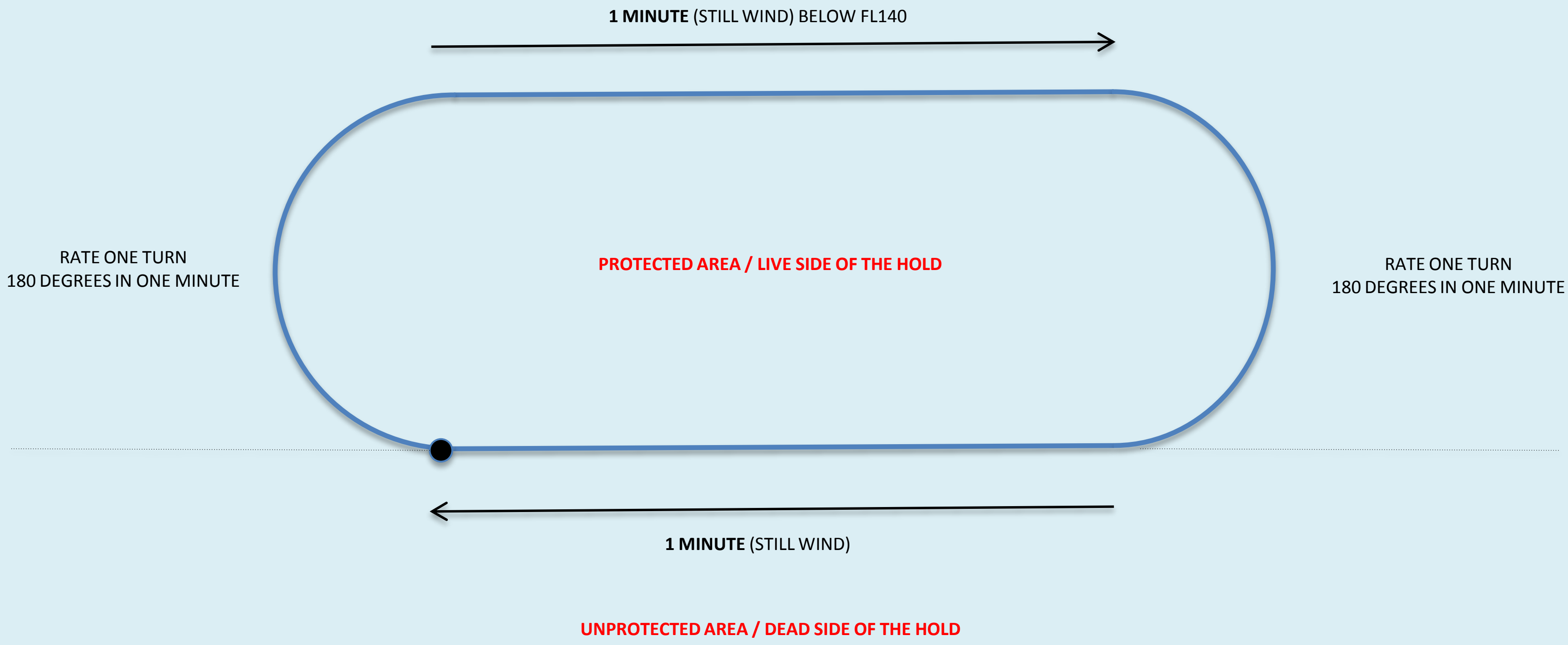
## HOLDING (1)

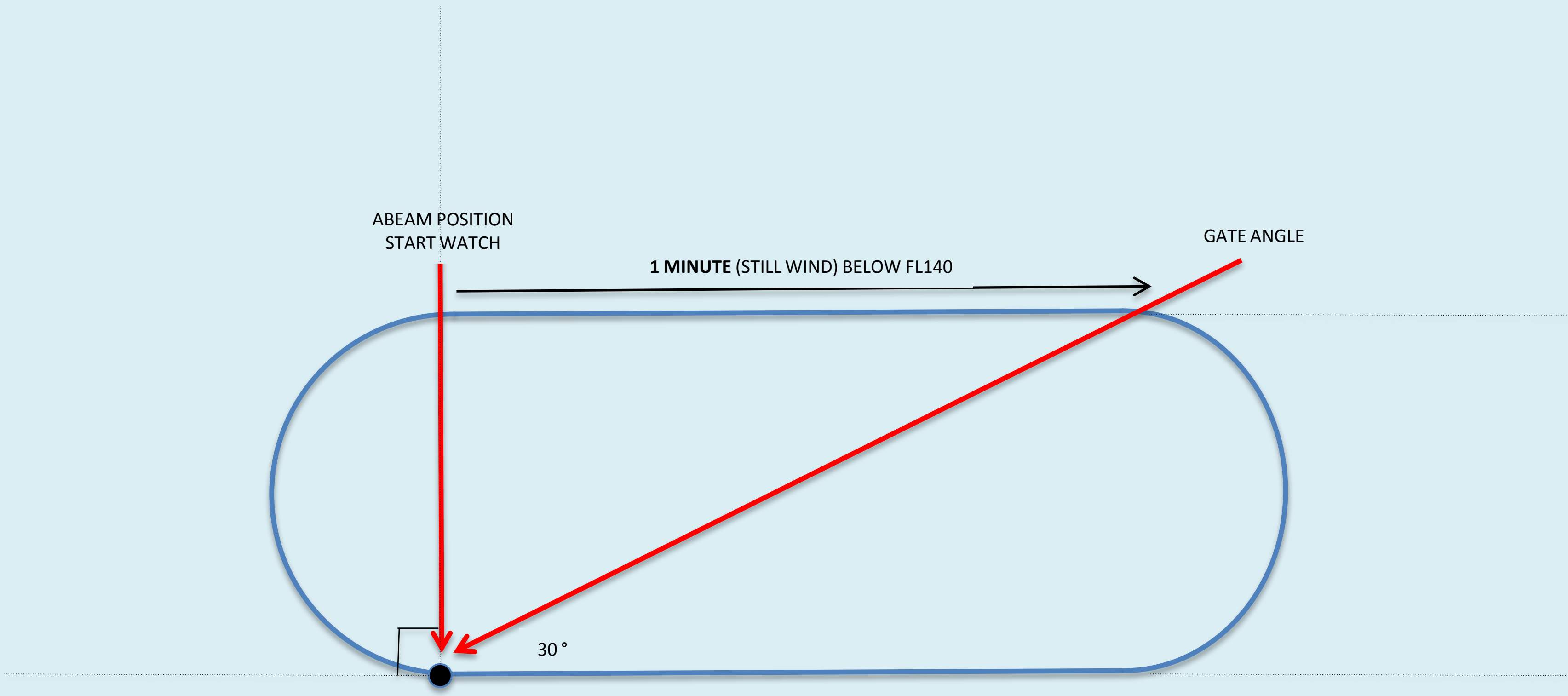
RIGHT (ICAO STANDARD)




ONE COMPLETE LAP OF THE HOLD SHOULD TAKE **4 MINUTES**

# HOLDING (2)

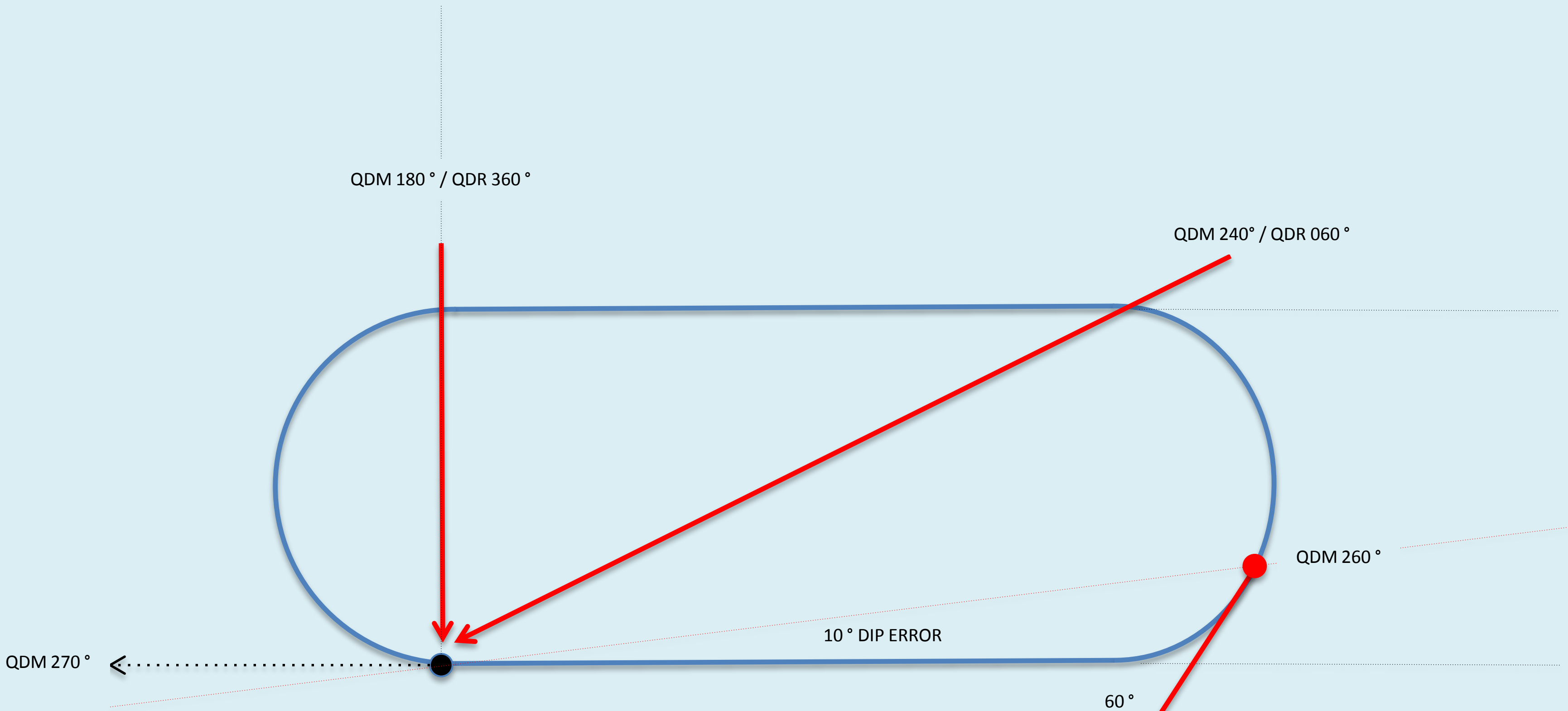
RIGHT (ICAO STANDARD)




FROM THE ABEAM POSITION THE HOLD SHOULD TAKE **3 MINUTES**

**HOLDING (3)**

RIGHT (ICAO STANDARD)




**60 DEGREE TO GO HEADING (210°)**

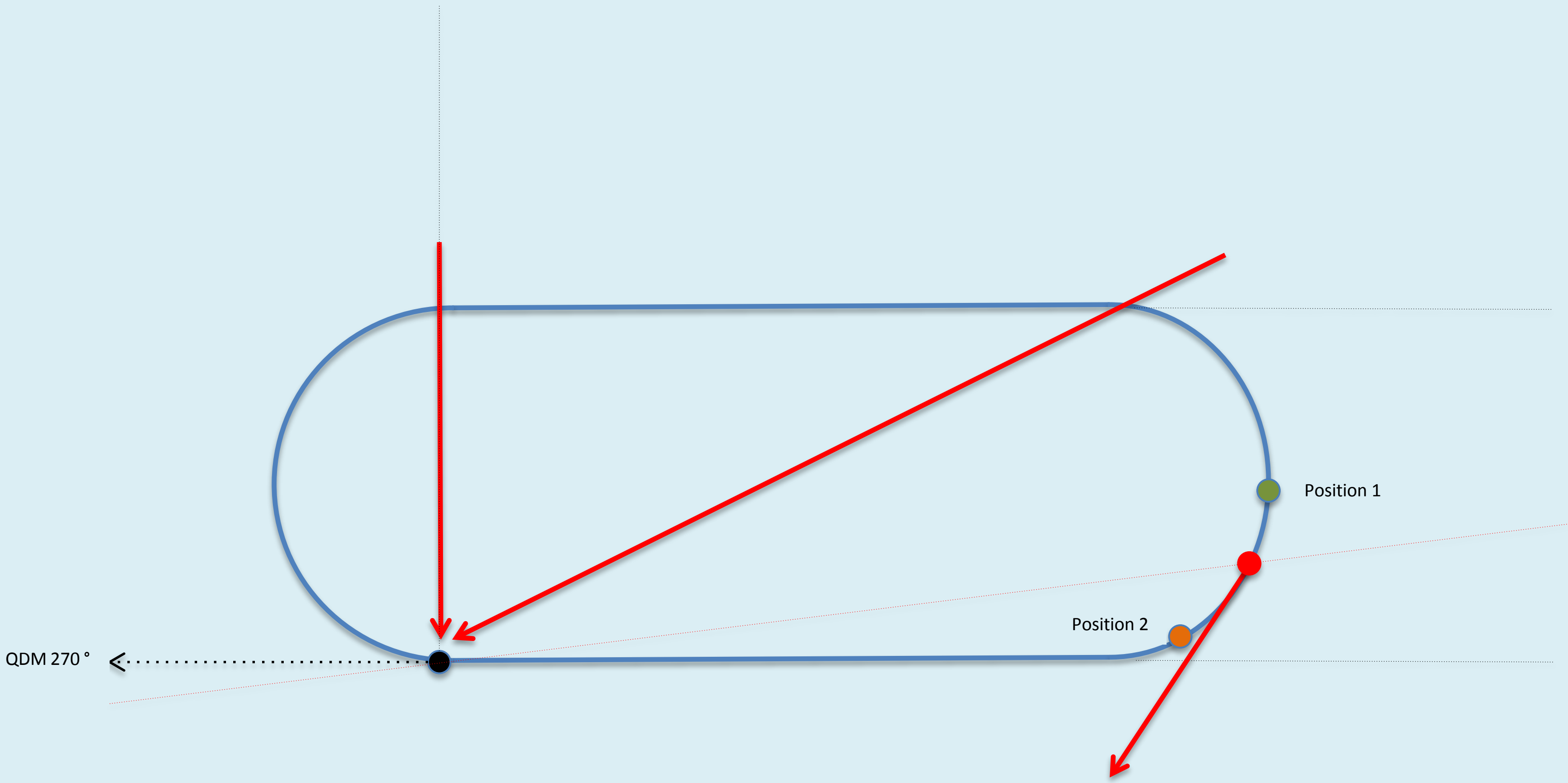
At the 60 degree to go heading, whilst still in
The turn the ADF should indicate the published
Inbound QDM (+/- 5°)

| | |
|---|---|
| RBI: | +60° |
| RMI: | 270° |

This is allowing for ADF 'DIP ERROR'

# HOLDING (4)

## RIGHT (ICAO STANDARD)




**Position 1:** When in the base turn should the ADF read less than your Required inbound QDM anticipate undershooting the inbound QDM.

