Operations Manual please contact the Aviation Secretary at secretary@royalaeroclubrrra.co.uk

Acknowledgements: The Records, Racing and Rally Association would like to acknowledge the work carried out by Cliff Hawkins and contributions from Robert Miller for Versions 1 and 2 of this handbook.

2. INTRODUCTION

This Air Racing Handbook forms part of the handicapped air race Pilot Assessment Syllabus (Part D Section 1):

- **Brief** – Race Standard Operating Procedures (Part B Section 1) and Air Racing Handbook (this document). You can self-brief or discuss further with a Check Pilot or Race Supervisor.

- **Initial Assessment** - Carried out by a Check Pilot to assess if you are safe to undertake the next stage of assessment

- **Secondary assessment** – Carried out by a Check Pilot to assess if you are safe to participate in your first race.

- **Supervised Practice/Race(s)** - Fly with a Check Pilot or Race Supervisor until you have been assessed as fit to race. This also provides you the opportunity to fly with a very experienced pilot/navigator who will guide you through a race weekend.

This handbook is for information purposes only the current Rules and Race Standard Operating Procedures are at the at the Members Area of the 3Rs website www.royalaeroclubrrra.co.uk

3. HANDICAPPED AIR RACING

3.1 What is it?

This should not be confused with formula-type pylon racing where aircraft of similar type race round a very short circuit, nor indeed Red Bull air racing which is for specialised aircraft and is more of a time trial than an air race.

Handicapped air racing's roots reach right back to the early days of aviation. As always in human endeavour, when aircraft were invented it wasn't long before people/pilots were pitching their craft and skills against each other in races. Initially these were conducted at max performance but it became obvious that for different types of aircraft to compete in the same race some form of handicapping was going to be necessary. The King's Cup was perhaps the first air race in the world to be run on a purely handicapped basis.

What does handicapped mean? It means that any aircraft propeller-driven that is capable of maintaining over 100 statute miles per hour in level flight can compete. Strangely these rules have remained unchanged since the 1920's and what happens is that each aircraft is tested for its maximum level in-flight speed and a handicap applied to the aircraft so that when the race starts (the race circuit is typically around 20-25 miles of 4-5 laps), the slowest aircraft start first, the faster ones later and if everyone flies a perfect race and the handicapper gets his or her job right then all the aircraft would cross the finish line at the same time. This, however, is where skill comes in as no one flies perfect laps and there is much technique in turning the aircraft round turn points and jockeying with wind gradients, convection currents and managing passing manoeuvres.

In essence the handicapping levels the playing field and from a General Aviation perspective opens exciting prospects of a broad range of aircraft being able to compete from the slowest such as Cessna 152's and Rollason Condors, through to faster aircraft like Sia-Marchetti SF260's and Beechcraft Barons. This leads to an exciting spectacle for spectators and participants alike.

Air races are conducted at six to eight venues per year, typically over a Saturday and Sunday, with a practice on the Saturday morning, race on Saturday afternoon, social function on the Saturday night and a race on the Sunday.

As well as exciting racing the Royal Aero Club Records, Racing and Rally Association (better known as the 3Rs) is renowned for its social side, which is inclusive of not only pilots and navigators but also supporters and volunteer helpers.

3.2 Why do we do it?

General Aviation offers a massive amount of freedom to those who take it up as a hobby but often people tend to find that flying the same trips year after year becomes less of a challenge and they look for something more to rejuvenate their flying.

Handicapped Air Racing offers a great forum for expanding the locations that you fly to and also allows you to compete for trophies that have a fantastic history behind them.

Flying in close proximity with other aircraft during turns and whilst straight and level, demands discipline and concentration, attributes which all too often suffer as complacency creeps into our regular flying trips. Taking part in handicapped Air Racing is a fantastic way to hone your flying skills and have the opportunity to win some prestigious trophies.

The 3Rs have a great social scene too so the fun certainly doesn't stop when you are back on the ground. Joining the 3Rs is more than just joining a racing club; it gets under your skin and is as addictive as flying was to you back when you were a student. Be warned, you can join anytime you like, but I doubt that you will ever leave!

4. SAFETY

Motorsport is potentially dangerous and Air Racing can be a particularly unforgiving form of motorsport, which must be respected. Safety is the primary focus for the 3Rs using a Safety Management System (SMS), a simple Pilot Assessment Syllabus and course design procedures to make Handicapped Air Racing a fun yet safe pursuit.

The SMS document can be found in the Members Area of the website, which you will have access to when you join. You will see it is 3Rs policy to operate a Just Safety Culture where safety reporting is strongly encouraged and de-identified after submission. The follow up actions are transparent by the posting of processed de-identified safety reports and Safety Committee Minutes in the same members area.

Safety Reports that require immediate action may change or add procedures and these will be communicated either in a Safety Bulletin or in the pre-race Safety and Handicapping Notes.

At the end of the season there will be an anonymous Safety Survey and the Safety Committee will review the years activity and survey results. At the Symposium the Safety Manager will give a presentation of how the organisation has performed, including the Safety Survey results and an opportunity given for all members to comment.

5. RULES

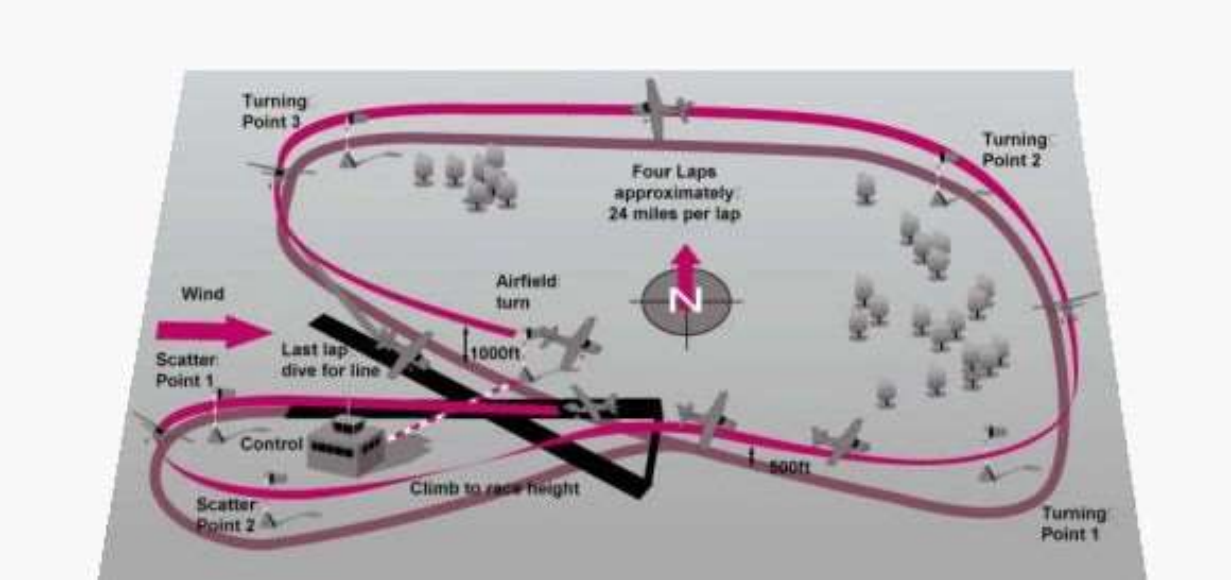
Every form of competition has rules and Handicapped Air Racing is no exception. For the complete and latest set of rules, please refer to the 3Rs website www.royalaeroclubrrra.co.uk where you can find them and also any specific supplementary regulations for a particular race weekend.

Each race venue is unique so not only is a full comprehension of the current rules essential but adherence to the SOP's and supplementary regulations is vital. The Clerk of the Course will also give specific instructions before any flying sortie during a race weekend in the form of a pre flight briefing.

Some of the key rules are listed below, but please note that this is not an exhaustive list:-

- Race pilots must have the following experience:
    - A minimum of 100 hours Pilot in Command (PIC)
    - 10 hours on type PIC
- Race aircraft must be capable of maintaining 100 Statute miles per hour with the engine operating under full power for the duration of the race.
- Propeller driven aircraft only, no jets or helicopters.
- All aircraft commence the race from a standing start.
- Races are typically 100 statute miles in length over a course of 20 to 25 miles. A typical racecourse is shown below.
- All turns are to the left.
- Typical race height is 500 or 700 feet with finishes down to 75 – 100 feet.
- The first aircraft over the finish line is the winner, subject to having not received any time penalties whilst flying.
- Penalties are awarded for cutting of turn points.

- Missing a turn or low flying results in disqualification.
- Points are awarded at each race and add together to form the British Air Racing championship along with other championships



A typical race course showing how scatter points are deployed for the start of a race, especially when the wind favours a taking off heading opposite to that of the race course. Note, that the 500 foot race height shown is often increased to 700 feet in the interest of noise abatement and although you see a right turn after Scatter Point 2 you will normally fly direct from the last Scatter Point to Turning Point 1, thereby keeping all turns to the left.

