Case 4

Route: Lydd to Oxford (VFR)
Date: 28 February 2023, departing 0900 hours UTC

Let's take a look at the weather forecast, assess the potential threats and start investigating how to mitigate against these risks.

a. Synoptic situation

What are the broad features in the synoptic chart, what is the main type of airmass covering the region and what kind of weather can we expect from it? How strong is the wind likely to be and what will its direction be?

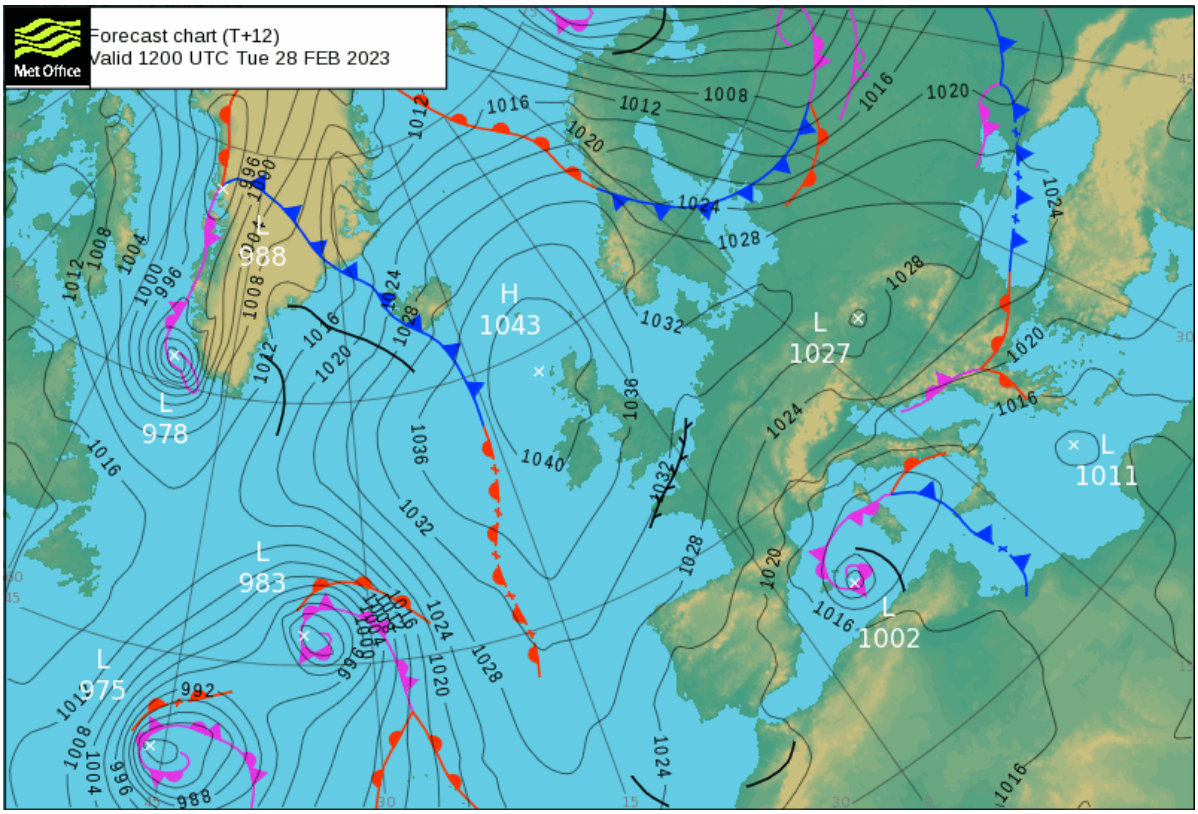


Fig xx-x: Synoptic Chart 28 February 2022, valid at 1200 UTC

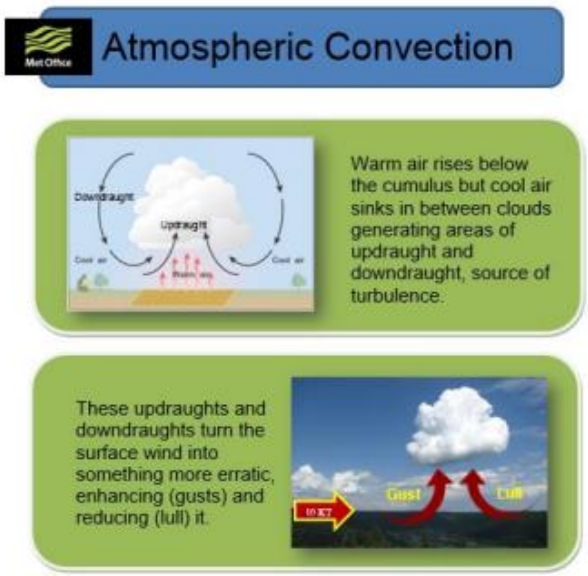
In this case study the UK is dominated by an anticyclone centred over northern Scotland. Anticyclones normally bring settled weather, however the seasons and origin of the airmass often result in differences in cloud cover. For example, whilst we associate high pressure as bringing fine sunny weather to the UK during the summer, the same high pressure can lead to extensive cloud cover at other times of the year – what is commonly known as 'Anticyclonic gloom'. The incidence of cloud cover 'trapped' under an

