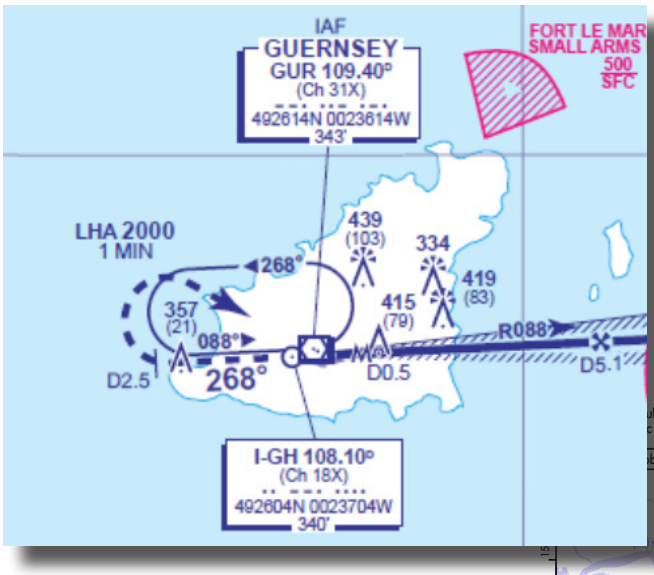
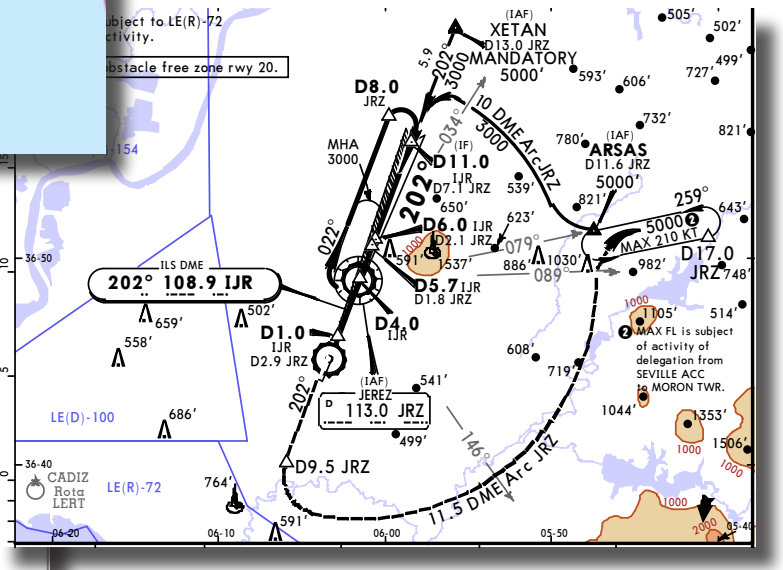
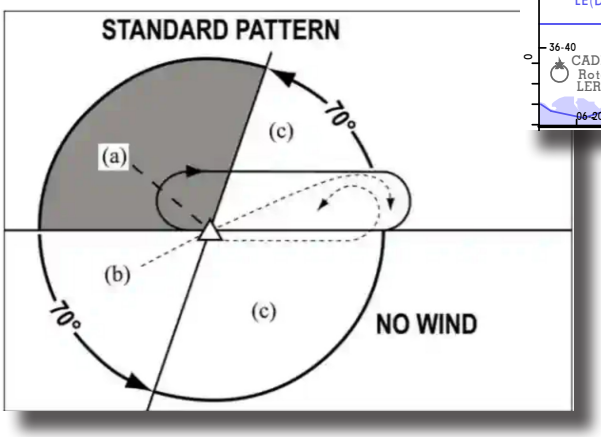
Student Study Guide

Introduction to the Instrument Rating

Stephen R.S. Evans







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Introduction the the Instrument Rating

"In the Empire of the Clouds, there be dragons"

Start Here.....

This is Part 1 in a multi-part series and if this is the first document you have read, you are starting in the right place. I am Stephen Evans and I have been flying IFR for over 20 years and teaching the IR for 4 years. I currently work at Fly-In-Spain at Jerez Airport in southern Spain.

These notes have been written from the experience I have gained watching many Students and the common and not-so-common mistakes they have made.