There are certain key areas during a race weekend, which require special attention by all those who take part or support an Air Race weekend.
In no particular order these areas are:-

- Crew (Pilot & Navigator)
- Line Up
- Start
- Scatter Turns
- Overtaking
- Race Turns
- Finish
- Recovery

6. CREW AND EQUIPMENT

Whilst the 3Rs as an organisation do everything they can to mitigate any dangers, the crew of each aircraft have a very big role to play in maintaining a high level of safety. Being thoroughly prepared even before arriving at the race venue helps keep your personal work load down and allowing you to concentrate on the matters in hand.

Continuity of crew, i.e. having the same navigator each weekend makes communication and interaction more consistent between the individuals. Pilots and their navigators are required to attend practice and race briefings and each of them should take notes during the briefing using the briefing sheet provided.

To ease the burden for the race pilot, it is a good idea for the navigator to ensure that the aircraft is refuelled and made ready in time for practice and race and to ensure prompt attendance at briefings.

For pilots racing without a navigator the importance of being organised and having read all supplementary regulations prior to arrival are even more crucial.

Even before taking off for the race, a good lookout by both crew is essential on the ground as race officials will be in close proximity whilst aircraft are marshalled into position.

Having set clocks and organised charts, the navigators can assist the pilot in the following areas:

- Checking airspeed before turning at the scatter
- Identifying turning points
- Calling when to roll out at the completion of each turn
- To maintain a good lookout during each leg and especially whilst in the turn
- When overtaking helping to keep the aircraft in sight at all times until well clear
- Increase feedback to pilot especially on the last lap and even more so on the last leg where the airspace will be more crowded
- Keeping a check on the finish height and not forgetting to allow for altimeter lag
- Maintain vigilance after the finish and until the aircraft is safely secured in its parking spot
- Ensure survival gear is readied in case of over water flight

If you do not have a second radio you may wish to consider carrying a spare handheld as a backup in the event of a communications (comms) failure. The procedure for the loss of comms is discussed later and will be covered in the practice and race briefings.

7. PERSONAL PROTECTIVE EQUIPMENT (PPE)

The standard 3Rs PPE requirements are:

7.1 Mandatory PPE

- Shorts, t-shirts, flip-flops or sandals are not permitted
- Peaked caps can only be worn if the peak is at the rear
- On courses where flight over water will be beyond gliding range of land life jackets must be worn and this will be specified in the Supplementary Regulations

7.2 Recommended PPE

- Flame retardant clothing and gloves to cover the skin and substantial footwear
- If practicable for your aircraft, a helmet and/or parachute
- If life jackets are mandated it is recommended to carry a life raft if practicable or wear a dry /immersion suit as UK sea temperatures remain low even during the summer months. Consideration should be given though to the possibility of a ditching against possible heat exhaustion during periods of high ambient temperatures.

8. RACE OVERVIEW

8.1 Briefing

The briefing is mandatory for all participants and officials and is given by the Clerk of the Course. More detailed information can be found in the SOPs (Part B Section 1) but the briefing will cover any items that deviate from the SOPs and venue specific.

8.2 Line Up

One of the Officials will marshal aircraft onto the runway in readiness for the starters to flag them away and you will normally be asked to check that your GPS's are on via a "GPS ON?" board or RT call. Space can be limited at some venues so be ready to taxi out 15 minutes prior to the start of the race especially if you are one of the first aircraft away.

8.3 Start

Aircraft are released from the start line at a predetermined time (explained in more detail in the result section below) by the drop of a flag. Ten seconds before the start time, the flag is raised as a signal to the race pilot to bring his engine to full power whilst he holds the aircraft still on the foot brakes. At the drop of the flag, the brakes are released and the race begins for that aircraft.

DO NOT use the park brake of your aircraft as one wheel may jam causing the aircraft to turn when the brakes are released.

Ensure that strobes are switched off until the aircraft has left the start line.

8.4 Scatter

The purpose of the scatter is twofold. Its first purpose is to provide a point at which the aircraft can be aligned with the racecourse after take off. If the wind vector is opposite that of the final leg of the race course, the use of two or even more scatter points allows the aircraft to navigate via a series of left hand turns onto a heading to reach the first turn.

The second purpose of the scatter point is to ensure that aircraft have sufficient distance in which to accelerate to a speed at which they can then safely turn without the fear of stalling.

For more information regarding stall speeds in a turn, refer to Appendix A.

8.5 Straight Legs

During the straight legs of the course your primary jobs are LOOKOUT and safe overtaking (if applicable); the secondary tasks are height keeping, navigation, engine and fuel monitoring. It is vital to develop a methodical LOOKOUT scan. During the straight legs you are permitted to climb/descend (respecting the minimum race height) but in order to be predictable this must be carried out smoothly

8.6 Race Turns

The race turn is a very demanding part of air racing and extreme caution must be used to ensure that your aircraft does not climb or descend in a turn. Absolute awareness of other aircraft around you is paramount during turns. If overtaking whilst approaching a turn, make clear position callouts to the aircraft in front of you, so that they know where you are. Remember, it is your responsibility for the safety of the overtaking manoeuvre.

For more information regarding stall speeds in a turn, refer to Appendix 1.

Plan ahead to ensure that neither aircraft is compromised during the turn. Never pass on the right and immediately turn in front of the other aircraft. You might have seen where the turn is but they might not have and may continue to fly straight.

Similar considerations must be made when passing on the left hand side in case the other pilot turns earlier than you expected.

It is during this phase of a race when the navigator plays a vital role in not only

spotting the turn and role out positions but also looking out for other aircraft. Under no circumstance is a turn to be retaken if it is missed. This applies during the practice session and the race as aircraft will end up on reciprocal headings. If a turn is missed, proceed to where you believe the next turn to be and most certainly do not fly through the middle of the course to “have another go” at a turn.

Should you see an aircraft flying on a strange heading on the course, put out a radio call to warn the other racers, it may be an alien craft which has not read the NOTAM or it may well be one of the race craft.

Whilst the responsibility for overtaking remains with the overtaking pilot (see next paragraph) if you miss a turn, or fly it wide, you have an obligation to maintain safe separation from those aircraft who are on the normal course track and must remain predictable with no rapid turning.

8.7 Overtaking

In the earlier stages of a race the field of aircraft is well spread out but a good look out is essential at all times as you can catch up with slower aircraft on your first lap depending on the speed differential.

During straight flight you are required to maintain a minimum separation distance (msd) of two wingspans (approximately 25m) from other race aircraft and during turns we recommend a msd of 4 wing spans (approximately 50m). The wingspan refers to that of the aircraft being overtaken.

When overtaking another race aircraft, the 3Rs have an exemption from the CAA to the rules of the air, which allow us to overtake on either the right or the left.

Overtaking directly above or below is not permitted as this will result in a period where either of the aircraft looses sight of the other. If overtaking above or below another aircraft, you must ensure that you are two wing spans displaced to one side (approximately 25m) as shown in the next photograph and diagrams - you must maintain visual contact throughout the overtaking manoeuvre.

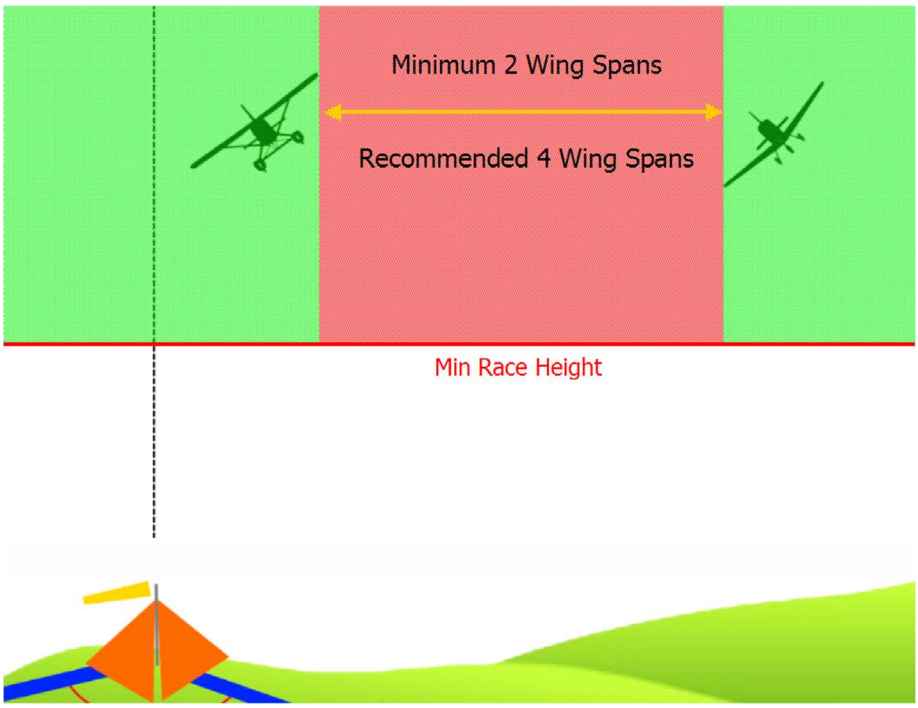
If you loose visual contact with the aircraft it is important to carry out the Loss of Visual Procedure without delay as follows:

Locate a clear area and make a small heading and/or pitch change towards it and call “Race A lost visual with Race B”. When visual contact regained call “Race A visual with Race B” and make a small heading and/or pitch change back towards the course.