anticyclone can have a significant impact on air temperatures, especially under a clear high pressure during winter months. This combined with light winds and moist ground can increase the potential for fog to form.

Wind flow is clockwise around an anticyclone, so in this example southern England is influenced by a NE'ly airflow. The synoptic chart also highlights a trough line running along the English Channel, likely to be the result of the airmass being modified by its passage over the relatively warm water of the English Channel. Troughs are indicative of lines of convection, often producing showers. What impacts might convective activity have over Kent as we prepare our flight?

So, whilst anticyclones are associated with generally fine flying conditions, the seasons, origin of the airmass will all have an impact on the weather. In winter, consider the potential for low temperatures (and, consequently, a low freezing level), areas of fog, cloud cover and the direction of wind flow.

Consider also the potential for locally induced convective activity over relatively warm surfaces and as the day warms, which may result in downdraughts, turbulence, reduced visibility, airframe icing and frozen precipitation, as summarised below.



b. Area forecast

In this case study we will consider the GAMET area forecast for the SE of the UK, valid for the period 0800-1700 UTC. The flight from Lydd to Oxford exists entirely within the area bounded by the SE GAMET, so this area forecast should be our focus. Looking at the GAMET, is there anything along the route that we should be taking into consideration? What is the main cloud base and visibility? What is the altitude of the freezing level? Can we expect any weather, turbulence or icing?

Met Office

GAMET Area Forecast
AMEND WEATHER CONDITIONS

GAMET South East Region
Issued on Tuesday 28 February 2023 at 08:09

Valid for 0800-1700 UTC

Met Situation Valid at 1200 UTC
MOD NE FLOW ACROSS THE REGION. A TROUGH LIES FROM N5130 E00200 TO N5000 E00000 TO CHERBOURG, MOV WSW AT 5KT IN THE E AND SLOW-MOV IN THE W.

Strong wind warning
ISOL SEA COT, MAINLY NEAR TROUGH, MEAN 15-20KT WITH GUSTS 25-30KT.

Freezing Level
GEN 2000FT BUT 3000FT FAR NE.

Weather Conditions

Zone 1

WHOLE REGION:

GEN 35KM, WITH 2-6/8CUSC 2500FT/3000-4000.

FitzRoy Road, Exeter, Devon, EX1 3PB United Kingdom

enquiries@metoffice.gov.uk
www.metoffice.gov.uk

ISOL, OCNL TROUGH, 7KM IN SHRA, WITH 0-4/8ST 800-1200FT/1500 AND 5-7/8CUSC 1500FT/6000-8000.
ISOL UPSLOPES, 4000M IN RADZ WITH 6/8ST 600-800FT/1500 AND 7/8SC 1500FT/6000.
ISOL LAN TL 10Z, 4000M IN BR WITH 4/8ST 400FT/1500.
ISOL TROUGH FM 15Z, 3000M IN HVY SHRA WITH 7/8CUSC 1500FT/11000.
ISOL LAN TL 09Z, 200M IN FG OR FZFG WITH 5/8ST SFC/1000.

WRNG: HILL FG. MOD ICE AND MOD TURB IN CLD.
***ISOL SEV ICE IN CLD BTN 3000FT AND 9000FT NEAR TROUGH E. ***

Wind

Norwich			
Height (above ground level) / time (UTC)	0900	1200	1500
1000ft	020 20 KT +03	030 20 KT +03	030 20 KT +03
3000ft	020 20 KT -02	030 20 KT -01	030 20 KT -01
6000ft	060 20 KT -05	060 20 KT -06	050 25 KT -06

Southampton			
Height (above ground level) / time (UTC)	0900	1200	1500
1000ft	030 20 KT +02	020 20 KT +03	020 20 KT +04
3000ft	040 20 KT -02	030 20 KT -02	020 25 KT -01
6000ft	050 25 KT -06	060 25 KT -06	050 25 KT -06

Oxford			
Height (above ground level) / time (UTC)	0900	1200	1500
1000ft	020 15 KT +02	030 15 KT +03	020 20 KT +03
3000ft	030 20 KT -03	030 20 KT -02	030 25 KT -01
6000ft	050 20 KT -05	050 20 KT -05	040 20 KT -06

Gatwick			
Height (above ground level) / time (UTC)	0900	1200	1500
1000ft	020 20 KT +02	020 20 KT +03	020 20 KT +04
3000ft	040 25 KT -02	030 25 KT -02	030 25 KT -01
6000ft	050 30 KT -07	060 30 KT -06	050 30 KT -07

Regional Outlook (Valid 1800-2400 UTC)
SIMILAR.