> 10 degrees error: Roll wings level
< 10 degrees error: reduce the angle of bank

Note: When rolling wings level there is now no 'dip error'. When ADF reads Inbound QDM minus 10 degrees (260°) roll the aircraft to a rate one turn to intercept the inbound QDM.

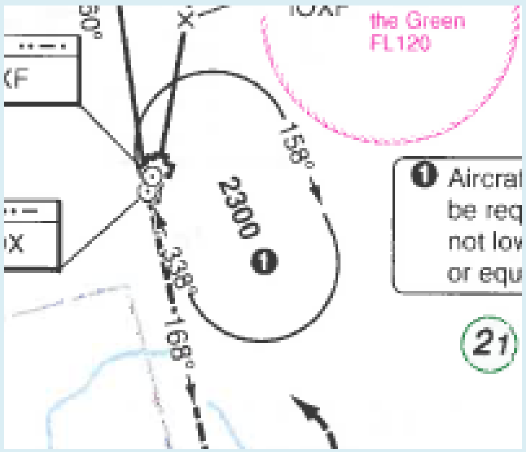
**Position 2:** When in the base turn should the ADF read more than your Required inbound QDM anticipate overshooting the inbound QDM.

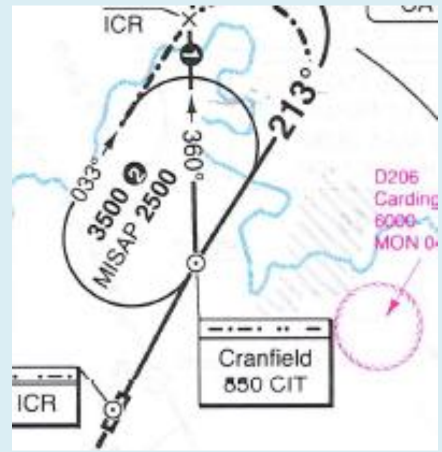
Expect to continue turning through the inbound still wind heading to re-intercept The inbound QDM.

**HOLDING (5)**

RIGHT (ICAO STANDARD)

**Calculate the following from the holds depicted below:**




Abeam QDM / QDR:……………………………………………….

Gate Angle:…………………………………………………………….

60 degree to go QDM / QDR:………………………………….

Abeam QDM / QDR:……………………………………………….

Gate Angle:…………………………………………………………….

60 degree to go QDM / QDR:………………………………….

# HOLDING (6)

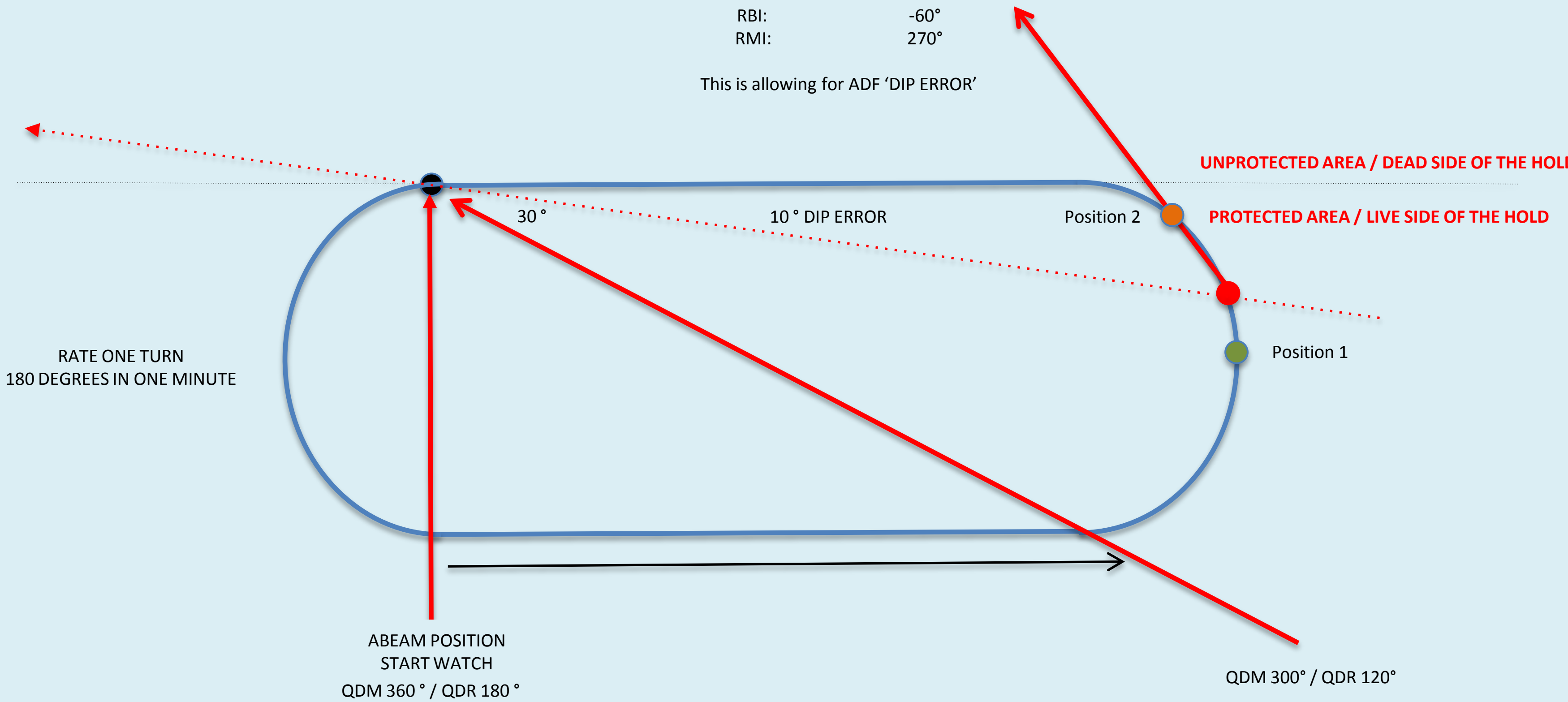
## LEFT (NONE STANDARD)

**60 DEGREE TO GO HEADING (300°)**

At the 60 degree to go heading, whilst still in
The turn the ADF should indicate the published
Inbound QDM (+/- 5°)

| | |
|---|---|
| RBI: | -60° |
| RMI: | 270° |

This is allowing for ADF 'DIP ERROR'



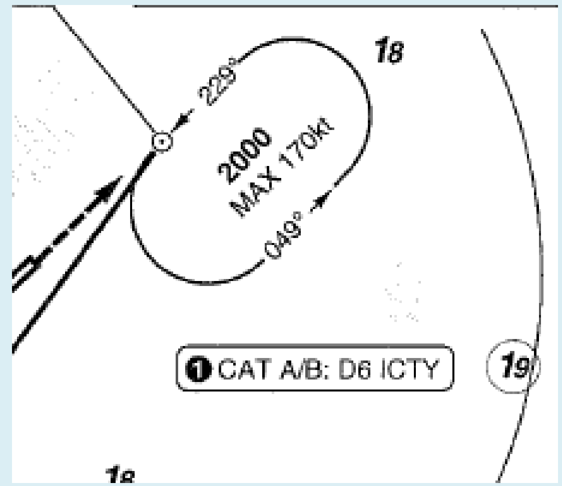

| | |
|---|---|
| **Position 1:** | When in the base turn should the ADF read more than your Required inbound QDM anticipate undershooting the inbound QDM. |
| | Expect to continue turning through the inbound still wind heading to re-intercept The inbound QDM. |

| | | |
|---|---|---|
| **Position 2:** | When in the base turn should the ADF read less than your Required inbound QDM anticipate overshooting the inbound QDM. | |
| | > 10 degrees error: | Roll wings level |
| | < 10 degrees error: | reduce the angle of bank |
| Note: | When rolling wings level there is now no 'dip error'. When ADF reads Inbound QDM minus 10 degrees (280°) roll the aircraft to a rate one turn to intercept the inbound QDM. | |

**HOLDING (7)**

LEFT (NONE STANDARD)

**Calculate the following from the holds depicted below:**


Abeam QDM / QDR:…………………………………………….

Gate Angle:…………………………………………………….

60 degree to go QDM / QDR:……………………………….

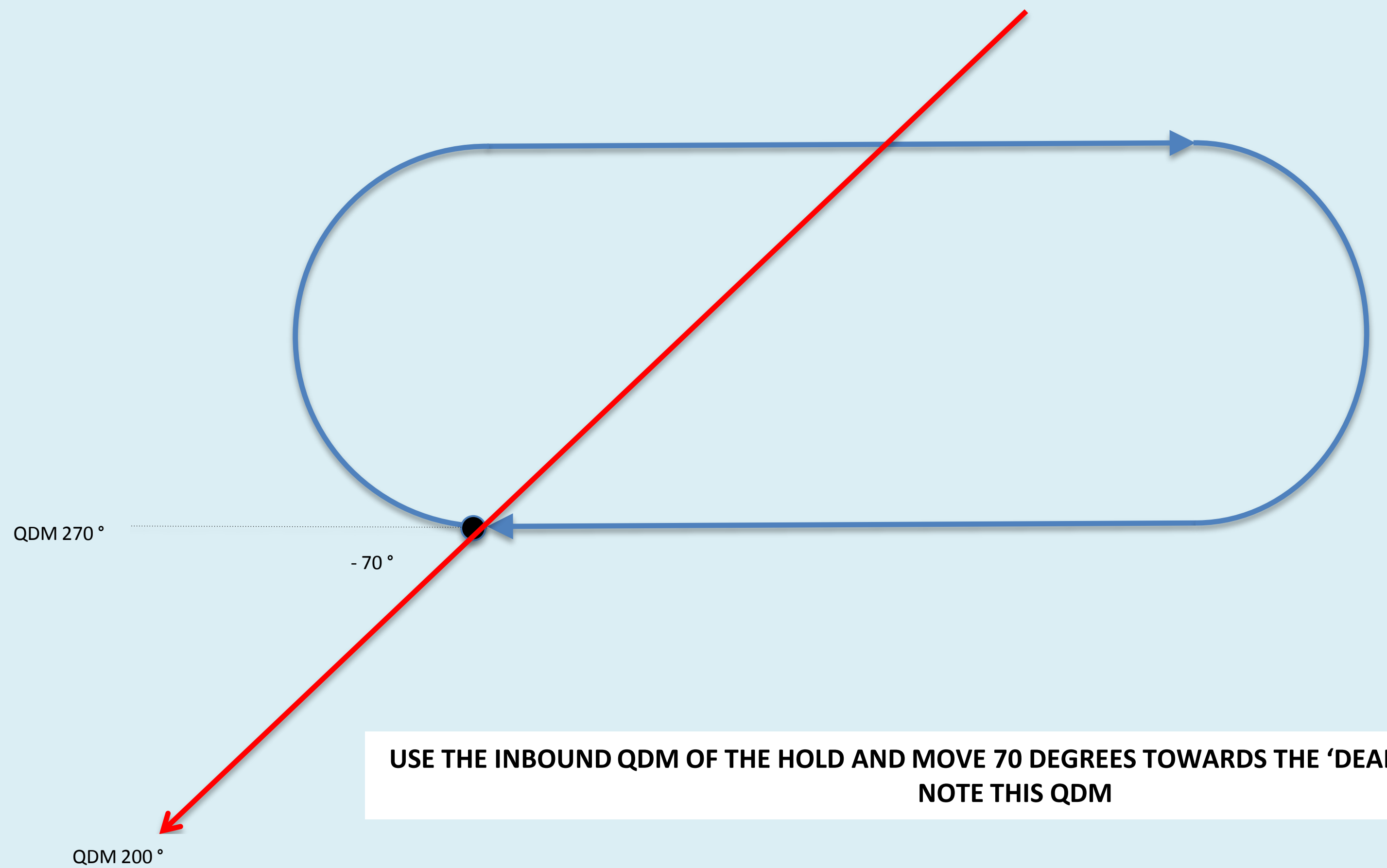
Abeam QDM / QDR:…………………………………………….

