# ACHA NAVIGATION MANUAL

PLAN ACCURATELY, FLY ACCURATELY, THINK AHEAD


ACHA NAVIGATION MANUAL – VERSION 1.0 – 08012023

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AEROCLUB HILVERSUM - AMSTERDAM

CUSTOMIZED FOR NL-ATO-227

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### 0.1 REVISION RECORD

| REVISION | REVISION DATE | TOTAL PAGES | REVISED PAGES | NOTES |
|---|---|---|---|---|
| 1.0 | 08-01-2023 | 43 | ALL | Eerste versie |
| 1.1 | 28011-2023 | 2 | 19,28 | Boldprint trekfout/sluithoek<br>Note extra fuel |
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# CHAPTER 1 INTRODUCTION

### 1.1 PREFACE

The art of navigating, from point A to point B, flying a certain route or a combination of both. A good navigation flight stands or falls with: good preparation, accurate flying and thinking ahead; PLAN ACCURATELY, FLY ACCURATELY, THINK AHEAD.

There are basically 4 ways of navigating:
1. Pilotage (following rivers, streams, railroads, highways, etc)
2. Dead reckoning (course and stopwatch)
3. Ground based radio navigation (VOR, ADF)
4. Satellite based navigation (GPS)

This manual mainly covers "pilotage" and "dead reckoning" and Sky Demon (GPS)

Nothing in this manual will prevent the PIC from using common sense and, should the need for it arise in the interest of the safety of passenger, pilot and aircraft, deviate from rules, regulations and procedures.

### 1.2 ACHA

With the ATO of the ACHA, the approach is that you first learn to navigate using clock, map, ground (in that order). The idea is that you do this for the first few overland flights with a backup of Sky Demon. If this goes well, this will turn around and Sky Demon will become "primary" and the map secondary (read: the backup). Both disciplines must be at a sufficient level and both are examined. When we talk about "map", it means; drawing the route on the map plus a fully completed navigation log. The following is consulted/used in preparation for the navigation flight:
1. AIP
2. Luchtvaartmeteo.nl to obtain the latest official weather
3. Homebriefing.nl for the latest and relevant NOTAMs
4. 1:500.000 ICAO Aeronautical VFR kaart, AIP approach kaartjes
5. Aircraft POH/AFM
6. Plotter in E6B
7. Stopwatch or watch with stopwatch function

**1.3 CONCEPTS**

Course (track) the line that the aircraft follows on the ground in relation to true north (TT) or magnetic north (MT).

Heading is the direction that the longitudinal axis of the aircraft points in relation to true north (TH), magnetic north (MH) or compass north (CH).

In aviation, winds are given in relation to true north, except for wind given by the control tower or ATIS, which is given in relation to magnetic north.

Correct way of converting a course to a direction;
TT + WCA = TH + VAR = MH + DEV = CH

The Garmin G5 in ACHA planes does not indicate heading but magnetic track (with the exception of the PH-DON). To calculate from TT to MT; TT + VAR = MT. There is no need to do any wind or compass correction on the MT.

IAS to TAS = IAS + 2%/1000ft.

All theory about variation, deviation, track, track error, wind triangle and use can be found in the Bas Vrijhof books.

**1.4 WHAT ARE WE GOING TO DO?**

Navigating a planned route on the ground with accurate times.
This can be for the benefit of:

- A flight from A to B
- Specific route (for sightseeing, photo flight, etc)
- Combination of both

1. In case of first: check AIP if the field is open, if flight can be made within UDP and if there are any restrictions for the field (PPR, fueling, etc).
2. In case of second: check the route globally and check that it does not go through prohibited, restricted or danger areas. If so, check AIP (section enroute, navigation warnings) for opening criteria (times, NOTAMs) and consider planning around these areas if necessary. If the route goes through a CTR, consider planning around the CTR (crossing clearance is often given, but in case of refusal, a "last minute change of plan" becomes necessary).
3. In case of combination of both: both of the aforementioned checks.

**Note: Example navigation flight is based on the C-172 (PH-DON). For the DV20 use the graphs in the performance chapter in the DV20 manual.**

# CHAPTER 2 FLIGHT PREPARATION

### 2.1 CHOICE OF WAYPOINTS

Waypoints must of course be easy to recognize. A certain shape or characteristic of the turning point that is stands out from the immediate surroundings makes it easier to recognize from the aircraft. Think of a "weird" bend in the river, crossing of major highways, cities or a bridge ect. A handy tool for this is Google Earth. Google Earth is often more accurate than the map and you can better visualize what a point looks like.

Points that are high, for example a lighthouse, are difficult to recognize from height or with poor visibility, but easily recognizable with good visibility and flying at low altitude. Visualize how you can recognize a point from the air. Also think about contour lines (not so relevant in the Netherlands) and how they can hide your point. (See also chapter 3.6)

In this manual, we call these waypoints "checkpoints". Checkpoints because at these points we check whether we are still navigating correctly and whether navigation changes are needed for the rest of the flight.

### 2.2 DRAWING UP A CARD

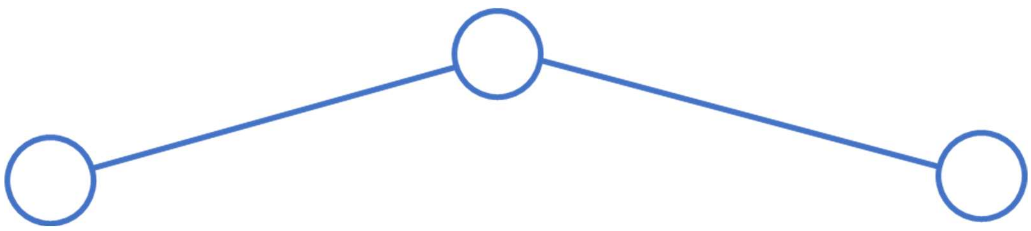
Once the route is known, draw circles in the map around Checkpoints (waypoints) to the destination.
The first circle starts on: (we call it " starting point" in this manual):

1. a clearly recognizable point near the airport to which you can fly visually or;
2. the departure fix if indicated on an AIP visual departure map.

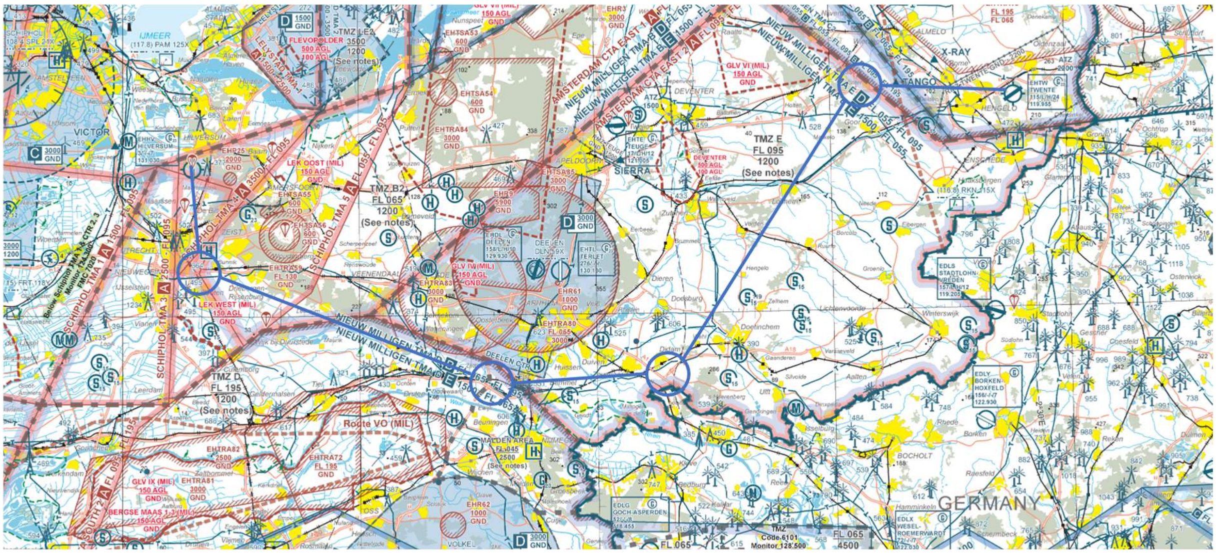
The last circle is on: (we call that "endpoint" in this manual):

1. A clearly recognizable point near the field of arrival or;
2. A clearly recognizable point near the arrival fix if indicated on AIP visual approach chart (MIKE at EHLE or S at EHTE bv).

Draw lines from circle to circle where the line goes through the two turning points but does not infringe inside the circle so we can clearly see the checkpoint.



The first line goes from the departure field to the *starting point* (which can be approached visually) or the departure fix, the last line goes from the *end point* through the airport of arrival. Use a black thick pencil on a paper map or an erasable marker on a laminated map.
Below is an example of a route from EHHV to EHTW.


TMZ E
FL 095
1200
(See notes)
TMZ B2
FL 065
1200
(See notes)
TMZ D
FL 195
1200
(See notes)
NIEUW MILLIGEN TMA
SCHIPHOL TMA 3
LEK WEST (MIL)
LEK OOST (MIL)
VICTOR
SIERRA
TANGO
X-RAY
Route VO (MIL)
GERMANY

## 2.3 THE VFR NAV LOG

A line on the map alone is not much use. To create structure in the flight, we use a NAV LOG. In this log we put all items that are important and/or useful to be able to navigate our route as well as possible.

**VFR – NAVIGATION LOG**

| | | | | | | |
|---|---|---|---|---|---|---|
| ENIGINE START : | | REGISTRATION : | | RADIO FREQUENTIES | | |
| TAKEOFF : | | TACHO : | | HILVERSUM RADIO : 131.030 | : | : |
| LANDING : | | HOBBS : | | AMSTERDAM INFO : 124.300 | : | : |
| ENIGINE STOP : | | VUT : | | DUTCH MIL : 132.350 | : | : |

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| TIME | | FLIGHT TIMES | | | ENROUTE | ALTITUDES | | HEADINGS | | | | | | | | | | FUEL | | SPEEDS | | DISTANCE | | WIND | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LEG | ACC | ETO | RETO | ATO | CHECKPOINT | MSA | ALT | MT | CH | ± DEV | MH | VAR | TH | WCA | TT | | | START | BURN | TAS | GS | LEG | ACC | DIR | SPEED |
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**WEATHER LOG:**

| | METAR | | TAF | |
|---|---|---|---|---|
| DEPARTURE | | | | |
| ENROUTE | | | | |
| DESTINATION | | | | |
| ALTERNATE | | | | |
| WIND 500 ft | ° | | kts | °C |
| WIND 1500 ft | ° | | kts | °C |
| WIND 3000 ft | ° | | kts | °C |
| WIND FL50 | ° | | kts | °C |
| WIND FL100 | ° | | kts | °C |

**NOTAMS:**

| | |
|---|---|
| DEPARTURE | |
| ENROUTE | |
| DESTINATION | |
| ALTERNATE | |
| | |
| | |
| FLIGHTPLAN FILED? ☐ YES ☐ NO | |

**FUEL CALCULATION:**

| | VOLUME | WEIGHT | TIME |
|---|---|---|---|
| TAXI AND RUNUP | | | |
| TRIP | | | |
| CONTINGENCY (5%) | | | |
| ALTERNATE | | | |
| FINAL RESERVE | | | |
| EXTRA | | | |
| TOTAL TAKE-OFF FUEL | | | |

TAXI FUEL + TRIP FUEL + CONTINGENCY FUEL + ALTERNATE + FINAL RESERVE FUEL + EXTRA (IF REQUIRED) = TOTAL TAKE-OFF FUEL

**MASS & BALANCE**

| | MASS | ARM | MOMENT |
|---|---|---|---|
| BASIC EMPTY WEIGHT | X | = | |
| PILOT + FRONT PASSENGER | X | = | |
| REAR PASSENGER | X | = | |
| LUGGAGE | X | = | |
| ZERO FUEL MASS | X | = | |
| FUEL | X | = | |
| TOTAL MASS AND MOMENT | | | |

MASS X ARM = MOMENT | MOMENT ÷ WEIGHT = CENTER OF GRAVITY (CG)

**TAKE-OFF DISTANCES**

| | TORA | GROUND ROLL | 50 FT OBSTACLE |
|---|---|---|---|
| SOFT-FIELD | | | |
| HARD-SURFACE | | | |

**LANDING DISTANCE**

| | LDA | GROUND ROLL | 50 FT OBSTACLE |
|---|---|---|---|
| SOFT-FIELD | | | |
| HARD-SURFACE | | | |

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## 2.4 CHECKPOINTS

Write down on the NAV LOG at 'checkpoints'

- Field of departure.
- *Startpunt* of departure fix.
- All intermediate checkpoint (waypoint).
- *End point.*
- Field of arrival.

Draw a line from the departure field to the starting point or departure fix (if published) and determine the distance and increase it by 2 miles due to the circuit/departure route. If the route to the departure fix deviates significantly from a straight line, determine the distance as best you can (scale on map can be used) and increase by 2 miles. <u>Calculating a course is not necessary because we will fly visually flown to this point.</u>

**Calculate the true course (TT) for each subsequent leg** using, for example, a plotter **and distance**, note it in the NAV LOG.

Draw a line from the end point to the field of arrival and increase the distance by 2 miles for the circuit. If the route from the end point to the field of arrival deviates significantly from a straight line (e.g. due to a published arrival route), determine the distance as best you can (scale on map can be used) and increase the distance by 2 miles. <u>Calculating a course is not necessary, after all, it is flown visually from here.</u>

Below, completed NAV LOG with true courses (TT) and distances.

**VFR – NAVIGATION LOG**

| | | | |
|---|---|---|---|
| ENIGINE START : | REGISTRATION : | RADIO FREQUENTIES | |
| TAKEOFF : | TACHO : | HILVERSUM RADIO : 131.030 | |
| LANDING : | HOBBS : | AMSTERDAM INFO : 124.300 | |
| ENIGINE STOP : | VUT : | DUTCH MIL : 132.350 | |

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| TIME | | FLIGHT TIMES | | | ENROUTE | ALTITUDES | | HEADINGS | | | | | | | | FUEL | | SPEEDS | | DISTANCE | | WIND | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LEG | ACC | ETO | RETO | ATO | CHECKPOINT | MSA | ALT | MT | CH | ± DEV | MH | VAR | TH | WCA | TT | START | BURN | TAS | GS | LEG | ACC | DIR | SPEED |
| | | | | | EHHV | | | | | | | | | | | | | | | | | | |
| | | | | | BEGINPUNT | | | | | | | | | | | | | | | 10 | 10 | | |
| | | | | | WAYPOINT | | | | | | | | | | 111° | | | | | 25 | 35 | | |
| | | | | | WAYPOINT | | | | | | | | | | 088° | | | | | 14 | 49 | | |
| | | | | | EINDPUNT | | | | | | | | | | 034° | | | | | 27 | 76 | | |
| | | | | | EHTW | | | | | | | | | | | | | | | 14 | 90 | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
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**2.5 HEIGHTS**

→ *Minimum*
Determine the minimum altitude as follows: 500ft or 1000ft above highest obstacle. Follow the course with the plotter, take the highest obstacle and increase by 500ft or 1000ft. In the Netherlands, obstacles lower than 328ft are not shown on maps, if visibility is poor, consider adding 328ft to 500ft or 1000ft to determine minimum altitude. Round up.

In NAV LOG, write down the MSA (minimum safe altitude = the height that is definitely free of obstacles if you don't know exactly where you are). In our example, first leg 374+500, second leg 606+500, third leg 606+500.

*(SERA 5005.f) Except when necessary for take-off or landing, or except by permission from the competent authority, a VFR flight shall not be flown: (1) over the congested areas of cities, towns or settlements or over an open-air assembly of persons at a height less than 300 m (1 000 ft) above the highest obstacle within a radius of 600 m from the aircraft; (2) elsewhere than as specified in (1), at a height less than 150 m (500 ft) above the ground or water, or 150 m (500 ft) above the highest obstacle within a radius of 150 m (500 ft) from the aircraft.*

→ *Maximum*
Service ceiling of aircraft.
Cloud base or 1000ft below the cloud base (depending on airspace classification).
Airspace classification, where **can** you fly.
VFR cruising altitudes/levels boven 3500msl.
(in the transition layer you can only climb/descend, NOT fly level. SERA.3110)

Write down on NAV LOG at ALT the altitude you want to fly depending on

- Airspace.
- The prevailing wind and/or sun (long navigation leg against the sun is less pleasant).
- 'Economy cruise' (see next chapter).
- Your own preference and the above minimum and maximum

In our example, we take 2000ft.

**VFR – NAVIGATION LOG**

| | | RADIO FREQUENTIES | | |
|---|---|---|---|---|
| ENIGINE START : | REGISTRATION : | | | |
| TAKEOFF : | TACHO : | HILVERSUM RADIO : 131.030 | | |
| LANDING : | HOBBS : | AMSTERDAM INFO : 124.300 | | |
| ENIGINE STOP : | VUT : | DUTCH MIL : 132.350 | | |

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| TIME | | FLIGHT TIMES | | | ENROUTE | ALTITUDES | | HEADINGS | | | | | | | | FUEL | | SPEEDS | | DISTANCE | | WIND | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LEG | ACC | ETO | RETO | ATO | CHECKPOINT | MSA | ALT | MT | CH | ± DEV | MH | VAR | TH | WCA | TT | START | BURN | TAS | GS | LEG | ACC | DIR | SPEED |
| | | | | | EHHV | | | | | | | | | | | | | | | 10 | 25 | | |
| | | | | | BEGINPUNT | 900 | 2000 | | | | | | | | 111° | | | | | 25 | 35 | | |
| | | | | | WAYPOINT | 1200 | 2000 | | | | | | | | 088° | | | | | 14 | 49 | | |
| | | | | | WAYPOINT | 1200 | 2000 | | | | | | | | 034° | | | | | 27 | 76 | | |
| | | | | | EINDPUNT | | | | | | | | | | | | | | | 14 | 90 | | |
| | | | | | EHTW | | | | | | | | | | | | | | | | | | |

## 2.6 VARIATION

Determine the variation on the route that is flown. Use the thumb rule EAST LEAST/WEST BEST.
In other words, with west variation a +, with east variation a – (in the Netherlands -1 or -2).
Note this variation in the NAV LOG at VAR.