UK Extended Outlook (Valid 0000-2400 UTC)
HIGH PRESSURE REMAINING DOMINANT, CENTRED NW OF THE BRITISH ISLES GIVING LARGELY SETTLED CONDITIONS AND A LIGHT TO MOD N TO NE FLOW.

WDSPR SCT/BKN, LCA FEW LEE MON, CUSC WITH ISOL SHRA SEA WINDWARD COT, OCNL UPSLOPES. RISK OF SHSN ON MON, MAINLY IN THE N. ISOL, BUT OCNL UPSLOPES IN E, ST AND HILL FG. RISK ISOL BR AND FG/FZFG DEVELOPING OVERNIGHT, CLEARING MID MORNING.

WINDS LIGHT TO MOD N OR NE.

In general, we can expect good visibility throughout our flight, with areas of cloud with a base of 2500ft. The tops of these clouds are 4000-4000ft, so fairly shallow. The highest point over the South Downs is 900ft and 1000ft over the Cotswolds. Area forecast references to cloud are referenced to mean sea level, so over these areas of high ground, the cloud base will only be about 1500ft.

A concern is the presence of the slow moving trough line, which is very close to our departure airport, Lydd. Close to the trough the GAMET highlights a chance of showers. In any showery activity we can expect the cloud base to lower to 800ft and the surface visibility to reduce to 7km.

Other possible hazards include a small risk of rain or drizzle on upslopes that face the direction of the wind flow. These may reduce the cloud base to 600ft and the visibility to 4000m. Over high ground this will mean cloud on the surface, so we should not discount the potential for localised areas of mist or fog, resulting from cloud lowering to the surface.

In areas of cloud we can expect the potential for icing and turbulence (which may be severe close to the trough). We should therefore definitely avoid entering areas of cloud cover.

Spot wind and temperatures are available for Gatwick, which is along our intended route, and for Oxford (our intended destination). At our flying altitude we can expect a NE'ly wind at 20KT, and outside air temperature below zero. The freezing level section of the forecast confirms the zero degree isotherm at 2000ft.

There is a strong wind warning in effect for coastal areas and close to the trough. Lydd is both coastal and near to the trough. Lydd's runway is aligned 03-21, so thankfully cross wind on take-off should not be an issue. However, beware of gusts to 30kts.

c. Site specific information

Let's have a look at the METARs/TAFs along the route, do they confirm the information contained in the GAMET? Have we checked possible diversion airfield(s) along the track as well as our destination? Are they suitable?

METAR EGMD 280820Z 02010KT 9999 VCSH SCT014 BKN019 BKN024 05/03 Q1032=
METAR EGKK 280820Z 01008KT 340V040 9999 SCT018 03/01 Q1033=
METAR EGKB 280820Z 35007KT 9999 BKN017 02/01 Q1033=
METAR COR EGLL 280820Z AUTO 01004KT 340V040 9999 NCD 03/01 Q1034 NOSIG=
METAR EGUB 280820Z 00000KT 7000 3000NE BR FEW003 OVC017 M00/M00 Q1034 TEMPO 7000 BR RMK YLO1 TEMPO WHT=
METAR EGTK 280820Z 01006KT 9999 VCSH SCT012 BKN017 04/03 Q1034=

TAF EGMD 280757Z 2809/2818 02009KT 9999 FEW015 SCT025 PROB40 TEMPO 2809/2818 03015G25KT 7000 SHRA BKN008=
TAF EGKK 280458Z 2806/0112 02008KT 9999 SCT035 PROB30 TEMPO 2806/2810 BKN009 PROB30 TEMPO 2816/2823 7000 SHRA BKN014=
TAF EGKB 280757Z 2809/2818 01007KT 9999 FEW005 SCT030 PROB30 TEMPO 2809/2810 7000 BKN005 PROB30 TEMPO 2810/2812 BKN010=
TAF EGLL 280459Z 2806/0112 02009KT 9999 FEW045 PROB30 TEMPO 2806/2809 BKN007 PROB30 TEMPO 2809/2811 BKN014 PROB30 TEMPO 2812/2822 8000 SHRA BKN014=