Gate Angle:…………………………………………………….

60 degree to go QDM / QDR:……………………………….

## HOLDING (8)

JOINS INTO THE HOLD

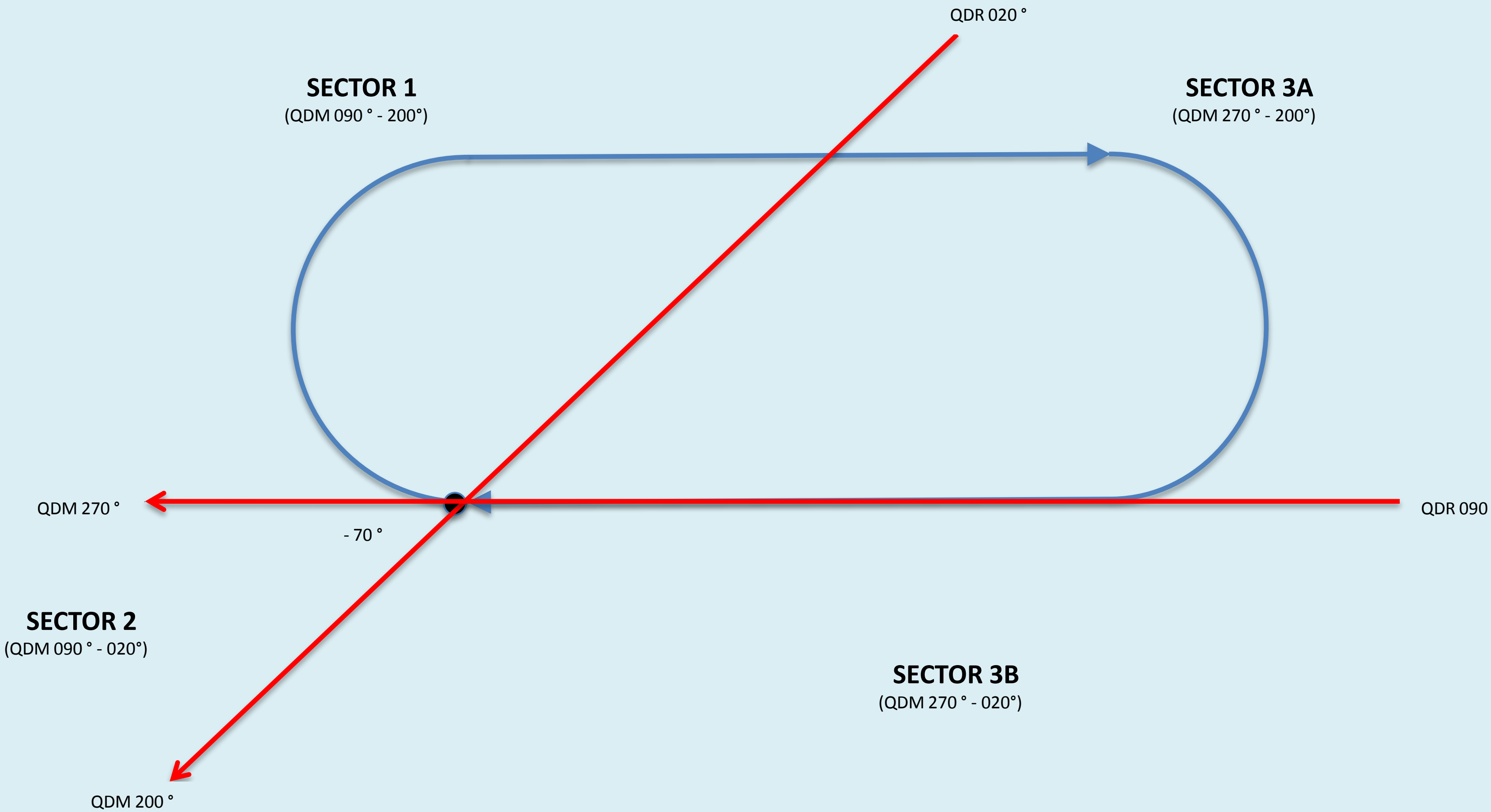



**USE THE INBOUND QDM OF THE HOLD AND MOVE 70 DEGREES TOWARDS THE 'DEAD SIDE OF THE HOLD'. NOTE THIS QDM**

**HOLDING (9)**

JOINS INTO THE HOLD, SECTORS

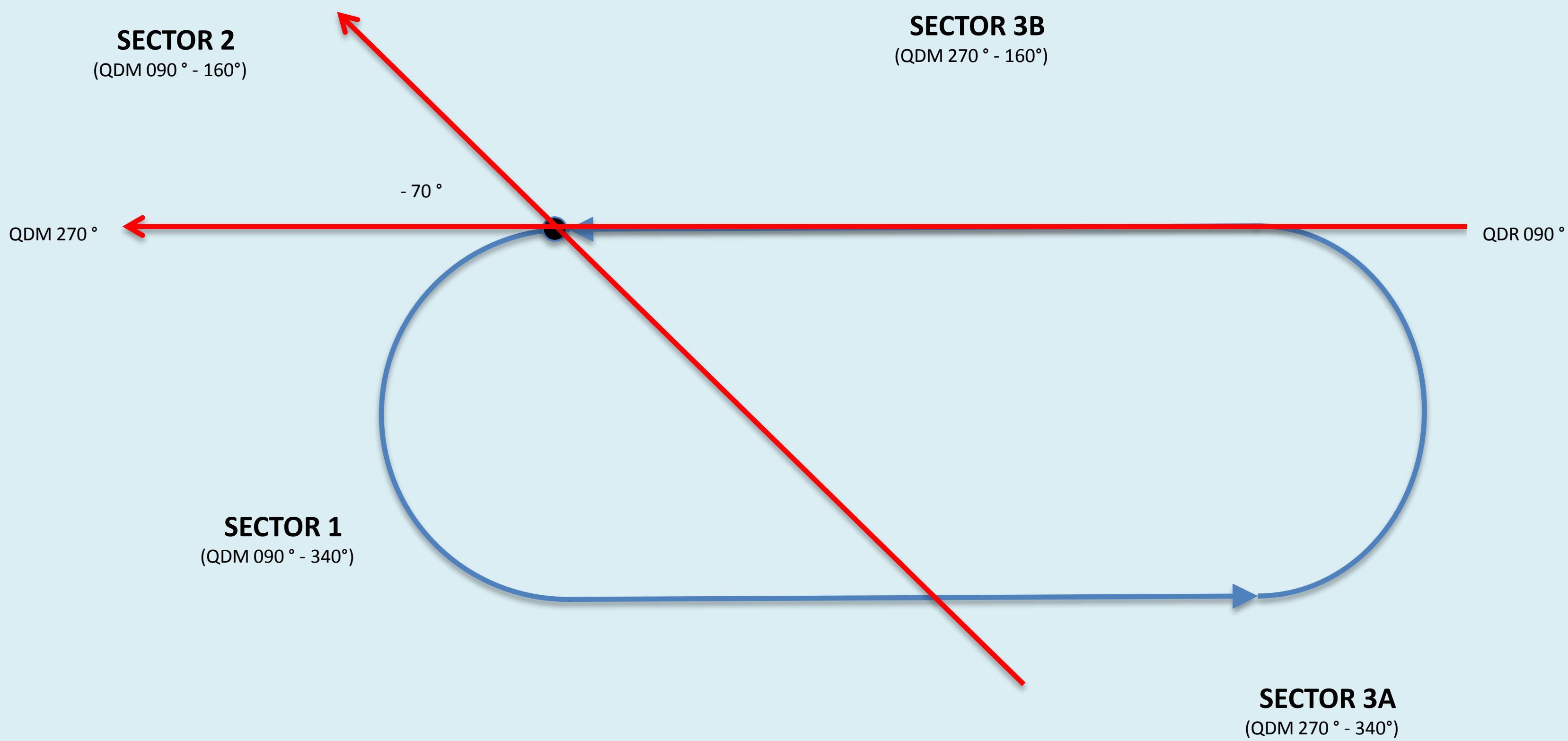
RIGHT HAND HOLD



## HOLDING (10)

JOINS INTO THE HOLD, SECTORS

LEFT HAND HOLD

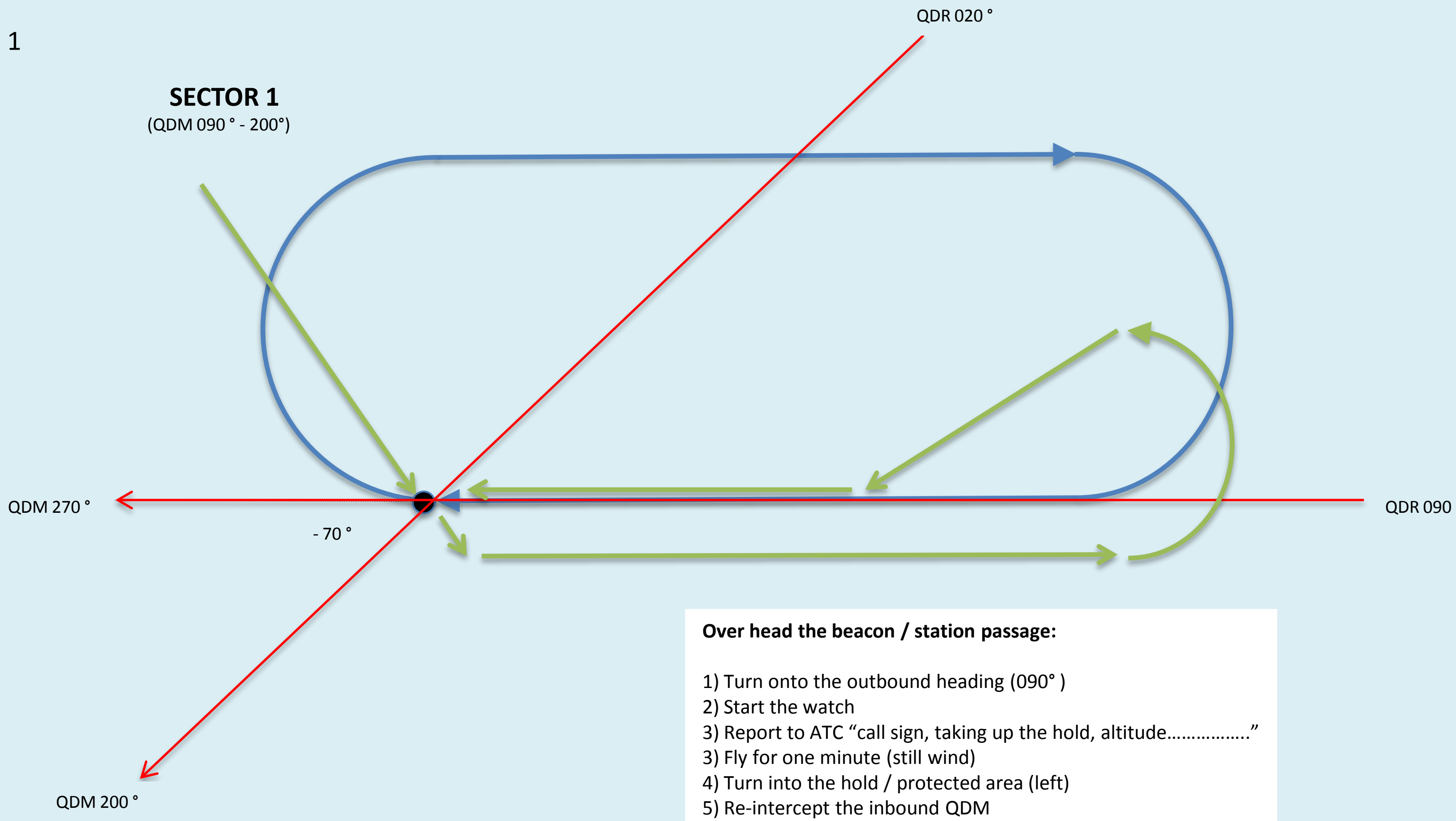


**HOLDING (11)**

JOINS INTO THE HOLD, SECTORS

RIGHT HAND HOLD

SECTOR 1




**Over head the beacon / station passage:**

1) Turn onto the outbound heading (090° )
2) Start the watch
3) Report to ATC "call sign, taking up the hold, altitude……………."
3) Fly for one minute (still wind)
4) Turn into the hold / protected area (left)
5) Re-intercept the inbound QDM

