# COPS Aircraft Flight Planning:

## Mission Scenario

## “High Pressure Convection”

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## CI forcing processes

❶ ❷ Surface/boundary layer triggered air mass convection **(non-forced/non-frontal)**

❸ ❹ Large-scale lifting, no surface front; convection breaking out over a wider area **(forced/non-frontal)**

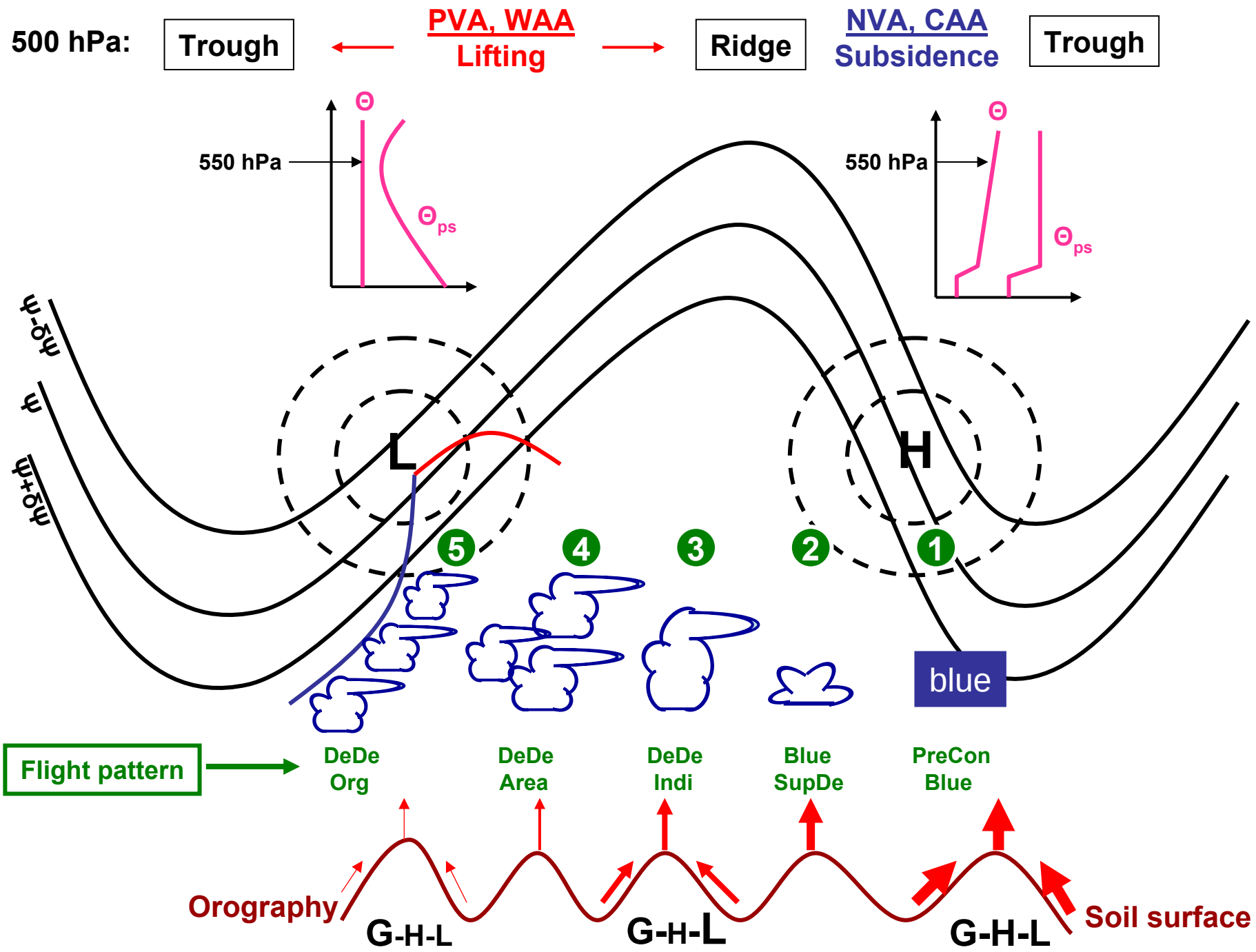
❺ Embedded convection along a surface front in a region of large-scale lifting **(forced and frontal)**

