Weather for GA

Julian Scarfe
PPL/IR Europe
www.pplir.org

Europe Air Sports

EGU

EHPU

EPFU

EPU

PPL/IR

EMFU

EMF

Europe Air Sports

Three key points

PPL/IR EUROPE

- We're humans, not automatons
- Wolves are dangerous, really
- Treat GA as an innovative, agile market

Risk

- We improve safety by managing risk
- The only way to manage risk to zero is not to fly
- Most GA accidents arise through lack of awareness of risk rather than choice to take a known risk
- Quality information is the key to changing risks from unmanageable to manageable
- Some risks can be (almost) eliminated by reasonable and pragmatic rule-based mitigation measures
  - e.g. without visual reference, only flying trajectories known to be free of terrain and obstacles avoids Controlled Flight Into Terrain
- Other risks are more difficult to eliminate
  - e.g. mid-air collision by using see-and-avoid

GA risk portfolio

PPL/IR EUROPE

- Loss of Control in-flight [LOC-I]
- Controlled Flight into Terrain [CFIT]
- Mid-air collision [MAC]
- Transition from Ground ⇔ Air
- Handling Technical Failures

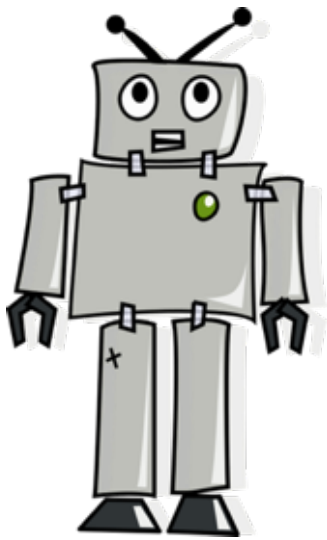
The weather hazards

- Convection
  - LOC-I
- Icing
  - LOC-I
- Wind (in the boundary layer)
  - Ground ⇔ Air
- Low cloud and visibility
  - Ground ⇔ Air, CFIT, LOC-I for VFR

The pilot as an Automaton

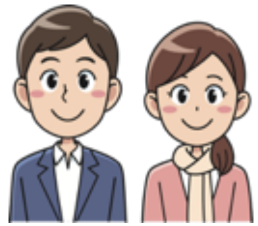
NCO.OP.135
(b) Before commencing a flight, the pilot-in-command shall be familiar with all available meteorological information appropriate to the intended flight. Preparation for a flight away from the vicinity of the place of departure, and for every flight under IFR, shall include:
(1) a study of available current weather reports and forecasts; and
(2) the planning of an alternative course of action to provide for the eventuality that the flight cannot be completed as planned, because of weather conditions.

- Pilot plans flight one day in advance
- Pilot wakes up on morning of flight
- Pilot reviews weather at airport one hour before flight
- Pilot makes objective go/no-go decision based on available information
- Pilot returns home if flight aborted



The pilot as a Human Being

PPL/IR EUROPE



- Pilot invites friends for a day trip 3 days in advance
- Pilot books aircraft (with opportunity cost)
- Pilot arrives late at airport, aircraft has not been fueled as requested
- Pilot makes quick check of wx for outbound flight
- While at destination, one friend explains the importance of the board meeting he is due to attend next morning
- The weather for the return is marginal, actually a bit worse than marginal…

Consequences of the pilot as a human

- Good information *days* in advance allows the pilot to:
  - Flex the timing of the flight
  - Flex the destination of the flight
  - Set expectations with passengers and other stakeholders
  - Make contingency plans by public transport…

- If we want to avoid pilots making bad decisions, we need to help them to make real risk management decisions in the real world.

- Forecasts over a few days timescale matter

Wolves

PPL/IR EUROPE

- The boy who cried “wolf!”
  - Aesop's Fable #210

- Warnings that do not correspond to experience tend to be ignored after the first few appearances, and are disregarded in risk assessment

Don’t pet the cat!