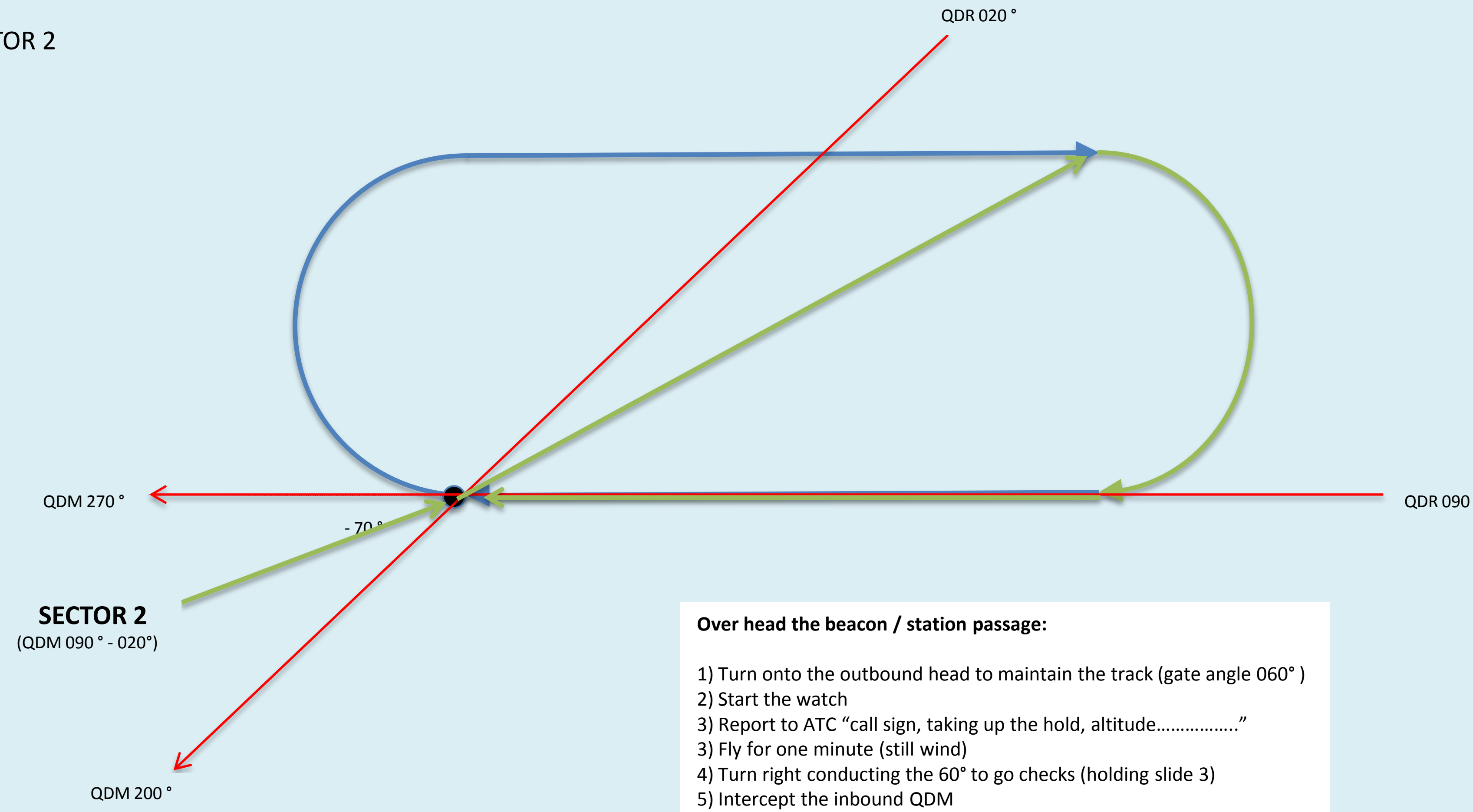
NOTE: THE DECISION OF WHICH JOING TO CONDUCT IS BASED UPONT HE AIRCRAFT HEADING WHILST MAINTAINING A CONSTANT TRACK

## HOLDING (12)

JOINS INTO THE HOLD, SECTORS

RIGHT HAND HOLD

SECTOR 2




**Over head the beacon / station passage:**

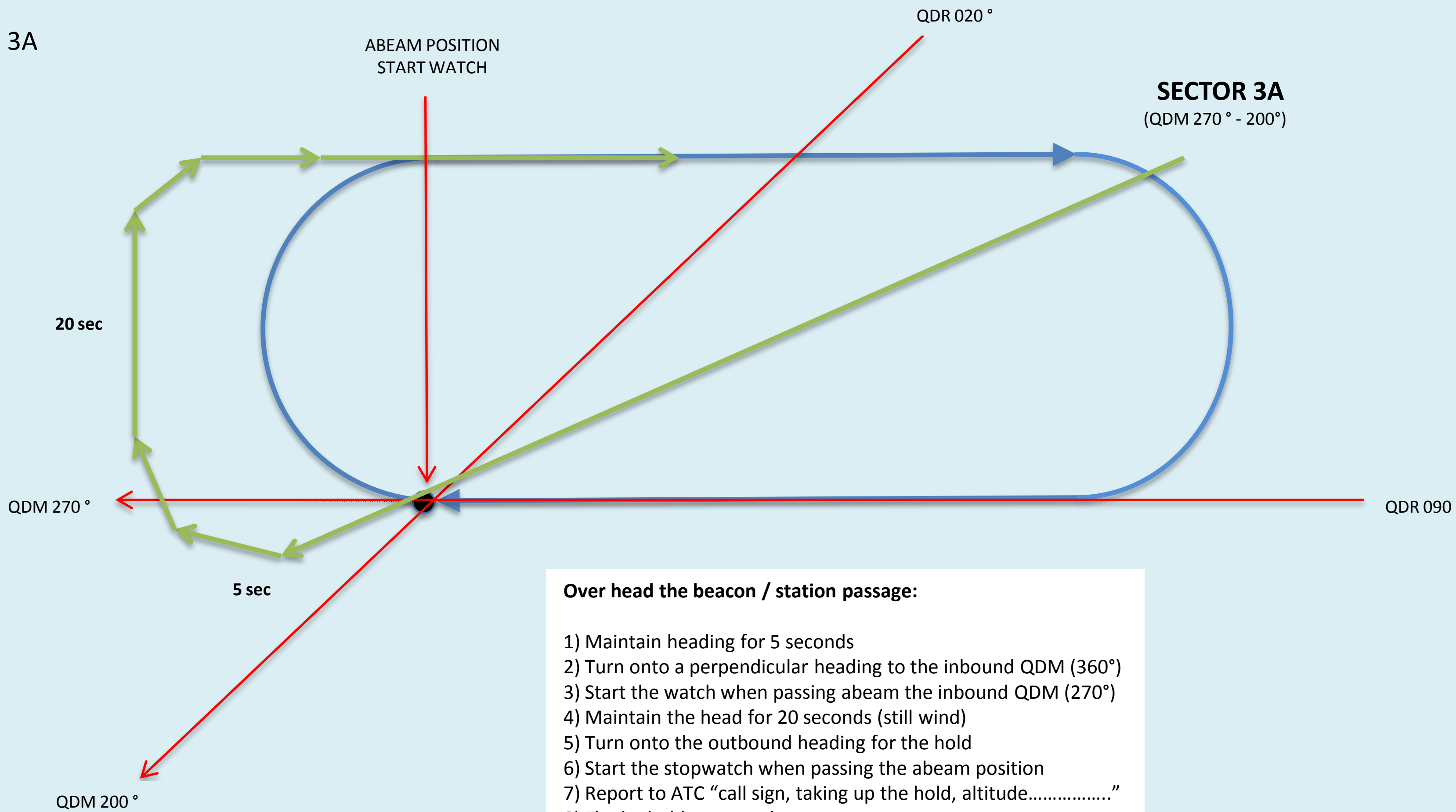
1) Turn onto the outbound head to maintain the track (gate angle 060° )
2) Start the watch
3) Report to ATC "call sign, taking up the hold, altitude……………."
3) Fly for one minute (still wind)
4) Turn right conducting the 60° to go checks (holding slide 3)
5) Intercept the inbound QDM

**HOLDING (13)**

JOINS INTO THE HOLD, SECTORS

RIGHT HAND HOLD

SECTOR 3A




**Over head the beacon / station passage:**

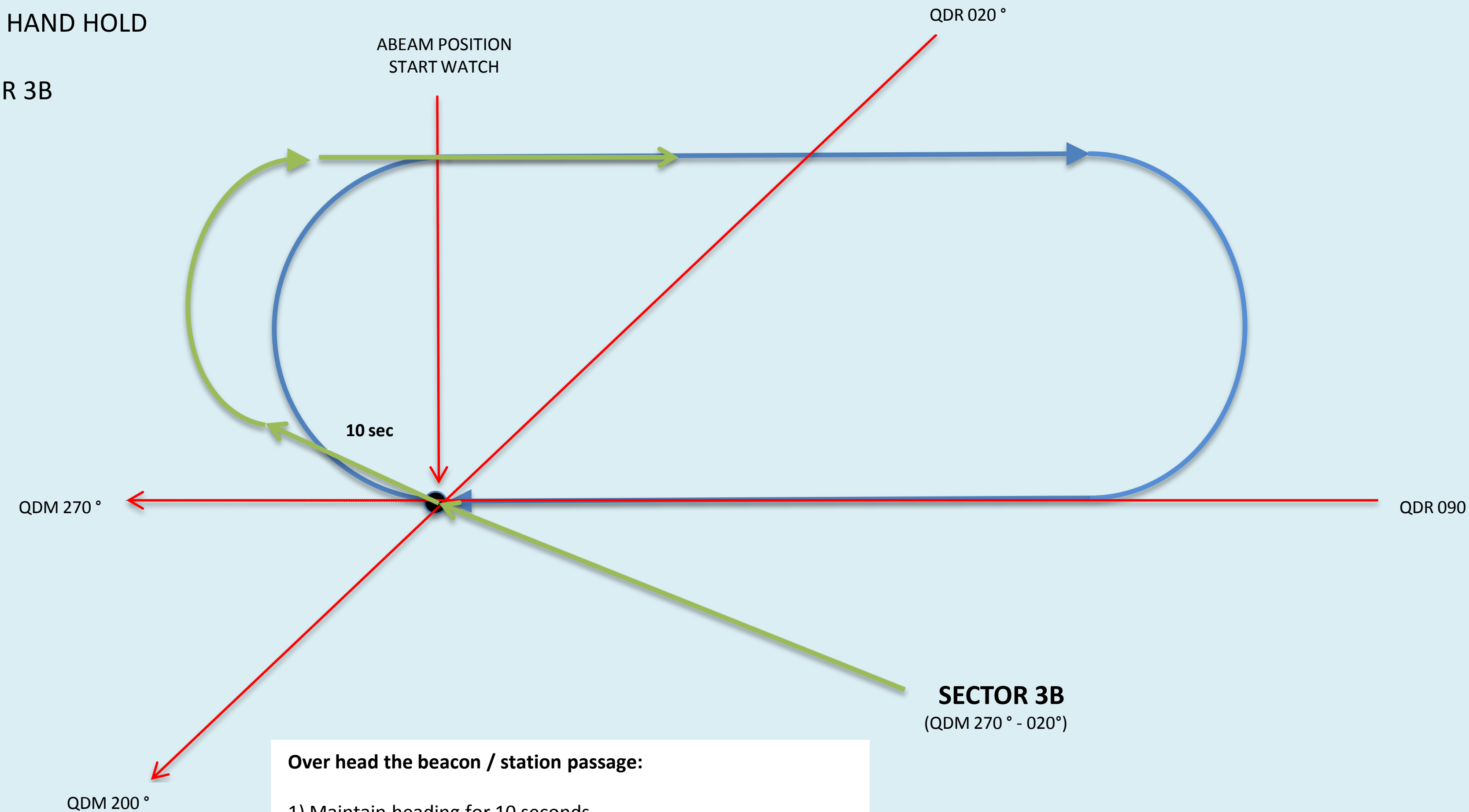
1) Maintain heading for 5 seconds
2) Turn onto a perpendicular heading to the inbound QDM (360°)
3) Start the watch when passing abeam the inbound QDM (270°)
4) Maintain the head for 20 seconds (still wind)
5) Turn onto the outbound heading for the hold
6) Start the stopwatch when passing the abeam position
7) Report to ATC “call sign, taking up the hold, altitude…………….”
8) Fly the hold as normal

# HOLDING (14)

JOINS INTO THE HOLD, SECTORS

RIGHT HAND HOLD

SECTOR 3B




**Over head the beacon / station passage:**

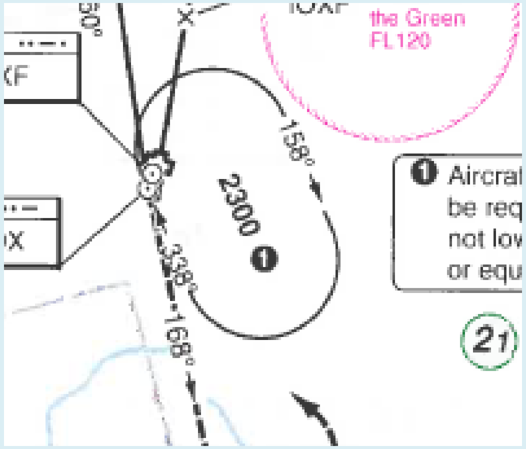
1) Maintain heading for 10 seconds
2) Turn onto the outbound head for the hold
3) Start the watch when passing the abeam position
4) Report to ATC "call sign, taking up the hold, altitude……………."
8) Fly the hold as normal

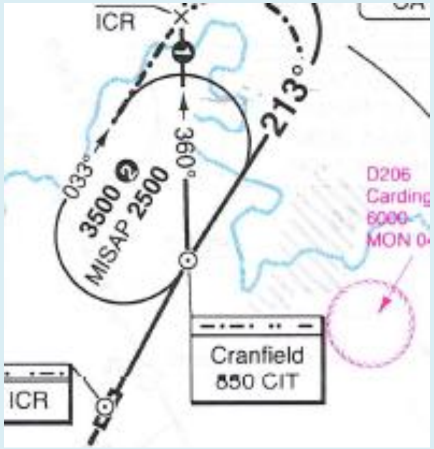
**HOLDING (15)**

JOINS INTO THE HOLD, SECTORS

RIGHT HAND HOLD

**Calculate the following from the holds depicted below:**




Sector 1 sectors:………………………………………………………….