**VFR – NAVIGATION LOG**

| | | RADIO FREQUENTIES | | |
|---|---|---|---|---|
| ENIGINE START : | REGISTRATION : | | | |
| TAKEOFF : | TACHO : | HILVERSUM RADIO : 131.030 | | |
| LANDING : | HOBBS : | AMSTERDAM INFO : 124.300 | | |
| ENIGINE STOP : | VUT : | DUTCH MIL : 132.350 | | |

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| TIME | | FLIGHT TIMES | | | ENROUTE | ALTITUDES | | HEADINGS | | | | | | | | FUEL | | SPEEDS | | DISTANCE | | WIND | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LEG | ACC | ETO | RETO | ATO | CHECKPOINT | MSA | ALT | MT | CH | ± DEV | MH | VAR | TH | WCA | TT | START | BURN | TAS | GS | LEG | ACC | DIR | SPEED |
| | | | | | EHHV | | | | | | | | | | | | | | | 10 | 10 | | |
| | | | | | BEGINPUNT | 900 | 2000 | | | | | -2° | | | 111° | | | | | 25 | 35 | | |
| | | | | | WAYPOINT | 1200 | 2000 | | | | | -2° | | | 088° | | | | | 14 | 49 | | |
| | | | | | WAYPOINT | 1200 | 2000 | | | | | -2° | | | 034° | | | | | 27 | 76 | | |
| | | | | | EINDPUNT | | | | | | | | | | | | | | | 14 | 90 | | |
| | | | | | EHTW | | | | | | | | | | | | | | | | | | |

## 2.7 DIVERSION

When we cannot or don't want to continue to our destination?

- Weather is too bad (clouds and/or visibility).
- The wind on the runway is beyond our limit and/or beyond the POH limit.
- Field is temporarily closed.
- UDP is getting closer and you won't make it to your destination.
- Some other unforeseen situation.

What requirements must the diversion field meet?

- Good enough for the operation (runway length, both for landing but also for a take-off later).
- Weather must be sufficient (clouds and/or visibility).
- Non-restricted (AMS, military airports), PPR.
- Accessible (not by restricted airspace), high terrain in combination with low clouds.

For your diversion, it is sufficient to plan a straight line from your *end point*. Plan this with 20kt - 30kt headwind (no course info) or the current wind on the day of departure and you will always have enough fuel.

**VFR – NAVIGATION LOG**

| | | | |
|---|---|---|---|
| ENIGINE START : | REGISTRATION : | RADIO FREQUENTIES | |
| TAKEOFF : | TACHO : | HILVERSUM RADIO : 131.030 | |
| LANDING : | HOBBS : | AMSTERDAM INFO : 124.300 | |
| ENIGINE STOP : | VUT : | DUTCH MIL : 132.350 | |

NL-ATO-227

| TIME | | FLIGHT TIMES | | | ENROUTE | ALTITUDES | | HEADINGS | | | | | | | | FUEL | | SPEEDS | | DISTANCE | | WIND | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LEG | ACC | ETO | RETO | ATO | CHECKPOINT | MSA | ALT | MT | CH | ± DEV | MH | VAR | TH | WCA | TT | START | BURN | TAS | GS | LEG | ACC | DIR | SPEED |
| | | | | | EHHV | | | | | | | | | | | | | | | 10 | 10 | | |
| | | | | | BEGINPUNT | 900 | 2000 | | | | | -2° | | | 111° | | | | | 25 | 35 | | |
| | | | | | WAYPOINT | 1200 | 2000 | | | | | -2° | | | 088° | | | | | 14 | 49 | | |
| | | | | | WAYPOINT | 1200 | 2000 | | | | | -2° | | | 034° | | | | | 27 | 76 | | |
| | | | | | EINDPUNT | | | | | | | | | | | | | | | 14 | 90 | | |
| | | | | | EHTW | | | | | | | | | | | | | | | | | | |
| | | | | | EHTW | | | | | | | | | | | | | | | 14 | 14 | | |
| | | | | | BEGINPUNT(eindpunt) | 1200 | 2000 | | | | | -2° | | | 255° | | | | | 17 | 31 | | |
| | | | | | EINDPUNT | | | | | | | | | | | | | | | 5 | 36 | | |
| | | | | | EHTE | | | | | | | | | | | | | | | | | | |

**NOW STUDY THE PLANNED ROUTE CAREFULLY WITH EMPHASIS ON PIVOT POINTS, LANDMARKS, TERRAIN AND OBSTACLES!!**

## 2.8 THE DAY OF THE FLIGHT

On the day of the navigation flight, the NAV LOG and the map can be filled in.
Check the latest NOTAMS on www.homebriefing.nl.
Check on www.luchtvaartmeteo.nl if the weather is sufficient to complete the flight. Visibility and cloud base must meet the requirements of the airspace in which the aircraft are flown and the ACHA ATO requirements (see appendix for ATO requirements). We also retrieve the data with which we can further fill in the NAV LOG: altitude winds and temperature.

```
.
BEWOLKING: BKN SC 1500-2500 VT, VOORAL IN HET WESTEN LOKAAL 1000-1500
VT. BIJ DE OCCLUSIE VOORAL IN HET WESTEN EN NOORDEN TOENEMEND KANS
OP BKN ST 500-1000 VT. TOPPEN 3000-4000 VT, BIJ DE OCCLUSIE TOPPEN
GELAAGD TOT 6000-8000 VT.
.
ZICHT: MEER DAN 10 KM, IN NEERSLAG 5-8 KM, IN MATIGE MOTREGEN 3-5 KM.
.
NULGRADEN NIVEAU: 3000-4000 VT, IN SC BEWOLKING LOKAAL 2500 VT, TEN
ZUIDEN VAN DE OCCLUSIE 4000-5000 VT.
.
HOOGTEWINDEN EN TEMPERATUREN:
15 UTC: 21 UTC:
0500VT 150-190/20 +14 210 /20 +14
1500VT 160-200/25 +12 210 /30 +12
3000VT 170-220/30 +09 220 /30 +09
FL 050 180-240/25 -01 230 /20 +01
FL 100 190-240/25 -10 210-250/25 -09
GERUIMDE WIND IN HET ZUIDEN.
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.
VOORUITZICHTEN VOOR MORGEN: EEN NW-ZO GEORIENTEERDE OCCLUSIE LIGT BIJ
AANVANG VAN DE DAGLICHTPERIODE BOVEN HET MIDDEN, BEWEEGT
NOORDOOSTWAARTS EN VERLAAT AAN HET BEGIN VAN DE MIDDAG HET
NOORDOOSTEN. BIJ EN TEN NOORDOOSTEN VAN DEZE OCCLUSIE ST EN LOKAAL
MOTREGEN. TEN ZUIDWESTEN VAN DEZE OCCLUSIE STERK VERBETERENDE
CONDITIES. EEN VOLGENDE NW-ZO GEORIENTEERDE OCCLUSIE BEREIKT HET
```

## 2.9 POWER AND SPEED

Determine from the POH/AFM with the planned flight altitude (pressure altitude) and reported temperature;

- The desired power with associated speed and fuel consumption or;
- The desired speed with corresponding power and fuel consumption.

Note this speed in the NAV LOG at TAS.
In our example we take data from the POH of the PH-DON and take a power setting of 2300rpm at 2000ft with standard temperature, which gives 62% bhp with a KTAS of 103 and a fuel burn of 6.9gph.

Note: see appendix for pressure altitude calculation

SECTION 5
PERFORMANCE

CESSNA
MODEL 172P

## CRUISE PERFORMANCE

CONDITIONS:
2400 Pounds
Recommended Lean Mixture (See Section 4, Cruise)

| PRESSURE ALTITUDE FT | RPM | 20°C BELOW STANDARD TEMP % BHP | KTAS | GPH | STANDARD TEMPERATURE % BHP | KTAS | GPH | 20°C ABOVE STANDARD TEMP % BHP | KTAS | GPH |
|---|---|---|---|---|---|---|---|---|---|---|
| 2000 | 2500 | - - - | - - - | - - - | 76 | 114 | 8.5 | 72 | 114 | 8.1 |
| | 2400 | 72 | 110 | 8.1 | 69 | 109 | 7.7 | 65 | 108 | 7.3 |
| | 2300 | 65 | 104 | 7.3 | 62 | 103 | 6.9 | 59 | 102 | 6.6 |
| | 2200 | 58 | 99 | 6.6 | 55 | 97 | 6.3 | 53 | 96 | 6.1 |
| | 2100 | 52 | 92 | 6.0 | 50 | 91 | 5.8 | 48 | 89 | 5.7 |
| 4000 | 2550 | - - - | - - - | - - - | 76 | 117 | 8.5 | 72 | 116 | 8.1 |
| | 2500 | 77 | 115 | 8.6 | 73 | 114 | 8.1 | 69 | 113 | 7.7 |
| | 2400 | 69 | 109 | 7.8 | 65 | 108 | 7.3 | 62 | 107 | 7.0 |
| | 2300 | 62 | 104 | 7.0 | 59 | 102 | 6.6 | 57 | 101 | 6.4 |
| | 2200 | 56 | 98 | 6.3 | 54 | 96 | 6.1 | 51 | 94 | 5.9 |
| | 2100 | 51 | 91 | 5.8 | 48 | 89 | 5.7 | 47 | 88 | 5.5 |
| 6000 | 2600 | - - - | - - - | - - - | 77 | 119 | 8.6 | 72 | 118 | 8.1 |

### VFR – NAVIGATION LOG

| | | | | |
|---|---|---|---|---|
| ENIGINE START : | REGISTRATION : | RADIO FREQUENCIES | | |
| TAKEOFF : | TACHO : | HILVERSUM RADIO : 131.030 | | 62%, 103KTAS, 6,9GPH |
| LANDING : | HOBBS : | AMSTERDAM INFO : 124.300 | | |
| ENGINE STOP : | VUT : | DUTCH MIL : 132.350 | | |

NL-ATO-227

| TIME LEG | TIME ACC | FLIGHT TIMES ETO | RETO | ATO | ENROUTE CHECKPOINT | ALTITUDES MSA | ALT | HEADINGS MT | CH | ± DEV | MH | VAR | TH | WCA | TT | FUEL START | BURN | SPEEDS TAS | GS | DISTANCE LEG | ACC | WIND DIR | SPEED |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | EHHV | | | | | | | | | | | | | | | 10 | 10 | | |
| | | | | | BEGINPUNT | 900 | 2000 | | | | | -2° | | | 111° | | | 103 | | 25 | 35 | | |
| | | | | | WAYPOINT | 1200 | 2000 | | | | | -2° | | | 088° | | | 103 | | 14 | 49 | | |
| | | | | | WAYPOINT | 1200 | 2000 | | | | | -2° | | | 034° | | | 103 | | 27 | 76 | | |
| | | | | | EINDPUNT | | | | | | | | | | | | | 103 | | 14 | 90 | | |
| | | | | | EHTW | | | | | | | | | | | | | | | | | | |
| | | | | | EHTW | | | | | | | | | | | | | | | 14 | 14 | | |
| | | | | | BEGINPUNT(eindpunt) | 1200 | 2000 | | | | | -2° | | | 255° | | | 103 | | 17 | 31 | | |
| | | | | | EINDPUNT | | | | | | | | | | | | | 103 | | 5 | 36 | | |
| | | | | | EHTE | | | | | | | | | | | | | | | | | | |

### 2.10 FIRST AND LAST LEG NAV LOG

With the data we have now we can calculate time and fuel burn of the first leg from the departure field to the *starting point* and the last leg from *the end point* to arrival field. These legs are so short and different headings (and speeds are flown during the climb and landing) for the circuit that the wind has little influence on the day of the flight.

Take the calculated corrected distance from the departure field to the *starting point.*

**The C172** POH has a time/distance/fuel table. Use the table and previously found cruise TAS and cruise fuel burn to calculate time and fuel burn to the first pivot point. A handy table is attached in the appendix.

CESSNA
MODEL 172P

SECTION 5
PERFORMANCE

**TIME, FUEL, AND DISTANCE TO CLIMB**

**MAXIMUM RATE OF CLIMB**

CONDITIONS:
Flaps Up
Full Throttle
Standard Temperature

NOTES:
1. Add 1.1 gallons of fuel for engine start, taxi and takeoff allowance.
2. Mixture leaned above 3000 feet for maximum RPM.
3. Increase time, fuel and distance by 10% for each 10°C above standard temperature.
4. Distances shown are based on zero wind.

| WEIGHT LBS | PRESSURE ALTITUDE FT | TEMP °C | CLIMB SPEED KIAS | RATE OF CLIMB FPM | FROM SEA LEVEL | | |
|---|---|---|---|---|---|---|---|
| | | | | | TIME MIN | FUEL USED GALLONS | DISTANCE NM |
| 2400 | S.L. | 15 | 76 | 700 | 0 | 0.0 | 0 |
| | 1000 | 13 | 76 | 655 | 1 | 0.3 | 2 |
| | 2000 | 11 | 75 | 610 | 3 | 0.6 | 4 |
| | 3000 | 9 | 75 | 560 | 5 | 1.0 | 6 |
| | 4000 | 7 | 74 | 515 | 7 | 1.4 | 9 |
| | 5000 | 5 | 74 | 470 | 9 | 1.7 | 11 |
| | 6000 | 3 | 73 | 425 | 11 | 2.2 | 14 |
| | 7000 | 1 | 72 | 375 | 14 | 2.6 | 18 |
| | 8000 | -1 | 72 | 330 | 17 | 3.1 | 22 |
| | 9000 | -3 | 71 | 285 | 20 | 3.6 | 26 |
| | 10,000 | -5 | 71 | 240 | 24 | 4.2 | 32 |
| | 11,000 | -7 | 70 | 190 | 29 | 4.9 | 38 |

**The Katana** has no time/distance/fuel table, conservative interpolation gives an average climb rate of 500fpm, climb speed of 70kts and a fuel burn of 25.0 ltr/hr. A handy table is attached in the appendix.
In the example, the distance from the departure field to the *starting point* is 10NM.
The climb to 2000ft takes up 4NM; 6NM is therefore flown with cruise speed and a cruise fuel burn. Take the previously found TAS 103kts and Fuel burn 6.9gph.

| Time | Fuel burn | |
|---|---|---|
| 3min | 0,6USG | 4NM |
| 3min | 0,4USG | 6NM |
| 6min | 1,0USG | 10NM |

+

Fill in this information for the first leg. Don't forget to add 1.1 USG for engine start, taxi and take-off.

The same is also done for the last leg (a wind correction is not necessary, after all, this leg is rarely flown in a straight line).
Arrival leg including VFR circuit correction = 14NM with cruise speed 103kts and fuel burn of 6.9gph.

| Time | Fuel burn | Distance |
|---|---|---|
| 8min | 0,9 USG | 14NM |

Of course, not the entire circuit is flown with 103KTS, but the differences are so small (due to short distance) that this is irrelevant.

**VFR – NAVIGATION LOG**

| ENGINE START : | REGISTRATION : | RADIO FREQUENTIES | |
|---|---|---|---|
| TAKEOFF : | TACHO : | HILVERSUM RADIO : 131.030 | 62%, 103KTAS, 6,9GPH |
| LANDING : | HOBBS : | AMSTERDAM INFO : 124.300 | |
| ENGINE STOP : | VUT : | DUTCH MIL : 132.350 | |

NL-ATO-227

| TIME | | FLIGHT TIMES | | | ENROUTE | ALTITUDES | | HEADINGS | | | | | | | | FUEL | | SPEEDS | | DISTANCE | | WIND | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LEG | ACC | ETO | RETO | ATO | CHECKPOINT | MSA | ALT | MT | CH | ± DEV | MH | VAR | TH | WCA | TT | START | BURN | TAS | GS | LEG | ACC | DIR | SPEED |
| 6 | | | | | EHHV | | | | | | | | | | | | 2,1 | | | 10 | 10 | | |
| | | | | | BEGINPUNT | 900 | 2000 | | | | | -2° | | | 111° | | | 103 | | 25 | 35 | | |
| | | | | | WAYPOINT | 1200 | 2000 | | | | | -2° | | | 088° | | | 103 | | 14 | 49 | | |
| | | | | | WAYPOINT | 1200 | 2000 | | | | | -2° | | | 034° | | | 103 | | 27 | 76 | | |
| 8 | | | | | EINDPUNT | | | | | | | | | | | | 0,9 | 103 | | 14 | 90 | | |
| | | | | | EHTW | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | | | | | EHTW | | | | | | | | | | | | 2,4 | | | 14 | 14 | | |
| | | | | | BEGINPUNT(eindpunt) | 1200 | 2000 | | | | | -2° | | | 255° | | | 103 | | 17 | 31 | | |
| 3 | | | | | EINDPUNT | | | | | | | | | | | | 0, 3 | 103 | | 5 | 36 | | |
| | | | | | EHTE | | | | | | | | | | | | | | | | | | |

Another, less accurate, method is to take a standard conservative time and fuel consumption. For example, 10 minutes and 3USG for departure to *starting point* and 10 minutes and 1.5USG for arrival from *end point.* For Katana, use the same times but 4.0 ltr and 2.0 ltr respectively.