I was once told as a young man there are three types of people in the world. There are those who never learn from their mistakes. You know them, they are ones who have been married and divorced three times. Then there are those who make mistakes, but learn from them. This is the majority of us. But then there are the really smart ones, who *watch and learn from other peoples mistakes*.

These manuals are a gift from all my previous Students to you. Learn from their mistakes and be part of the "Smart Ones".
To be fair, you have already taken your first steps towards being "smart", as you are actually bothering to read this document.

As you are reading this document, you will have completed either your ATPL or CPL exams and maybe the EASA CBIR exams as well. As such the authority believes you have all the theoretical knowledge needed to be able to go flying in Instrument conditions, but they are wrong.

What you have learnt is "**what**" and "**where**" and "**rules**" . All of the exams are theoretical. You know what a Hold is, but you do not yet know HOW to fly one in. Much of the question bank was written by old *fuddie-duddies*, put out to pasture after a long and illustrious career in aviation like some kind of reward you give a dog for good behaviour.

Maybe they were not even a pilot, maybe an Air traffic controller or worse still a manager? This is the reason much of the syllabus is dogmatic and narrow. By way of example "*Thunderstorms are only ever 1 hour long*". That is because the Swiss author of that particular Met question only has experience of Swiss thunderstorms! A friend in the UK Met Office fell off his chair laughing when he read that one. You get the idea, and probably suspected it yourself already.

Relevant to the IR the "ATPLs" , for example, go into great length to explain the construction of a Hold, but not how to practically fly one in bumpy weather with minimal equipment. Doc 4444 has filled your head with rules and regulations, but nothing about practical mental arithmetic that can be done under pressure and on-the-fly.

As a result of EASA's spectacular focus on facts and figures, there is a massive knowledge gap between practical Instrument Flying and the studies you made to get over the artificial hurdle that was the Exams.

The purpose of these Student notes is not to tell you **WHAT** flying under Instruments conditions is about, but **HOW** to best fly under Instrument rules with simplicity and accuracy.

If you are reading these notes for the first time, then arguably you are about to embark on the hardest course you will face in your flying career. Very few people who obtain a good pass at ME-IR will have any problem with their Type-rating and MCC/JOC/APC course and in this respect the ME-IR is the last big hurdle a prospective commercial pilot has from an airmanship point of view.

The Rating

You are going to apply for an Instrument Rating, Single Pilot Operations.

Some pilots take the CB-IR route. To explain, there is no difference between the standards and accuracy expected of an IR or CB-IR candidate in the IR Test. The only difference is the route they took to the Flying section of the course.

Some CB-IR applicants have a dismissive approach to the IR. Often I hear something quoted like this:

> "*Well why should I learn how to use an RBI and NDB, my Wangdoodle-500 back home has got twin Garmin G1000, SBAS and autopilot, why do I need to learn about such ancient equipment?*"

The answer is is in the small print on the Pilots License.
It will state "Instrument Rating", not "*Herr Schmidt, certified to fly in rain in a Wangdoodle 500*"

The Authority make no distinction between an Instrument Rating that entitles you to fly your Wangdoodle in IMC or a Boeing 737-800 in IMC. This is why the test is professional and difficult. You do not get to pick and choose in the course what you think is relevant or not. You are being tested to become an Instrument Rated Pilot, Single-Pilot Operations.

Reality Check #1

If you believe that flying IR is just about following the "magenta line", you are just about to have a very rude awakening and if I cannot persuade you otherwise, then maybe you are not ready for the responsibility, duty, trust and obligations which come with the grant of the Instrument Rating.

You must therefore approach the course from the point of view of your IR Examiner, who will be the one to give you your IR. Put simply, they have to decide:

> "*Would I be happy putting my children and another 120 people on board a plane piloted by this candidate as a single pilot (the Captain is incapacitated), in icing conditions, at night and in IMC conditions on an Approach into Innsbruck?*"

You need to be honest with yourself first and foremost. Would you be confident with your flying skills to take on this responsibility when you put yourself forward for test? These are the "litmus tests" and "reality-checks" that you should use to assess and be self-critical of your progress.

It is often said that the Private Pilots License is a "license to learn", not so a profession rating such as the IR.