It is vital that the changes you make are small as there maybe an aircraft overtaking you. You may have to make a change that will put you inside the course, or turn, but it is vital not to loose contact with the aircraft and that responsibility is yours as the overtaking aircraft.

The use of radio calls to other aircraft in your vicinity is a major boost to everyone's spatial awareness – but this is a safety frequency and not a chat one.

Any overtaking manoeuvre is the responsibility of the overtaking aircraft and thought must be given to the position of your aircraft in relation to other especially if overtaking approaching or in a turn. Do not put either aircraft in a position, which may compromise separation or visual contact.



8.8 Finish

From a point approximately 3 to 5 miles from the finish line on the last leg of the race, aircraft will pass “Point Alpha” which is the designated position at which descent from race height to finish height is permitted.

With anywhere between 15 – 25 aircraft, or even more in the prestigious races, all descending to the finish line together, the sky becomes very crowded. A good look out by both pilot and navigator is paramount as is holding a steady course. Under no circumstances must any sudden or violent manoeuvres be performed as a faster aircraft could be passing you on either side. You must maintain a minimum separation distance of 2 wing spans if overtaking.

Pilots are generally briefed that once a race aircraft has crossed the finish line they should climb straight ahead, gently to 1,000 ft aal and begin a left hand circuit of the

airfield. Circling of the airfield has to be maintained until the last aircraft has crossed the finish line and the Clerk of the Course has called “Race Complete.

8.9 Recovery

The recovery starts from the last turning point in race practice or when the Clerk of the Course calls “Race Complete” and finishes when lined up on finals. The recovery procedure for all runways will be published in the Safety and Handicapping Notes or as amended at the briefing

Hearing “Race Complete” over the radio is by no means an instruction to relax as all aircraft will be trying to land in very short order and in close proximity to one another. The CAA allows the 3Rs another exemption in that we are permitted to have more than one aircraft on the runway at the same time.

When pilots hear that the race is complete they continue to circle the airfield in the briefed pattern until they are in a position to turn final. There are four types of landings that we do:

- Hot/Cold Stream Landing (Runway width >= 18m)
- Stream Landing (Runway width <18m)
- Normal Landing (like when you are not racing)
- Dual Runways (combining the above)

For more detailed information about these types of landing please see the Race SOPs (OM Part B Section 1 Paragraph 5.18).

Some runways do not have convenient exit taxiways and if aircraft on the runway require to back track then the remaining race aircraft will continue to circle the airfield until the runway is clear again and this will be briefed

The most important thing is to follow the briefed procedure unless it is unsafe to do so.

9. DIARY OF A WEEKEND

9.1 Preparation

As mentioned previously, the more preparation that can be carried out before arrival the better. Once you have landed you will have many tasks to perform in a short time.

You may have raced many times previously and consider that the supplementary regulations are the same as you have seen before. These regulations are adjusted to suit each venue and hold vital information about the weekend and may also include information on any new or unusual procedures, which may need to be adopted to suit the venue or conditions.

9.2 Race Number

Each aircraft has a unique race number, which will be allocated prior to the race weekend by the 3Rs. Generally each pilot continues with that same number throughout his or her racing career. The race numbers must be displayed on the aircraft in line with the current rules in force (Rule 94 at time of publication).

Radio calls use the aircrafts race number rather than the registration, for example “Race 28, Race 5 right of you in the turn”. If you are unsure of the aircraft ahead of you a call such as “Race 44 inside of aircraft at Turn 3” or similar would be sufficient.

9.3 Insurance

Each aircraft has to be insured for Handicapped Air Racing. This additional insurance cover is generally free, depending on the company. The policy needs to be adapted inline with the Rules (Rule 177 at the time of publication). This phrasing will also be published in the race entry documentation.

9.4 Entry Forms

Entry forms need to be completed and submitted by the due date, typically seven days before the event. Failure to submit an entry form on time may prevent you from racing although late entries can be accepted subject to approval and payment of an additional fee. Typical race grids vary in number from 15 to 25 aircraft. In aid of safety, entry numbers are restricted to ensure that no more than 2 aircraft per lap mile are entered.

This formula is used as a double check for entry field sizes, where N = number of aircraft, S = speed difference (MPH) between fastest and slowest aircraft, L = lap length and C = lap length (Statute miles)

$$\frac{N \times S \times L}{C}$$ should not greatly exceed 1,500

9.5 Documents

Apart from the properly completed entry forms and evidence of Insurance (specified as below) all competitors must be able to produce on request to the Clerk of the Course or Stewards all documents required by the Air Navigation Order or subsequent EASA/JAR's including, but not limited to, the following: (Failure to produce any of the following will result in exclusion from racing)

- A valid pilots licence with a current certificate of experience/test or currency & class rating
- A valid medical certificate
- A valid certificate of airworthiness or permit to fly for the aircraft
- A certificate of registration
- An Aircraft radio licence
- A certificate of maintenance review and maintenance statement
- A noise certificate (if applicable)
- A certificate of Insurance
- A current FAI competitors licence

9.6 Arrival and Check In

Race officials are generally on the airfield at 09:00 ready for the check in procedure.

Competing pilots with their aircraft must report to the Clerk of the Course Office to check in between 09:30 and 10:45 hours on the Saturday morning Once checked in aircraft are under the scrutiny of the handicappers and **will not be allowed to land away** until following completion of the race weekend, unless they have the approval of the Stewards and Clerk of the Course.

Permission to land away between the Stewards Cup and the Kings Cup races will **NOT** be granted.

9.7 Pre Flight

Aircraft must be readied in preparation for the practice session and supervised octagon (explained in detail later). Practice briefing is at 11:00 unless otherwise stated and pilots are reminded that their fuel states must be correct before the briefing in readiness for a prompt departure after the briefing.

A suggested Start Race Fuel level is your race fuel burn in litres rounded up to the next 10 litres then doubled. This allows for a hold and diversion eg race fuel burn = 36 litres suggested Start Race Fuel level = 80 litres
However, you should remember that this is handicapped racing so if you fly with full fuel every race (assuming that is within your weight and balance limits) you will not

be penalised. As fuel equals time in aviation consideration should be given using full fuel – It also makes it very simple when fuelling for the race!

The Stewards will monitor your race finish fuel and will take a very dim view of any pilot finishing with low fuel states.

9.8 Briefing – Race Practice

The Clerk of the Course will conduct a briefing for the practice session including the supervised octagon. As much of the information at briefings is the same Standard Operating Procedures (Part B Section 1) are used to help only concentrate on information that is different each race. Virtually every venue has some special procedure, which needs to be followed so to help you a few days before a race you will receive Safety and Handicapping Notes from the Race Organising Committee that will contain the procedures. You will need these notes at the briefing, as they will be referred to. For example the recovery to the airfield may have to vary from a left hand pattern to a right hand pattern to maintain separation between landing aircraft and those taking off and practicing the scatter.

He will also refer to the Loss Of Communications Procedure. Normally this will be to proceed into the centre of the course and commence a hold and, if fitted, set the Transponder to 7600 (Radio Failure). Once the practice/race finish time has elapsed the aircraft will return to the airfield and land after the last race aircraft has landed.

During the check-in procedure, each crew will be issued with a course map and a briefing sheet, which must be brought to the briefing to note any variable data. Do not rely on notes scribbled on the back of your hand!

To help make air racing safe it is vital to follow the brief and SOPs unless doing so is unsafe. Deviation from the brief by a racer, or a brief deemed to be unsafe, will require the submission of an Air Safety Report/Safety Report respectively to monitor this part of our activity. To avoid any misunderstanding about your responsibility during a practice/race please note the following:

“The purpose of the 3R’s is to facilitate the coming together of airmen and airwomen and their participation in a race or rally. In good faith the 3R’s provides briefings to promote a safe and structured event. The 3R’s may also from time to time make requests of aircrew in line with the rules of the race. However, the 3R’s has no legal authority to direct aircraft. Air and ground crews are reminded that the commander of the aircraft is AT ALL TIMES responsible for the safe conduct of the flight and should never comply with any request which would endanger any person, vehicle, vessel or structure. Commanders are responsible for the legality of the flight and no request by any officer of the 3R’s should be construed as a request to break the law. If you consider any element of the briefing to be unsafe, you will be given an opportunity to voice your concerns at the end of the briefing.”