- Conservatism in forecasts can be counterproductive

Moderate icing

The weather hazards

- Convection
  - LOC-I
- Icing
  - LOC-I
- Wind (in the boundary layer)
  - Ground ⇔ Air
- Low cloud and visibility
  - Ground ⇔ Air, CFIT, LOC-I for VFR

Convection – variables

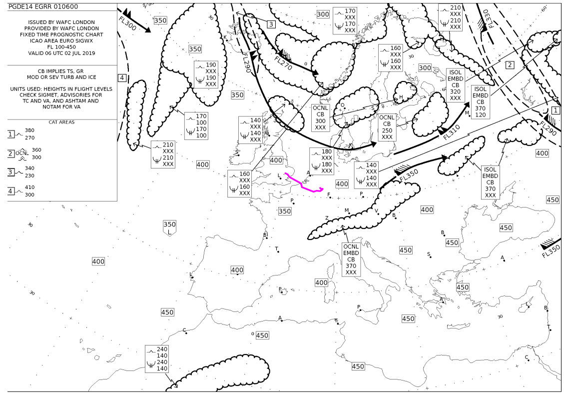
PPL/IR EUROPE

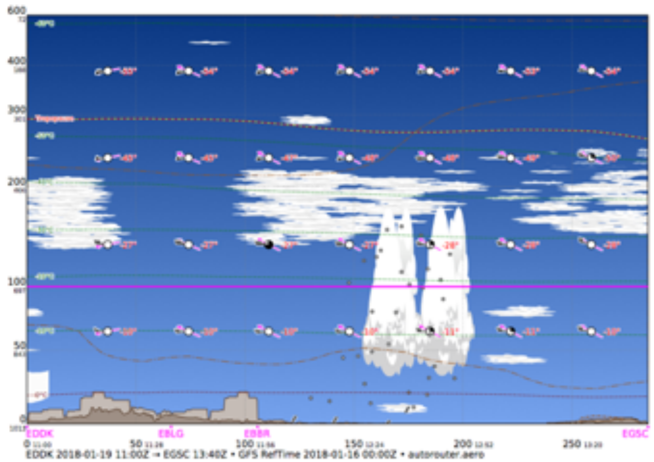
- The tops
  - Can I get above the convection?
- The base
  - Could I fly VFR below the convection?
- The distribution
  - Can I steer around the convection, including the shoulders
  - Visible or embedded in layers
- The intensity
  - Growing or dying?

Convection – current info

PPL/IR EUROPE

- The tops
  - SIGWX charts, GFS model
- The base
  - TAFs, SIGWX charts
- The distribution
  - TAFs (TEMPO vs PROB40 TEMPO vs PROB30 TEMPO)
  - Lifted index and CAPE
  - Rainfall radar images in flight
- The intensity
  - Lifted index and CAPE





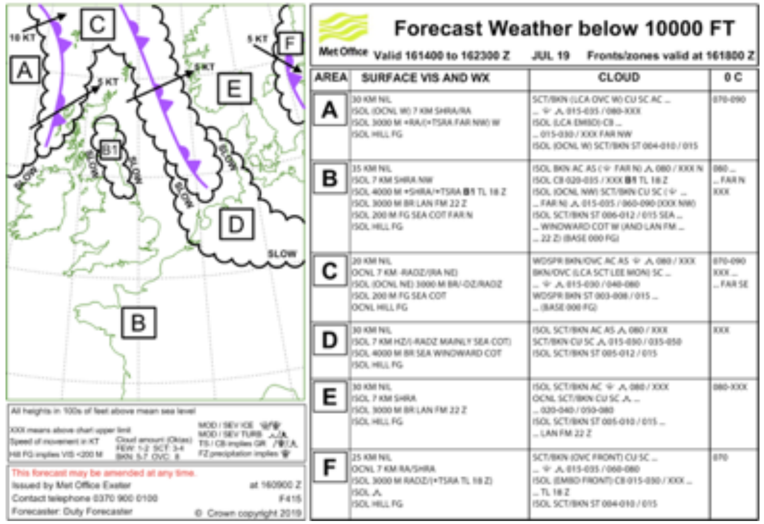
Icing – variables

- Levels of the icing layer
  - Can I cruise in an ice-free layer?
  - Can I get to/from my cruising level without significant exposure?
  - Is there warm enough air to shed icing above the MSA?
- Intensity/distribution of icing within the layer
  - How long can I tolerate in the icing layer?