You will have to have all the skills necessary to pass the Skills test, **BEFORE** the test, and not think that you can pick them up along the way afterwards. Now, before you think it, no, you are not expected to fly a 737 in IMC at the end of the course, that is what a type-rating is for.

However, you and four of your mates in a rented Seneca, on your way back from a Skiing weekend trying to divert to Munich due to icing, with all your ski-gear in the back. That's real.

If there is any course that will show up your inadequacies as a Pilot then the IR is it.

Please be under no illusions that this course will test your understanding of aircraft management, planning and accuracy to the limits.

But believe me when I tell you that hard work and focus will all be worth it in the end .

Reality Check #2

The second reality check for you is the realisation that the EASA-stated number of hours for the IR course are an absolute minimum. Unless you are an utter Sky-God in the making, you will need more hours of training than the minimum stated.

The hours stated by EASA is a legal minimum, written by Lawyers, and politicians. It may form the basis of a Training Course, but less than 5% of students will pass the ME-IR on minimum hours.

The reasons are many-fold; poor weather, lack of resources, training interruptions, bad luck and to be frank, your capabilities.

Whatever you do, budget an extra 10-15% of time and money, be prepared to knuckle down and study hard and do not put yourself under undue or unnecessary pressure.
If progress is slower than you had imagined, just accept it and keep moving forward. Under no circumstance set artificial deadlines by cancelling accommodation or booking return flights, as this will create a highly-negative learning environment, in what is already an highly stressful situation.

Listen to your Instructor. They know how to teach, because they them selves are constantly learning from the mistakes their students make. *This makes you are the beneficiary of other peoples errors*, so be happy when your Instructor makes suggestions or debriefs you, they are trying to help you.

Lastly be humble, accept the comments made to you and be prepared to be self-critical. Don't over-do it so you lose confidence, but be prepared to laugh at yourself when you really mess-up, it will help your learning mentality and relieve pressure. This is important as very few people learn under excess pressure.

You are at the School to learn and humans learn from making mistakes. You are here to make mistakes and fail in a safe, controlled environment.

My Dad told me: "I*f you make a mistake and you can imagine sometime in the future to look back and laugh at it, then laugh at it now*". Pick yourself up, dust yourself down and get back on the horse!

Don't take your eyes off the prize. Once you have your IR and the first time you execute a flight in real-IMC down to minimums and you walk away from the plane; you will suddenly realise the enormity of your achievement and the sense of pride of achieving a safe flight. This will make everything worthwhile.

This I promise you.

One last piece of encouragement, when you sit down with your Examiner, assuming the performance, mass and balance and planning has been done right, they will assume you have already passed. It is only your errors that will stop this from happening

Reality Check #3

Homework. You will need to set aside at least one hour of personal study, per day, outside of the lessons to minimise repetition of Instructor-led lessons.

You need peace and quiet to practice what you have learnt and to prepare for the next lesson.

This could be used for practicing on a personal simulator, reading through your notes of the previous lesson and the feedback from the instructor. It may well be preparing for the next lesson or reading about the next subject.

If the comments in **Reality Check #2** concern you, then good-quality personal study is the most effective way to reduce the possibility of over-running on your hours.

The Course Structure

The Instrument rating is actually two synergistic disciplines that compliment each other.

These are:

- Applied IF, and
- Radio Navigation

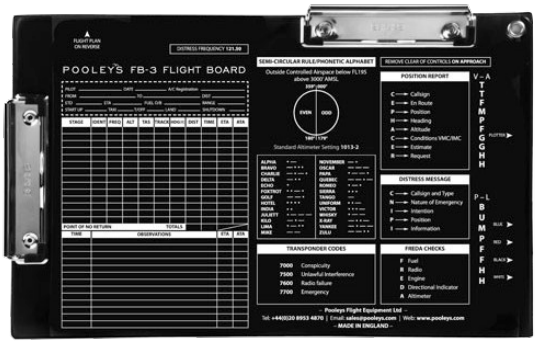
Applied IF is covered in the next section of this series and is about how to fly an aircraft with sole reference to its instruments. Crudely put, "*how to fly in the crap and deal with problems when they come up.*"

Radio Navigation, is rather facetiously, "*once you are in the crap, how to fly to where you want to go, and if you can't, what are you going to do about it?*" *

Getting Organised.