## Mission Szenarios

**Scenario "Forced Convection" addresses cases ❸ to ❺**

**Scenario "High Pressure Convection" addresses cases ❶ to ❸**

**Scenario "Targeted Observations" (E-TReC)**


500 hPa:
Trough
PVA, WAA
Lifting
Ridge
NVA, CAA
Subsidence
Trough
Θ
550 hPa
Θps
Θ
550 hPa
Θps
ψ-δψ
ψ
ψ+δψ
L
H
5
4
3
2
1
blue
Flight pattern
DeDe
Org
DeDe
Area
DeDe
Indi
Blue
SupDe
PreCon
Blue
Orography
G-H-L
G-H-L
G-H-L
Soil surface

# Mission Scenario "High Pressure Convection"

## Blue Sky --- > Shallow Convection -- > Deep Convection-- > Dis. Convection

non frontal / non forced

**07—08--09---10---11---12---13---14---15---16---17---18---19---20---21---22 local**

G-Falcon ----------FLUX pattern (up to 3 times)
----------FL 130 or 180 , Drops----------

F-Falcon ----------MAP pattern (1) ---------→BOX pattern CuCong, Cb----------
----------FL 150, Drops----------→FL150, Drops ----------

(*)BAE 146----------LONG-LEGS---→BOX pattern----------
----------VFR < FL 100-→FL 100/270 ----------

(*)DO 128----------FLUX pattern (2 to 3)----------→BOX pattern (DeDe)----------
----------mid/upper PBL (VFR)----------→up to FL 245 (IFR) ----------

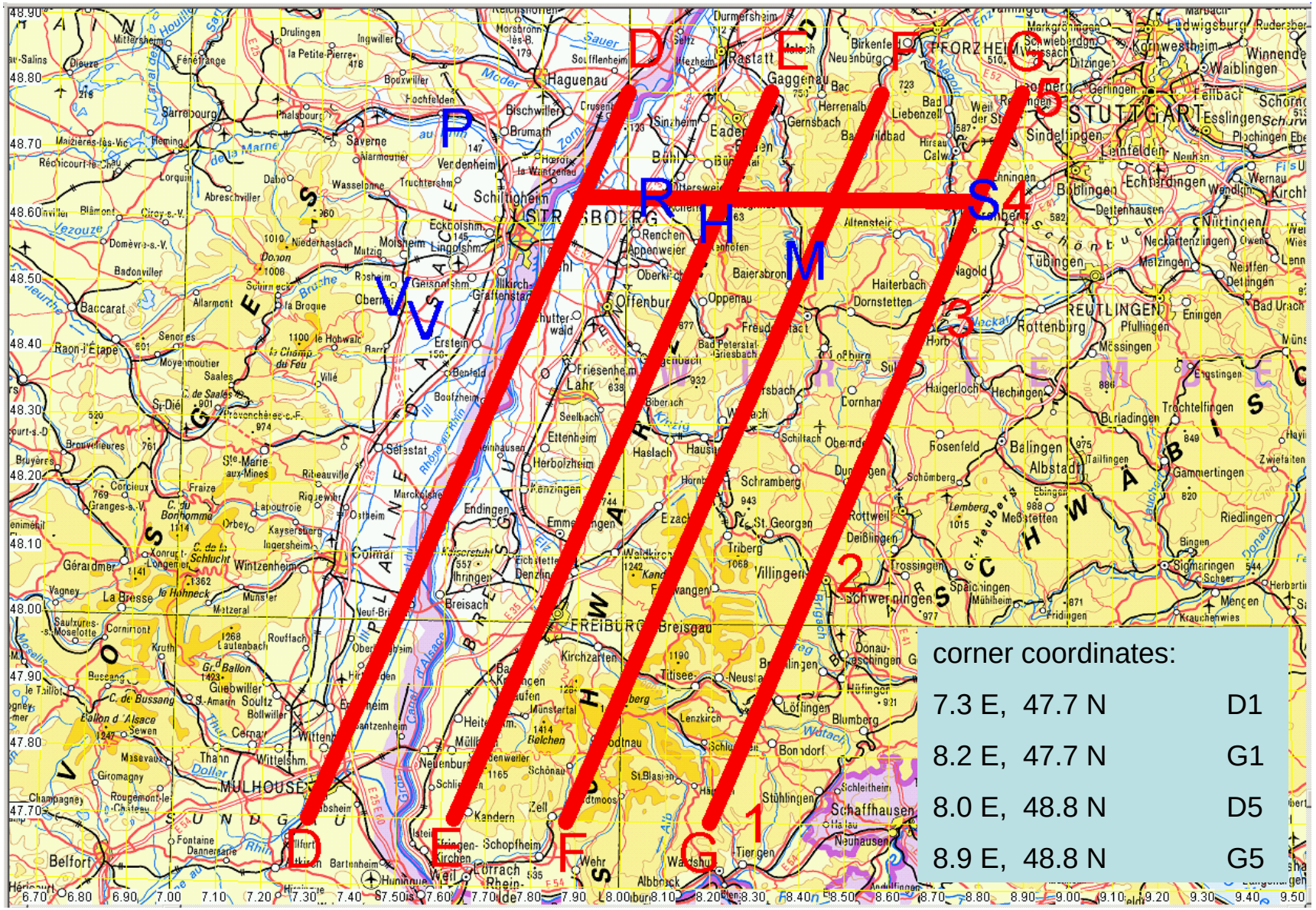
*Zeppelin--Valley pattern (Rhine-Kinzig-Murg-Nagold)----------Valley pattern (R-K-M-N)--→CuCong----
---lowest level, VFR----------lowest level, VFR----------→on request-