Sector 2 sectors:………………………………………………………….

Sector 3A sectors:……………………………………………………….

Sector 3A perpendicular heading:……………………………….

Sector 3B sectors:……………………………………………………….

Sector 1 sectors:………………………………………………………….

Sector 2 sectors:………………………………………………………….

Sector 3A sectors:……………………………………………………….

Sector 3A perpendicular heading:……………………………….

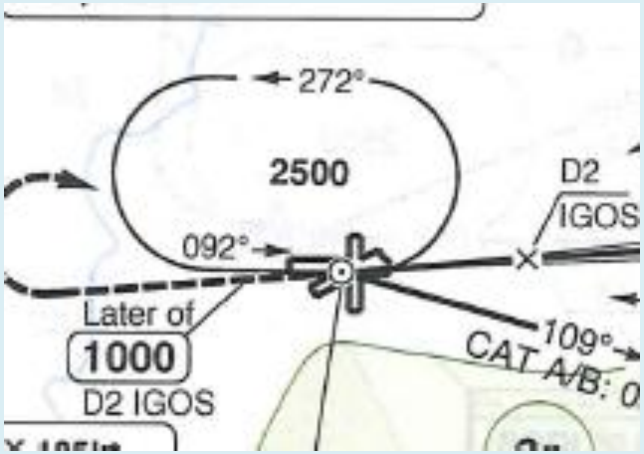
Sector 3B sectors:……………………………………………………….

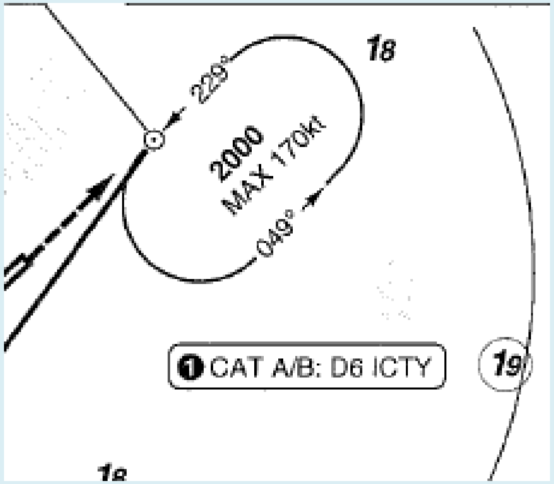
HOLDING (16)

JOINS INTO THE HOLD, SECTORS

LEFT HAND HOLD

**Calculate the following from the holds depicted below:**




Sector 1 sectors:………………………………………………………

Sector 2 sectors:………………………………………………………

Sector 3A sectors:……………………………………………………

Sector 3A perpendicular heading:……………………………

Sector 3B sectors:……………………………………………………

Sector 1 sectors:………………………………………………………

Sector 2 sectors:………………………………………………………

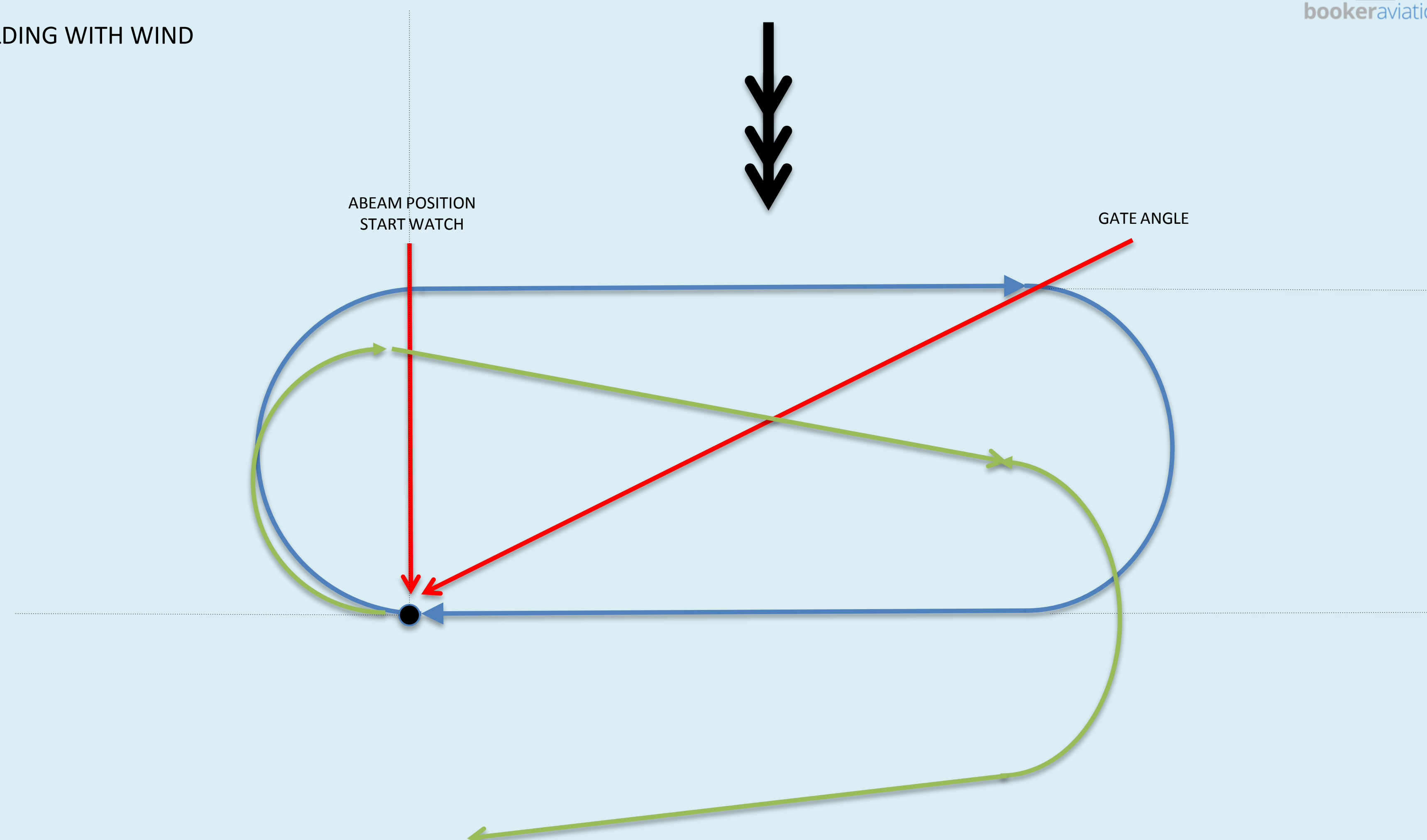
Sector 3A sectors:……………………………………………………

Sector 3A perpendicular heading:……………………………

Sector 3B sectors:……………………………………………………

# HOLDING (17)

## HOLDING WITH WIND



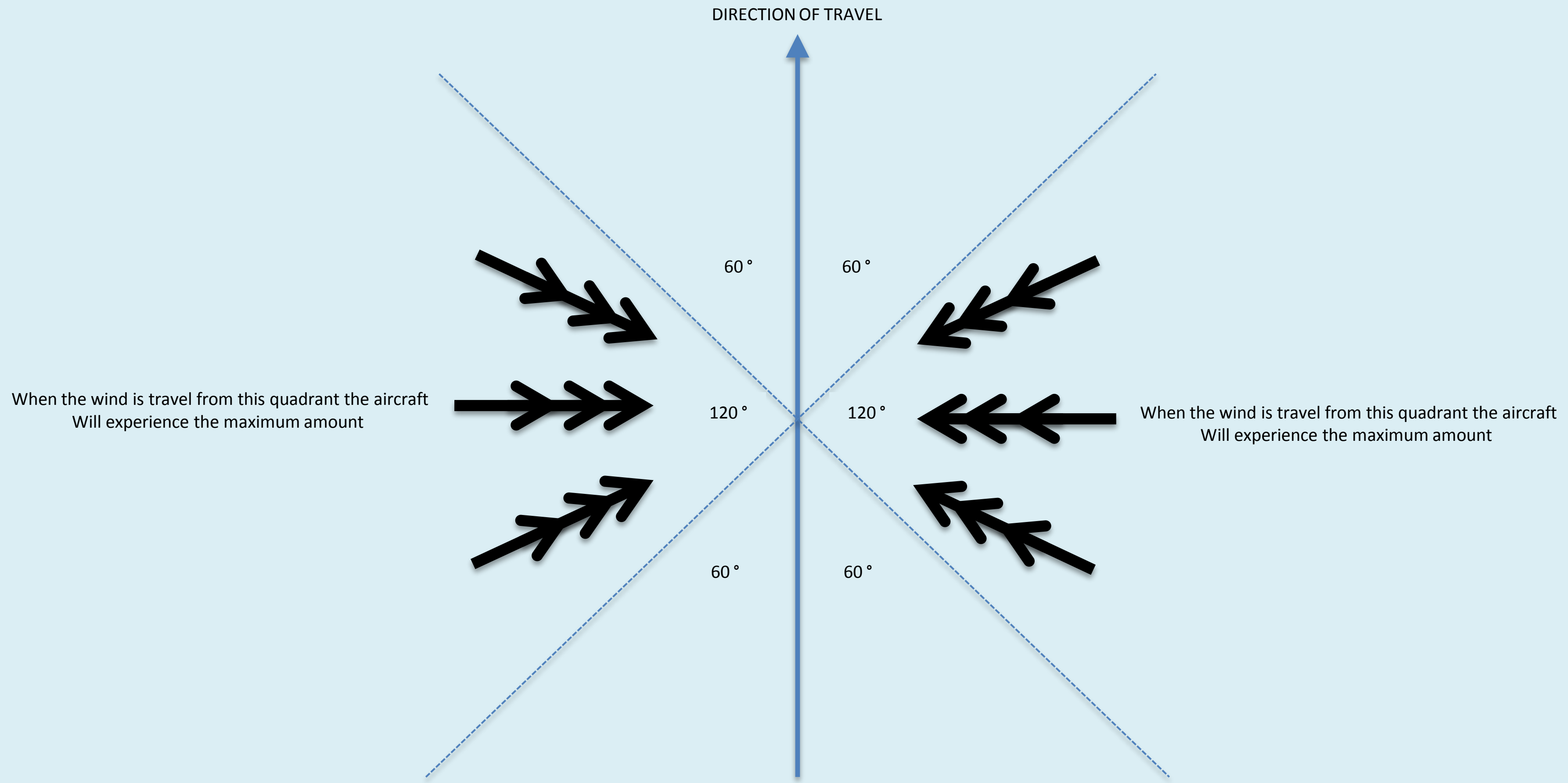

If no compensation is made for wind (such as above) the aircrafts track will be as depicted above. The following things will happen:

1) Initial turn onto the outbound head will have a reduced radius of turn due to the headwind component
2) The aircraft will drift to the right when flying outbound
3) The base turn will have an increased radius of turn due to the tailwind component
4) The aircraft will drift the left when on the inbound heading.

**YOU AS PILOTS MUST COMPENSATE FOR THIS**

**HOLDING (18)**

HOLDING WITH WIND

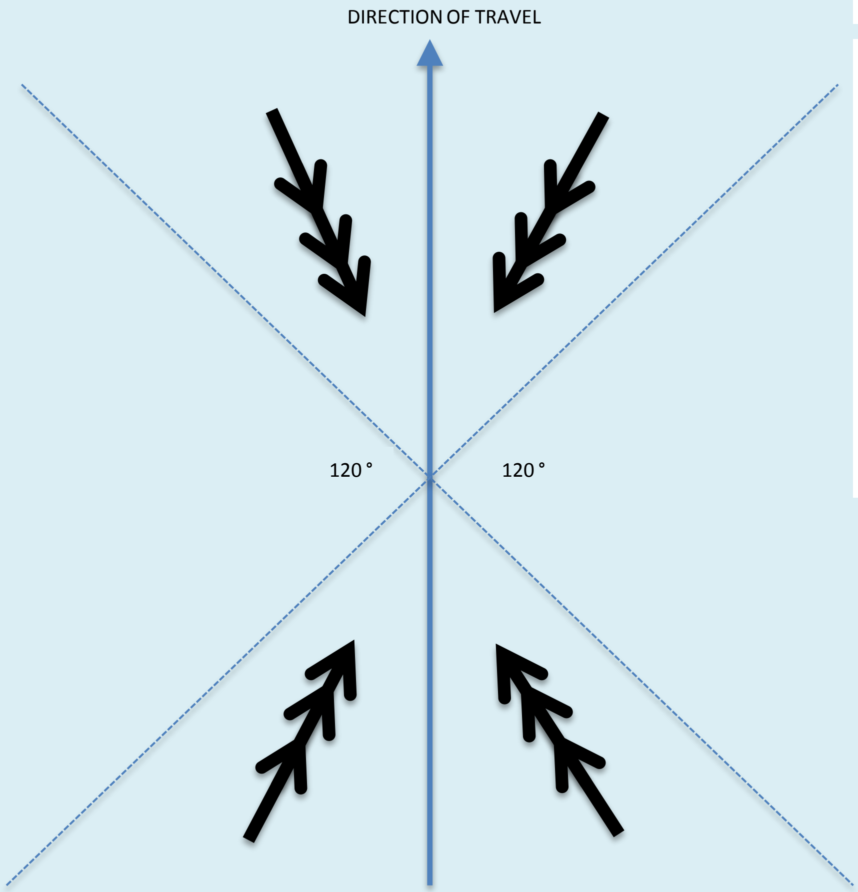



Maximum Drift (MD) is dependent on the wind speed (when within 60° of the aircrafts lateral axis)

**Maximum Drift (MD)** = (60 / TAS) x wind speed

Example: an aircraft is holding at 120 KTAS and the wind is travelling from 90° to the flight path at a speed of 20 KTAS. The maximum drift is 10°. This means every minute the aircraft will drift 10 off track.