## 2.11 COMPLETING THE NAV LOG

Note the winds aloft at the altitude at which you are flying. Interpolate if necessary.

With this information, the NAV LOG can be completed using the E6B.

The winds allow the ground speeds to be calculated on each leg. The leg times can be calculated with the ground speeds. With the leg times, the fuel burn on each leg can be calculated.

Example:
starting point to first waypoint, TAS = 103, wind 180/25. GS = 91. 25 nm with 91 kts gives time of 17 min. 17 min with fuel burn 6.9 gph gives a burn of 2.0 USG.

**VFR – NAVIGATION LOG**

| | | | | | |
|---|---|---|---|---|---|
| ENIGINE START : | REGISTRATION : | RADIO FREQUENTIES | | | NL-ATO-227 |
| TAKEOFF : | TACHO : | HILVERSUM RADIO : 131.030 | | 62%, 103KTAS, 6,9GPH | |
| LANDING : | HOBBS : | AMSTERDAM INFO : 124.300 | | | |
| ENIGINE STOP : | VUT : | DUTCH MIL : 132.350 | | | |

| TIME | | FLIGHT TIMES | | | ENROUTE | ALTITUDES | | HEADINGS | | | | | | | | FUEL | | SPEEDS | | DISTANCE | | WIND | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LEG | ACC | ETO | RETO | ATO | CHECKPOINT | MSA | ALT | MT | CH | ± DEV | MH | VAR | TH | WCA | TT | START | BURN | TAS | GS | LEG | ACC | DIR | SPEED |
| | | | | | EHHV | | | | | | | | | | | | | | | | | | |
| 6 | 6 | | | | | | | | | | | | | | | | 2,1 | | | 10 | 10 | | |
| | | | | | BEGINPUNT | | | | | | | | | | | | | | | | | | |
| 17 | 23 | | | | | 900 | 2000 | 109° | | | 122° | -2° | 124° | 13° | 111° | | 2 | 103 | 91 | 25 | 35 | 180 | 25 |
| | | | | | WAYPOINT | | | | | | | | | | | | | | | | | | |
| 8 | 31 | | | | | 1200 | 2000 | 086° | | | 100° | -2° | 102° | 14° | 088° | | 0,9 | 103 | 101 | 14 | 49 | 180 | 25 |
| | | | | | WAYPOINT | | | | | | | | | | | | | | | | | | |
| 13 | 44 | | | | | 1200 | 2000 | 032° | | | 040° | -2° | 042° | 8° | 034° | | 1,5 | 103 | 123 | 27 | 76 | 180 | 25 |
| | | | | | EINDPUNT | | | | | | | | | | | | | | | | | | |
| 8 | 52 | | | | | | | | | | | | | | | | 0,9 | 103 | | 14 | 90 | | |
| | | | | | EHTW | | | | | | | | | | | | | | | | | | |
| | | | | | EHTW | | | | | | | | | | | | | | | | | | |
| 9 | 9 | | | | | | | | | | | | | | | | 2,4 | | | 14 | 14 | | |
| | | | | | BEGINPUNT(eindpunt) | | | | | | | | | | | | | | | | | | |
| 11 | 20 | | | | | 1200 | 2000 | 253° | | | 239° | -2° | 241° | -14° | 255° | | 1,3 | 103 | 93 | 17 | 31 | 180 | 25 |
| | | | | | EINDPUNT | | | | | | | | | | | | | | | | | | |
| 3 | 23 | | | | | | | | | | | | | | | | 0,3 | 103 | | 5 | 36 | | |
| | | | | | EHTE | | | | | | | | | | | | | | | | | | |

Since the ACHA planes do not have heading indicators but a G5, we cannot fly compass heading (CH) (with the exception of PH-DON) but magnetic track (MT). For this reason, an extra column has been created on the NAV LOG with MT. MT= TT + VAR.

**2.12 FUEL CALCULATION**

Next, a fuel calculation must be made.

The law prescribes that every flight must be planned in such a way that there is sufficient fuel on board, taking into account the weather, the performance of the aircraft, delays and any unforeseen circumstance. There must also be a final reserve fuel (FRF). The MINIMUM final reserve fuel is 30 minutes for a day VFR navigation flight (45 minutes for a night VFR flight).

### NCO.OP.125 Fuel/energy and oil supply – aeroplanes and helicopters

*Regulation (EU) 2021/1296*

(a) The pilot-in-command shall ensure that the quantity of fuel/energy and oil that is carried on board is sufficient, taking into account the meteorological conditions, any element affecting the performance of the aircraft, any delays that are expected in flight, and any contingencies that may reasonably be expected to affect the flight.

(b) The pilot-in-command shall plan a quantity of fuel/energy to be protected as final reserve fuel/energy to ensure a safe landing. The pilot-in-command shall take into account all of the following, and in the following order of priority, to determine the quantity of the final reserve fuel/energy:

(1) the severity of the hazard to persons or property that may result from an emergency landing after fuel/energy starvation; and

(2) the likelihood of unexpected circumstances that the final reserve fuel/energy may no longer be protected.

(c) The pilot-in-command shall commence a flight only if the aircraft carries sufficient fuel/energy and oil:

(1) when no destination alternate is required, to fly to the aerodrome or operating site of intended landing, plus the final reserve fuel/energy; or

(2) when a destination alternate is required, to fly to the aerodrome or operating site of intended landing, and thereafter, to an alternate aerodrome, plus the final reserve fuel/energy.

### AMC1 NCO.OP.125(b) Fuel/energy and oil supply — aeroplanes and helicopters

*ED Decision 2022/005/R*

**PLANNING CRITERIA — FINAL RESERVE FUEL/ENERGY**

The final reserve fuel (FRF)/energy should be no less than the required fuel/energy to fly:

(a) for aeroplanes:

(1) for 10 minutes at maximum continuous cruise power at 1 500 ft (450 m) above the destination under VFR by day, taking off and landing at the same aerodrome/landing site, and always remaining within sight of that aerodrome/landing site;

(2) for 30 minutes at holding speed at 1 500 ft (450 m) above the destination under VFR by day; and

(3) for 45 minutes at holding speed at 1 500 ft (450 m) above the destination or destination alternate aerodrome under VFR flights by night and IFR; and

Below is an example of how we make a fuel calculation. This is the same format as Sky Demon uses. The contingency fuel is an amount of fuel to take into account unforeseen circumstances (more headwind than planned, flying around a shower, etc.). The law does not prescribe how much the contingency fuel must be, only that it is sufficient to absorb unforeseen circumstances that can REASONABLY be expected. The contingency fuel can be expressed in a % of the trip fuel or a minimum number of minutes. Contingency fuel will depend on circumstances, experience and also payload.

For taxi+runup, use the value from the POH for the Cessna (1.1 USG). The DV20 POH does not give a value for taxi + run-up, use 2.5ltr as a conservative value. For the trip fuel, add up the fuel burns of all legs together. Do the same for the alternate fuel. For contingency fuel, take either a percentage of the calculated trip fuel or X number of minutes based on the cruise fuel burn. For Final Reserve Fuel (FRF) the law says fuel burn at 1,500 ft with holding speed, in practice, take the cruise fuel burn at 1,500 ft altitude and calculate how much is required for 30 minutes. This is conservative compared to holding speed (lowest power setting in the POH).

| | USG/LITERS | WEIGHT | MINUTEN |
|---|---|---|---|
| TAXI+RUNUP | 1,1 USG | | |
| TRIP | 6,3 USG | | 52 MIN |
| CONTINGENCY | 0,6 USG | | 5 MIN |
| ALTERNATE | 4,0 USG | | 23 MIN |
| FINAL RESERVEFUEL (FRF) | 3,5 USG | | 30 MIN |
| MIN REQUIRED FUEL | 15,5 USG | | 1:50 MIN |
| EXTRA FUEL | 9,5 USG | | 1:22 MIN |
| TAKE OFF FUEL | 25,0 USG | 150 | 3:12 MIN |

OG

O FREQUENTIES

62%, 103KTAS, 6,9GPH

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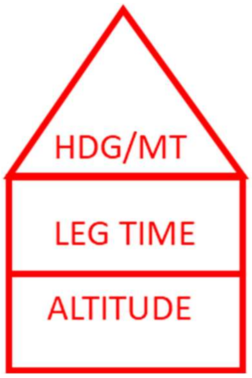
| NGS | | | | FUEL | | SPEEDS | | DISTANCE | | WIND | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| VAR | TH | WCA | TT | START | BURN | TAS | GS | LEG | ACC | DIR | SPEED |
| | | | | 25,0 | 2,1 | | | 10 | 10 | | |
| -2° | 124° | 13° | 111° | 22,9 | 2 | 103 | 91 | 25 | 35 | 180 | 25 |
| -2° | 102° | 14° | 088° | 20,9 | 0,9 | 103 | 101 | 14 | 49 | 180 | 25 |
| -2° | 042° | 8° | 034° | 20,0 | 1,5 | 103 | 123 | 27 | 76 | 180 | 25 |
| | | | | 18,5 | 0,9 | 103 | | 14 | 90 | | |
| | | | | 17,6 | | | | | | | |
| | | | | | 2,4 | | | 14 | 14 | | |
| -2° | 241° | -14° | 255° | | 1,3 | 103 | 93 | 17 | 31 | 180 | 25 |
| | | | | | 0,3 | 103 | | 5 | 36 | | |

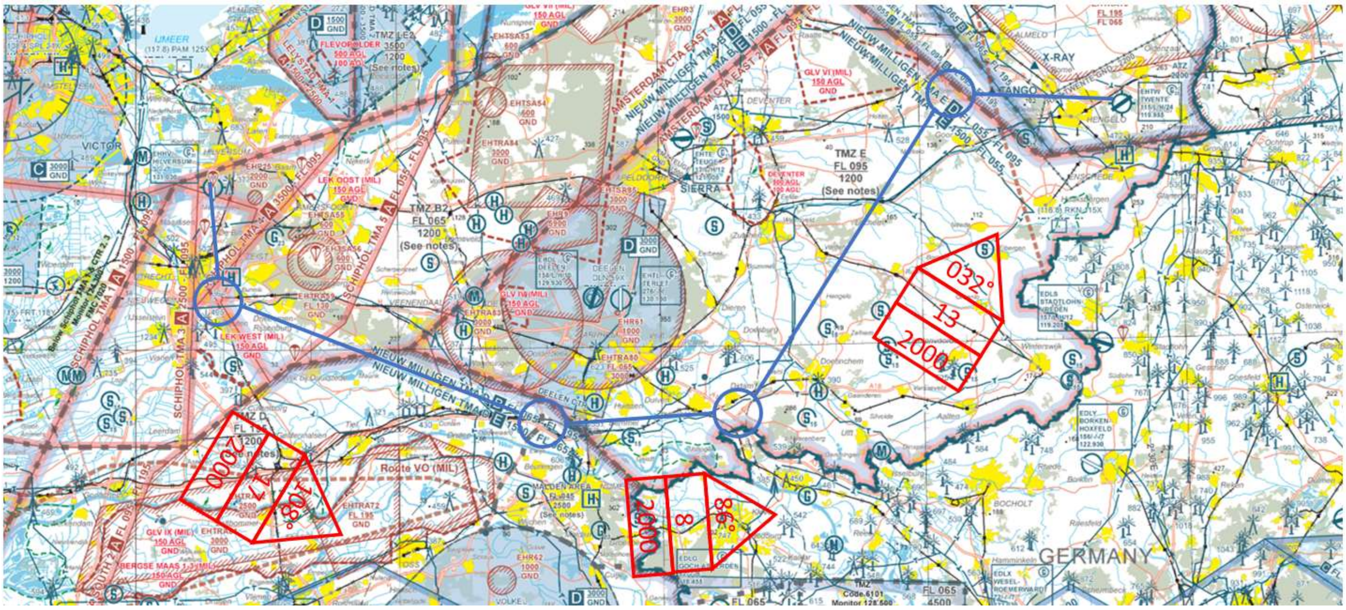
aand
n te

**Note:** In this example, 9.5 USG extra fuel is included. This is purely for illustration, extra fuel is always SCD (subject commanders discretion)

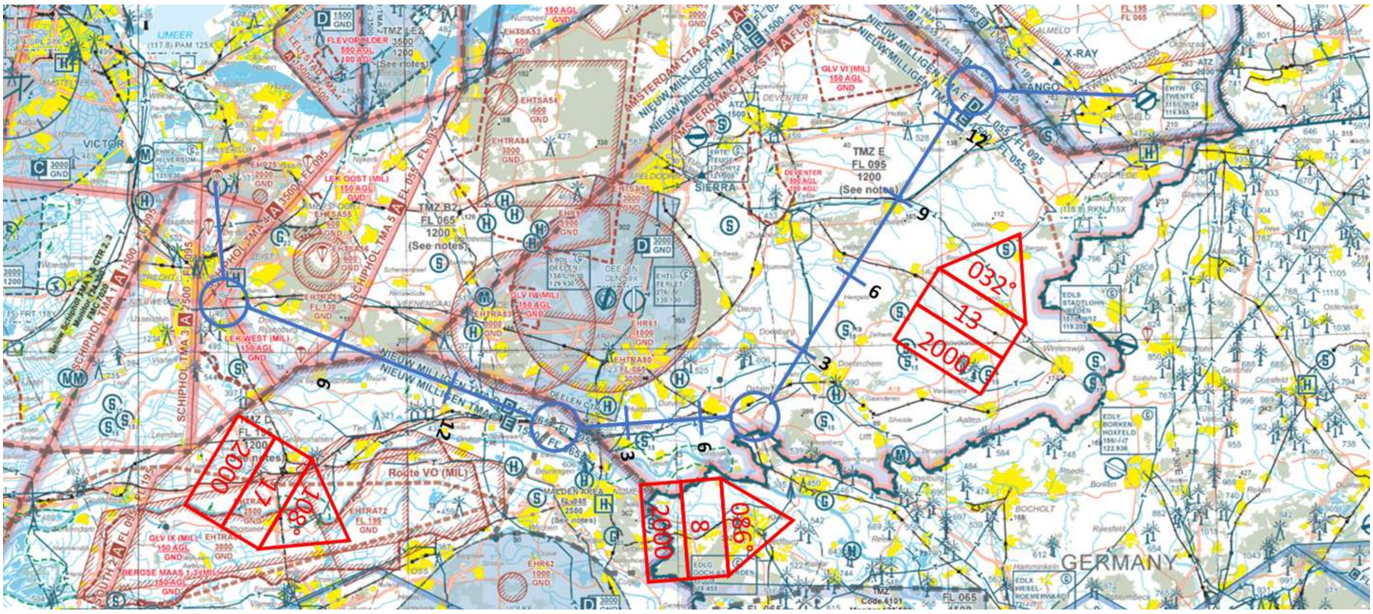
**2.13 NOTES ON MAP**

Now we can also draw the map so that navigating from the map can be easier/faster. This is an easy tool and an addition to the NAV log. We use the "house" below for this. At a glance we can see on the map what our next heading/track is going to be, how long it will take us to get our next leg and the altitude we want to fly.

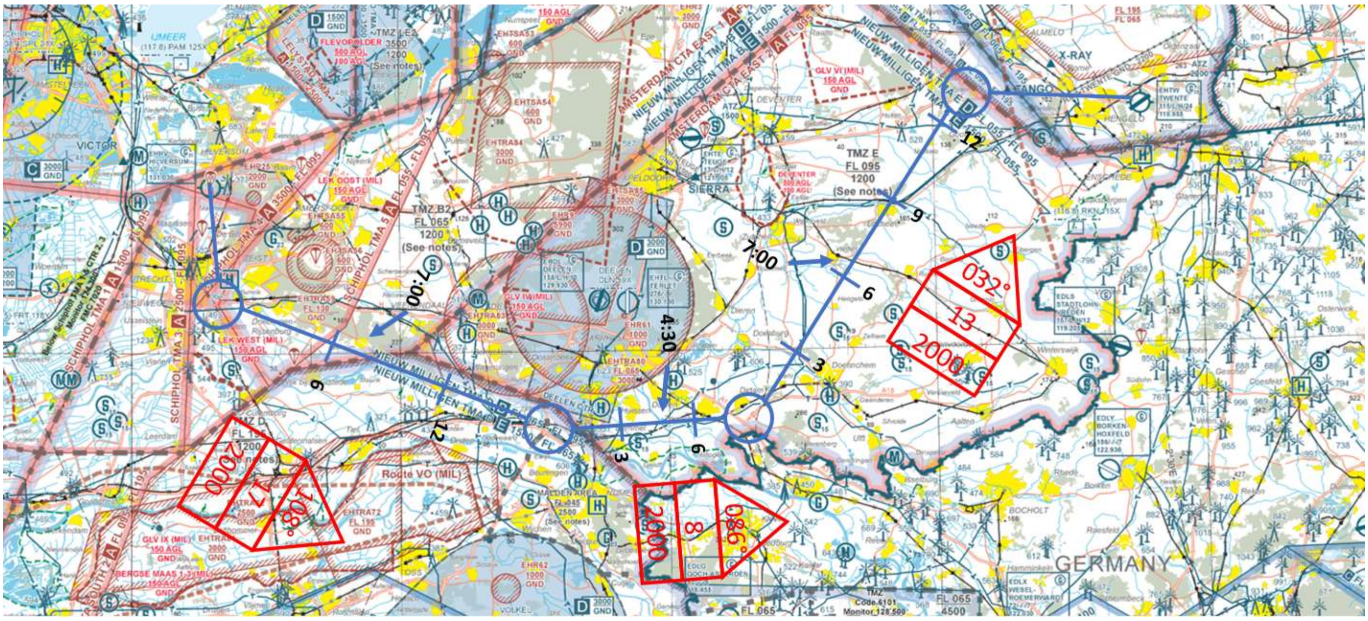


Now make tickmarks along the route every six or three minutes so that you can easily keep track of where you are during the flight. If you make tickmarks every 6 minutes, place them every ground speed/10 = number of NM. If you make tickmarks every 3 minutes, place them every ground speed/10/2 = number of NM.