TAF EGUB 280755Z 2809/2818 VRB02KT 6000 BR BKN020 PROB30 TEMPO 2809/2813 SCT012 BECMG 2810/2813 9999 NSW BKN025 TEMPO 2813/2818 BKN020 PROB30 TEMPO 2817/2818 SCT014=
TAF EGTK 280757Z 2809/2818 02008KT 9999 FEW015 SCT025 PROB40 TEMPO 2809/2812 BKN012 PROB30 TEMPO 2815/2818 8000 SHRA=

The METARs prior to take-off are looking fairly promising with good visibility (9999) and variable amounts of cloud at about 2000ft (remember, the cloud base in METARs and TAFs are referenced to ground level, not mean sea level). However there is a shower reported close to Lydd and Oxford (VCSH), and patchy low cloud at Benson (FEW003). The cold surface temperatures confirm the risk of carburettor and/or airframe icing in any cloud.

The TAFs along the route are consistently highlighting a probability (PROB30 or PROB40) of lower cloud during the morning. A good clue is the closeness of the air temperature and dew point values in the METARs, the closer they are the greater the risk of low cloud and /or poor visibility – the risk of fog is low, but not zero (remember, TAFs will omit weather conditions that are considered to be less than 30%).

d. Threat & Error Management

ANTICIPATION: Consider you limits and how the forecast cloud, visibility and weather hazards may present a threat. Lydd to Oxford is a fairly long flight so pilots need to have determined their own personal minima, and then compare that to the worst of the forecast weather enroute and the availability of nearby good weather options to get down safely.

- Cloud base and visibility values provided in any aviation forecast should be regarded as the most likely values, however be aware of the potential for lower than forecast cloud and/or visibility along the route.
- Visibility and cloud base is generally suitable for the flight, but here remains a risk of low cloud and/or visibility. What will we do in the event that encounter such conditions?
- Our planned route takes us over the relatively high ground of the South Downs and Cotswolds. Will we have sufficient cloud base to fly at a Minimum Safe Altitude and avoid icing conditions?' (remembering that cloud base detail in area forecasts are referenced to mean sea level, not ground level). An IMC/IR rated pilot would face the fact that, on going IMC, the rules say that you must fly at Minimum Safe Altitude (MSA), which is terrain elevation +300' for unmapped obstacles +1,000' safe clearance – this puts us into the 'icing zone' due to the low freezing level.
- What is our plan in the event that we encounter convection. Yes, the risk is forecast to be low, but it is not non-existent. In such an eventuality, we may encounter icing and turbulence, how do we intend to plan to avoid this situation?
- **Have we checked the latest forecast just before our flight? The GAMET used in this case study has been amended from the original forecast issued (in this case to draw awareness to an increased risk of severe icing in cloud close to the trough).**
- The risk of encountering low cloud and reduced surface visibility reduces during the afternoon. Might we consider delaying our flight for a couple of hours?

RECOGNITION: A safe flight depends on being able to conduct safe VFR navigation and respond to unexpected hazards.

- A big threat is sudden inadvertent IMC due to a low and fluctuating cloud base. This is a big cause of 'loss of control' and 'controlled flight into terrain' for non-instrument pilots. Do we have a plan to mitigate this threat?
- If we need to avoid low cloud en-route, what are our plans for diversion, delay, extended fuel use etc?
- Are we maintaining height/altitude accurately? Are we aware of vertical airspace limitations?
- If we find ourselves in cloud and are starting to detect ice accretion, what are our plans for manoeuvring out of the cloud and to de-ice?

RECOVERY: The potential for relatively low cloud and the possibility of convective showers makes planning for these eventualities important. South-east England is a very busy environment where nav and comms workloads tend to be very high, so bad weather could easily lead to overload. The stress of bad weather would just add to that.

- Do we have diversion information for appropriate airfields along our planned track?
- Have diversion plans and clear go / no-go decision points for the flight. Be prepared to develop and adapt recovery plans as situations develop.
- What is our plan for becoming unsure of our position if we inadvertently find ourselves in cloud? When did we last practise with London Centre / D&D on VHF 121.5MHz?
- Ensure careful monitoring of fuel, distance, speed and elapsed time when dealing with delays from encountered weather.
- During take-off for this flight, be ready to deal with gusts by changing your airspeed by up to 10KTs

e. Summary

Anticyclonic conditions normally provide settled weather. In this case the settled weather takes form of patchy cloud and good visibility along the route. This confidence is somewhat tempered by the potential for areas of cloud to lower close to, or onto, the surface, along upwind slopes of high ground. The other factor is the chance of convective activity, including showers, particularly close to the departure point.

Hazards to be aware of, and to plan for, therefore include; inadvertent IFR, icing, turbulence, showers enroute, and gustiness at take-off.