## HOLDING WITH WIND




When the wind is between 0° and 59° of the direction of travel **'SINGLE DRIFT'** must be calculated

(From slide 18): 60° or more = Maximum Drift

**Therefore the following conclusion can be assumed:**

Wind direction 10° off the initial still wind direction of travel = 1/6 (0.17) maximum drift

Wind direction 15° off the initial still wind direction of travel = ¼ (0.25) maximum drift

Wind direction 20° off the initial still wind direction of travel = 2/5 (0.4) maximum drift

Wind direction 30° off the initial still wind direction of travel = ½ (0.5) maximum drift

Wind direction 40° off the initial still wind direction of travel = 2/3 (0.67)maximum drift

Wind direction 45° off the initial still wind direction of travel = ¾ (0.75) maximum drift

Wind direction 50° off the initial still wind direction of travel = 5/6 (0.83) maximum drift

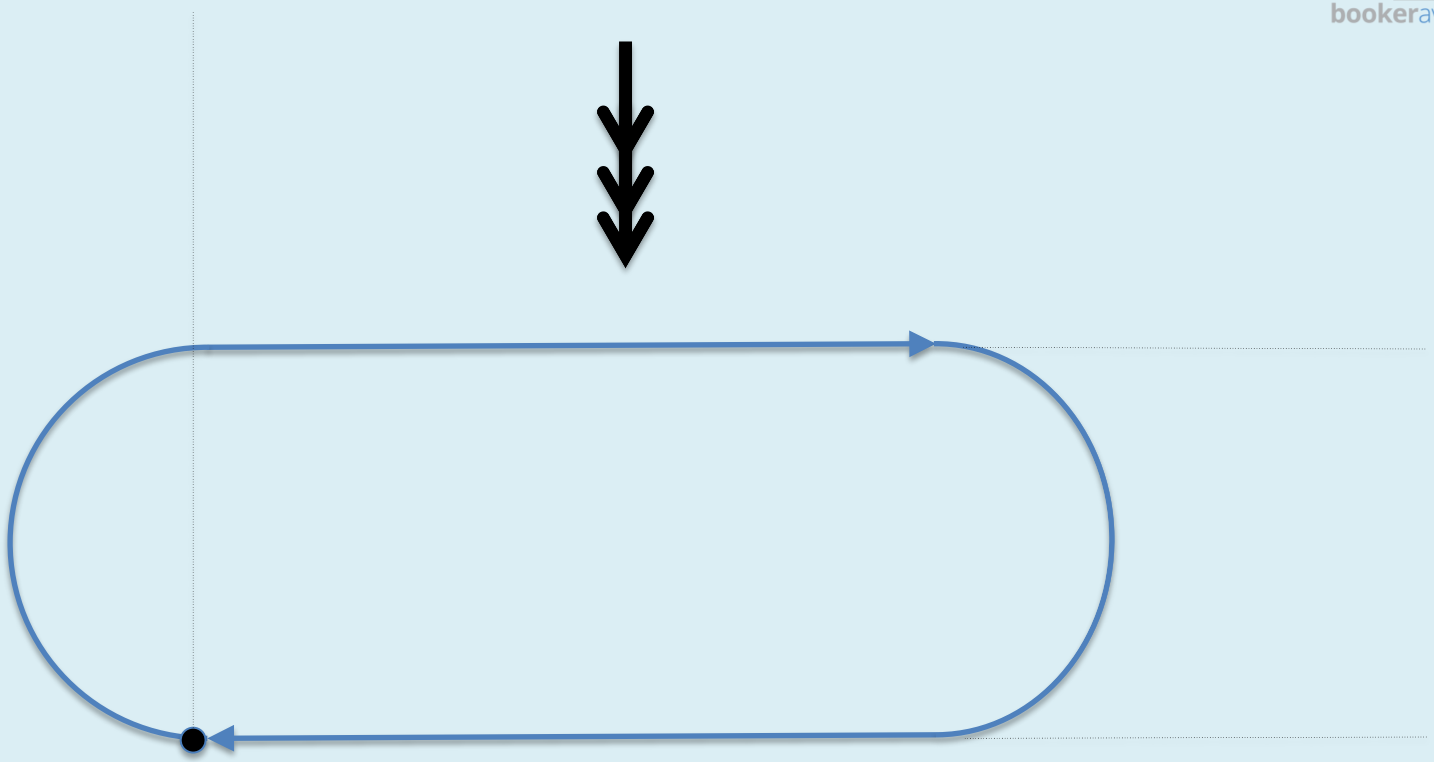
Quick method by using watch face:

Assumption: degrees = seconds for this method

10 = 1/6 of the watch face therefore the amount of single drift that shall be used is 1/6 Of the maximum drift.

If maximum drift equated to 20° then single drift in this example would equate to 4°

HOLDING WITH WIND



**RULE OF THUMB:**

IF THE WIND DIRECTION IS WITHIN 0° – 30° OF THE OUTBOUND STILL WIND HEADING APPLY: **2 x SINGLE DRIFT**

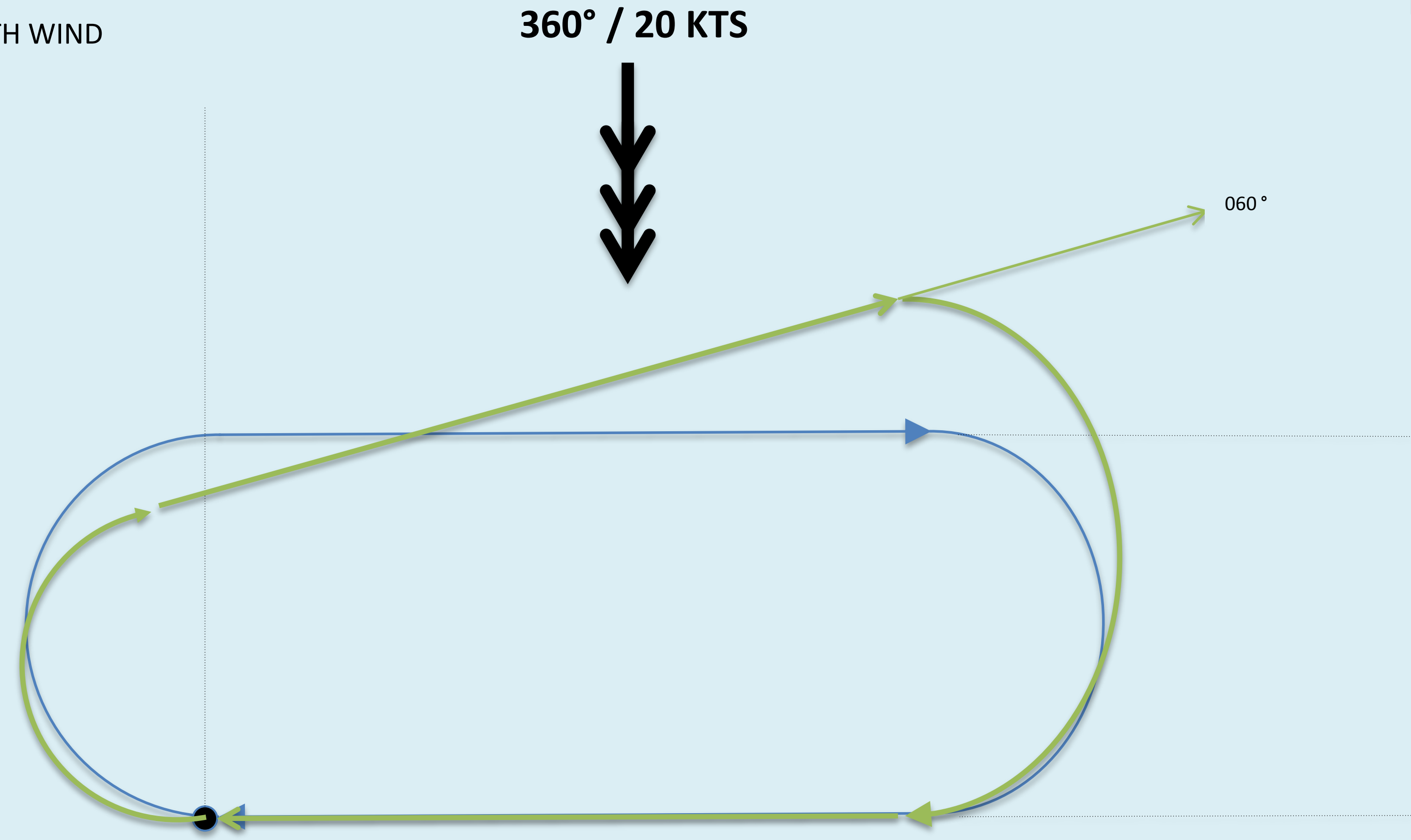
IF THE WIND DIRECTION IS BETWEEN 31° – 59° OF THE OUTBOUND STILL WIND HEADING APPLY **3 x SINGLE DIRFT**

IF THE WIND DIRECTION IS BETWEEN 60 – 90 OF THE OUTBOUND STILL WIND HEADING APPLY **3 x MAXIMUM DRIFT**

THE MAXIMUM AMOUNT OF DRIFT THAT CAN BE APPLIED TO THE OUTBOUND HEADING IS 30°

# HOLDING (21)

HOLDING WITH WIND




With a wind from the North (as depicted above) the flown hold is represented in green

Maximum Drift (MD) = 10°

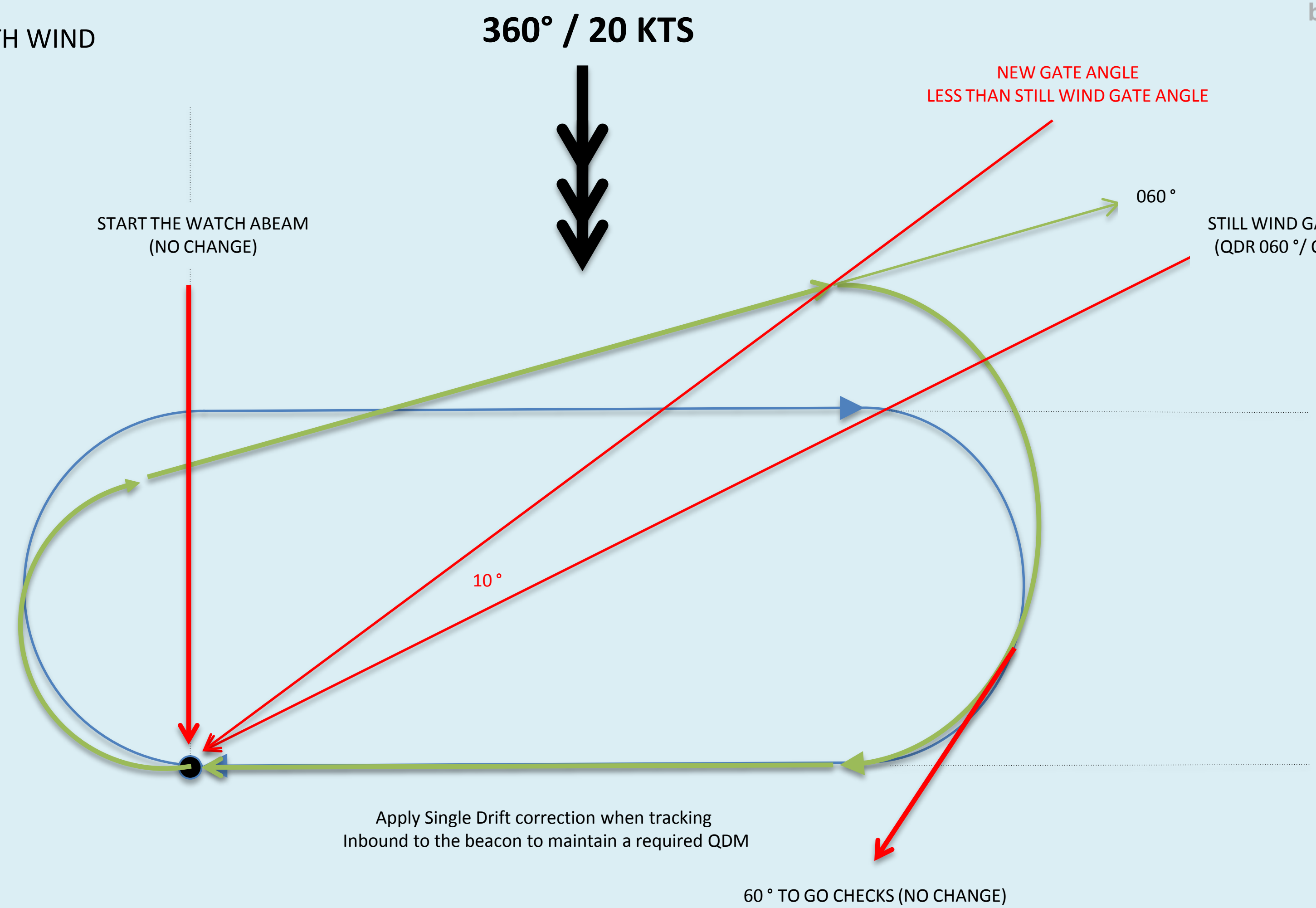
The wind is 90° off the still wind outbound heading (090°) therefore apply 3 x maximum drift