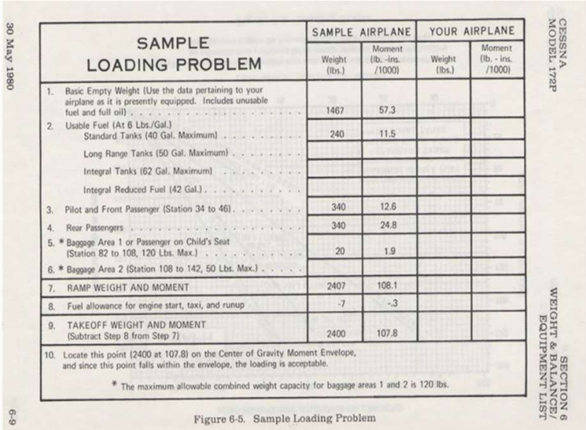



Now make at least 1 checkpoint per leg (depending on the length of the leg), a clearly recognizable point where you can check whether you are on time and on course on that leg.



## 2.14 MASS & BALANCE AND TAKE-OFF AND LANDING DISTANCE

Finally, a mass & balance calculation must now be made and a take-off and landing distance calculation for the departure and arrival field and possibly the diversion field.



30 May 1980 CESSNA MODEL 172P

| SAMPLE LOADING PROBLEM | SAMPLE AIRPLANE Weight (lbs.) | SAMPLE AIRPLANE Moment (lb. -ins. /1000) | YOUR AIRPLANE Weight (lbs.) | YOUR AIRPLANE Moment (lb. - ins. /1000) |
|---|---|---|---|---|
| 1. Basic Empty Weight (Use the data pertaining to your airplane as it is presently equipped. Includes unusable fuel and full oil) | 1467 | 57.3 | | |
| 2. Usable Fuel (At 6 Lbs./Gal.) Standard Tanks (40 Gal. Maximum) | 240 | 11.5 | | |
| Long Range Tanks (50 Gal. Maximum) | | | | |
| Integral Tanks (62 Gal. Maximum) | | | | |
| Integral Reduced Fuel (42 Gal.) | | | | |
| 3. Pilot and Front Passenger (Station 34 to 46) | 340 | 12.6 | | |
| 4. Rear Passengers | 340 | 24.8 | | |
| 5. * Baggage Area 1 or Passenger on Child's Seat (Station 82 to 108, 120 Lbs. Max.) | 20 | 1.9 | | |
| 6. * Baggage Area 2 (Station 108 to 142, 50 Lbs. Max.) | | | | |
| 7. RAMP WEIGHT AND MOMENT | 2407 | 108.1 | | |
| 8. Fuel allowance for engine start, taxi, and runup | -7 | -.3 | | |
| 9. TAKEOFF WEIGHT AND MOMENT (Subtract Step 8 from Step 7) | 2400 | 107.8 | | |

10. Locate this point (2400 at 107.8) on the Center of Gravity Moment Envelope, and since this point falls within the envelope, the loading is acceptable.

* The maximum allowable combined weight capacity for baggage areas 1 and 2 is 120 lbs.

6-9 Figure 6-5. Sample Loading Problem SECTION 6 WEIGHT & BALANCE/ EQUIPMENT LIST

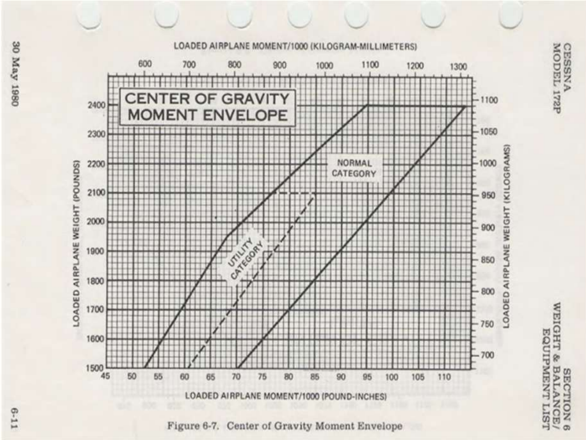
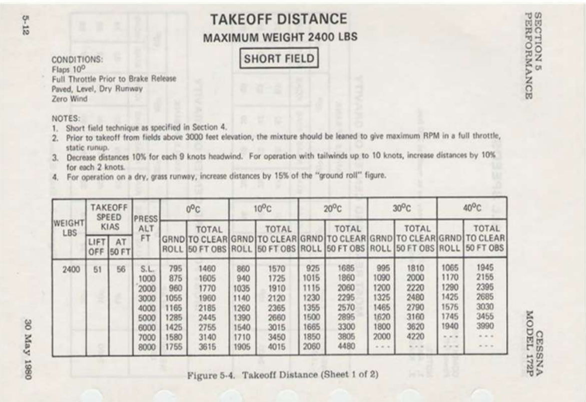


Figure 6-7. Center of Gravity Moment Envelope



5-12 SECTION 5 PERFORMANCE

TAKEOFF DISTANCE

MAXIMUM WEIGHT 2400 LBS

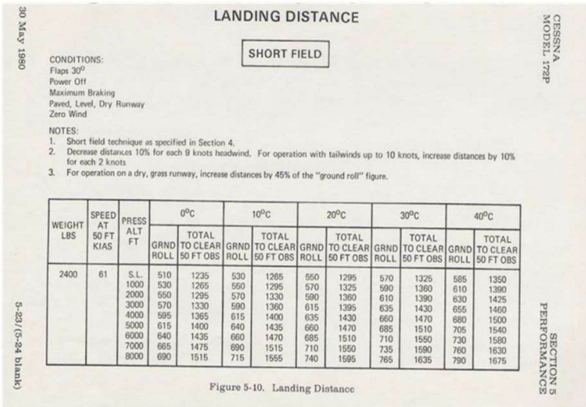
SHORT FIELD

CONDITIONS:
Flaps 10°
Full Throttle Prior to Brake Release
Paved, Level, Dry Runway
Zero Wind

NOTES:
1. Short field technique as specified in Section 4.
2. Prior to takeoff from fields above 3000 feet elevation, the mixture should be leaned to give maximum RPM in a full throttle, static runup.
3. Decrease distances 10% for each 9 knots headwind. For operation with tailwinds up to 10 knots, increase distances by 10% for each 2 knots.
4. For operation on a dry, grass runway, increase distances by 15% of the "ground roll" figure.

| WEIGHT LBS | TAKEOFF SPEED KIAS LIFT OFF | TAKEOFF SPEED KIAS AT 50 FT | PRESS ALT FT | 0°C GRND ROLL | 0°C TOTAL TO CLEAR 50 FT OBS | 10°C GRND ROLL | 10°C TOTAL TO CLEAR 50 FT OBS | 20°C GRND ROLL | 20°C TOTAL TO CLEAR 50 FT OBS | 30°C GRND ROLL | 30°C TOTAL TO CLEAR 50 FT OBS | 40°C GRND ROLL | 40°C TOTAL TO CLEAR 50 FT OBS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2400 | 51 | 56 | S.L. | 795 | 1460 | 860 | 1570 | 925 | 1685 | 995 | 1810 | 1065 | 1945 |
| | | | 1000 | 875 | 1605 | 940 | 1725 | 1015 | 1860 | 1090 | 2000 | 1170 | 2155 |
| | | | 2000 | 960 | 1770 | 1035 | 1910 | 1115 | 2060 | 1200 | 2220 | 1290 | 2395 |
| | | | 3000 | 1055 | 1960 | 1140 | 2120 | 1230 | 2295 | 1325 | 2480 | 1425 | 2685 |
| | | | 4000 | 1165 | 2185 | 1260 | 2365 | 1355 | 2570 | 1465 | 2790 | 1575 | 3030 |
| | | | 5000 | 1285 | 2445 | 1390 | 2660 | 1500 | 2895 | 1620 | 3160 | 1745 | 3455 |
| | | | 6000 | 1425 | 2755 | 1540 | 3015 | 1665 | 3300 | 1800 | 3620 | 1940 | 3990 |
| | | | 7000 | 1580 | 3140 | 1710 | 3450 | 1850 | 3805 | 2000 | 4220 | --- | --- |
| | | | 8000 | 1755 | 3615 | 1905 | 4015 | 2060 | 4480 | --- | --- | --- | --- |

30 May 1980 Figure 5-4. Takeoff Distance (Sheet 1 of 2) CESSNA MODEL 172P



30 May 1980 CESSNA MODEL 172P

LANDING DISTANCE

SHORT FIELD

CONDITIONS:
Flaps 30°
Power Off
Maximum Braking
Paved, Level, Dry Runway
Zero Wind

NOTES:
1. Short field technique as specified in Section 4.
2. Decrease distances 10% for each 9 knots headwind. For operation with tailwinds up to 10 knots, increase distances by 10% for each 2 knots
3. For operation on a dry, grass runway, increase distances by 45% of the "ground roll" figure.

| WEIGHT LBS | SPEED AT 50 FT KIAS | PRESS ALT FT | 0°C GRND ROLL | 0°C TOTAL TO CLEAR 50 FT OBS | 10°C GRND ROLL | 10°C TOTAL TO CLEAR 50 FT OBS | 20°C GRND ROLL | 20°C TOTAL TO CLEAR 50 FT OBS | 30°C GRND ROLL | 30°C TOTAL TO CLEAR 50 FT OBS | 40°C GRND ROLL | 40°C TOTAL TO CLEAR 50 FT OBS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2400 | 61 | S.L. | 510 | 1235 | 530 | 1265 | 550 | 1295 | 570 | 1325 | 585 | 1350 |
| | | 1000 | 530 | 1265 | 550 | 1295 | 570 | 1325 | 590 | 1360 | 610 | 1390 |
| | | 2000 | 550 | 1295 | 570 | 1330 | 590 | 1360 | 610 | 1390 | 630 | 1425 |
| | | 3000 | 570 | 1330 | 590 | 1360 | 615 | 1395 | 635 | 1430 | 655 | 1460 |
| | | 4000 | 595 | 1365 | 615 | 1400 | 635 | 1430 | 660 | 1470 | 680 | 1500 |
| | | 5000 | 615 | 1400 | 640 | 1435 | 660 | 1470 | 685 | 1510 | 705 | 1540 |
| | | 6000 | 640 | 1435 | 660 | 1470 | 685 | 1510 | 710 | 1550 | 730 | 1580 |
| | | 7000 | 665 | 1475 | 690 | 1515 | 710 | 1550 | 735 | 1590 | 760 | 1630 |
| | | 8000 | 690 | 1515 | 715 | 1555 | 740 | 1595 | 765 | 1635 | 790 | 1675 |

5-23/(5-24 blank) Figure 5-10. Landing Distance SECTION 5 PERFORMANCE

You can see that there is quite a lot of work in planning and calculating before you have taken the first step towards the plane. The more often you do this, the faster it will go, but always take enough time for this so that you are organised and prepared on the plane.

# CHAPTER 3 FLIGHT EXECUTION

### 3.1 REQUIRED ON-BOARD DOCUMENTS

**NCO.GEN.135 Documents, manuals and information to be carried**

*Regulation (EU) 2018/1975*

(a) The following documents, manuals and information shall be carried on each flight as originals or copies unless otherwise specified:

(1) the AFM, or equivalent document(s);

(2) the original certificate of registration;

(3) the original certificate of airworthiness (CofA);

(4) the noise certificate, if applicable;

(5) the list of specific approvals, if applicable;

(6) the aircraft radio licence, if applicable;

(7) the third party liability insurance certificate(s);

(8) the journey log, or equivalent, for the aircraft;

(9) details of the filed ATS flight plan, if applicable;

(10) current and suitable aeronautical charts for the route area of the proposed flight and all routes along which it is reasonable to expect that the flight may be diverted;

(11) procedures and visual signals information for use by intercepting and intercepted aircraft;

(12) the MEL or CDL, if applicable; and

(13) any other documentation that may be pertinent to the flight or is required by the States concerned with the flight.

(b) Notwithstanding (a), on flights:

(1) intending to take off and land at the same aerodrome/operating site; or

(2) remaining within a distance or area determined by the competent authority,

the documents and information in (a)(2) to (a)(8) may be retained at the aerodrome or operating site.

(c) The pilot-in-command shall make available within a reasonable time of being requested to do so by the competent authority, the documentation required to be carried on board.

**For solo flights, you also need a signed "solo declaration" from your instructor and for solo navigation flights, submitting a flight plan is mandatory (ACHA requirement).**

Please note: the journal that is normally used is a journal for domestic use. If you are flying abroad, the aircraft logbook must be taken with you. Notify ACHA operations in time that you want to go abroad so that you can take an updated logbook with you.

**FCL.045 Obligation to carry and present documents**

*Regulation (EU) 2018/1065*

(a) A valid licence and a valid medical certificate shall always be carried by the pilot when exercising the privileges of the licence.

(b) The pilot shall also carry a personal identification document containing his/her photo.

(c) A pilot or a student pilot shall without undue delay present his/her flight time record for inspection upon request by an authorised representative of a competent authority.

(d) A student pilot shall carry on all solo cross-country flights evidence of the authorisation required by FCL.020(a).

(e) A pilot intending to fly outside Union territory on an aircraft registered in a Member State other than the one that issued the flight crew licence shall carry, in print or in electronic format, the latest issue of the ICAO attachment, which includes a reference to the ICAO registration number of the agreement that recognises the automatic validation of licences, as well as the list of States which are party to this agreement.

### 3.2 COCKPIT MANAGEMENT

Fold the NAV LOG in half so that you have an A5 size that you can attach to your kneeboard, on the left side of the NAV LOG you will find all the data you need for the flight. Fold the ICAO VFR 1:500,000 as small as possible but in such a way that the route is still on it. Attach (with a paper clip, for example) the AIP-approach and Aerodrome cards to the back in the order that you are going to use them.

Before you takeoff, make a (mental) note of the takeoff time and remember the course you are going to fly at your starting point and put away the maps and NAV LOG so that they are not in way while you exit the circuit and fly to the starting point. Exit the circuit as published and visually fly to your *starting point.* Initial direction and altitude to your starting point can be included in your pre-take off crew briefing.

VFR – NA

| | | |
|---|---|---|
| ENIGINE START : | REGISTRATION : | |
| TAKEOFF : | TACHO : | HILVERSUM RADIO : 131.030 |
| LANDING : | HOBBS : | AMSTERDAM INFO : 124.300 |
| ENIGINE STOP : | VUT : | DUTCH MIL : 132.350 |

| TIME | | FLIGHT TIMES | | | ENROUTE | ALTITUDES | | | |
|---|---|---|---|---|---|---|---|---|---|
| LEG | ACC | ETO | RETO | ATO | CHECKPOINT | MSA | ALT | MT | CH |
| | | | | | EHHV | | | | |
| 6 | 6 | | | | | | | | |
| | | | | | BEGINPUNT | | | | |
| 17 | 23 | | | | | 900 | 2000 | 109° | |
| | | | | | WAYPOINT | | | | |
| 8 | 31 | | | | | 1200 | 2000 | 086° | |
| | | | | | WAYPOINT | | | | |
| 13 | 44 | | | | | 1200 | 2000 | 032° | |
| | | | | | EINDPUNT | | | | |
| 8 | 52 | | | | | | | | |
| | | | | | EHTW | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | EHTW | | | | |
| 9 | 9 | | | | | | | | |
| | | | | | BEGINPUNT (eindpunt) | | | | |
| 11 | 20 | | | | | 1200 | 2000 | 253° | |
| | | | | | EINDPUNT | | | | |
| 3 | 23 | | | | | | | | |
| | | | | | EHTE | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

### 3.3 COMPLETING THE NAV LOG

Arriving at your starting point (and all subsequent pivot points) do the **WHAT** check:

- **Weather (and traffic)**
- **Heading**
- **Altitude**
- **Timing**

Before you start the turn, check the weather in the direction you want to turn and check for other air traffic.
Turn to your heading (which you remembered for take-off).
Check if you are flying the right altitude.
Start your stopwatch and make a mental note of the ATO (actual time overhead). Once you are flying on your desired course (take a point in the distance) and are trimmed, enter the take-off time and at the *starting point* on your NAV LOG the ATO. Calculate and record the ETO at your next checkpoints.
When you arrive at your checkpoint, check ETO versus ATO and repeat the above!