You should get yourself organised before the course starts.

Kneeboard



Get an A4 kneeboard. You want the Pooleys FB3, which has a side-ring clips for A5 hole-punched binder pockets. **Price: ~€27.00.** Don't bother with A5 kneeboards, they are way too small, and frankly embarrassing. *Buy A5 in haste, repent at leisure.*

What you are going to do is print off your Approach Plates for all the Airports you are likely to visit, their SID's, STARS and the Radar Sectors for your local area. You will then, for every flight, arrange these plates like so:

- Aerodrome Taxiway Plate
- SID(s) for Departure Aerodrome
- Radar Sector Minimum Altitude Chart / Relevant Airways Chart
- STAR(s) for Arrival Aerodrome
- Approach Plates for your Arrival Aerodrome
- STAR(s) for your Diversion Airfield (Home Base?)
- Approach Plates for the Diversion Airfield.

Can you see what you have done? You have told the story of your planned flight and arranged the information you need in the order that you need it. The issue is, every flight is different and the A4-sized PDF's of the plates that come off of the National Authorities web-site or Jeppesens are bulky and cumbersome.

Solution: we print our plates two-per-A4 (within the browser or Acrobat print dialog box), and then cut the A4 in half. This gives us two A5 plates.

You then buy A5 transparent Binder Pockets and put your Plates in them. You will need to buy at least 15, but it is now a simple job to select and arrange your required flight-plates prior to each and every flight. **Price: ~€5 for 10**

Now you will understand the reason for getting a Kneeboard with side-rings. As you progress the flight, you simply flip over the last (now unwanted) plate to reveal the next one relevant to the next stage of the flight.

** Crying out "inshalla", and letting go of the controls is not a valid option !*

So for example:

You have completed the power-checks and are ready to taxi. The top plate when sitting on the Apron will be the Taxiway/Aerodrome plate so you know where "*E4 via T7 and A2*" is before you move off blocks. Once at the runway hold, just flip-over the Taxiway plate, and bingo!

There is your Standard Instrument Departure. ("SID").

Once the Sid is completed, you move to the En-Route phase of the flight.

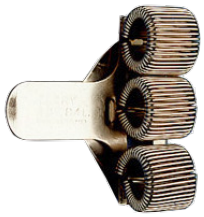
Simply flip over the SID and there is either the Radar Minimum Sector ("RMS") chart waiting for you, or if "On Airways" then you need the Airways Chart.

If flying "Off-Airways" then the RMS chart will give you Minimum Safety Altitudes to work with. If you make reference to your position on the RSA to your Examiner at Top of Climb ("ToC"), and declare you have achieved Minimum Safe Altitude ("MSA"), you have got another tick in the box and because you have referenced the RMS, they know your are not bulls**tting. (*this assumes you have of course reached MSA, if not, say not*)

On arriving at your destination, you come off Airways and flip the plate over to reveal the Standard Arrival ("STAR") to the Intermediate Approach Fix ("IAF"), where you might do a Hold, but in any case, you can then flip that over to the relevant Approach Plate.

This is what is meant by Cockpit management. In addition there is the Pilots Log ("PLOG", more on this later). Together the Plates and PLOG are tested for Cockpit management as part of your exam.

If you walk into to the Examiners briefing room and meet them for the first time and they see that you have a fully prepared Kneeboard, Plate plan and PLOG, then Tick ✓



Pen Clips

Pen-Clips for your Kneeboard. Get the 3x holder version, that is for :

- 1x Chinagraph pencil / felt-tip pen
- 1x ball-point pen
- 1x Pencil

If you are right-handed, mount it on the Kneeboard along the right-hand (short) side at the bottom. This way you can easily slide your pen/pencil etc in sideways and puts them out of the way. **Price: ~€5.00**

Pencil

Take my advice, get a Staedtler propelling pencil. The best one is the Stadtler Mars Micro, work a bit harder and try to get the rarer 0.9mm model, go for soft leads, HB or soft 2B.

This pencil has a sprung head, so if in turbulence you press too hard, it's less likely to break the lead.
Price: ~€7.00 for pencil, €3.00 for a pack of spare leads.

In 22 years of IF and aerobatics flying in some fairly rough weather, they have never let me down. Once you have used one, you wont go back to ball-point pens.