Outbound heading correction of - 30° (turning into wind)

**Outbound heading = 060°**

**HOLDING (22)**

HOLDING WITH WIND

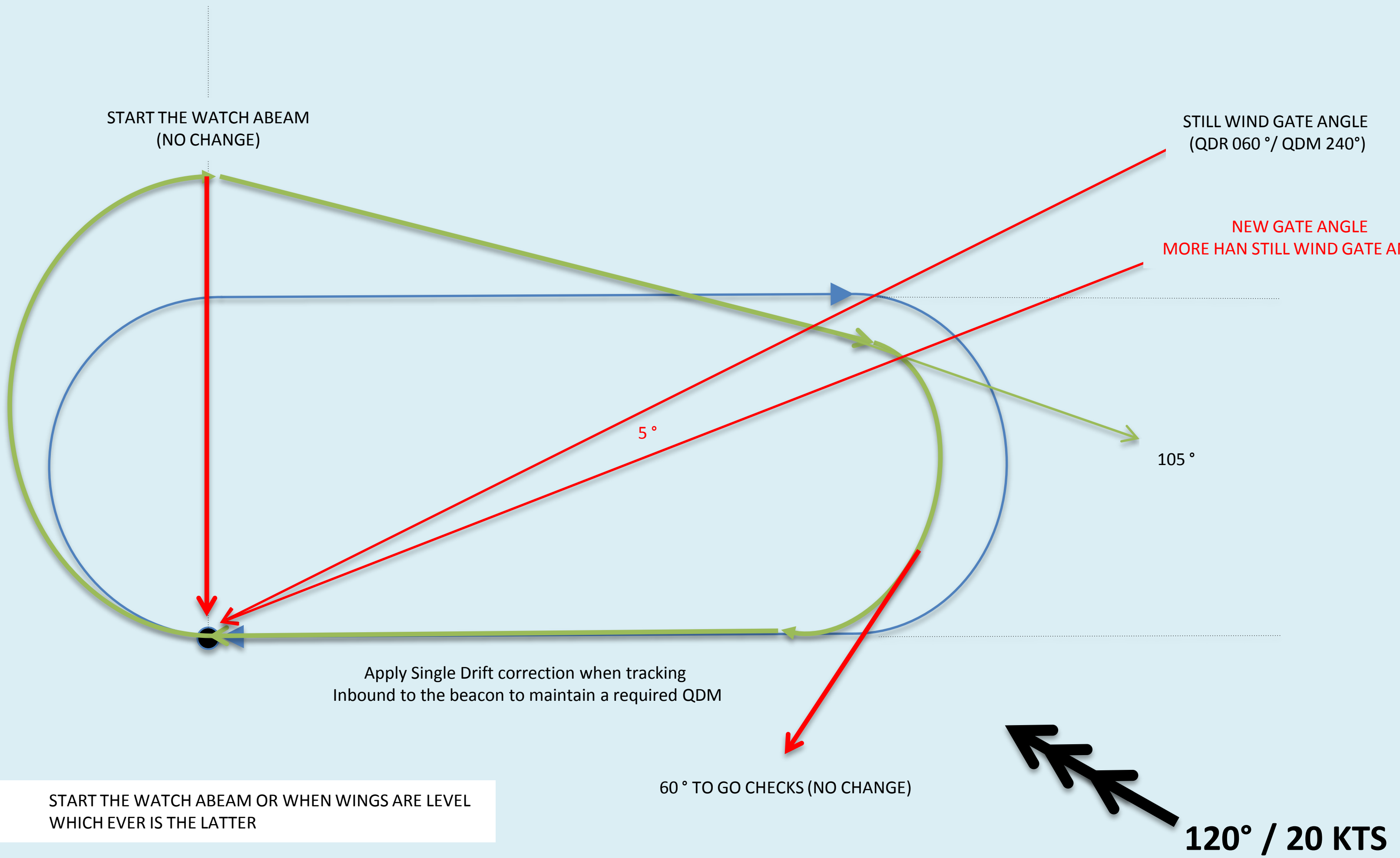



| | |
|---|---|
| **NOTE 1:** | START THE WATCH ABEAM OR WHEN WINGS ARE LEVEL WHICH EVER IS THE LATTER |

| | |
|---|---|
| **NOTE 2:** | As depicted above the gate angle will change. A rule of thumb is that it Will change by the amount of single drift. Using the above example the gate angle will be Approximately 10 ° less than the still wind gate angle as single drift = 10 °<br><br>Right Hand Hold: calculated outbound heading less than still wind assume gate angle less than still wind gate angle |

# HOLDING (23)

## HOLDING WITH WIND

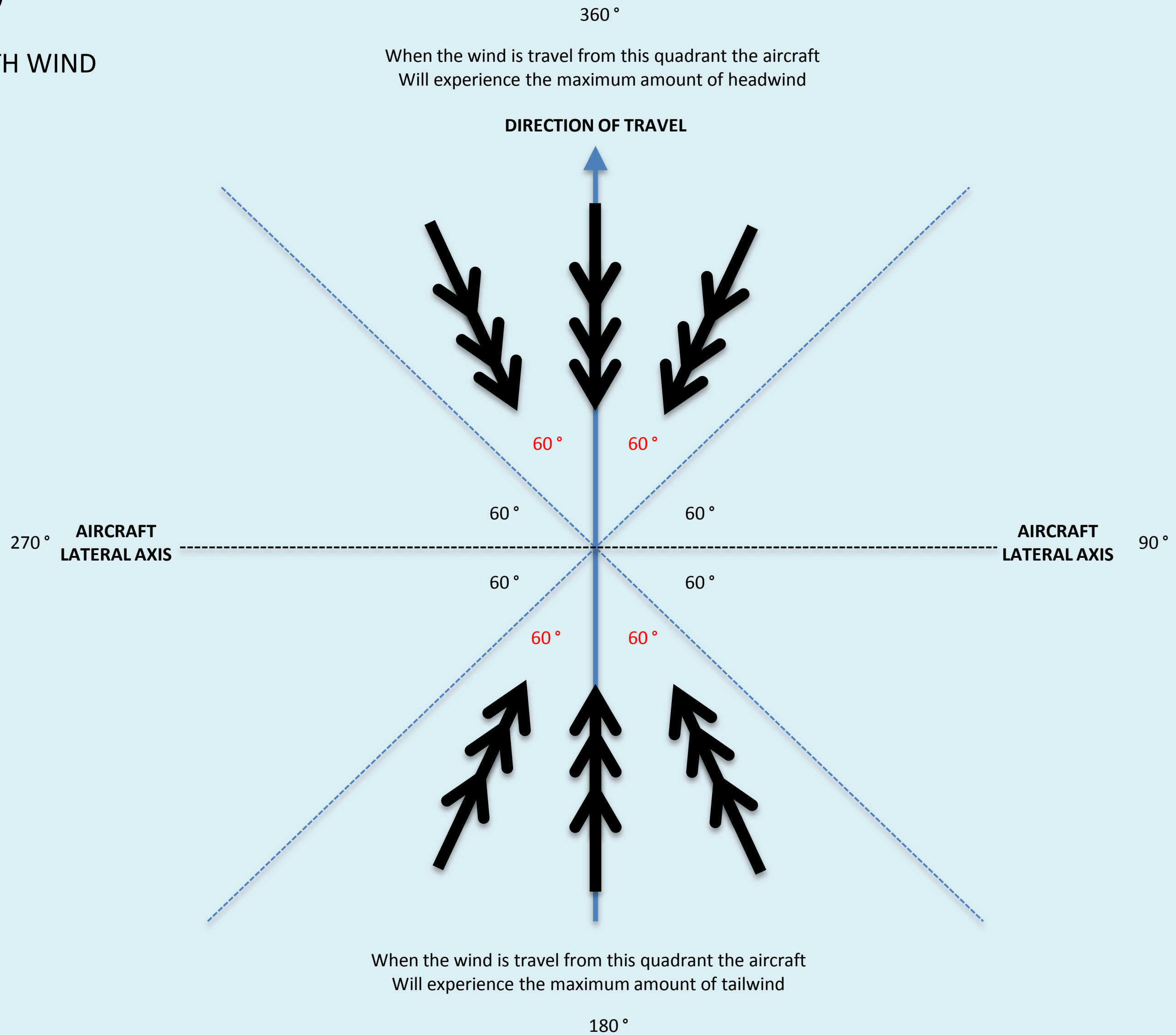



| | |
|---|---|
| **NOTE 1:** | START THE WATCH ABEAM OR WHEN WINGS ARE LEVEL WHICH EVER IS THE LATTER |

| | |
|---|---|
| **NOTE 2:** | As depicted above the gate angle will change. A rule of thumb is that it Will change by the amount of single drift. Using the above example the gate angle will be Approximately 5 ° more than the still wind gate angle as single drift = 5°<br><br>Right Hand Hold: calculated outbound heading less than still wind assume gate angle less than still wind gate angle |

## HOLDING (24)

HOLDING WITH WIND




**USE + / - 1 SECOND FOR EVERY KNOT OF HEAD / TAIL WIND OUTBOUND ON THE HOLD.**

# HOLDING (25)

## HOLDING WITH WIND

Same principal as calculating single drift but based this time on the **lateral axis** of the aircraft

**Therefore the following conclusion can be assumed:**

Wind direction 10° off the lateral axis of the aircraft= 1/6 (0.17) wind speed

Wind direction 15° off the lateral axis of the aircraft= ¼ (0.25) wind speed

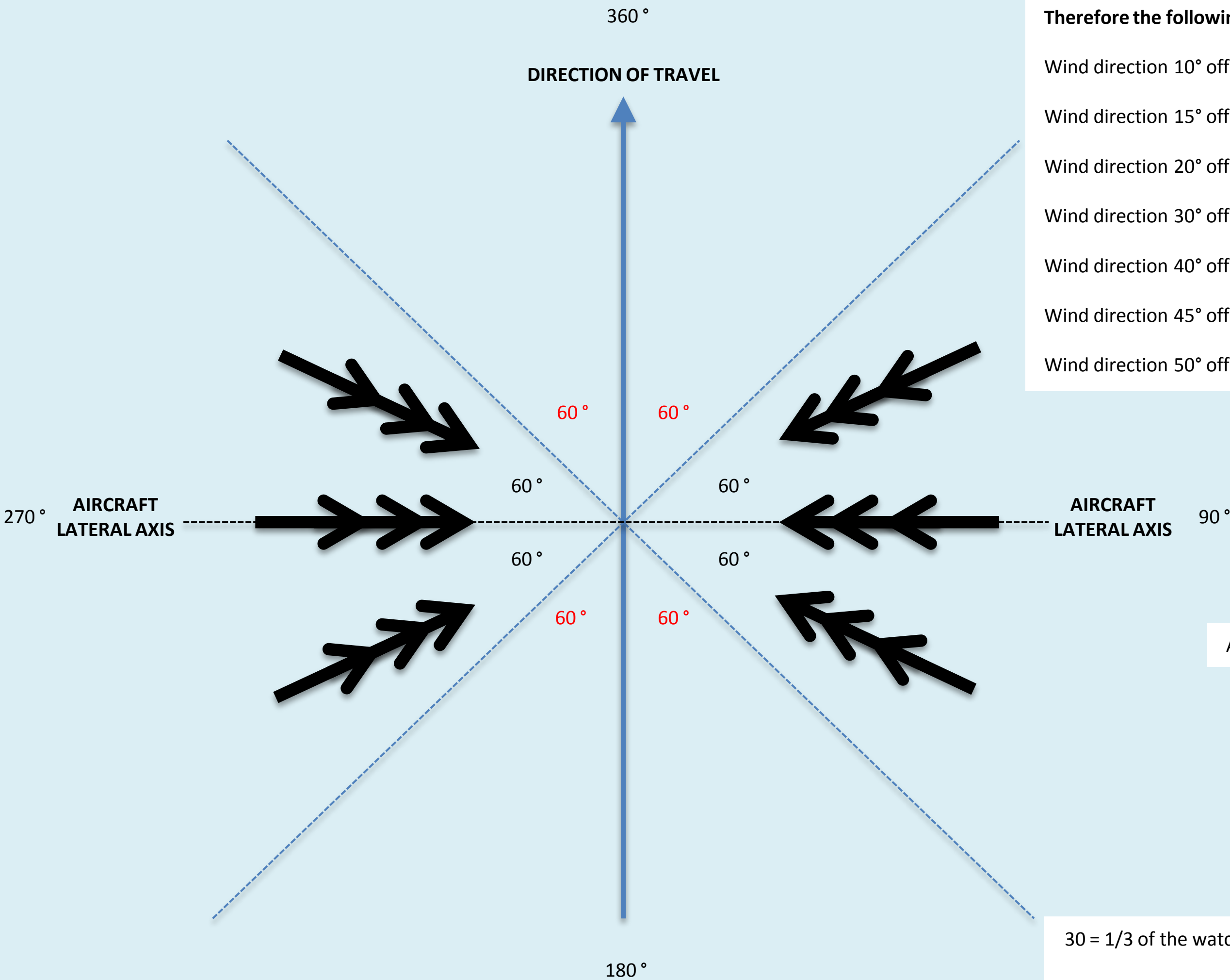
Wind direction 20° off the lateral axis of the aircraft= 2/5 (0.4) wind speed