9.9 GPS

If an aircraft is required to fly an octagon, at the end of the practice briefing, the crew will be issued with one or even two GPS units, which must be sited in the cockpit in a position that will always have a satellite signal. On the right hand side of the

cockpit on top of the instrument panel is a good place, as this will still allow a signal whilst in a turn.

Do not turn the GPS on immediately, as this will give the handicappers too much data to look at. It is sufficient to turn the units on when starting to taxi for take off. The GPS units must be handed back in immediately after the octagon has been completed and before the course is flown during practice.

9.10 Octagon

The octagon is a flight path which is used as part of a qualifying speed check conducted at each race weekend if required. This process is described in detail in the qualification section below.

9.11 Practice

Having complete the octagon and returned the GPS unit, race crew can now spend the remaining practice time to fly the course. A good look out at all time is important as aircraft may be flying on unexpected headings whilst orientating themselves to the course.

9.12 Race Pre-Flight

With the practice complete you need to have your aircraft ready for the race, i.e. refuelled to the same fuel state as at take off for the octagon or as declared at check in, in good time to allow you to get to the race briefing. There will be one hour between the start of the race briefing and the race but if specific procedures need to be briefed it can take up to 20 or 30 minutes.

9.13 Race Briefing

Starts with a debrief of the Practice/Saturday race to cover any safety points or other issues. As with the practice brief, the majority of a race briefing will be the same as many other race briefings before it. Attention needs to be paid to ensure that all procedures are understood. It is not unheard of to have aircraft doing left hand orbits next to the airfield after the race instead of orbiting the airfield in a left hand pattern or indeed orbiting the airfield in a right hand pattern instead of left hand.

To help make air racing safe it is vital to follow the brief unless doing so is unsafe.. Deviation from the brief by a racer, or a brief deemed to be unsafe, will require the submission of an Air Safety Report/Safety Report respectively to monitor this part of our activity. If you have any doubt about the brief ASK at the end under “Any Questions”.

9.14 Race

This is what you have come to do but do not let the excitement carry you away. You listened carefully to the briefing; now listen carefully to the chief steward on the radio as he marshals all aircraft into position on the runway. Lining up commences 5 minutes prior to the start of the race with the slowest aircraft taxiing first.

At some venues, the runway does not have a taxiway at the end ofthe runway so race aircraft need to commence taxiing in reverse order so you may well have to taxi out 15 or 20 minutes earlier than you normally do at other events.

Relax physically, concentrate mentally and stay predictable by following the brief and the procedures; if every one has a safe race the fun automatically follows, and that's what we all go racing for!

9.15 Debrief

Cover any safety points, improvements to procedures, decision for Sunday Scatter practice and social details.

9.16 Posting of Results

Depending on issues encountered by the Chief Handicapper the results will normally be posted after the race debrief and will be deemed to be provisional. The results will have a hand written time on them and there will be 15 minutes from this time in which racers may make a protest. See paragraph 11.3 for more details.

9.17 Presentation (Sunday)

After the Sunday results are confirmed there will be a presentation ceremony normally conducted by the Chairman. A local guest will usually present the trophies to the winners for 1st, 2nd and third except the Kings Cup (1st only)

10. AIRCRAFT QUALIFICATION

10.1 Why?

In order to allow aircraft of differing performance levels to compete, a method of handicapping has to be employed. The idea is to handicap the aircraft and not the pilot / aircraft combination thereby allowing scope for a skilled pilot to maximise any potential advantage that may be available due to the use of thermals or orographic lift for example.

10.2 How?

Since 2003 the use of GPS units inside the aircraft have been used to record the maximum straight and level speed (Vtop) of each aircraft and the speed returned is then fed into the handicapping software which then calculates the total estimated time for each aircraft to complete the race distance taking into account the course layout and the expected wind speed and vector.

2005 saw the implementation of the octagon for recording the Vtop of the aircraft. The benefit of the octagon is in improved resolution of the data and also more consistent data from one aircraft to another, as the qualifying course flown is the same for all aircraft.

Starting in 2009, to ensure that all pilots fly their octagons correctly, each race pilot had to fly the octagon with a supervisor, which could be a race official or another race pilot / navigator. The accuracy of the octagons flown saw a marked improvement when pilots were supervised and the quality of the Vtop data was consequently better than previously gained.

If required by the Chief Handicapper race aircraft will be issued with a GPS unit immediately after the practice briefing with which to record the octagon flight. To ensure that too much data isn't collected, the GPS should only be turned on as the aircraft taxi's out to the runway and turned off again after landing.

The octagon is flown at the very beginning of the Saturday practice session and the mechanism for the octagon is shown below. From 2014 the use of calibrated historical data has been used, and Octagons will be flown occasionally as a double check that the system is working correctly, or when a new racer enters his first weekend or when an aircraft has been modified since it's last race.

10.3 Octagon

As implied by its name, the octagon is a course of eight straight legs joined by eight LEFT HAND turns. Each leg is flown on the designated heading, straight and level for 30 seconds, a rate one left hand turn is then made to the next heading (45 Degrees less than the previous heading) and once the aircraft is stabilised another 30 second leg is flown. This procedure is continued until all eight legs have been completed. After the eighth leg has been completed, the aircraft returns to the airfield to hand in the GPS unit and to collect its navigator so that practice can be

undertaken of the racecourse. If you plan to race solo an experienced racer who has experience on your type will conduct this flight.

To reduce the risk of collision the 6 minute octagon should be commenced over a geographical reference point (the river/town in the example on the next page) and on one of the headings nominated by the Clerk of the Course i.e. 090°in the example below. The initial heading will generally be one that has the wind approaching the aircraft from the right hand side, which will automatically give separation to aircraft joining the octagon from aircraft completing the octagon, but this is not always possible. Faster aircraft will fly a larger octagon than small aircraft that helps to achieve separation but in addition to octagons being flown supervised, they are also now flown in a predefined order with the faster aircraft flying first and the slower aircraft last.

Controlling the order of despatch into the octagons minimises the risk of collision and allows separation to be controlled.

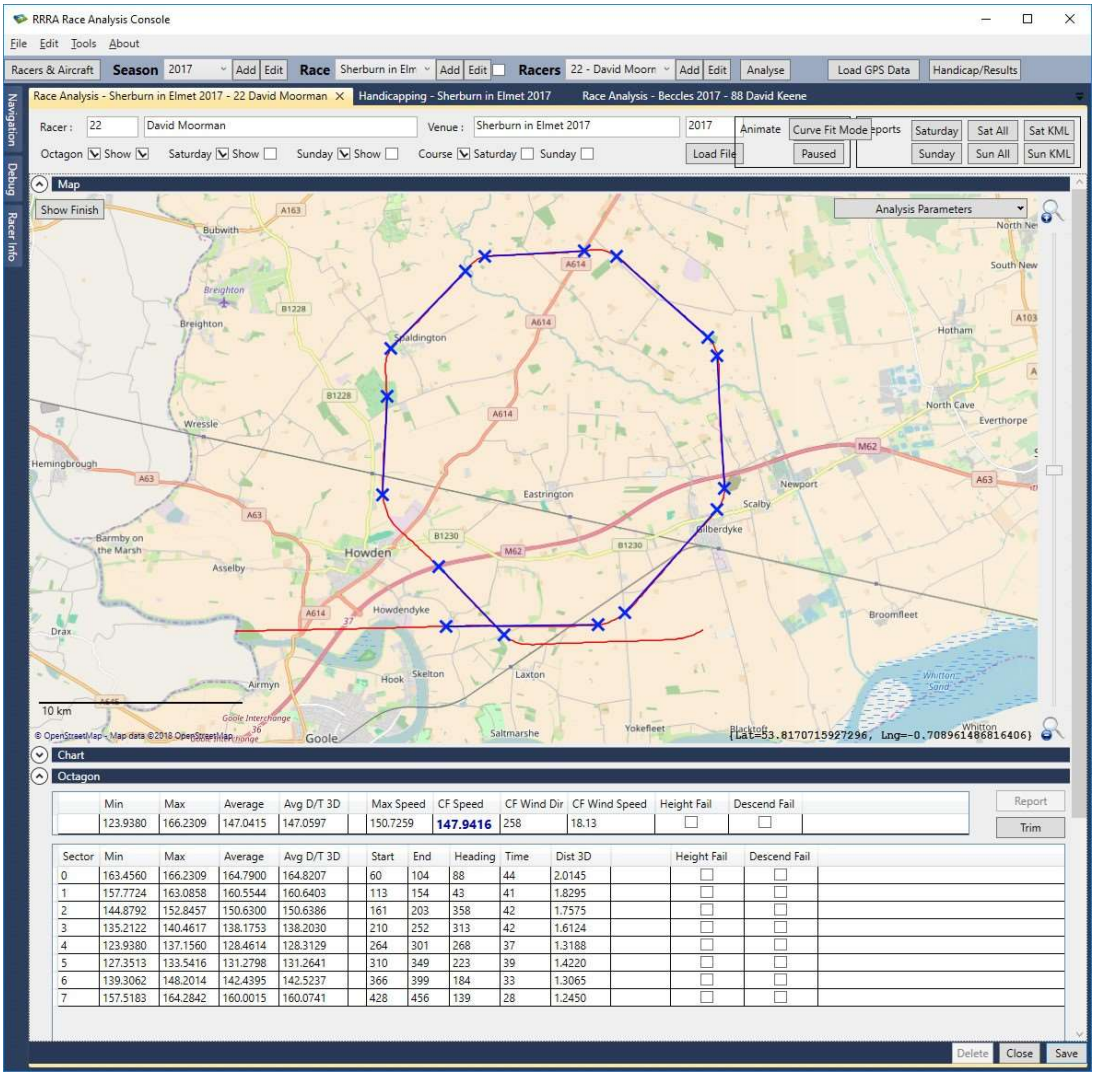
The Clerk of the Course will designate an altitude, which will place the aircraft typically at 700 agl and each aircraft reports on reaching the briefed entry point.

