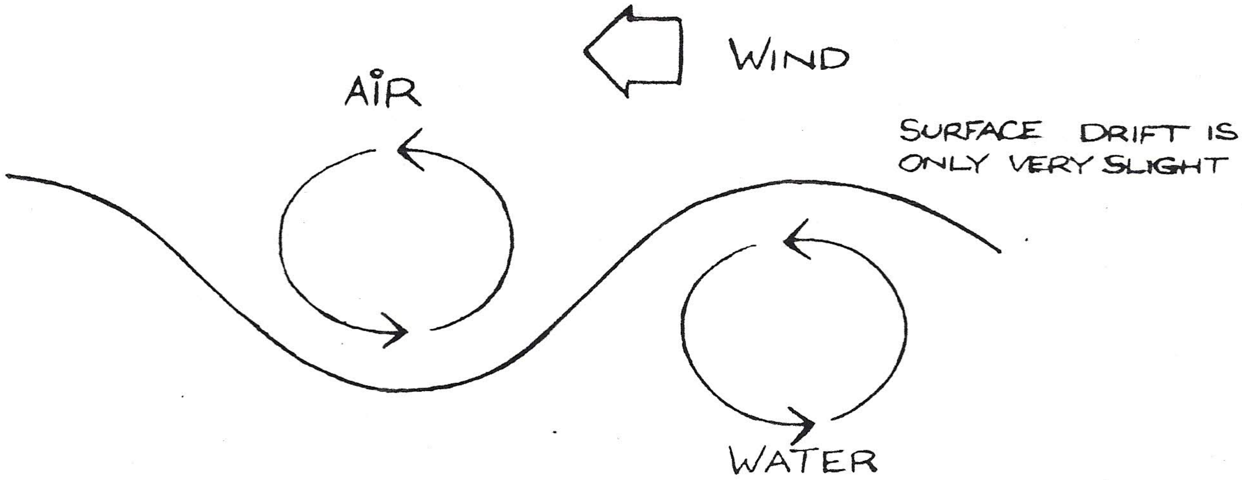
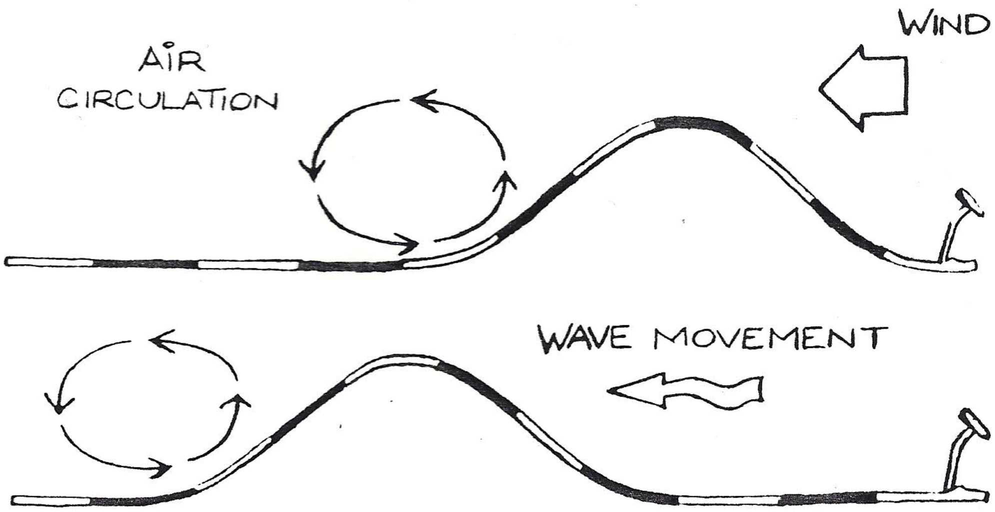
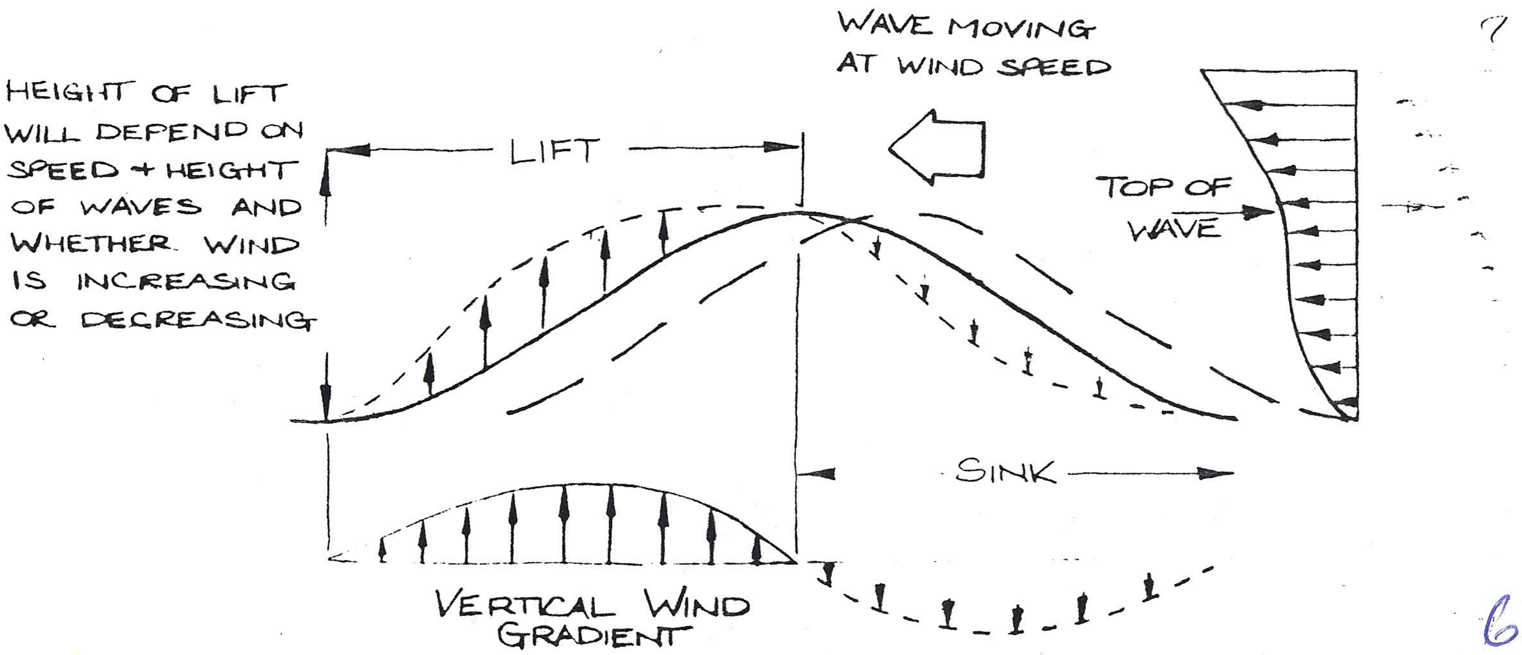
AIR FLOW OVER WAVES