Wind direction 30° off the lateral axis of the aircraft= ½ (0.5) wind speed

Wind direction 40° off the lateral axis of the aircraft= 2/3 (0.67) wind speed

Wind direction 45° off the lateral axis of the aircraft= ¾ (0.75) wind speed

Wind direction 50° off the lateral axis of the aircraft= 5/6 (0.83) wind speed




Quick method by using watch face:

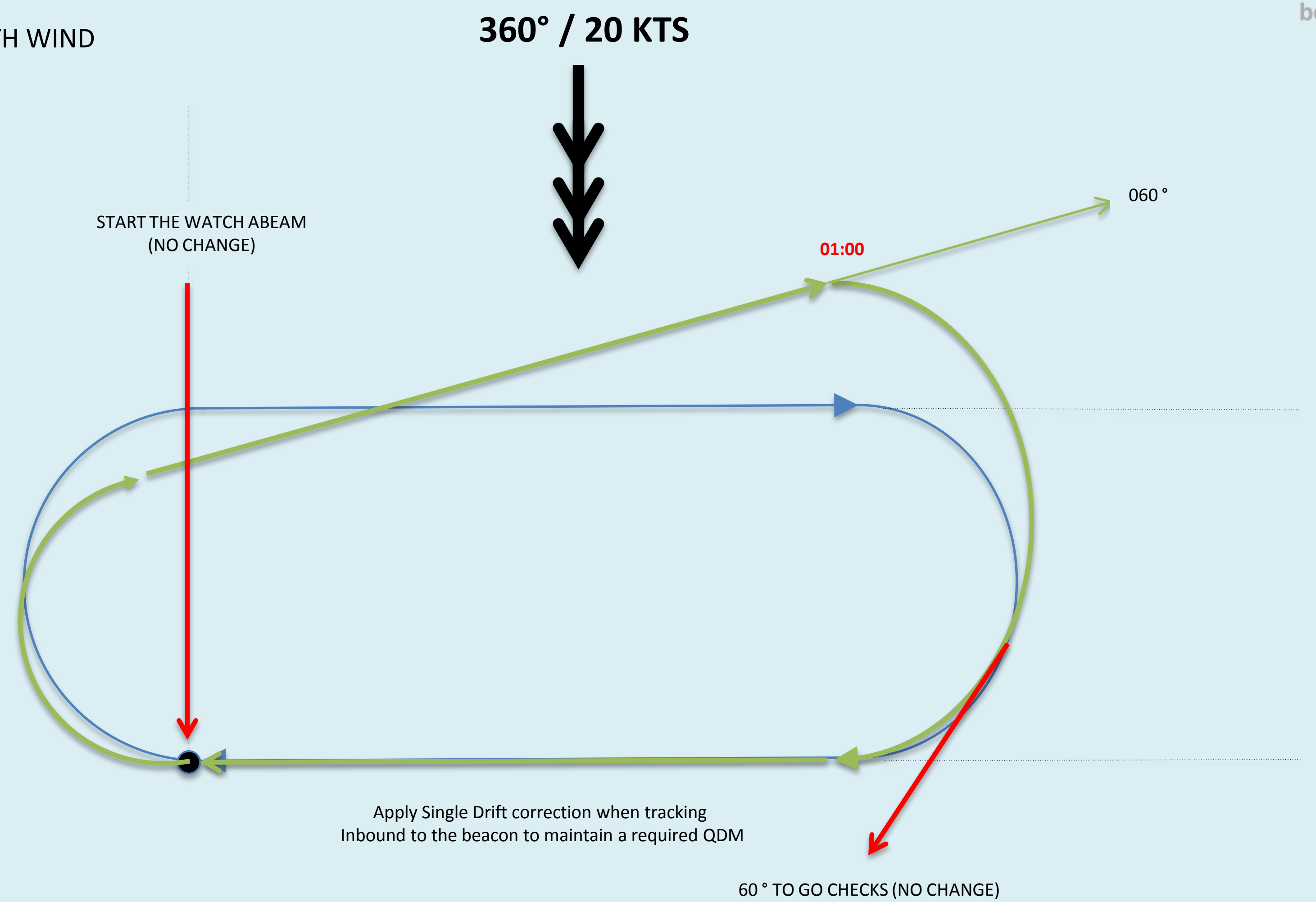
Assumption: degrees = seconds for this method

30 = 1/3 of the watch face therefore the amount of single drift that shall be used is 1/3 Of the wind speed.

If the wind speed is 20 kts then the head / tail wind component is 10 kts

**HOLDING (26)**

HOLDING WITH WIND



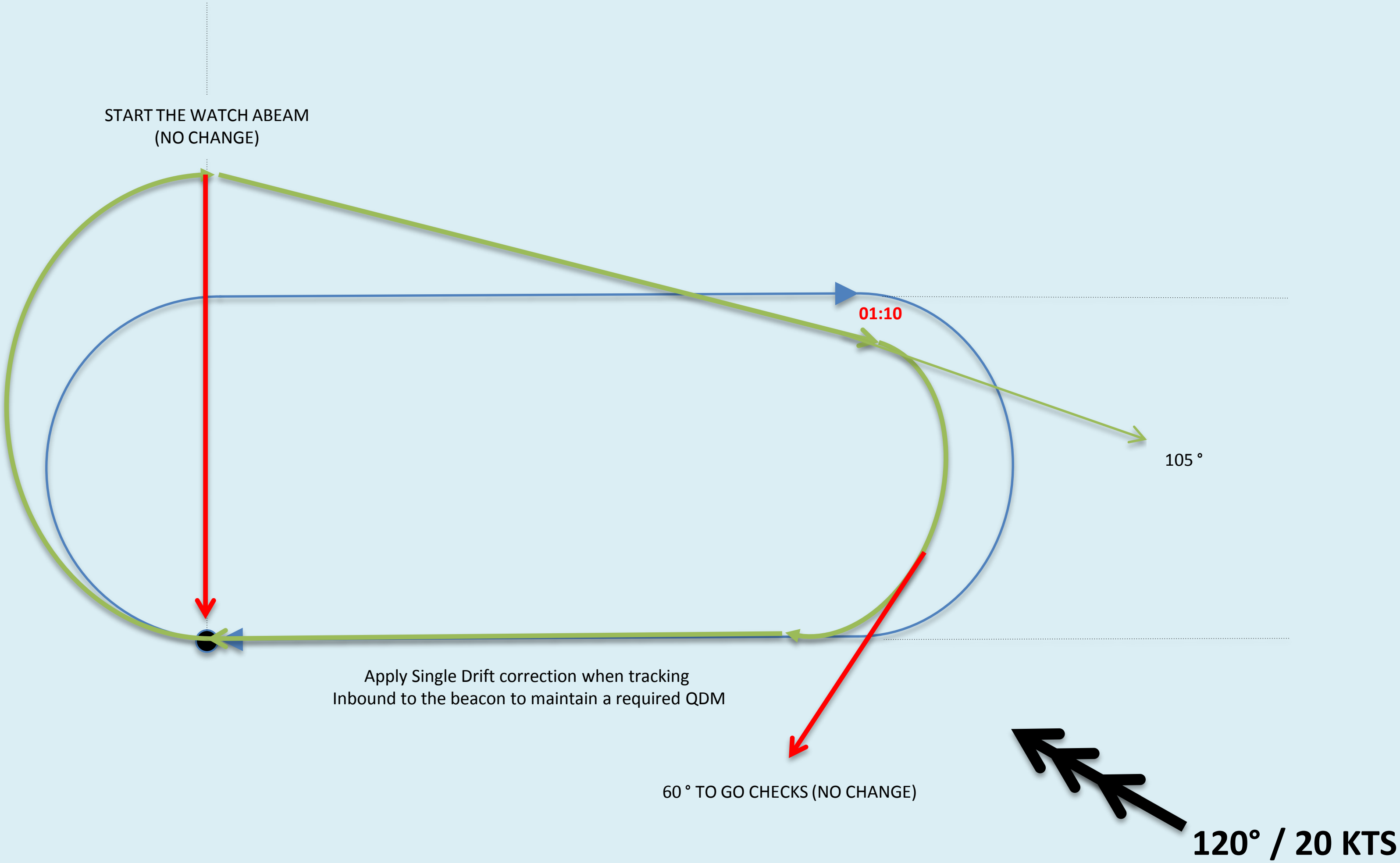

**(Using the examples from slide 20 – 22)**

The wind is 90° off the outbound still wind heading therefore there is no head / tail wind component.

Outbound time with this wind will be **01:00 (1 minute)**

# HOLDING (27)

## HOLDING WITH WIND



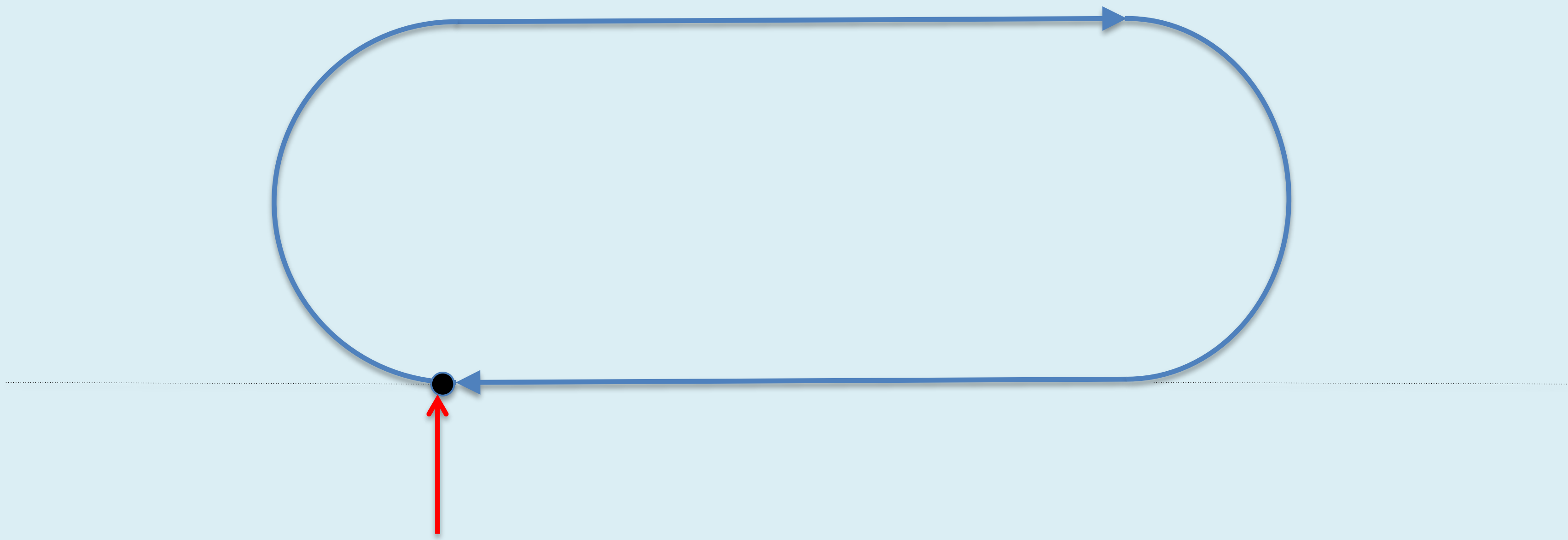

**(Using the examples from slide 23)**

The wind is 30° off the outbound still wind heading therefore the headwind component is 10 kts.

Outbound time with this wind will be **01:10**

# HOLDING (28)

## HOLDING WITH WIND



**(1/3 ERROR PRINCIPAL)**

WHEN OVERHEAD THE BEACON NOTE THE TIME.

IT SHOULD HAVE TAKEN 03:00 TO REACH THE BEACON

WHAT EVER THE ERROR IS DIVID THIS BY THREE AND APPLY THIS TO THE PREVIOUSLY CALCULATED OUTBOUND TIME.

| | | | | |
|---|---|---|---|---|
| **EXAMPLE 1:** Time at the beacon = 03:30 | error = 30 seconds | 1/3 of the error equates to 10 seconds | 10 seconds too late | reduce calculated outbound time by 10 seconds |
| **EXAMPLE 2:** Time at the beacon = 02:45 | error = 15 seconds | 1/3 of the error equates to 5 seconds | 15 seconds too early | increase calculated outbound time by 5 seconds |