*Dimona----------MAP (2 MAPs) or Valley----------MAP (2 MAPs) or Valley----------
----------lowest level PBL (VFR)----------lowest level PBL (VFR)----------

*Enduro----------Triangle/Cross-Section/Slope----------Triangle/Cross-Section/Slope----------
----------low PBL, FL100 (VFR)----------low PBL, FL100 (VFR)----------

*: VFR

# Scenario: High Pressure Convection; Platform 2: G-Falcon; Mission: FLUX



**Scenario:** **High Pressure Convection**
**Platform 2:** **G-Falcon, D-CMET**
**Mission:** **FLUX-PATTERN**

**# Flight level:**
FL 180 (~ 6 km)

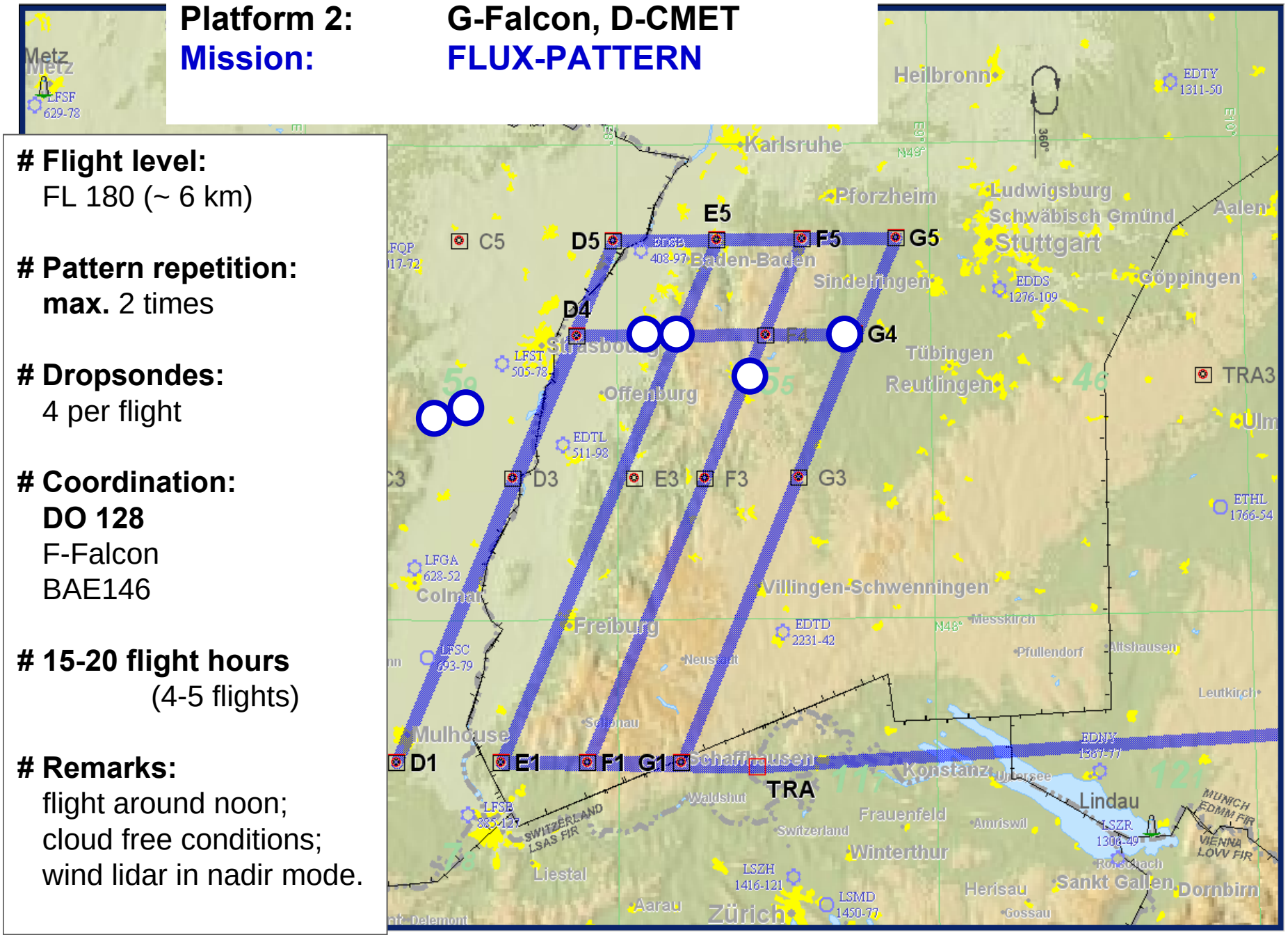
**# Pattern repetition:**
**max.** 2 times