Sometimes the 0.9mm is difficult to get hold of, in which case the 0.7mm is a good compromise.

Timepiece.

You need something with a second-hand on it, preferably analogue for reasons that will become apparent later. Don't waste your money on "bling" at this stage with a Breitling.

Once you have passed your A320/B737 type rating and completed your line training and you have your Second-Officer wanker-bars, then maybe. But realistically you will be so broke anyway so it will be the last thing on your mind !

A Seiko or Casio is absolutely fine. If it has a Stopwatch function then good, if it has a resettable Second-hand, then perfect. **Price: ~€50.00**

Self-Study and Homework

If you do not have a personal copy of the procedural training software, **RANT XL**, get one. **Price: £80.00**

You can download a Demo version for free. https://www.oddsoft.co.uk/downloadt1.html

If you are lucky enough to be a Student at Fly-In-Spain, then we have a copy available for use by the Students in the Briefing Room.

Your Instructor will show you how to get the best from it, but more important it will raise your situational awareness so that you are able to absorb the lessons being taught, especially the Single-needle work.

However I thoroughly recommend and encourage you to buy a personal copy for use at your home/hotel/Air B&B etc during the course.

Trust me I still use my copy today for practicing.

The Author can get a discount of £5 if you buy from him and he will even include a Staedtler pencil in the price and we have them off the shelf in Jerez.

RANT XL needs an Intel Windows PC/Laptop to run, but does not require much processing power so an old Pentium with Windows XP will do! If you are an Apple fan, you have two options, Parallels/Virtual Box plus a copy of Windows (ouch!) or WINE. WINE does not need a copy of Windows to work so saving money and time as you don't have to boot Windows first.

The thing is WINE is a bit convoluted to setup, but the author has successfully got it working on an Intel Mac, albeit with some minor, insignificant issues. Buy from him, he will set it up for free.

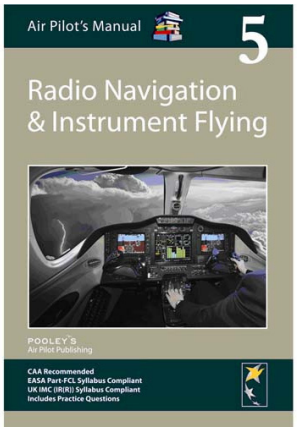
Also consider getting Microsoft Flight Simulator/X-PLane to practice hands-on instrument flying. The costs of the software and a USB-yoke are minuscule compared with the total cost of an Instrument rating.

Try eBay for pre-owned equipment as often these kits gets sold once a an IR student passes their Skills Test. As I am sure you will.

If these pieces of software can save you a few hours of Simulator lessons, or more importantly aircraft time, then it will be worth it.

Student Manual

For a Student Manual there are many books written about the IR. My notes are meant to supplement what has already been written and to offer practical mid-air advice on how to fly under Instrument Conditions rather than be a definitive guide.



For this reason I recommend the "Air Pilots Manual" produced by Pooleys and their "Radio Navigation & Instrument Flying Book", which is derived from the original work of the UK CAA-respected author, Trevor Thom, for his series of PPL books.

At Fly-In-Spain ("FIS") the IR instructors have standardised the use of this book for theory.

At FIS your IR Instructor may give you homework based on certain chapters of the book before your next lesson, as we use the material inside as a our Student study guides.

If you are a Student of Fly-In-Spain, we have produced a Starter Pack of all of the above items (except the watch) and is held in stock for simplicity, so saving you time and delivery costs.

Reality Check #4

The total cost of all of these items, will be approximately €200, which is equivalent to approximately 30 minutes flight training in a Seneca. You can now see, that a modest investment early on, can easily pay for itself later on.

Where Next ?

You have now completed Part 1 of an x part series. Why x? Well I don't yet know how many more of these I will have time to write, so we shall see. :-)

The next Study Guide is "Applied IF", but where to get it and the rest of the series?

My website has all of the documents here:

https://evansabove.us/fte_plates/index.php

Being publicly available, although I retain the copyright, I do not charge people to read and use them.

What I ask is that, if you find them useful and they assist you, then you buy me a Beer (or two!), equivalent to about one-quarter of the money you save. Fair enough?

Stephen Evans
2022