Headings need to be maintained within 10°and leg lengths need to be 30 seconds +/- 5 seconds. Altitude holding is extremely critical as deviations either up or down will reflect on the Vtop recorded and it is one of the responsibilities of the supervisor to ensure that the aircraft is maintained in a stable condition at all times.

Turns between the various headings need to be gentle rate 1 turns and certainly not steep turns as these will bleed speed and result in a low Vtop.

The 3Rs recommend that new racers practice this manoeuvre as part of their work up for the pilot assessment (check ride) – see Appendix B.

The following example of a flown octagon viewed from the software shows the effect of wind, which in this case was from the west, on the shape of the octagon. Entry to the octagon was at a point to the north east of the river by Goole on a heading of 090°and then the seven remaining legs were flown with the 135°leg being the final one before the aircraft recovers to the airfield.



10.4 Software

Software has been written specifically for the purpose of taking the GPS data and automatically extracting the race aircraft's Vtop - from the eight individual legs of the octagon disregarding the speed in the turns, and from the race data. The software also has the ability to extract the wind vector from the GPS data. The start times and start order of the race are established using the Vtop from GPS data, with the forecast wind and the course details.

The software is continually being upgraded and as of 2018, the acceleration of an aircraft at the start of a race is factored in.

An example of a start order sheet can be seen below from Beccles 2017 race weekend.

Start Time Sheet

Beccles 2017 **Airborne Trophy** **02/09/2017** **Saturday**

L / R	START	Registration	Race Number	Handicap Speed (kts)	Course Distance (NM)	Optimum Distance (NM)	Estimated Race Time (H:M:S)	Start Time	Adjusted Start Time	Added Time	Flag Up	Flag Down	Comments
L	1	G-AWUJ	12	95.97	97.384	97.840	1:01:19	15:30:00	15:30:00		15:29:50	15:30:00	
R	2	G-CBBS	88	124.00	97.384	97.986	0:47:29	15:43:50	15:43:50		00:13:40	00:13:50	
L	3	G-KDOG	9	124.02	97.384	97.986	0:47:29	15:43:50	15:44:00	10	00:13:51	00:14:01	Close Start
R	4	G-GORD	82	128.48	97.384	98.013	0:45:50	15:45:29	15:45:29		00:15:19	00:15:29	
L	5	G-TGER	2	129.21	97.384	98.017	0:45:35	15:45:44	15:45:44		00:15:35	00:15:45	
R	6	G-DAVM	22	146.76	97.384	98.132	0:40:10	15:51:09	15:51:09		00:21:00	00:21:10	
L	7	G-CGYO	55	159.68	97.384	98.226	0:36:57	15:54:22	15:54:22		00:24:13	00:24:23	
R	8	G-ORCA	44	163.48	97.384	98.255	0:36:06	15:55:13	15:55:13		00:25:04	00:25:14	
L	9	G-GRIN	69	166.09	97.384	98.275	0:35:32	15:55:47	15:55:47		00:25:37	00:25:47	
R	10	G-OTRV	47	175.25	97.384	98.349	0:33:42	15:57:37	15:57:37		00:27:27	00:27:37	
L	11	G-RVPL	26	177.63	97.384	98.369	0:33:15	15:58:04	15:58:04		00:27:54	00:28:04	
R	12	G-NNRA	31	178.24	97.384	98.374	0:33:08	15:58:10	15:58:12	2	00:28:03	00:28:13	Close Start

The Optimum Distance is the distance flown based on Handicap Speed and flying 60 degree angle of bank turns.

The optimum distance that each aircraft should fly during the race is shown with the faster aircraft flying a longer distance due to the increased radius of the turns flown at higher speed. The column for the start time and adjusted start times are generally the same as each other, except when two aircraft would be launched with a time separation of less than ten seconds. In the example above, it can be seen that the start times for two aircraft have been adjusted and after the race is completed, this time adjustment would be adjusted back to ensure a true result is achieved.

The flag up time column is used by the start marshals. Each aircraft is waived away from the start line by a flag which is raised ten seconds prior to the start for each aircraft to give the pilot sufficient time to prepare for take-off.

10.5 Staggered Start

If a staggered start is required for any aircraft due to start times being less than ten seconds apart, the times would be adjusted back to compensate. In the example above Race 9 G-KDOG and Race 88 G-CBBS have close starts. In this case G-KDOG had their start time adjusted by adding 10 seconds to separate them from G-CBBS. Similarly with Race 31 G-NNRA and Race 26 G-RVPL and the adjustment for G-NNRA is 2 seconds.

10.6 Results

After the race has been completed all GPS units are recovered from the race aircraft; usually this is done as you taxy back - stop beside a GPS collector wearing a Hi-Viz jacket and indicate to them when it is safe to approach the aircraft by holding the GPS units at arms length. The handicapping team download all the race data in order to be able to produce a set of provisional results. The final results can be seen below from Beccles 2017 showing penalties and adjustments applied.

Race Results Sheet

Beccles 2017 Merlin Trophy 03/09/2017 Sunday

Position	Race Number	Registration	Handicap Speed (kts)	Measured Race Speed (kts)	Speed Change (%)	Optimum Distance (NM)	Measured Race Distance (NM)	Excess Distance (NM)	Estimate Race Time (H:M:S)	Measured Actual Race Time (H:M:S)	Excess Race Time (H:M:S)	Start Time (H:M:S)	Close Start Adjustment (S)	Rule 9 Penalties (S)	Other Penalties (S)	Time Keepers Time (H:M:S)	Time Keepers Time + Penalties (H:M:S)	Finish Time Difference (H:M:S)	Comments
1	26	G-RVPL	178.09	178.29	0.11%	98.127	98.981	0.853	0:33:16	0:33:56	0:00:40	0:00:00	0	1	0	01:02:57	01:02:58		[Rule 9 exceeded, new speed 178.2, added 1s 1]
2	44	G-ORCA	163.24	163.00	-0.15%	98.008	97.822	-0.186	0:36:18	0:36:59	0:00:41	0:00:00	0	0	0	01:03:01	01:03:01	00:00:03	
3	81	G-NNRA	178.30	179.88	0.89%	98.129	99.298	1.169	0:33:14	0:33:47	0:00:33	0:00:00	8	16	0	01:02:59	01:03:07	00:00:09	[Rule 9 exceeded, new speed 179.8, added 16s 16]
4	55	G-OGYO	159.89	159.50	-0.25%	97.983	98.754	0.771	0:37:03	0:37:54	0:00:51	0:00:00	0	0	0	01:03:10	01:03:10	00:00:12	
5	22	G-DAVM	147.11	147.50	0.27%	97.891	98.750	0.859	0:40:18	0:40:57	0:00:39	0:00:00	0	5	10	01:02:57	01:03:12	00:00:14	[Rule 9 ex, new speed 147.43, added 5s] Cut TP2 Lap 3
6	82	G-GORD	129.33	129.11	-0.17%	97.778	98.867	1.090	0:45:53	0:47:01	0:01:08	0:00:00	0	0	0	01:03:25	01:03:25	00:00:27	
994	47	G-OTRV	176.23	163.00	0.16%	98.111	97.822	-0.290	0:33:37	0:36:59	0:03:22	0:00:00	0	2	0	01:02:47	01:02:49	00:00:00	[Rule 9 ex, new speed 176.42, add 2s] Miss TP2 Lap 1
995	9	G-KDOG	124.67	124.49	-0.14%	97.748	98.476	0.727	0:47:40	0:48:35	0:00:55	0:00:00	0	0	0	01:03:13	01:03:13	00:00:15	Disq. Miss TP2 Lap 2
996	12	G-AWLU	96.14	96.70	0.58%	97.601	99.740	2.140	1:02:18	1:03:42	0:01:24	0:00:00	0	20	0	01:03:43	01:04:03	00:01:05	[Rule 9 ex, new speed 96.65, add 20s]
997	2	G-TGER	129.32	0.00	-100.00%	10000.000	0.000	0.000	0:00:00	0:00:00	0:00:00	0:00:00	0	0	0	00:00:00	00:00:00	00:00:00	DNS
998	69	G-GRIN	165.83	0.00	-100.00%	10000.000	0.000	0.000	0:00:00	0:00:00	0:00:00	0:00:00	0	0	0	00:00:00	00:00:00	00:00:00	DNS
999	88	G-EBBS	123.46	0.00	-100.00%	10000.000	0.000	0.000	0:00:00	0:00:00	0:00:00	0:00:00	0	0	0	00:00:00	00:00:00	00:00:00	DNS

Field Average 0.05% Racers included in Average

Rule 9 Limit 0.05% 44, 81, 26, 47, 22

11. PENALTIES

The purpose of handicapping an Air Race is to equalise all aircraft regardless of the different performance levels of the different types. If all pilots fly a perfect race then all the aircraft should cross the finish line at the same time but invariably mistakes are made or indeed advantages are gained which spreads the field out. In the example above, it can be seen that the field was spread over a time period of 56 seconds but with the majority of the aircraft crossing the line within 15-20 seconds of each other.