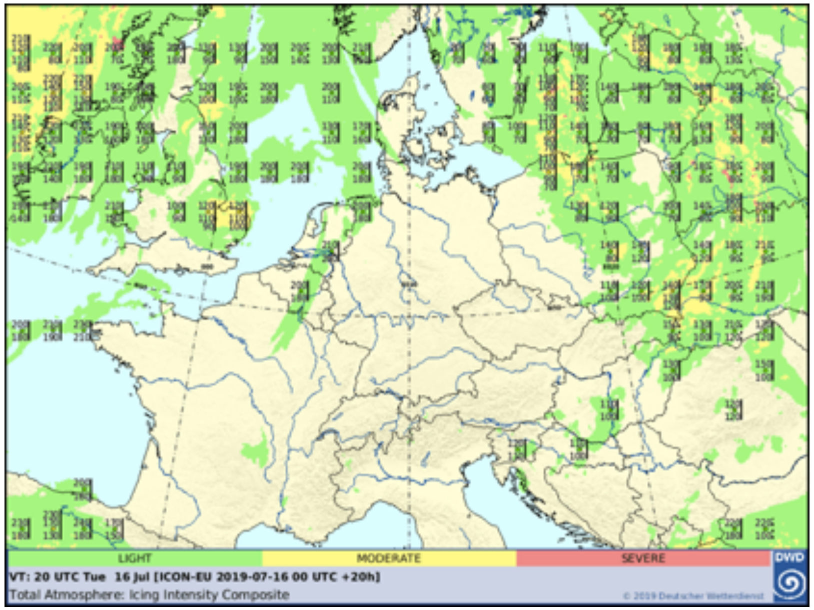
Icing – current info

PPL/IR EUROPE

- Levels of the icing layer
  - GFS model for temperatures (SIGWX charts are poor)
  - ADWICE



- Intensity/distribution of icing within the layer
  - GFS model cloud base/tops and RH + SIGWX charts for likely cloud distribution at levels
  - ADWICE



Wind – variables

- Surface wind strength and direction
  - Assess suitability of particular runway
- Short term temporality – gustiness
  - Significantly increases risk of mishandling
- Longer term temporality – transience
  - Can often wait out the gustiness associated with a shower

Wind – current info

PPL/IR EUROPE

- Surface wind strength and direction
  - TAFs and METARs
  - GFS model output (mean surface wind)
  - Often too coarse to be useful (+/-30 deg is a big difference)
- Short term temporality – gustiness
  - TAFs and METARs
  - GFS model output (max surface wind)
  - Not sensitive enough (+ 10 kt is a big difference)
- Longer term temporality – transience
  - TAFs and METARs

Low cloud & visibility – variables

For IFR operations, only interested in airports

- Net requirement: probability of visual reference from minima at time T
- Slant range “visibility” from decision point to touchdown point – will I see (enough) lights?
  - Need to plan alternates to mitigate risk
- Low level cloud much more significant for 2D approach operations (non-precision approach) or with higher DHs
  - Becoming less critical as 3D approaches dominate
- Time dependence of visibility and cloud
  - Hold or divert decision

Low cloud & visibility – current info

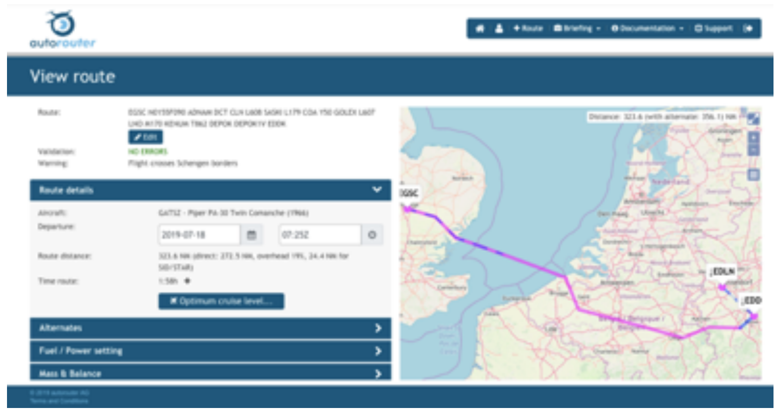
PPL/IR EUROPE

- Slant range "visibility"
  - TAFs and METARs
  - Difficult to get good info days ahead
- Low level cloud much more significant for 2D approach operations (non-precision approach) or with higher DHs
  - TAFs and METARs
  - Difficult to get good info days ahead
- Time dependence of visibility and cloud
  - TAFs and METARs

Innovation in General Aviation

PPL/IR EUROPE

- All the successful innovation in GA has come from the bottom up, without regulatory intervention e.g.
  - Skydemon
  - FLARM
  - Autorouter
- Mandates and certification stifle innovation by reducing flexibility
- National Met Providers do **not** need to develop end-to-end solutions, but cost-effective access to good data is required to facilitate third parties to develop safety-enhancing applications



Three key points

- We’re humans, not automatons
  - Don’t assume perfect, objective decisions
  - Help us to plan ahead
- Wolves are dangerous, really
  - Specificity, not just sensitivity, is key to good information
  - Avoid “false positives”, unnecessary warnings
- Treat GA as an innovative, agile market
  - Inform GA pilots about risks, do **not** impose standards
  - Focus at an EU and national level on access to data