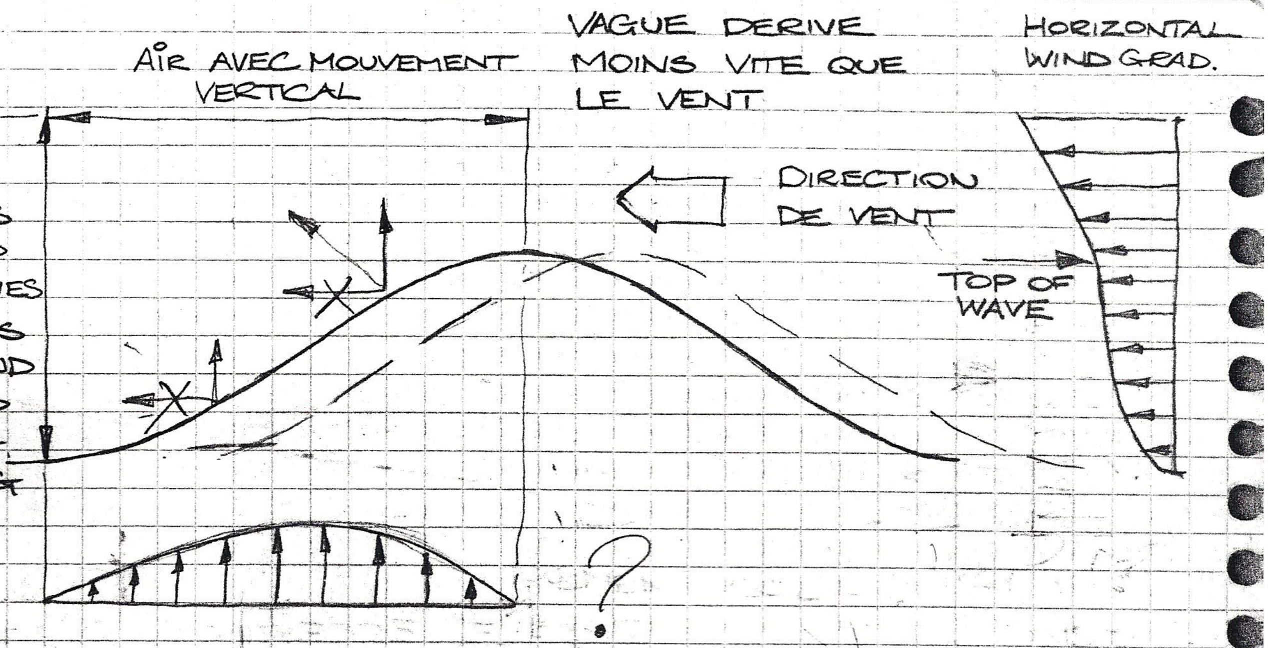
WATER ON SURFACE HAS A CIRCULAR MOTION BUT SURFACE DRIFT WILL ONLY BE ABOUT $\frac{1}{50}$ OF WIND SPEED