See the example below:

**VFR – NA**

| | | | |
|---|---|---|---|
| ENIGINE START : | REGISTRATION : | | |
| TAKEOFF 11:15 | TACHO : | HILVERSUM RADIO | : 131.030 |
| LANDING : | HOBBS : | AMSTERDAM INFO | : 124.300 |
| ENIGINE STOP : | VUT : | DUTCH MIL | : 132.350 |

| TIME | | FLIGHT TIMES | | | ENROUTE | ALTITUDES | | | |
|---|---|---|---|---|---|---|---|---|---|
| LEG | ACC | ETO | RETO | ATO | CHECKPOINT | MSA | ALT | MT | CH |
| 6 | 6 | | | | EHHV | | | | |
| 17 | 23 | | | 11:21 | BEGINPUNT | 900 | 2000 | 109° | |
| 8 | 31 | 11:38 | | | WAYPOINT | 1200 | 2000 | 086° | |
| 13 | 44 | | | | WAYPOINT | 1200 | 2000 | 032° | |
| 8 | 52 | | | | EINDPUNT | | | | |
| | | | | | EHTW | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| 9 | 9 | | | | EHTW | | | | |
| 11 | 20 | | | | BEGINPUNT(eindpunt) | 1200 | 2000 | 253° | |
| 3 | 23 | | | | EINDPUNT | | | | |
| | | | | | EHTE | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

The navigation flight has begun!!

### 3.4 CALLING/MONITORING AMS INFO, DUTCH MILL

Check in at Dutch Mil or AMS info and give the ETA for your destination (take-off time + legs acc)

**Luchtverkeersdiensten**

LVNL richt zich in hoofdzaak op luchtverkeersdienstverlening aan burgerluchtverkeer in het gebied waarvoor Nederland verantwoordelijk is gesteld: het vluchtinformatiegebied Amsterdam (FIR). De Amsterdam FIR strekt zich uit boven het Nederlandse grondgebied en een groot deel van de Noordzee.

De luchtverkeersdienstverlening bestaat uit drie taken:

**Luchtverkeersleiding**

Luchtverkeersleiding is het regelen van het luchtverkeer door het geven van klaringen en aanwijzingen aan bestuurders van luchtvaartuigen. De luchtverkeersleiding is opgesplitst in een drietal deeldisciplines: algemene verkeersleiding - area control, naderingsverkeersleiding - approach control en plaatselijke verkeersleiding - aerodrome control.

Organisatorisch zijn alle luchtverkeersleidingsdiensten ten behoeve van de Mainport Schiphol ondergebracht in het directoraat Operations. Daartoe horen: area control en de plaatselijke en naderingsverkeersleiding voor de luchthavens Amsterdam Airport Schiphol en Rotterdam The Hague Airport. De dienstverlening voor de regionale luchthavens valt onder de LVNL Regional Unit.

**Vluchtinformatieverstrekking**

Vluchtinformatieverstrekking is het geven van inlichtingen tijdens een vlucht ten behoeve van een veilige en doelmatige vluchtuitvoering. Het gaat hier onder andere om informatie over weersverschijnselen langs de vliegroute, inlichtingen over wijziging in de bruikbaarheid van navigatiehulpmiddelen en veranderingen in de staat van luchtvaartterreinen en faciliteiten.

**Alarmering**

Alarmering heeft tot doel de betrokken instanties te waarschuwen aangaande luchtvaartuigen die hulp behoeven in de vorm van opsporing en redding en deze instanties bij te staan voor zover dat vereist is.

Remember! AMSTERDAM INFO or DUTCH MIL provide flight information. Officially, information about other air traffic is not part of the tasks under flight information.

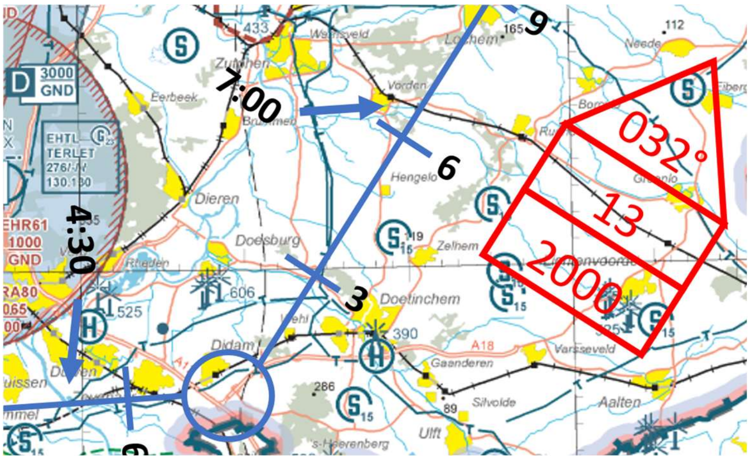
LVNL's aim is to do this as much as possible (workload permitting), but don't assume that as soon as you have called up you will receive information about **ALL** the air traffic around you.

**SO KEEP AN EYE OUT!**

### 3.5 CLOCK, MAP, GROUND

What do we mean by that? Use the stopwatch/clock to determine where you are on the map, find an object on the map and then look for it outside. Important! Not everything you see on the ground is on the map, but everything on the map you should be able to see outside when you're on course! Keep the map in such a way that the flight direction is up or north up, depending on your own preference.

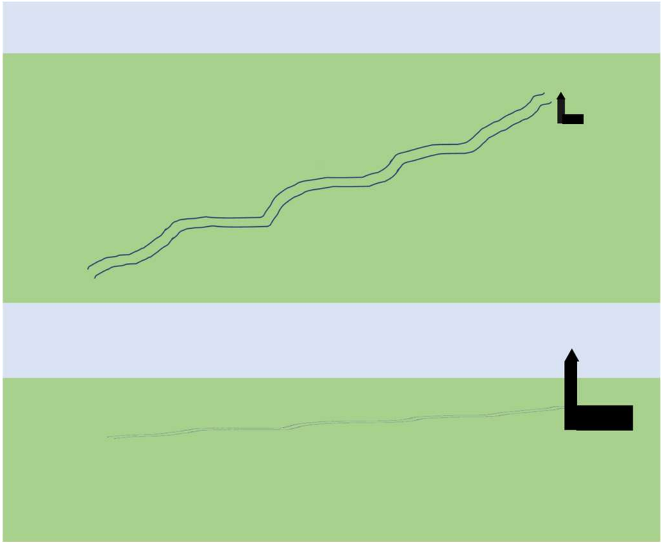
### 3.6 LARGE TO SMALL




After we have turned to track 032° I see Doetinchem to the right of the course, on the southwest side of Doetinchem there is a powerline that crosses our route. 3.5NM further on is a village (Hengelo) on the right, from Hengelo there is a road to the left of our track to Vorden, from Vorden there is a river with a railway line above it that crosses our route. First, find a large landmark and use it to locate smaller points.

### 3.7 HIGH VS LOW

Flat objects can easily be seen from great heights, such as cities, roads, rivers, lakes. Tall objects often disappear into the background. As the height decreases, flat objects will become more difficult to see, but vertical obstacles will be easier to see against the horizon



An example above. At a high altitude a river is clearly visible, the chimney next to it less well. When the height is lower, the river becomes flatter and therefore thinner, but the chimney becomes longer and goes towards the horizon.

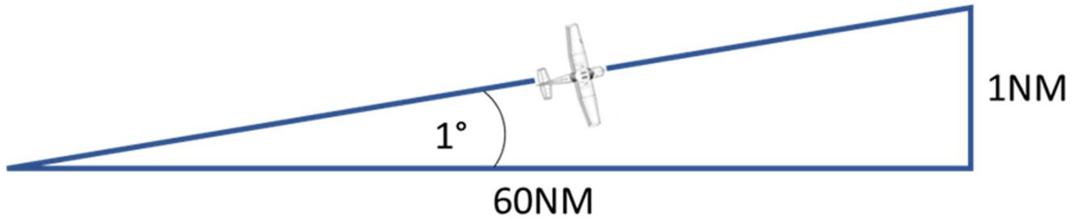
On the photo on the left at a higher altitude the lake behind IJsselstein is clearly visible as well as the shape of IJsselstein itself, the tower of Lopik is less visible. On the photo on the right, at a lower altitude the lake behind IJsselstein is less visible, the shape of IJsselstein itself is flatter but the tower of Lopik is more clearly visible.

### 3.8 COURSE AND TIME CORRECTIONS

If you notice that you are not on course after flying a certain distance, you can use the 1:60 rule to make a course correction.

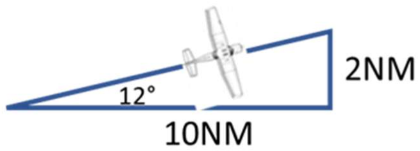
1:60 rule:

The 1:60 rule means that if you have an X-track error of 1 NM after having flown 60 NM, you have a course error of 1°. In other words, after having flown 60 NM, the number of degrees off track is equal to the number of NM off track or vice versa.




How do you apply this in practice? If you notice after flying X number of NM that you're Y number of NM off track, you take the factor you need to make X 60 and multiply that factor by Y

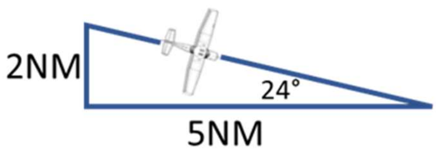
Example:




After flying 10NM you notice that you are 2NM off track. To turn 10NM into 60NM you have to multiply by 6. Multiply 2NM by 6 and you are **12°** off course. Faster is:

60/distance flown x NM off track, in other words: 60/ 10 x 2 = **12°**. So you have to correct **12°** to fly parallel to your desired course.

Now suppose you want to be back on your desired course within 5NM? Use the same calculation method: 60 / 5 x 2 = **24°** (= closing angle)




**track error = 60/ distance flown x cross track error**

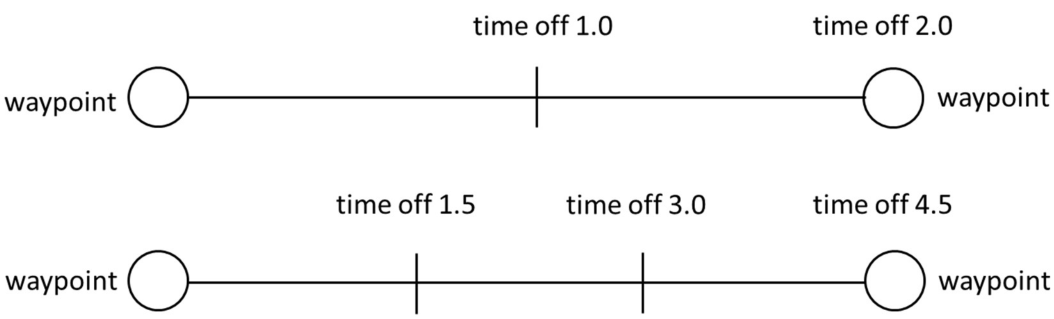
**Closing angle = 60/ distance to fly x cross track error**

With this rule, after some practice ,you can make accurate navigation calculations.

A slightly simpler method is after you have calculated the track error, double it to get back on your course (only works if you are not yet past half of your leg) and once you are on your original course you only correct the track error.

If it turns out that the time is incorrect at a checkpoint, first try to find out if this is due to a wind change/inaccurate wind or a one-off other reason (height change, evasion for other traffic, has the speed been flown accurately, etc.). If it is not because of the wind (and therefore a one-off), it is sufficient to add the difference in time to the ETO to obtain a RETO(revised ETO). If the time is not correct because of the wind, then the difference in time is cumulative for the rest of the flight. For example, if the time difference with the calculated time is 1 minute at the halfway point of a leg, then the time difference will be 2 minutes at the end of the leg. If the time difference is 1.5 minutes on one third of the leg, the time difference will be 3.0 minutes on two thirds of the leg and 4.5 minutes at the end of the leg etc.

update de RETO.




**3.9 FUEL CHECKS**

It is crucial for safe flight operations that an accurate fuel calculation is made before departure. Fuel consumption during the flight must be monitored. The fuel indicators of most GA aircraft do not show accurate values. A more accurate way is to keep track of the time. If you are ahead or behind off the times on your NAV LOG, you have used more/less than calculated. For example, calculate in advance what your consumption is per 5 minutes, if you are 5 minutes behind, for example, you will know how much more fuel you have used above what you calculated.

**3.10 ARRIVING AT DESTINATION**

If the field has an ATIS, listen to it in time. As soon as the end point of the navigation route has been identified, the VFR map can be stored and we continue navigating on the AIP approach chart (this must be carefully studied before the flight). If necessary, sign off with Dutch Mil or AMS info and establish radio contact with the local traffic control or airport authority. Fly the circuit as indicated on the AIP chart or instructed by local air traffic control. Especially at the starting point of the circuit, WATCH OUT FOR OTHER TRAFFIC!

After landing, when there is no air traffic control/airport service: Don't forget to close your flight plan!!

# CHAPTER 4 CHANGE OF PLAN

### 4.1 DIVERSION

There can be several reasons to divert, but the most common is the weather:

- Decreasing visibility
- Lowering Cloud Base
- Wind outside limits
- Heavy rain/thunderstorms
- Windshear

A diversion can also be caused but not limited to:

- Fuel situation worsening due to a stronger than anticipated headwind
- Airport closure
- Approaching UDP due to stronger than anticipated headwinds

The diversion can be more or less planned (end of the flight) but also unplanned at any point along the route, making a new planning necessary (re-planning in flight). The alternate airport chosen during the flight preparation may not be reachable at any other point along the route and it may be necessary to divert to another airport.

Most importantly: **KEEP FLYING!**

If the decision is made that a diversion is desirable/necessary, find a clearly recognizable point on the ground that is also present on the map and circle around it if necessary. Mark this point on the map by drawing a circle around it.

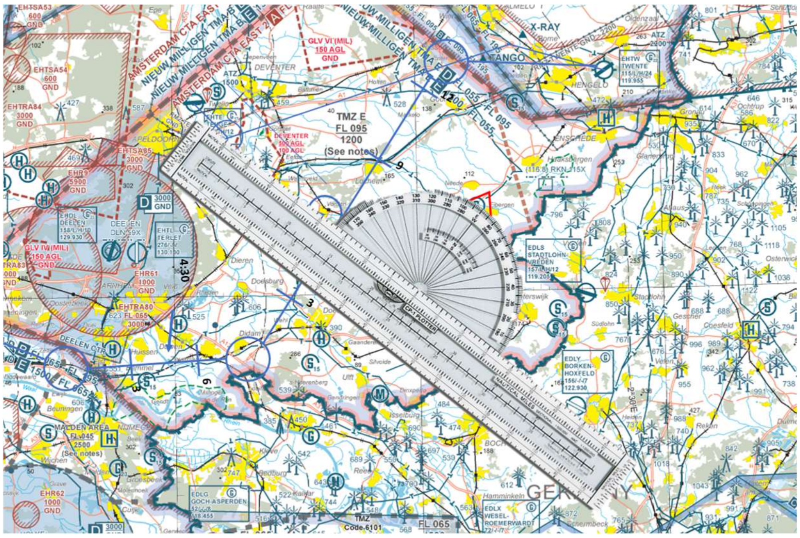
Choose a suitable diversion airport. A diversion airport must at least meet the following requirements:

- Good enough for the operation (runway length).
- Weather above VFR limits.
- Open and non-restricted (AMS, military airfields), PPR.
- Accessible (not by restricted airspace), high terrain in combination with low ceilings, FUEL!!

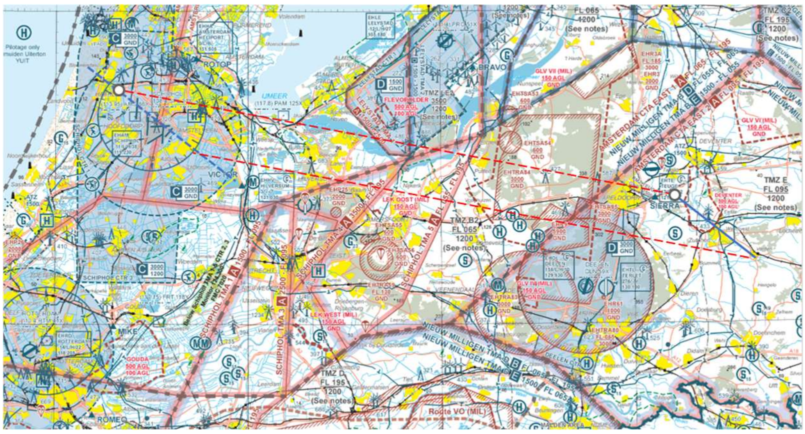
It is good practise/airmanship to contact air traffic control to ask about the weather and status of the diversion airport. Of course you can ask AMS info or Dutch Mill for a course and distance to an alternative field, but we assume that this is not possible in the procedure below.

Draw a line from the marked point on the map to a clearly recognizable point or arrival fix at the diversion airport. Find the course to the diversion airport. Several methods can be used for this:

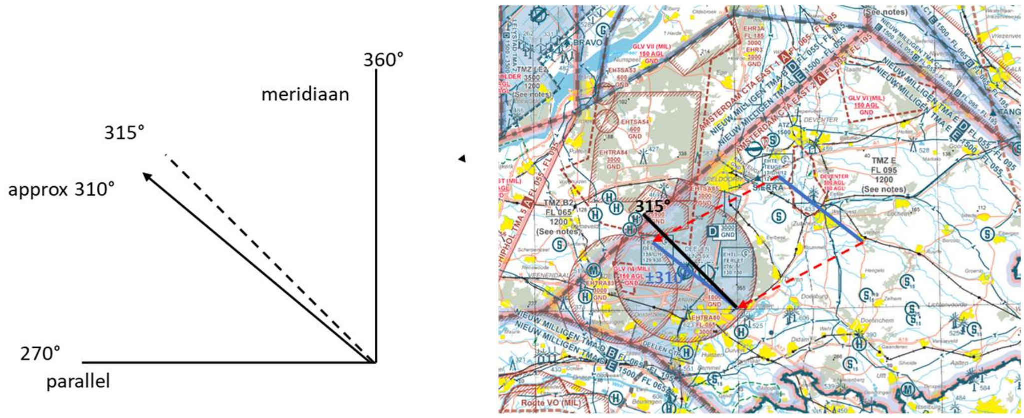
- Plotter (disadvantage, relatively many heads down)
- Project the line to a VOR rose (unfortunately, not to many VOR roses on the NL VFR ICAO map)
- Using meridians and parallels.