**# Dropsondes:**
4 per flight

**# Coordination:**
**DO 128**
F-Falcon
BAE146

**# 15-20 flight hours**
(4-5 flights)

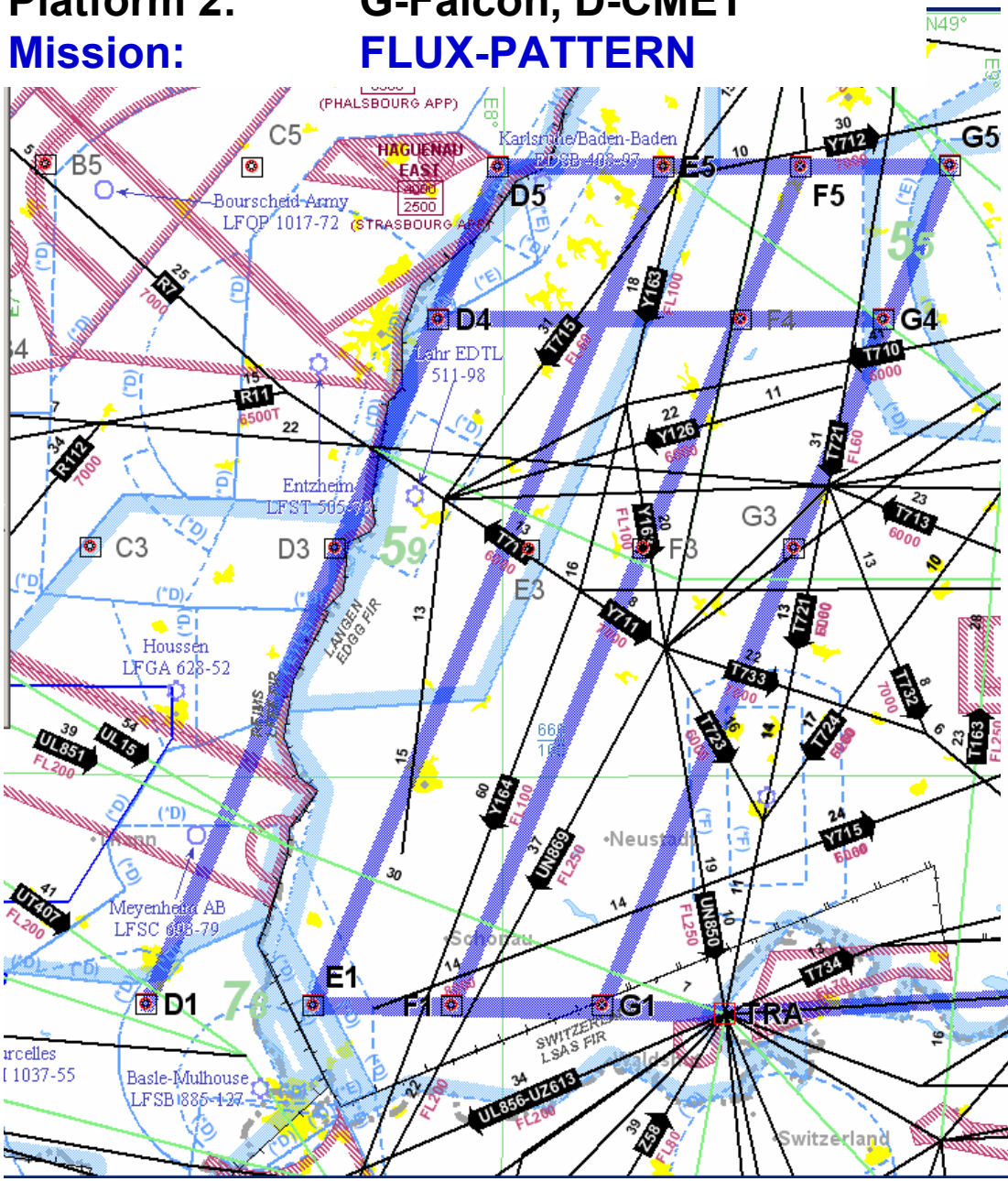
**# Remarks:**
flight around noon;
cloud free conditions;
wind lidar in nadir mode.