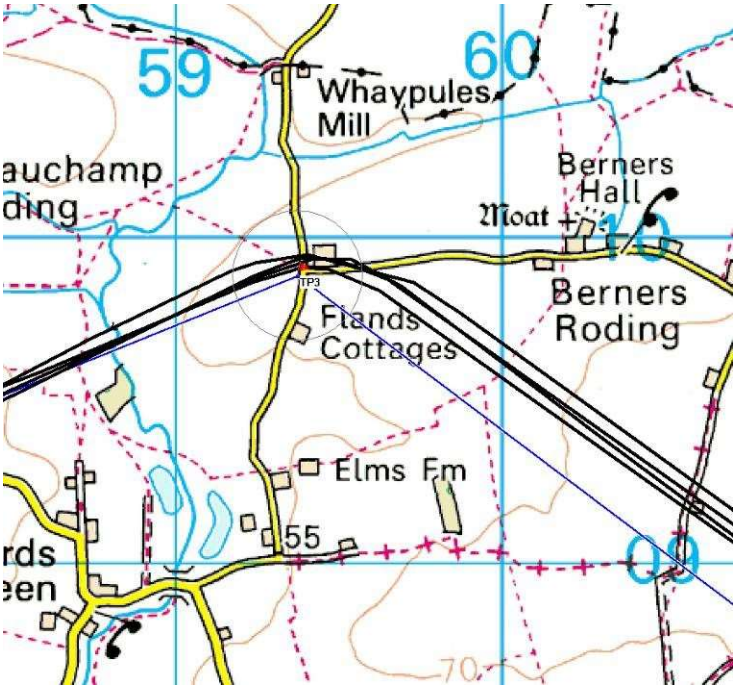
There are a number of other reasons why a competitor may have his finish time adjusted and the cutting of a turn point is one such incident, which is explained below.

Other transgressions such as flying too low at any point on the race course or missing a turn point completely will result in exclusion from the results.

After penalties and adjustments the field spread for Beccles 2017 Sunday race was 1minute and 5 seconds.

11.1 Turn Point Cuts and Misses

One area where most time can be lost during the race is during a turn. In the following example, the racecourse is indicated by the blue line and the track of the race aircraft around the turn by the black line. The distance from the turn point varies from 20 metres to 60 metres which whilst it may sound close will not result in a race win. If every turn during a 4 lap race is taken at a distance of 25 metres then the aircraft will fly over 300 metres further than its optimum race distance. Increase that distance to 40 meters and the excess distance travelled will be 1,000m – very few racers consistently achieve this level of accuracy. However, it is worth remembering the golfer Gary Player's famous saying "The harder I practice, the luckier I get".

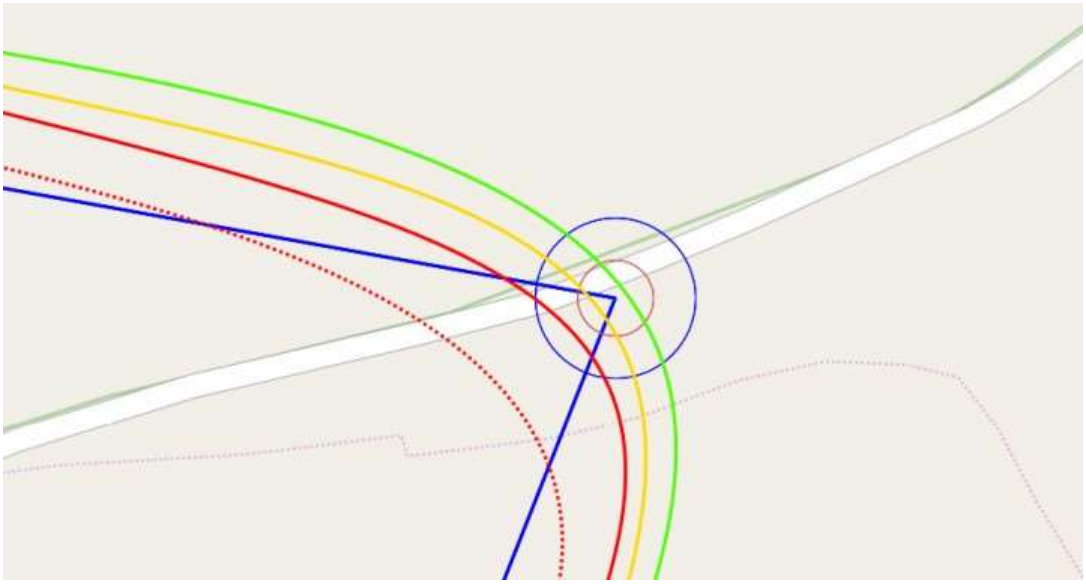


A much tighter turn can be seen in the example below which was flown during the practice session before the race.

This looks like a perfect turn with the aircraft right above the turn, however, the Rules state should the GPS trace pass inside the turnpoint by a distance of up to 8.5m then this will be classed as a “CUT” and a 5 second penalty will be applied to the aircrafts finish time.
Should the GPS trace pass inside the turnpoint by a distance of more than 8.5m then this will be classedas a “MISS” and the aircraft will be disqualified and listed on the results sheet.

Whilst turn points can be manned most of the observations are using GPS.

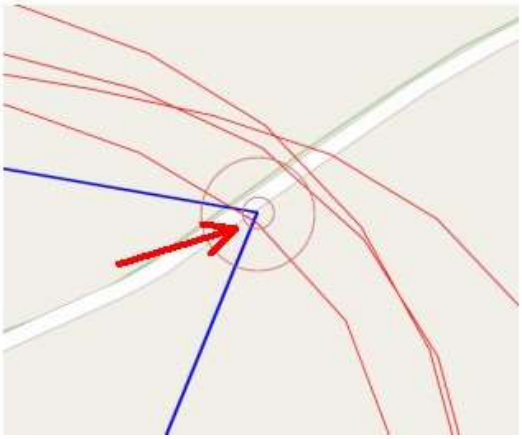
The above maps can make it hard to see any issues so the handicap program produces each turn at a much smaller scale. This can be seen more clearly in the diagram below:

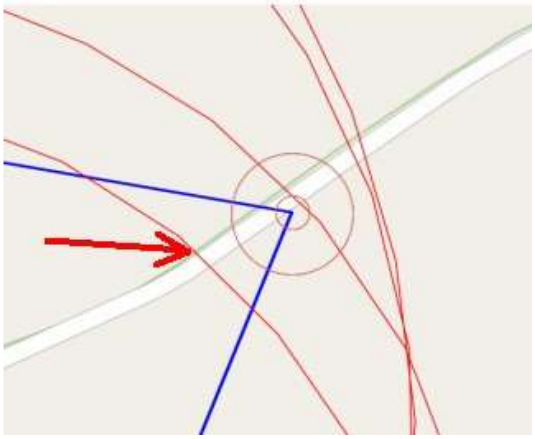


The diagram above shows 4 coloured tracks as an example of a Bad Miss, Miss, Cut and good turn. In the above diagram, the blue circle has a 25m radius however the current software applies a 2.5m circle and an 8.5m circle for judging cuts and misses under the current rules:

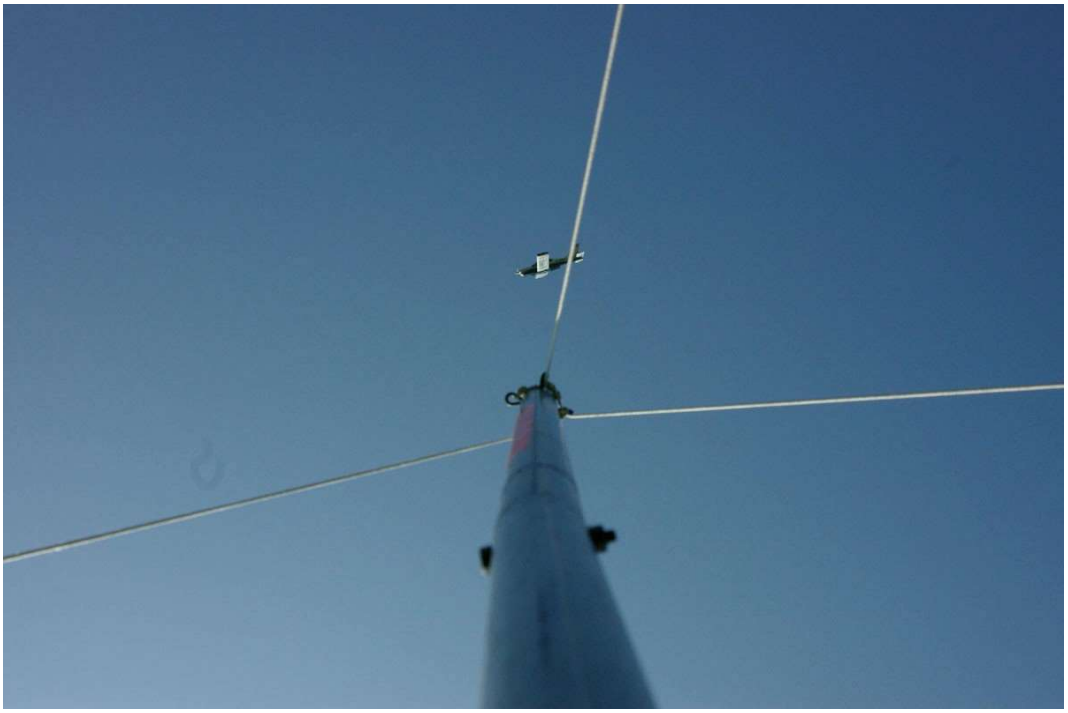
- **Bad Miss.** Dotted (red) line misses the turn completely
- **Miss**. First solid inner (red) line passes inside the course and outside the Turn-point circle
- **Cut**. Middle solid line (amber) passes inside the course and inside the Turn-point circle
- **Good turn**. Outer (green) line passes outside the course, although it is inside the circle

Post race the handicapper will email you a debrief pack and you can see how you performed at each turn and there are some examples below with a cut on the left (15 seconds penalty) and a miss on the right (disqualified).





The photo above shows a typical turn point consisting of high visibility panels and a windsock on a pole. The turn point observer stands inside the tent and looks up the pole as aircraft complete the turn. The view will be as in the photograph below. This photograph actually shows a perfect turn but due to the position of the camera, the parallax error makes it look as if the aircraft has missed the turn.



11.2 Flying Too Low

During the race briefing, the height at which the race is to be flown will be advised, this is generally 700’ over land and 500’ over water if the local conditions allow. Any aircraft observed from GPS data to be flying too low will be disqualified and their FAI Licence may be endorsed.

On the final leg of the final lap, aircraft are allowed to descend from race height upon reaching a point designated as “POINT ALPHA” down to the finish height, which is typically 75’ – 100’. Again if an aircraft is observed to have begun the descent too early or crosses the finish line below the designated height then a disqualification and endorsement may be awarded.

11.3 Result Posting & Protests

Results are posted in the format shown previously and all competitors have a 30 minute period in which they can protest against any results that they believe to be incorrect. The protest must be in writing, preferably using the Protest Form [available on the website – or the Race Office] to the Clerk of the Course and carries a protest fee of £25, which is refunded if the protest is upheld.

12. WANT TO RACE?

Assuming you meet our experience requirements listed at the beginning please contact us via the website for more information.

We look forward to seeing you partake in this challenging and historic part of aviation, improving your flying skills, enjoying the social life and discovering one of UK aviations best kept secrets!

APPENDIX A – TURN PERFORMANCE

A.1 Basic Theory

This is a reminder to all air race pilots, old and new. You will remember that when you flew your air race check out that you had to demonstrate some knowledge of your aircraft's turning performance. In the POH for your aircraft there is a table of stalling speeds at various angles of bank but as pilots taking a pride in honing your skills (one of the reasons for racing maybe) you really need an understanding of the performance.

You were asked what is the basic stalling speed of your aircraft and how that varied with "G" in turns. This can be illustrated as below:

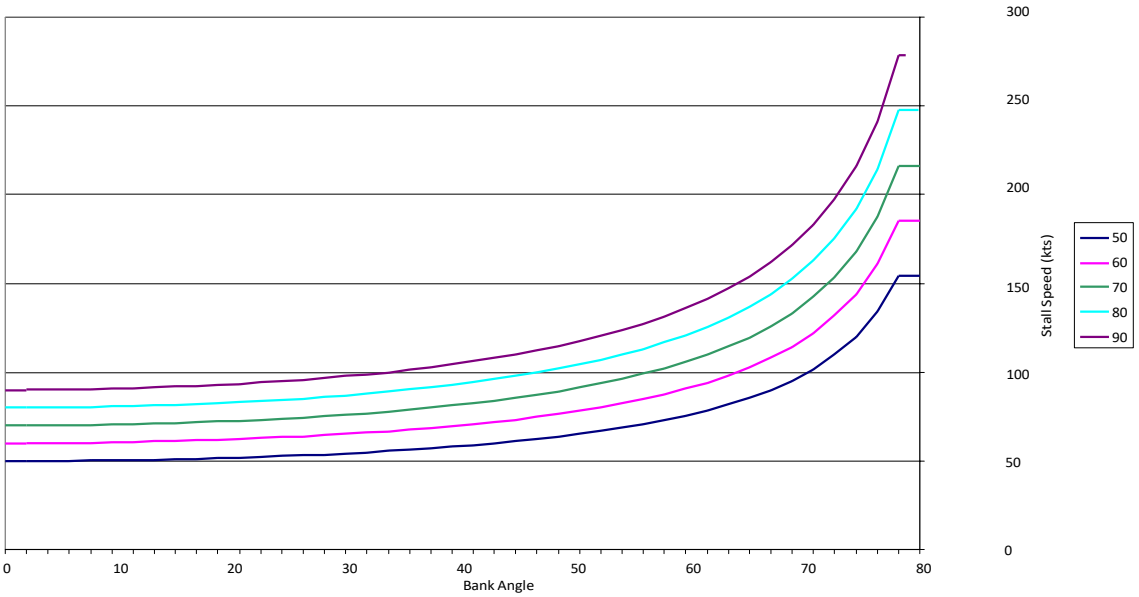
Flight manuals provide normal level stall speeds and these will occur at a particular angle of attack. If an aeroplane is loaded, as in a turn, it will still stall at that angle of attack. However, in a turn a further increase in angle of attack is required to generate greater lift. This increases its loading & in consequence raises its stalling speed. The formula below explains the relationship between load factor & stall speed:-

Normal level stall speed x square root of the load factor (g) = Turn Stall Speed

Take the basic stalling speed (knots, mph, kph) and multiply by the following factors for level flight turns

Angle of Bank	**"G"**	**Factor**	**Clean stall 50 knots**	**Clean stall 60 knots**	**Clean stall 70 knots**	**Clean stall 80 knots**	**Clean stall 90 knots**
0	1	1.0	50	60	70	80	90
30	1.15	1.07	54	64	75	86	97
45	1.414	1.19	59	71	83	95	107
60	2.0	1.414 (√2)	71	85	99	113	127
70.5	3.0	1.732 (√3)	86	103	120	137	154
75.5	4.0	2.0	98	118	138	157	176
78.45	5.0	2.236	110	134.16132	154	175	197

Note how steeply the stalling speed increases once the bank angle exceeds 70 degrees. This effect is clearly illustrated in graph below:-



Before you enter a racing turn you should have planned at what angle of bank you intend to fly taking into account the angle through which you will turn and how much speed you will lose during the turn due to drag etc. Remember that when in a bank close to the stall, the use of aileron to level the wings may lead to an increase in angle of attack for the wing, which is being raised, and may itself cause that wing to stall.

The scatter turn also MUST be planned and the angle of bank used should give you a safe margin above the stall. You need to know what speed you will have achieved after take off (get your navigator to call out the speeds and KNOW the limiting angle of bank that you may attempt with a safe margin.

You will be selecting the angle of bank using the Visual horizon and not the artificial horizon so be familiar with your aircraft's visual attitudes. **You must not rely on artificial aircraft stall warning to keep you out of trouble**.

A.2 Some Additional Theory

A force is required to move any object or to change its state of uniform motion. And so it is with your aircraft after you have been in straight and level flight with lift, weight, thrust and drag forces and couples all balanced. When you decide that you wish to turn a corner another force is required to accelerate the aircraft towards the centre of the circle. You probably remember that when you bank the aircraft you are inclining what we call the lift vector such that the vertical component opposes the weight and the horizontal component provides the acceleration towards the centre of the circle (the turning force). In order for the vertical component to be sufficient to counteract the weight the value of the lift vector must be increased. Also in order to increase the lift you need to increase the angle of attack to increase the Coefficient of Lift without changing the indicated airspeed or the properties of the wing.