Direction determination using plotter



Determining the course using VOR rose




Determining course using parallel and meridian.

Use of the wind protractor is not explained but also possible.

When we have found the true course, we can calculate the magnetic course with the VAR. Then we have to make a wind correction on the magnetic course and calculate a ground speed. Course and ground speed can be calculated with, among other things:

- The E6B
- Mental dead reckoning
- Visualisatie heading indicator

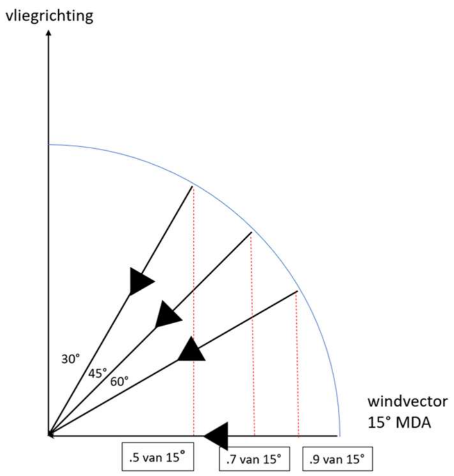
→ Mental dead reckoning (MDR)

Calculate the MAX DRIFT ANGLE (this can be done during flight preparation as soon as the wind is known). The MDA is the maximum drift that the aircraft gets when the wind is perpendicular to the direction of flight and depends on the wind speed and flight speed.

**MDA** = 60/TAS x wind speed

In our example: TAS = 103kts; WS = 25kts **MDA** = 60/100 x 25= 15°

If the wind is perpendicular to the direction of flight, the drift is 15° (L/R), If the wind comes straight from the front/back, the drift is zero, in between the drift will be a function of the SIN of the wind direction. Use the following rule of thumb!



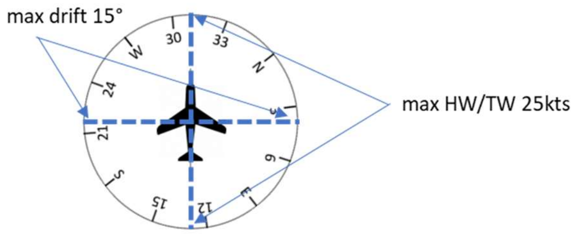

- If the wind is less than 30° from the left or right, you don't use drift correction.
- If the wind comes 30° from the left or right, you use 0.5 of the MDA = ±8°.
- If the wind comes 45° from the left or right, you use 0.7 of the MDA = ±10°.
- If the wind comes 60° from the left or right, you use 0.9 of the MDA = ±14°.
- If the wind comes more than 60° from the left or right, use the entire MDA of 15°.

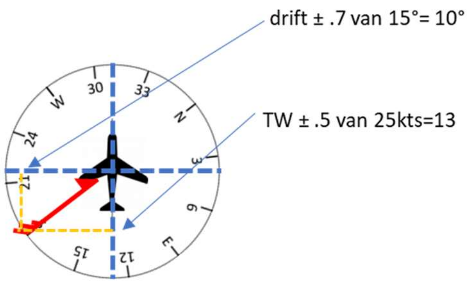
To calculate the headwind or tailwind component, you use the same method, only the other way around.
- If the wind comes straight from the front or back, add/subtract the entire wind from your TAS.
- If the wind is 30° to the left or right of the nose/tail, add/subtract .9 of the wind to/from your TAS.
- If the wind is 45° to the left or right of the nose/tail, add/subtract .7 of the wind to/from your TAS.
- If the wind is 60° to the left or right of the nose/tail, add/subtract .5 of the wind to/from your TAS.
- If the wind comes more than 60 left/right from the nose/tail, there is no correction on the TAS.

In our example: the TT to the alternate is ± 310°, **MDA** = 60/103 x 25 = 15°. VAR =-2°, the wind comes from 180°/25, so 40° left rear. 0.7 from 15° = 10°, MH = 310° - 10° -2° = 298°, GS = 103 + .7 from 25kts = ±120kts.

With the E6B MH = 297°, GS = 117kts

**→ Visualisatie heading indicator.**




With this method, the drift and HW/TW Visualized on the heading indicator. The horizontal blue dashed line from the aircraft to the outside of the HI is the maximum drift (15°), the vertical blue dashed line is the maximum HW/TW (25kts).

Now visualize where the wind is coming from on the HDG scale.

Visualize a vertical line from the tail of the wind vector to the horizontal drift line. The intersection point indicates the fraction of the drift.

Next, visualize a horizontal line from the tail of the wind vector to the vertical HW/TW line. The intersection point indicates the fraction of the HW/TW.

As soon as the MH is found, you can turn to the diversion airport. Start the stopwatch. Now calculate the flight time. Find the distance using the plotter or use the minutes along a meridian or use your thumb, which stands for about 10NM. Make it simple! Every 6 minutes you complete GS/10.

120kts/10 = 12NM, every 3 minutes you cover GS/10/2. 120/10/2 = 6NM off, etc. Find the new flight time. In our example, ±10 NM is just under 6 minutes.

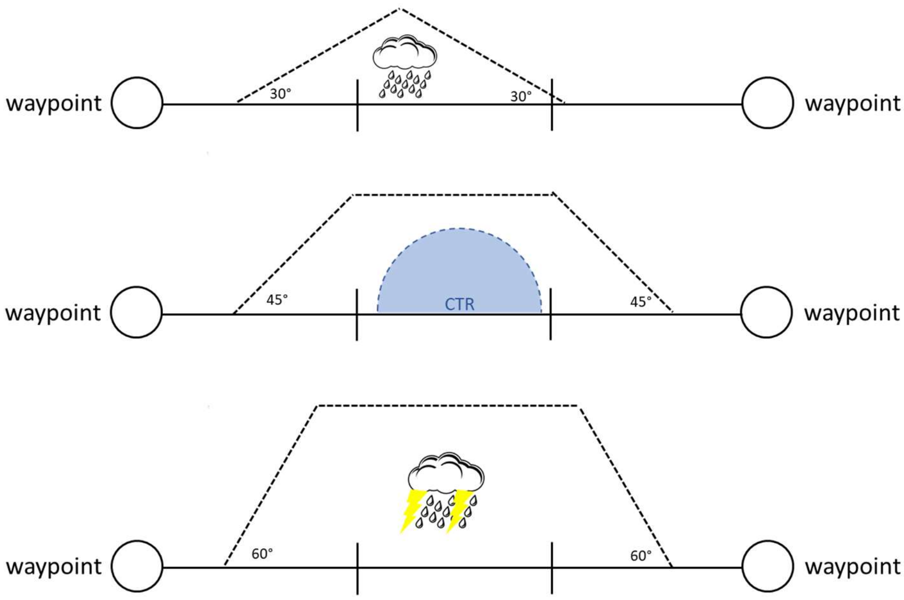
It all seems quite complicated but after some practice it is not that hard (can also be practiced at home)!

Summary:

1. Fly circles around a clearly identifiable point.
2. Draw a line from this point to the diversion airport and determine the TT and distance.
3. Calculate the drift and ground speed.
4. Set course for evasive field and start the stopwatch.
5. Calculate the flight time with the ground speed.
6. Track the progress on the map.

**4.2 DEVIATING FROM COURSE**

During flight, it may be necessary to temporarily change course, for example due to a shower or because permission is not obtained to fly through a CTR or unexpected closure of a restricted area. One way is to change course at a fixed angle (30°, 45°, or 60°) and fly back to the planned course at the same angle. In case of a shower, always swerve upwind)




The flight time between the checkpoints in which deviations are made will also increase. Calculate the new flight time by multiplying the time flown on the first deviating course by the factor below and adding it to the previously calculated time.

| EVASIVE RATE | EXTENDS FACTOR |
|---|---|
| 30° | 0.25 |
| 45° | 0.5 |
| 60° | 1.0 |

Examples:

On a 20-minute leg, you decide to change course 30° to the left for 6 minutes, and then move the course 30° to the right for 6 minutes to return to the original course. Extend the total leg time by 1/4 of 6 minutes = 1:30, total new leg time 21:30 minutes.

On a leg of 25 minutes, you decide to change course 45° to the right for 8 minutes and then change the course 45° to the left for 8 minutes to return to the original course.
Extend the total leg time by 1/2 of 8 minutes = 4, total new leg time 29 minutes.

### 4.3 UNCERTAINTY OF POSITION AND LOST PROCEDURE

***Unsure of your position procedure***

Once you are unsure of your position**:**

1. Note the time.
2. Contact air traffic control to request assistance.
3. Consider using radio navigation beacons that are available to determine position, (just keep flying the plane).
4. If fuel levels are low or close to controlled airspace and not in radio contact with air traffic control, select 121.5 and make a PAN call.
5. If this is not necessary, check the heading indicator with ball compass and keep flying straight and level on the planned course.
6. Estimate the distance traveled since the last known position.
7. Compare the ground to the approximate position on the map (look at terrain and valleys or lines such as traffic roads, train tracks, rivers, or coastlines).
8. Once the position has been found again, keep checking the course (also keep looking for other air traffic) and continue the flight. Check the approximate position regularly and keep looking for unique landmarks (roads, train tracks, lakes, rivers, etc.).

***Procedure as soon as lost***

If the "uncertain position procedure" did not help:

1. Inform someone! — Make a radio call on the frequency you were already on and say the word 'LOST'.
2. If you can't make contact on that frequency or you haven't made a radio connection with someone yet, select 121.5 and make a PAN call; select 7700 with ALT on the transponder.

In any case:
Keep flying in VMC conditions, stay aware of the amount of fuel, and try to look for a field where a precautionary landing can be made.

Consider the '**HELP ME**' mnemonic:
H. High ground/obstructions — are there any nearby?
E. Entering controlled airspace — is that a possibility?
L. Limited experience, low time, or student pilot — let someone know.
P. PAN call in good time — don't leave it too late.
M. Meteo conditions — is the weather deteriorating?
E. Endurance — is fuel getting low?

If you are lost, after a successful landing, make a VMS notification.

# CHAPTER 5 SKY DEMON

## 5.1 INTRODUCTION

Nowadays, electronic aids for navigation are indispensable. The complexity of air traffic combined with complex airspace in the Netherlands and Belgium in particular make the use of GPS, iPad, etc. indispensable. SkyDemon (SD) is widely used. Not only does SkyDemon enable you to navigate accurately, but also assists in flight preparation. There are also disadvantages. Think of heads down in the cockpit and no longer looking outside for other traffic, dependence on SkyDemon, etc. SkyDemon is emphatically not a replacement for basic navigation skills but an addition to it! This chapter mainly focuses on flight preparation using SkyDemon, the advantages but also disadvantages/pitfalls.

## 5.2 REGULATIONS

As the following texts from EASA part NCO indicate, the use of SkyDemon is allowed as long as the use does not pose a danger! Attention should be paid to the attachment of the tablet and the possible use of cables. These must be safe at all times.

### NCO.GEN.125 Portable electronic devices

*Regulation (EU) 2018/1975*

The pilot-in-command shall not permit any person to use a portable electronic device (PED) on board an aircraft, including an electronic flight bag (EFB), that could adversely affect the performance of the aircraft systems and equipment or the ability of the flight crew member to operate the aircraft.

### AMC1 NCO.GEN.125 Portable electronic devices (PEDs)

*ED Decision 2019/008/R*

**ELECTRONIC FLIGHT BAGS (EFBS) — HARDWARE**

(a) EFB viewable stowage

When a viewable stowage device is used, the pilot-in-command should ensure that, if the EFB moves or is separated from its stowage, or if the viewable stowage is unsecured from the aircraft (as a result of turbulence, manoeuvring, or other action), it will not jam flight controls, damage flight deck equipment, or injure any person on board.

The viewable stowage device should not be positioned in such a way that it obstructs visual or physical access to aircraft controls and/or displays, flight crew ingress or egress, or external vision. The design of the viewable stowage device should allow the user easy access to any item of the EFB system, and notably to the EFB controls and a clear view of the EFB display while in use.

(b) Cables

If cables are used to connect an EFB to an aircraft system, power source, or any other equipment:

(1) the cables should not hang loosely in a way that compromises task performance and safety; flight crew should be able to easily secure the cables out of the way during operations (e.g. by using cable tether straps); and

(2) the cables should be of sufficient length so that they do not to obstruct the use of any movable device on the flight deck.

Before using SkyDemon, the instructions for use should be thoroughly studied (AMC2 NCO. GEN.125(a)). Charts must be current; performance profiles and W&B tools must first be checked on the ground using the AFM (AMC2 NCO. GEN.125(b)3 and (d)).

If the MAP function is used, there must be a back-up, this can be another electronic device or paper MAP as long as it is suitable ((AMC2 NCO. GEN.125(b)4)

## AMC2 NCO.GEN.125 Portable electronic devices (PEDs)

*ED Decision 2019/008/R*

**ELECTRONIC FLIGHT BAGS (EFBs) — FUNCTIONS**

(a) Familiarisation

The pilot-in-command should familiarise himself or herself with the use of the EFB hardware and its applications on the ground before using them in flight for the first time.

A user guide should be available for the pilot-in-command.

(b) Check before flight

Before each flight, the pilot-in-command should perform the following checks to ensure the continued safe operation of the EFB during the flight:

(1) general check of the EFB operation by switching it ON and checking that the applications they intend to use in flight are adequately operative;

(2) check of the remaining available battery power, if applicable, to ensure the availability of the EFB during the planned flight;

(3) check of the version effectivity of the EFB databases, if applicable (e.g. for charts, performance calculation and weight and balance applications); and

(4) check that an appropriate backup is available when a chart application or an application displaying aircraft checklists is used.

(c) Chart applications

The navigation charts that are depicted should contain the necessary information in an appropriate format, to perform the operation safely. Consideration should be given to the size of the display to ensure legibility.

(d) Performance calculation and weight and balance functions or applications

Prior to the first use of a performance calculation or weight and balance function or application, and following any update of the database supporting the function or the application, a check should be performed on the ground to verify that the output of the application corresponds with the data derived from the AFM (or other appropriate sources);

There are several map options on SkyDemon, none of which resemble the LVNL VFR ICAO 1:500,000 of the Netherlands. The use however is allowed! A MAP must comply with AMC1 NCO. GEN(a)(10), SkyDemon cards meet that requirement.

## AMC1 NCO.GEN.135(a)(10) Documents, manuals and information to be carried

*ED Decision 2014/016/R*

**CURRENT AND SUITABLE AERONAUTICAL CHARTS**

(a) The aeronautical charts carried should contain data appropriate to the applicable air traffic regulations, rules of the air, flight altitudes, area/route and nature of the operation. Due consideration should be given to carriage of textual and graphic representations of:

(1) aeronautical data, including, as appropriate for the nature of the operation:

(i) airspace structure;

(ii) significant points, navigation aids (navaids) and air traffic services (ATS) routes;

(iii) navigation and communication frequencies;

(iv) prohibited, restricted and danger areas; and

(v) sites of other relevant activities that may hazard the flight; and

(2) topographical data, including terrain and obstacle data.

(b) A combination of different charts and textual data may be used to provide adequate and current data.