**Scenario:** **High Pressure Convection**

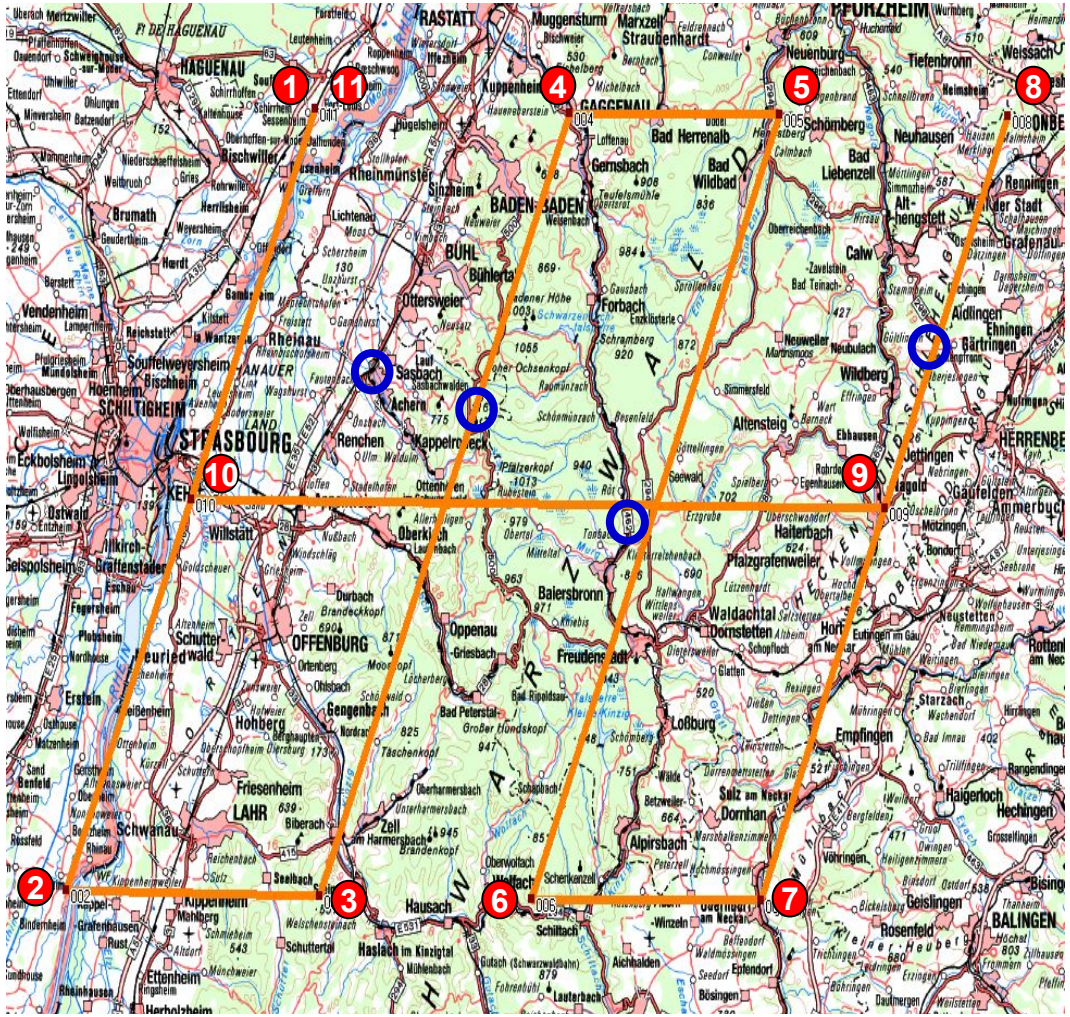
**Platform 2:** **G-Falcon, D-CMET**

**Mission:** **FLUX-PATTERN**




- EDMO (Oberpfaffenhof
- KPT (Kempten)
- TRA (Trasadingen)
- Waypoint at "G1"
- G5
- Waypoint at "F5"
- Waypoint at "F1"
- Waypoint at "E1"
- Waypoint at "E5"
- Waypoint at "E5"
- Waypoint at "D5"
- Waypoint at "D1"
- Waypoint at "D4"
- Waypoint at "G4"
- Waypoint at "G1"
- Waypoint at "F1"
- Waypoint at "F5"
- Waypoint at "E5"
- Waypoint at "E1"
- TRA (Trasadingen)
- KPT (Kempten)
- MERSI
- MAH (Maisach)
- EDMO (Oberpfaffenhof

**Scenario:** High Pressure Convection
**Platform 5:** DO 128, D-IBUF
**Mission:** FLUXES-RHS




| | |
|---|---|
| **# Upper level:** | below FL 100 |
| **# Lower level:** | 500 ft agl |
| **# Coordination:** | D-CMET<br>BAE 146<br>Dimona<br>Enduro,<br>Zeppelin |
| **# Airbase:** | KA Baden/Baden |
| **# Level:** | 1-2 within PBL<br>1 above PBL |
| **# Profiles:** | on demand (< FL 100) |
| **# Specific:** | time-coordinated flight with D-CMET below northern part of D-CMET |