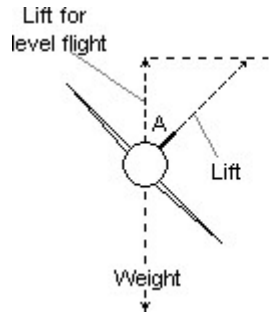
Lift = CL ½ ρ V^2 S

(CL is Coefficient of Lift, ρ is air density, V is TAS and S is Wing form)

The CL increases with α (angle of attack) up to a critical angle where the CL is a maximum and we call this the stalling angle of the wing. Strictly speaking we should not talk about "Stalling Speed" but the speed at which the stalling angle is reached. At the stall in the above lift formula CL is constant at CL^{Max}, S is constant and with the density constant we can see that the Lift is proportional to the TAS^2.

A.3 Load Factor (Or G Loading)

As an aircraft wing's angle of bank increases in a steep or racing turn, so too will its associated load factor (normally measured in G). This factor can be calculated mathematically by dividing the Lift required by the Aircraft's Weight. As show here in the diagram and formula, where the turn bank angle is given as "A°".



Load factor (n) = $\frac{\text{Lift}}{\text{Weight}}$

From trigonometry, the Cosine of angle "A" will be equal to $\frac{Weight}{Lift}$, which is the inverse of the load factor,

therefore: $n = \frac{1}{Cos(A)}$ So allowing any load factor to be calculated.

A.4 Stalling Speed At Increasing Angles Of Bank

By transposition we can see that:
TAS at the stall in a level turn = Basic "Stall TAS" x √ Load Factor; e.g. in a 4G level turn the speed at which the stalling angle is reached is twice what we call the basic stalling speed.
Don't forget that the "penalty paid for the extra lift in turns is extra drag". The airflow over the wing creates forces summarised as Total Reaction (TR). By convention we refer to the useful component of TR (that which is at right angles to the Relative Air Flow (RAF)) as Lift and the component that is parallel to the RAF as Drag, hence if you increase TR you increase drag as well as lift.

The above calculations are theoretical because in turns at full power there are effects of propeller wash, inclined thrust etc which do not occur at the power off stall. The calculations do give you an eye-opening clue as to what happens to your turning performance at full power.

APPENDIX B - RACE CHECK FOR NEW RACE PILOTS

New Pilots attending Race Check flights are required to produce their Pilot's and Aircraft Documents as per the list below. As part of this procedure they will be specifically requested to demonstrate their knowledge of their aircraft's turning performance and the relationship between 'G', bank angle and stalling speed.

DOCUMENT LIST (Please refer to current rules for the latest document requirements and insurance wording)

- Pilots Licence & Medical Certificate
- Aircraft Operating Handbook (C of A only)
- Aircraft C of A / ARC or Permit and Validity
- Aircraft Certificate of Insurance
- Certificate of Release to Service
- Plus other relevant Aircraft Documents

The race check flight will require the aircraft to take off and land using only half the width available of the runway (unless the strip/runway is very narrow), flown on a precise track during take off and landing and to be able to fly level left hand turns on a simulated race circuit at full power, which must of course be flown with a very good lookout and not on instruments.

You will also be required to demonstrate the Loss of Visual procedure given a simulated scenario whilst flying the simulated race circuit agreed with your check pilot. We suggest 4-5 legs about 3 minutes long with easy to see turning points and clear of any built up areas/structures. One leg must have a turn between 120-150 degrees.

At the end of the flight, or beginning if briefed, you fly a simulated Scatter Point 1 and then approach and land on the briefed side of the runway at your nominate IAS speeds.

Pilots are strongly advised to practice before submitting themselves for a check as the accuracy standards required are probably higher than you have previously flown to in General Aviation. Pilots are also advised to make early appointments for a check flight, in time for the race weekend they wish to participate in, allowing plenty of time for weather delays. Check Flights will not be carried out at a race meeting weekend as the Check Pilot maybe a race official or competing race pilot/navigator.

APPENDIX C – CHECK PILOTS AND RACE SUPERVISORS

Please contact the Aviation Secretary, either through the website form or secretary@royalaeroclubrrra.co.uk and he/she will provide you with the contact details of your nearest suitable check pilot.

APPENDIX D – OFFICIALS

Detailed duties of the Race Officials can be found in the Operations Manual Part A Section 3 but the following is a broad summary to give a basic understanding.

Chief Steward – Is assisted by a Steward nominated by him and is primarily responsible to the Chairman for the safe conduct of the meeting and is also the Safety Management System (SMS) manager. The secondary roles are to check that the race has been conducted fairly by scrutinising aircraft and GPS data and to adjudicate any protests made to the Clerk of the Course. In the event of a protest a third steward will be nominated to reach a majority decision. It should be noted that to maintain impartiality the Chief Steward is not part of the race organisation or reporting process.

Clerk of the Course – He is essentially the Race Director and has sole responsibility to the Stewards for the organisation and conduct of the meeting. He will have liased with the airfield and his officials listed below and will give you a briefing prior to the practice and each race and conduct the debriefs. He will take control of the airfield frequency, direct the race and hand control of the frequency back when all racers are on the ground. He will post the provisional results report from the Chief Handicapper and process any protests before announcing the final results. His officials are:

Secretary of the Meeting - Normally this post is filled by the Aviation Secretary and is responsible for the administration side of the meeting and will be the person who you need to report to on the Saturday morning of the race for registration. And hopefully on the Sunday when you collect your trophy they will ask you to sign for it if you are permitted to retain it until the AGM/Prize Giving Night!

Timekeeper (s) – Liases with the Handicapper to ensure racers and officials receive the start times. In conjunction with the Starter they start each competitor and record the elapsed times at the finish.

Starter – When instructed by the timekeeper they will raise and lower the flag to start each competitor and sometimes this will be a VIP guest of the 3Rs.

Handicappers – They will usually be involved in the design of the course and gaining its approval from the CAA. At the race meeting they will enter met data into the race software, plus any Octagon GPS data, to establish a racers handicap speed and produce the start time sheet (shown earlier). After the race they will input the GPS data and produce a provisional results report for the Clerk of the Course. Post race the Chief Handicapper will send you a race report via email for you to analyse and will notify the Chief Steward of any irregularities found in the GPS data.

Chief Marshal/Observer – Responsible for organising the deployment and recovery of the Scatter and Turn Points and briefing any observers who may man one of the points. 3Rs racers hugely respect this job, as the Chief Marshal/Observer will often be out doing his deployment before racers wake up!

Although not a race official the **Social Secretary** is a very important part of the weekend team as they will organise the social aspects of the weekend including transport (if available), the Saturday meal and information on local hotels.

APPENDIX E - AWARDS

FOR INFORMATION ONLY

The up to date points and associated rules are to be found in the 3Rs Rules available from the Documents section of the website - www.royalaeroclubrrra.co.uk

THE BRITISH AIR RACING CHAMPIONSHIP – JUBILEE TROPHY

Championship races are run on both Saturday and Sunday.The points from the pilot's best X races of the season will be calculated for theoverall result.

THE SCHNEIDER TROPHY

To qualify for entry into the Schneider Trophy, both pilot and aircraft, though not necessarily together, must have completed at least one Championship event prior to the race. In addition, both pilot and aircraft together must complete without exclusion for an endorsable offence, the Rolls Royce Merlin Trophy.

THE KING'S CUP

Entry is restricted to British and Commonwealth citizens who must have completed without exclusion for an endorsable offence, the Steward's Cup. In addition both pilot and aircraft, though not necessarily together, must have completed at least one preliminary Championship race out of a season of six or more.

THE MOSSEY PRESTON TROPHY

This is presented to the pilot with the highest number of points overall and includes all races.

THE SONIC CHALLENGE TROPHY

The Sonic Challenge Trophy comprises of all races run on a Saturday.

THE OUTRAM TROPHY

Points are given on every race, to pilots who are in their first season of air racing. They must not have raced in a Records, Racing & Rally Association air race before.

THE MITEL SWORD

This award is presented to the season highest placed acting Service Person, or a person who has previously served in Her Majesty's Armed Forces.

THE ABC TROPHY

This Trophy is presented to the seasons highest placed home built aircraft owner.

THE TWIN ENGINE TROPHY

This Trophy is presented to the highest placed twin engine aircraft owner competing at the Alderney race weekend.

THE NAVIGATOR TROPHY

This Trophy is presented to the season's highest placed navigator.
Points are awarded to all navigators who complete a race without exclusion.

THE PILOTS SALVER

The Pilots introduced the Salver in 1989. It is presented by election from the Pilot members, to a Cause, Person, or Organisation etc., that they think worthy of recognition.