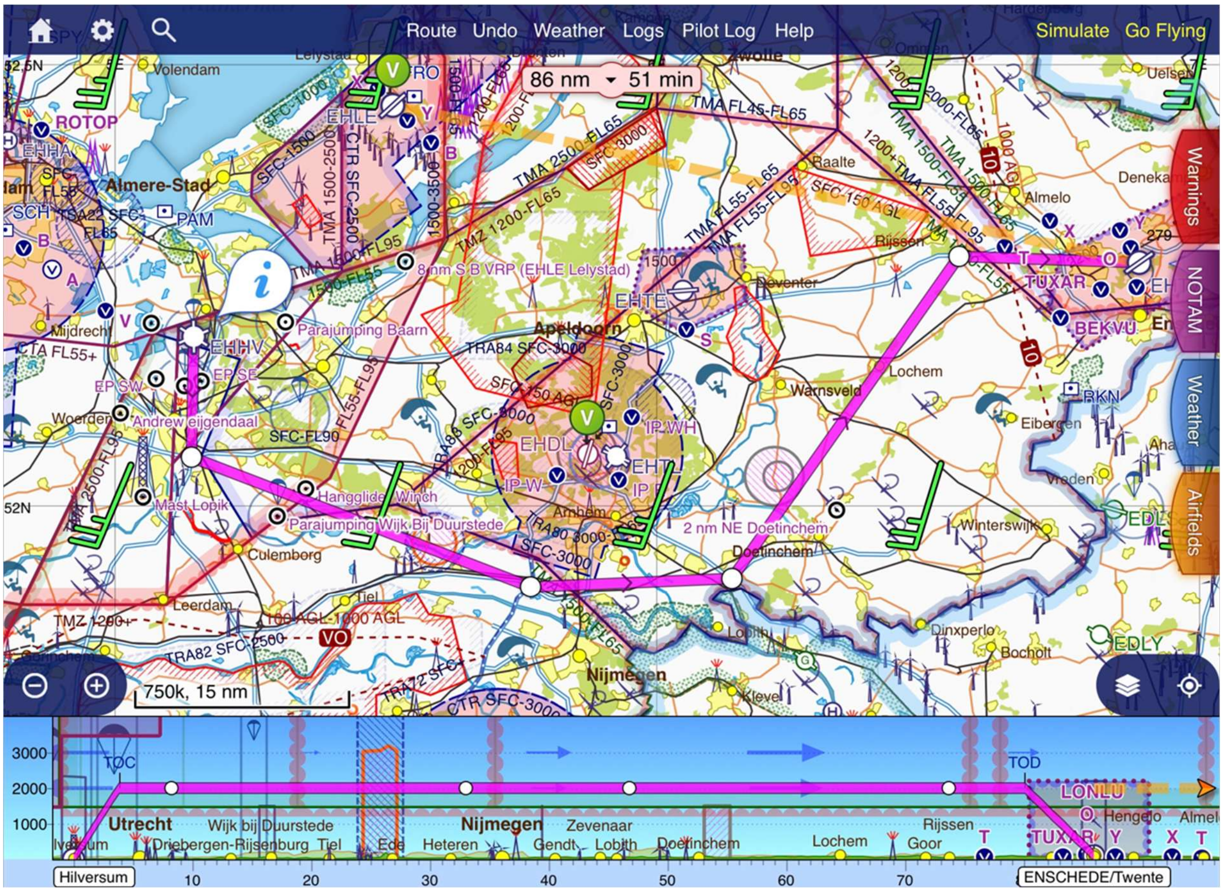
(c) The aeronautical data should be appropriate for the current aeronautical information regulation and control (AIRAC) cycle.

(d) The topographical data should be reasonably recent, having regard to the nature of the planned

### 5.3 FLIGHT PREPARATION

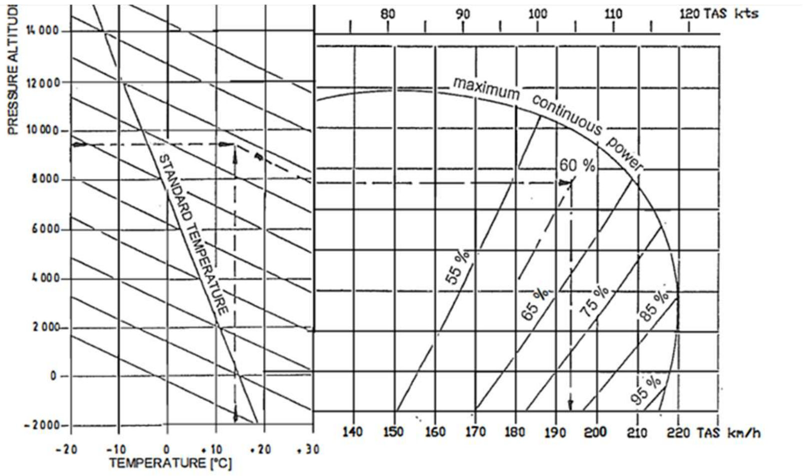
The first part of the flight preparation is still the same. Decide what you want to do (route or destination), find pivot points on the SD map and put the route in SD. See user manual (https://www.skydemon.aero/help/manual.pdf).

The **advantage** is that courses and distances no longer have to be measured using the plotter, SD does this for you and creates a NAV LOG for you.
After a route has been created, information about fuel on board, take-off time/date, weights, etc. can be entered in the route tab, flight details, information about fuel on board, take-off time/date, weights, etc. SD then calculates headings, ground speeds, times and fuel data with the correct winds and fills in this data in the NAV LOG.




The **disadvantage** is, the calculations are only accurate if SD calculates with the correct data! Before using SD, it must be checked that the correct performance is in the aircraft profile (AMC2 NCO. GEN.125(d)). Make sure that the power setting and cruise speed you wish to use match the AFM. Multiple power settings and altitudes can be added to the aircraft profile in advance.

Check the AFM for any notes!




| | | |
|---|---|---|
| *Example:* | Pressure altitude: | 9500 ft |
| | Temperature: | + 14 °C (57 °F) |
| | power setting: | 60 % |
| *Result:* | True airspeed (TAS): | 104.2 kts (193 km/h) |

**CAUTION**

In case of operation without wheel fairings the maximum cruise speed is reduced by approximately 5%.

| Revision No. | Reference | Date | Page |
|---|---|---|---|

Weight & balance data can also be entered in flight details. Check the aircraft profile for correct data. Here the data of the weighing report can be entered, also check that the weight/arm/moment diagram corresponds to the AFM.

Once this is done, a briefing package can be created and printed. The briefing package includes:

- pilot log
- Weather
- NOTAMS
- fuel, weight & balance
- enroute maps

Print it out and you will immediately have your backup.

< Back | **Pilot Log** | Print Settings Columns

## Hilversum - ENSCHEDE/Twente

Aircraft: PH-DON (172N)
Pilot: : PIC van ACHA

| | | | | | |
|---|---|---|---|---|---|
| **Startup** | | **Brakes Off** | | **Fuel Required** | 14,9 gal |
| **Takeoff** | | **Landing** | | **Planned Fuel** | 25,0 gal |
| **Brakes On** | | **Shutdown** | | **Endurance** | 3 hr 24 m |

| Elevation 3 ft (0 hPa)<br>SR 07:44 Z, MCT 07:03 Z | MSA | Level | TAS | TrkT | TrkM | Wind | HdgM | GS | Dist | Time | FuelR | ETA | ATA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EHHV Hilversum<br>**N520318 E0050835** | 1700 | **2000** | 103 | 181 | 179 | 180/25 | **178** | 67 | 8,2 (8,2) | 7 (7) | 22,8 | | |
| N520318 E0050835<br>**N515426 E0054604** | 1700 | **2000** | 103 | 111 | 108 | 180/25 | **122** | 91 | 25 (33) | 16 (24) | 20,9 | | |
| N515426 E0054604<br>**N515500 E0060820** | 1700 | **2000** | 103 | 087 | 085 | 180/25 | **099** | 101 | 14 (47) | 8 (32) | 20,0 | | |
| N515500 E0060820<br>**N521659 E0063326** | 1700 | **2000** | 103 | 035 | 032 | 180/25 | **040** | 123 | 27 (74) | 13 (45) | 18,5 | | |
| N521659 E0063326<br>**EHTW ENSCHEDE/Twente** | 1500 | **2000** | 103 | 092 | 089 | 180/25 | **104** | 94 | 12 (86) | 8 (53) | 17,6 | | |
| EHTW ENSCHEDE/Twente<br>**EHLE Lelystad** | 1600 | **2000** | 103 | 282 | 280 | 180/25 | **266** | 105 | 52 (137) | 29 (82) | 14,3 | | |
| Elevation 115 ft (4 hPa)<br>SS 15:20 Z, ECT 16:01 Z | | | | | | | | | **86** | **52** | (gal) | | |

| | | | | | |
|---|---|---|---|---|---|
| **EHHV Hilversum** | | **EHTE DEVENTER/Teuge** | | **EHLE Lelystad** | |
| Hilversum Radio | 131,030 | Teuge Radio | 121,005 | Lelystad Arrival | 134,530 |
| **Nieuw Milligen E TMA** | | **Flight Information Service** | | Lelystad Tower | 135,180 |
| Dutch Mil Info | 132,350 | Amsterdam Information | 124,300 | ATIS | 120,730 |
| **EHDL Deelen** | | **Schiphol 1 TMA** | | Lelystad Delivery | 123,680 |
| RAPCON West | 123,580 | Schiphol | 119,055 | | |
| **EHTL Terlet** | | Schiphol Arrival | 118,405 | | |
| Terlet Radio | 130,130 | Schiphol Approach | 131,155 | | |

There are small differences between the fuel calculation made in chapter 2.11 and the fuel calculation made by SD. In the calculation of chapter 2.11, the distance from the airport of departure to the starting point and from the end point to the airport of destination has been increased by 2 NM but no wind has been used. SD does not increase the distance but does use the current wind (can be turned off). SD calculates route to the diversion airport in a straight line, in our example we calculated from a starting point to an end point. Small differences, be aware of whether they are conservative or not and consider taking extra fuel.

| | USG/LITERS | WEIGHT | MINUTEN |
|---|---|---|---|
| TAXI+RUNUP | 1,1 USG | | |
| TRIP | 6,3 USG | | 52 MIN |
| CONTINGENCY | 0,6 USG | | 5 MIN |
| ALTERNATE | 4,0 USG | | 23 MIN |
| FINAL RESERVEFUEL (FRF) | 3,5 USG | | 30 MIN |
| MIN REQUIRED FUEL | 15,5 USG | | 1:50 MIN |
| EXTRA FUEL | 9,5 USG | | 1:22 MIN |
| TAKE OFF FUEL | 25,0 USG | 150 | 3:12 MIN |

< Flight Details **Fuel**

| PLANNED FUEL | |
|---|---|
| Usable 40/151 | 25,0 gal |
| **MINIMUM FUEL** | |
| Taxi/Takeoff | 1,1 gal |
| Cruise | 6,3 gal |
| Diversion | 3,5 gal |
| Holding Time | 3,4 gal |
| Landing | 0,4 gal |
| Contingency | 0,3 gal |
| Total | 15,0 gal |

Also note that SD calculates the holding time as the time with the fuel burn at cruising altitude/level. Legally, you have to use the fuel burn at an altitude of 1500ft with holding speed (or MCT in case the 10 minute option is used). In practice, this will make little difference because the holding speed at a lower altitude gives a lower fuel burn than cruise speed at altitude.

### NCO.OP.125 Fuel/energy and oil supply – aeroplanes and helicopters

*Regulation (EU) 2021/1296*

(a) The pilot-in-command shall ensure that the quantity of fuel/energy and oil that is carried on board is sufficient, taking into account the meteorological conditions, any element affecting the performance of the aircraft, any delays that are expected in flight, and any contingencies that may reasonably be expected to affect the flight.

(b) The pilot-in-command shall plan a quantity of fuel/energy to be protected as final reserve fuel/energy to ensure a safe landing. The pilot-in-command shall take into account all of the following, and in the following order of priority, to determine the quantity of the final reserve fuel/energy:

(1) the severity of the hazard to persons or property that may result from an emergency landing after fuel/energy starvation; and

(2) the likelihood of unexpected circumstances that the final reserve fuel/energy may no longer be protected.

(c) The pilot-in-command shall commence a flight only if the aircraft carries sufficient fuel/energy and oil:

(1) when no destination alternate is required, to fly to the aerodrome or operating site of intended landing, plus the final reserve fuel/energy; or

(2) when a destination alternate is required, to fly to the aerodrome or operating site of intended landing, and thereafter, to an alternate aerodrome, plus the final reserve fuel/energy.

### AMC1 NCO.OP.125(b) Fuel/energy and oil supply — aeroplanes and helicopters

*ED Decision 2022/005/R*

**PLANNING CRITERIA — FINAL RESERVE FUEL/ENERGY**

The final reserve fuel (FRF)/energy should be no less than the required fuel/energy to fly:

(a) for aeroplanes:

(1) for 10 minutes at maximum continuous cruise power at 1 500 ft (450 m) above the destination under VFR by day, taking off and landing at the same aerodrome/landing site, and always remaining within sight of that aerodrome/landing site;

(2) for 30 minutes at holding speed at 1 500 ft (450 m) above the destination under VFR by day; and

(3) for 45 minutes at holding speed at 1 500 ft (450 m) above the destination or destination alternate aerodrome under VFR flights by night and IFR; and

The briefing package from SD does not include AIP-approach cards! You can print this directly from SD.

SD does not make take-off and landing distance calculations for the relevant fields, these must be made by pilot.

### 5.4 FLIGHT OPERATIONS

Even though it is easy to follow the magenta line, don't forget to navigate using the basic navigation techniques. A tablet is a piece of technology that can fail.

The direction indicator at the bottom of the screen shows true track by default. This can be changed in settings, instruments to magnetic track. If you click on a leg with your finger, there is a distance, time and heading. The ACHA aircraft with G5 (with the exception of the PH-DON) only have magnetic track. Magnetic track is on the NAV LOG (if checked at COLUMNS). You can also click a little longer on the leg and then click on leg properties at the "what's here" menu, then you will also find MT.

< Back — **Pilot Log** — Print Settings Columns

Hilversum - ENSCHEDE/Twente

Aircraft: PH-DON (172N)
Pilot: : PIC van ACHA

| | | | | | |
|---|---|---|---|---|---|
| **Startup** | | **Brakes Off** | | **Fuel Required** | 14,9 gal |
| **Takeoff** | | **Landing** | | **Planned Fuel** | 25,0 gal |
| **Brakes On** | | **Shutdown** | | **Endurance** | 3 hr 24 m |

| Elevation 3 ft (0 hPa)<br>SR 07:44 Z, MCT 07:03 Z | MSA | Level | TAS | TrkT | TrkM | Wind | HdgM | GS | Dist | Time | FuelR | ETA | ATA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EHHV Hilversum<br>**N520318 E0050835** | 1700 | **2000** | 103 | 181 | 179 | 180/25 | **178** | 67 | 8,2 (8,2) | 7 (7) | 22,8 | | |
| N520318 E0050835<br>**N515426 E0054604** | 1700 | **2000** | 103 | 111 | 108 | 180/25 | **122** | 91 | 25 (33) | 16 (24) | 20,9 | | |
| N515426 E0054604<br>**N515500 E0060820** | 1700 | **2000** | 103 | 087 | 085 | 180/25 | **099** | 101 | 14 (47) | 8 (32) | 20,0 | | |
| N515500 E0060820<br>**N521659 E0063326** | 1700 | **2000** | 103 | 035 | 032 | 180/25 | **040** | 123 | 27 (74) | 13 (45) | 18,5 | | |
| N521659 E0063326<br>**EHTW ENSCHEDE/Twente** | 1500 | **2000** | 103 | 092 | 089 | 180/25 | **104** | 94 | 12 (86) | 8 (53) | 17,6 | | |
| EHTW ENSCHEDE/Twente<br>**EHLE Lelystad** | 1600 | **2000** | 103 | 282 | 280 | 180/25 | **266** | 105 | 52 (137) | 29 (82) | 14,3 | | |
| Elevation 115 ft (4 hPa)<br>SS 15:20 Z, ECT 16:01 Z | | | | | | | | | **86** | **52** | (gal) | | |

| | | | | | |
|---|---|---|---|---|---|
| **EHHV Hilversum** | | **EHTE DEVENTER/Teuge** | | **EHLE Lelystad** | |
| Hilversum Radio | 131,030 | Teuge Radio | 121,005 | Lelystad Arrival | 134,530 |
| **Nieuw Milligen E TMA** | | **Flight Information Service** | | Lelystad Tower | 135,180 |
| Dutch Mil Info | 132,350 | Amsterdam Information | 124,300 | ATIS | 120,730 |
| **EHDL Deelen** | | **Schiphol 1 TMA** | | Lelystad Delivery | 123,680 |
| RAPCON West | 123,580 | Schiphol | 119,055 | | |
| **EHTL Terlet** | | Schiphol Arrival | 118,405 | | |
| Terlet Radio | 130,130 | Schiphol Approach | 131,155 | | |

# CHAPTER 6 ANNEXES

### 6.1 KOMPAS DEVIATION CARDS

| PH-SKM | |
|---|---|
| FOR | STEER |
| 360° | 357° |
| 030° | 027° |
| 60° | 058° |
| 90° | 089° |
| 120° | 119° |
| 150° | 150° |
| 180° | 179° |
| 210° | 207° |
| 240° | 238° |
| 270° | 268° |
| 300° | 299° |
| 330° | 328° |

| PH-MFT | |
|---|---|
| FOR | STEER |
| 360° | 358° |
| 030° | 028° |
| 060° | 058° |
| 090° | 091° |
| 120° | 121° |
| 150° | 151° |
| 180° | 180° |
| 210° | 211° |
| 240° | 242° |
| 270° | 271° |
| 300° | 301° |
| 330° | 329° |

| PH-SKC | |
|---|---|
| FOR | STEER |
| 360° | 2° |
| 030° | 32° |
| 060° | 63° |
| 090° | 93° |
| 120° | 122° |
| 150° | 153° |
| 180° | 182° |
| 210° | 214° |
| 240° | 242° |
| 270° | 272° |
| 300° | 298° |
| 330° | 332° |

| PH-DON | |
|---|---|
| FOR | STEER |
| 360° | 358° |
| 030° | 031° |
| 060° | 065° |
| 090° | 094° |
| 120° | 124° |
| 150° | 154° |
| 180° | 178° |
| 210° | 206° |
| 240° | 235° |
| 270° | 265° |
| 300° | 298° |
| 330° | 328° |

### 6.2 TIME/DISTANCE/FUEL TABLES TO STARTING POINT NAVIGATION ROUTE

Below are usefull tables to calculate the time and fuel burn to the starting point for the C172 and DV20. If the altitude that will be flown and the distance to the starting point are known, these two data can be used to enter the table and time and fuel burn can be calculated and entered on NAV LOG. If there is a strong wind that affects a large part of the leg to the starting point, there is also a table with a headwind of 20 kts.