**O Supersites**

# COPS Aircraft Flight Planning:

## Mission Scenario

## “Targeted Observations”

**in sensitive upstream regions,**
**~ 24 h before deep convection within**
**COPS area is forecasted.**

**Scenario:** Forced Convection
**Platform 2:** G-Falcon, D-CMET
**Mission:** TARGET

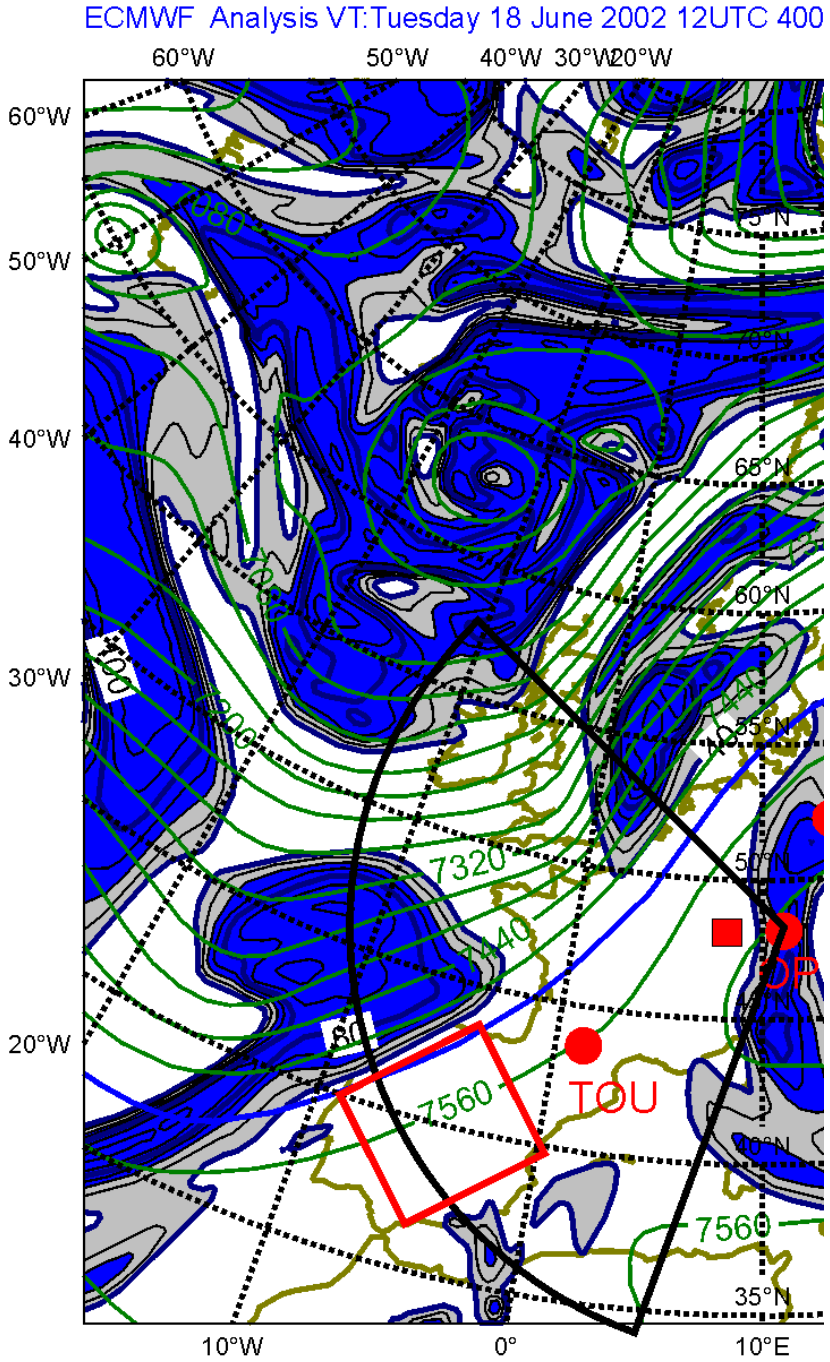
**Red box: target region.**

**Black segment: sector of likely target regions with a radius of 1800 km.**

**Measurements along PV streamers or streamlines during transfer to target region.**

- **Wind lidar in scanning mode**
- **FL 310 - 410**
- **~20 flight hours (5 flights)**
- **~30 dropsondes**

**Problem: DS over France/Spain/GB?**



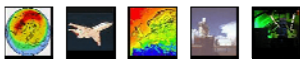

Relative humidity and geopotential height at 400 hPa on 18.6.02 12UT, 30 h before heavy precipitation occurred in the Black Forest.