C172 PH-DON & PH-SKC TIME/DIST/FUEL + CRUISE 2300RPM STANDAARD TEMPERATURE NAAR BEGINPUNT NAV ROUTE

| Altitude | time | fuel | distance | distance to EP | | distance to EP | | distance to EP | | distance to EP | | distance to EP | | distance to EP | | distance to EP | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | minutes | gallons | NM | 4NM | | 5NM | | 6NM | | 7NM | | 8NM | | 9NM | | 10NM | |
| | | | | tot time | tot fuel | tot time | tot fuel | tot time | tot fuel | tot time | tot fuel | tot time | tot fuel | tot time | tot fuel | tot time | tot fuel |
| | | | | minutes | gallons | minutes | gallons | minutes | gallons | minutes | gallons | minutes | gallons | minutes | gallons | minutes | gallons |
| 1000 | 01:29 | 0,3 | 1,9 | 02:43 | 0,4 | 03:18 | 0,5 | 03:53 | 0,6 | 04:28 | 0,6 | 05:03 | 0,7 | 05:38 | 0,8 | 06:13 | 0,9 |
| 1500 | 02:15 | 0,5 | 2,9 | 02:55 | 0,5 | 03:30 | 0,6 | 04:05 | 0,7 | 04:40 | 0,7 | 05:15 | 0,8 | 05:50 | 0,9 | 06:25 | 0,9 |
| 2000 | 03:03 | 0,6 | 3,9 | 03:08 | 0,6 | 03:43 | 0,7 | 04:18 | 0,8 | 04:53 | 0,8 | 05:28 | 0,9 | 06:03 | 1,0 | 06:38 | 1,0 |
| 2500 | 03:53 | 0,8 | 4,9 | | | 03:56 | 0,8 | 04:31 | 0,8 | 05:06 | 0,9 | 05:41 | 1,0 | 06:16 | 1,0 | 06:51 | 1,1 |
| 3000 | 04:45 | 1,0 | 6,0 | | | | | | | 05:19 | 1,0 | 05:54 | 1,1 | 06:29 | 1,1 | 07:04 | 1,2 |
| 3500 | 05:39 | 1,1 | 7,2 | | | | | | | | | 06:09 | 1,2 | 06:43 | 1,2 | 07:18 | 1,3 |
| 4000 | 06:35 | 1,3 | 8,3 | | | | | | | | | | | 06:58 | 1,4 | 07:33 | 1,4 |

C172 PH-DON & PH-SKC TIME/DIST/FUEL + CRUISE 2300RPM STANDAARD TEMPERATURE **20kts headwind** NAAR BEGINPUNT NAV ROUTE

| Altitude | time | fuel | distance | distance to EP | | distance to EP | | distance to EP | | distance to EP | | distance to EP | | distance to EP | | distance to EP | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | minutes | gallons | NM | 4NM | | 5NM | | 6NM | | 7NM | | 8NM | | 9NM | | 10NM | |
| | | | | tot time | tot fuel | tot time | tot fuel | tot time | tot fuel | tot time | tot fuel | tot time | tot fuel | tot time | tot fuel | tot time | tot fuel |
| | | | | minutes | gallons | minutes | gallons | minutes | gallons | minutes | gallons | minutes | gallons | minutes | gallons | minutes | gallons |
| 1000 | 01:29 | 0,3 | 1,4 | 03:22 | 0,5 | 04:06 | 0,6 | 04:49 | 0,7 | 05:32 | 0,8 | 06:16 | 0,9 | 06:59 | 0,9 | 07:43 | 1,0 |
| 1500 | 02:15 | 0,5 | 2,1 | 03:37 | 0,6 | 04:21 | 0,7 | 05:04 | 0,8 | 05:48 | 0,9 | 06:31 | 0,9 | 07:14 | 1,0 | 07:58 | 1,1 |
| 2000 | 03:03 | 0,6 | 2,8 | 03:53 | 0,7 | 04:36 | 0,8 | 05:20 | 0,9 | 06:03 | 1,0 | 06:47 | 1,0 | 07:30 | 1,1 | 08:13 | 1,2 |
| 2500 | 03:53 | 0,8 | 3,6 | | | 04:53 | 0,9 | 05:36 | 1,0 | 06:20 | 1,1 | 07:03 | 1,1 | 07:46 | 1,2 | 08:30 | 1,3 |
| 3000 | 04:45 | 1,0 | 4,4 | | | | | | | 06:36 | 1,2 | 07:20 | 1,2 | 08:03 | 1,3 | 08:47 | 1,4 |
| 3500 | 05:39 | 1,1 | 5,3 | | | | | | | | | 07:37 | 1,3 | 08:21 | 1,4 | 09:04 | 1,5 |
| 4000 | 06:35 | 1,3 | 6,1 | | | | | | | | | | | 08:39 | 1,5 | 09:22 | 1,6 |

Add 1,1,gallon to fuel numbers for engine start and taxi

DV20 PH-SKM & PH-MFT CRUISE 2400RPM ENTRY POINT NAVIGATION ROUTE

| Altitude | time | fuel | distance | distance to EP | | distance to EP | | distance to EP | | distance to EP | | distance to EP | | distance to EP | | distance to EP | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | minutes | liters | NM | 4NM | | 5NM | | 6NM | | 7NM | | 8NM | | 9NM | | 10NM | |
| | | | | tot time | tot fuel | tot time | tot fuel | tot time | tot fuel | tot time | tot fuel | tot time | tot fuel | tot time | tot fuel | tot time | tot fuel |
| | | | | minutes | liters | minutes | liters | minutes | liters | minutes | liters | minutes | liters | minutes | liters | minutes | liters |
| 1000 | 01:26 | 0,6 | 1,7 | 02:47 | 1,0 | 03:22 | 1,2 | 03:57 | 1,4 | 04:32 | 1,6 | 05:07 | 1,7 | 05:42 | 1,9 | 06:17 | 2,1 |
| 1500 | 02:14 | 0,9 | 2,6 | 03:01 | 1,2 | 03:36 | 1,4 | 04:10 | 1,5 | 04:45 | 1,7 | 05:20 | 1,9 | 05:54 | 2,1 | 06:29 | 2,2 |
| 2000 | 03:06 | 1,3 | 3,7 | 03:16 | 1,3 | 03:50 | 1,5 | 04:24 | 1,7 | 04:58 | 1,9 | 05:33 | 2,1 | 06:07 | 2,2 | 06:41 | 2,4 |
| 2500 | 04:02 | 1,7 | 4,8 | | | 04:08 | 1,7 | 04:42 | 1,9 | 05:17 | 2,1 | 05:51 | 2,2 | 06:26 | 2,4 | 07:01 | 2,6 |
| 3000 | 05:03 | 2,1 | 6,1 | | | | | | | 05:33 | 2,2 | 06:08 | 2,4 | 06:43 | 2,6 | 07:18 | 2,8 |
| 3500 | 06:08 | 2,6 | 7,5 | | | | | | | | | 06:27 | 2,6 | 07:02 | 2,8 | 07:38 | 3,0 |
| 4000 | 07:16 | 3,0 | 9,0 | | | | | | | | | | | 07:17 | 3,0 | 07:53 | 3,2 |

DV20 PH-SKM & PH-MFT CRUISE 2400RPM ENTRY POINT NAVIGATION ROUTE **20KTS HEADWIND**

| Altitude | time | fuel | distance | distance to EP | | distance to EP | | distance to EP | | distance to EP | | distance to EP | | distance to EP | | distance to EP | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | minutes | liters | NM | 4NM | | 5NM | | 6NM | | 7NM | | 8NM | | 9NM | | 10NM | |
| | | | | tot time | tot fuel | tot time | tot fuel | tot time | tot fuel | tot time | tot fuel | tot time | tot fuel | tot time | tot fuel | tot time | tot fuel |
| | | | | minutes | liters | minutes | liters | minutes | liters | minutes | liters | minutes | liters | minutes | liters | minutes | liters |
| 1000 | 01:26 | 0,6 | 1,2 | 03:28 | 1,2 | 04:11 | 1,4 | 04:55 | 1,7 | 05:38 | 1,9 | 06:21 | 2,1 | 07:05 | 2,3 | 07:48 | 2,6 |
| 1500 | 02:14 | 0,9 | 1,9 | 03:44 | 1,4 | 04:27 | 1,6 | 05:10 | 1,8 | 05:53 | 2,1 | 06:36 | 2,3 | 07:18 | 2,5 | 08:01 | 2,7 |
| 2000 | 03:06 | 1,3 | 2,7 | 04:02 | 1,6 | 04:44 | 1,8 | 05:26 | 2,0 | 06:09 | 2,2 | 06:51 | 2,5 | 07:33 | 2,7 | 08:16 | 2,9 |
| 2500 | 04:02 | 1,7 | 3,5 | | | 05:06 | 2,0 | 05:49 | 2,2 | 06:32 | 2,4 | 07:15 | 2,7 | 07:58 | 2,9 | 08:41 | 3,1 |
| 3000 | 05:03 | 2,1 | 4,5 | | | | | | | 06:53 | 2,6 | 07:36 | 2,8 | 08:20 | 3,1 | 09:03 | 3,3 |
| 3500 | 06:08 | 2,6 | 5,4 | | | | | | | | | 08:02 | 3,1 | 08:45 | 3,3 | 09:29 | 3,5 |
| 4000 | 07:16 | 3,0 | 6,5 | | | | | | | | | | | 09:04 | 3,5 | 09:48 | 3,7 |

| press Alt | std temp | RPM | power | MP | FF l/h |
|---|---|---|---|---|---|
| 0 | 15 | 2400 | 85% | 27,7 | 18,3 |
| 1000 | 13 | 2400 | 85% | 27,2 | 18,5 |
| 1500 | 12 | 2400 | 85% | 26,9 | 18,6 |
| 2000 | 11 | 2400 | 85% | 26,7 | 18,7 |
| 2500 | 10 | 2400 | 82,5% | 26,1 | 18,1 |
| 3000 | 9 | 2400 | 80% | 25,5 | 17,5 |
| 3500 | 8 | 2400 | 77,5% | 24,9 | 16,9 |
| 4000 | 7 | 2400 | 75% | 24,3 | 16,3 |

Add 2,5 ltr to fuel figures for engine start and taxi

### 6.3 DRUKHOOGTE (PRESSURE ALTITUDE) BEREKENING

Take the difference between QNH (regional or airport) and standard pressure of 1013.2 and multiply by 27 ft. In case pressure is lower than standard, add outcome to planned altitude, in case pressure is higher than standard, subtract outcome from planned altitude.

Example: planned altitude = 2000 ft with QNH of 1000. 1013.2-1000 x 27 = 356. Pressure is lower so add the result to 2000. Pressure altitude = 2356 ft

### 6.4 ACHA ATO WEATHER PLANNING MINIMA VFR

NL-ATO-227

**ACHA ATO weather planning minima VFR**

- Weather must me above VFR minima for the entire flight + 1 hour(not applicable for circuit flight)

**Additional planning minima for VFR solo cross country flight:**

- The additional operating minima for VFR solo cross country flights as listed below shall apply from ETD to ETA + 2 hours

**Additional planning minima for VFR solo circuit flying and first solo circuit flying**

- The additional operating minima for VFR training flights for solo circuit flying and first solo circuit flying as listed below shall apply from ETD to ETA +1 hour

**ACHA ATO weather operating minima VFR**

**General operating minima VFR**

- All flights shall adhere to legal minimum visibility/minimum distance from clouds in the airspace to be used

**Additional operating minima for VFR training flights**

| **VFR dual flight training** | **Additional operating minima VFR solo x-county training flights(students)** | **Additional operating minima VFR solo circuit training flights** | **Additional operating minima VFR first solo circuit training flights** |
|---|---|---|---|
| • Minimum visibility(horizontal) of 3km;<br>• Wind components within limits as published in POH;<br>• No clouds below 600ft AGL<br><br>Note: the flight instructor may only deviate from the above mentioned minimums with respect to crosswind for dual flight after:<br><br>• Written approval from HT(personalized for the instructor) | • Minimum visibility(horizontal) 8km;<br>• Maximum wind speed (including) gust 20kts;<br>• Maximum crosswind 12kts;<br>• No tailwind(during landing and take off);<br>• No Cloud below 1500ft AGL;<br>• No precipitation;<br>• No thunderstorms;<br>• No moderate or heavy turbulence | • Minimum visibility(horizontal) 8km;<br>• Maximum wind speed (including) gust 20kts;<br>• Maximum crosswind 12kts;<br>• No tailwind(during landing and take off);<br>• No Cloud below 1200ft AGL;<br>• No precipitation;<br>• No thunderstorms;<br>• No moderate or heavy turbulence | • Minimum visibility(horizontal) 8km;<br>• Maximum wind speed (including) gust 15kts;<br>• Maximum crosswind 5kts;<br>• No tailwind;<br>• No Cloud below circuit altitude + 1000ft AGL;<br>• No precipitation;<br>• No thunderstorms;<br>• No moderate or heavy turbulence |

**In-flight replanning:** In case of inflight replanning , continuation of a flight revers to the point from which a revised flight plan applies

Note: the instructor can decide to not approve the flight with weather above afore mentioned limits

**Important note:** in all cases RVR shall be more than 800 m.

## 6.5 SERA.5001 VMC AND DISTANCE FROM CLOUD MINIMA + CRUISING LEVEL TABLE

### SERA.5001 VMC visibility and distance from cloud minima

*Regulation (EU) 2016/1185*

VMC visibility and distance from cloud minima are contained in Table S5-1.

| Table S5-1 (*) | | | |
|---|---|---|---|
| **Altitude band** | **Airspace class** | **Flight visibility** | **Distance from cloud** |
| At and above 3 050 m (10 000 ft) AMSL | A (**) B C D E F G | 8 km | 1 500 m horizontally<br>300 m (1 000 ft) vertically |
| Below 3 050 m (10 000 ft) AMSL and above 900 m (3 000 ft) AMSL, or above 300 m (1 000 ft) above terrain, whichever is the higher | A (**) B C D E F G | 5 km | 1500 m horizontally<br>300 m (1 000 ft) vertically |
| At and below 900 m (3 000 ft) AMSL, or 300 m (1 000 ft) above terrain, whichever is the higher | A (**) B C D E | 5 km | 1500 m horizontally<br>300 m (1 000 ft) vertically |
| | F G | 5 km (***) | Clear of cloud and with the surface in sight |

(*) When the height of the transition altitude is lower than 3 050 m (10 000 ft) AMSL, FL 100 shall be used in lieu of 10 000 ft.

(**) The VMC minima in Class A airspace are included for guidance to pilots and do not imply acceptance of VFR flights in Class A airspace.

(***) When so prescribed by the competent authority:

(a) flight visibilities reduced to not less than 1 500 m may be permitted for flights operating:

(1) at speeds of 140 kts IAS or less to give adequate opportunity to observe other traffic or any obstacles in time to avoid collision; or

(2) in circumstances in which the probability of encounters with other traffic would normally

### APPENDIX 3 TABLE OF CRUISING LEVELS

*Regulation (EU) No 923/2012*

1.1. The cruising levels to be observed are as follows:

| TRACK[1] | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| From 000 degrees to 179 degrees | | | | | | From 180 degrees to 359 degrees | | | | | |
| IFR Flights | | | VFR Flights | | | IFR Flights | | | VFR Flights | | |
| Level | | | Level | | | Level | | | Level | | |
| FL | Feet | Metres | FL | Feet | Metres | FL | Feet | Metres | FL | Feet | Metres |
| 010 | 1000 | 300 | — | — | — | 020 | 2000 | 600 | — | — | — |
| 030 | 3000 | 900 | 035 | 3500 | 1050 | 040 | 4000 | 1200 | 045 | 4500 | 1350 |
| 050 | 5000 | 1500 | 055 | 5500 | 1700 | 060 | 6000 | 1850 | 065 | 6500 | 2000 |
| 070 | 7000 | 2150 | 075 | 7500 | 2300 | 080 | 8000 | 2450 | 085 | 8500 | 2600 |
| 090 | 9000 | 2750 | 095 | 9500 | 2900 | 100 | 10000 | 3050 | 105 | 10500 | 3200 |
| 110 | 11000 | 3350 | 115 | 11500 | 3500 | 120 | 12000 | 3650 | 125 | 12500 | 3800 |
| 130 | 13000 | 3950 | 135 | 13500 | 4100 | 140 | 14000 | 4250 | 145 | 14500 | 4400 |
| 150 | 15000 | 4550 | 155 | 15500 | 4700 | 160 | 16000 | 4900 | 165 | 16500 | 5050 |
| 170 | 17000 | 5200 | 175 | 17500 | 5350 | 180 | 18000 | 5500 | 185 | 18500 | 5650 |
| 190 | 19000 | 5800 | 195 | 19500 | 5950 | 200 | 20000 | 6100 | 205 | 20500 | 6250 |
| 210 | 21000 | 6400 | 215 | 21500 | 6550 | 220 | 22000 | 6700 | 225 | 22500 | 6850 |
| 230 | 23000 | 7000 | 235 | 23500 | 7150 | 240 | 24000 | 7300 | 245 | 24500 | 7450 |
| 250 | 25000 | 7600 | 255 | 25500 | 7750 | 260 | 26000 | 7900 | 265 | 26500 | 8100 |
| 270 | 27000 | 8250 | 275 | 27500 | 8400 | 280 | 28000 | 8550 | 285 | 28500 | 8700 |
| 290 | 29000 | 8850 | | | | 300 | 30000 | 9150 | | | |
| 310 | 31000 | 9450 | | | | 320 | 32000 | 9750 | | | |