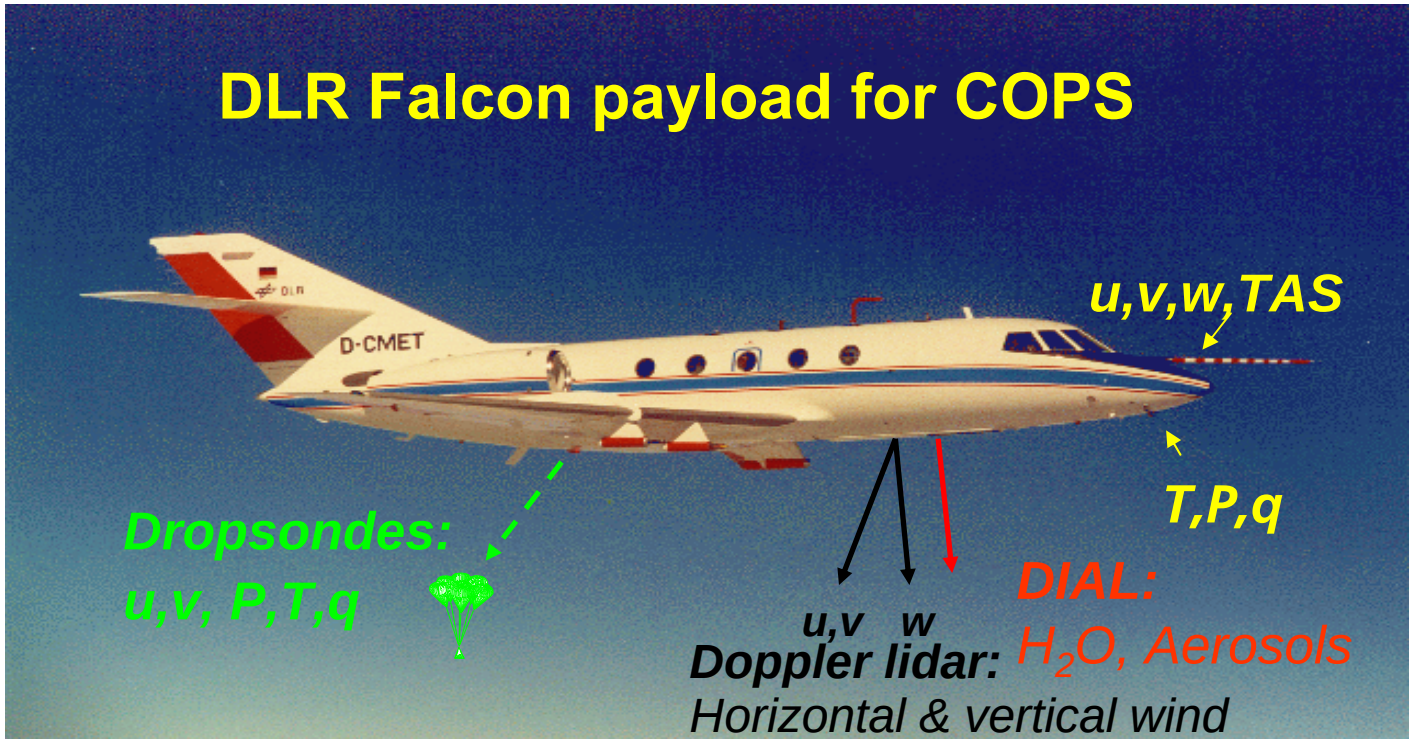
# Proposed Decision Plan for Aircraft Missions

- **3 COPS generic mission scenarios:**
  - **forced convection,**
  - **high pressure convection,**
  - **targeted observations.**

- **COPS Briefings:**
  - **All PI's can suggest missions based on the generic scenarios.**
  - **Decision making with respect to weather situation and remaining flight time allocated to the respective mission** (like IHOP_2002).
  - **10:00 LT of day before mission: submit flight plan to ATC.** Reasons: dense airspace over Germany, complex authorization process in France.








| Altitude [m]<br>FL [hft] | 3000<br>100 | 6000<br>200 | 9500<br>310 | 12500<br>410 |
|---|---|---|---|---|
| Range [km] | 2100 | 2800 | 3200 | 3700 |
| Endurance [h] | 04:10 | 04:15 | 04:45 | 05:00 |

**Availability: Weeks 26 - 31, 6 weeks from 28.6. - 5.8.2007.**

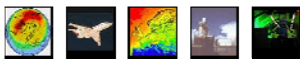
installation, test & first mission flight in week 26.

**In total 45 flight hours, 40 days funded 50/50 by DFG/DLR-IPA.**

# Use Baden Airpark or Oberpfaffenhofen?

- Advantages:
  - saves ~ 30 min for each flight,
  - more flexibility for weekend operations,
  - direct participation in mission planning & science meetings.
- Disadvantages:
  - no support for lidar maintenance,
  - limited data evaluation capability (no wind).
- Compromise:
  - occasionally land in Baden, depending on mission planning.
  - Permanently 2 DLR persons for mission planning in Baden during the 6 weeks of Falcon presence.





# DLR Falcon Objectives for COPS

Investigate the connection between tropospheric wind and water vapour structures (PV and moisture streamers, dry layers) and the location and timing of convection and precipitation. Detailed knowledge of the large-scale conditions is a prerequisite for improving QPF.

Characterise the initial and boundary conditions of convection with high resolution wind and water vapour fields. Investigate the spatial variability of humidity, wind and latent heat fluxes. Contribute to improve parameterisations of subgrid-scale processes over complex terrain.

Perform targeted upstream measurements for the quantification of humidity advection to the COPS area and for near real-time assimilation of humidity into a NWP model, which will significantly improve short range QPF.