AIR IS ROLLED ALONG IN FRONT OF THE WAVE

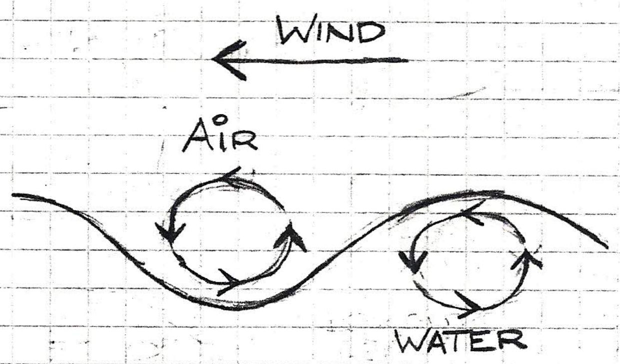


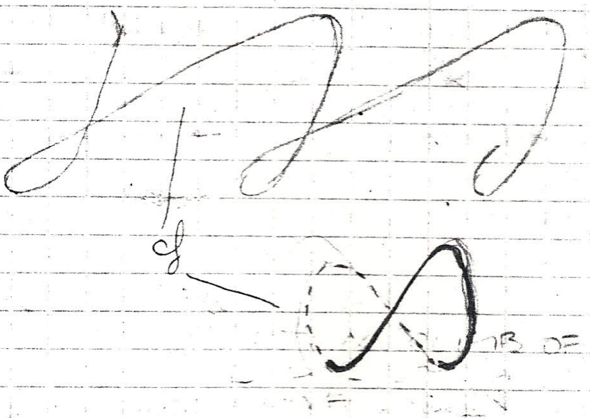


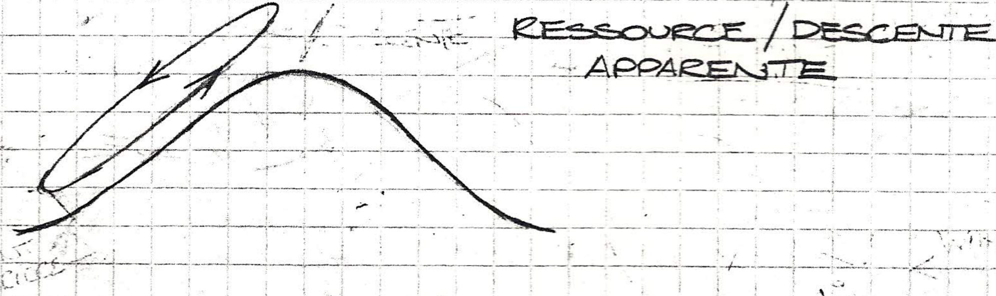
HEIGHT OF LIFT DEPENDS ON SPEED AND HEIGHT OF WAVES (WHICH DEPENDS ON FETCH) AND WHETHER WIND IS INCREASING OR DECREASING

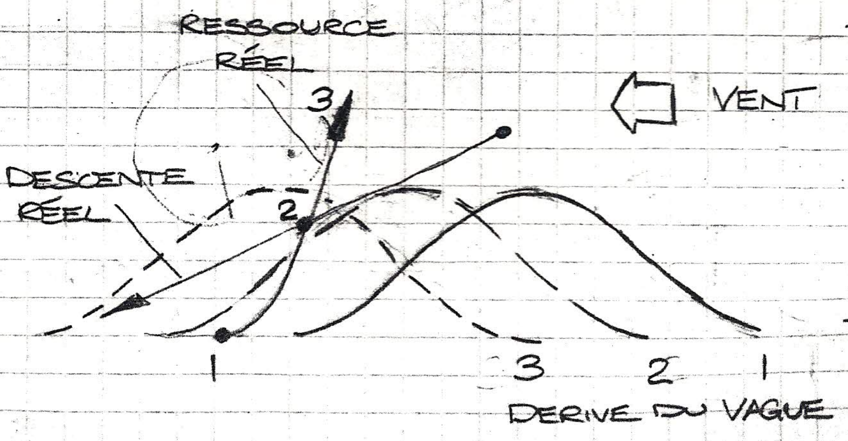


VERTICAL WIND GRADIENT
(COMPARE WITH THERMAL)







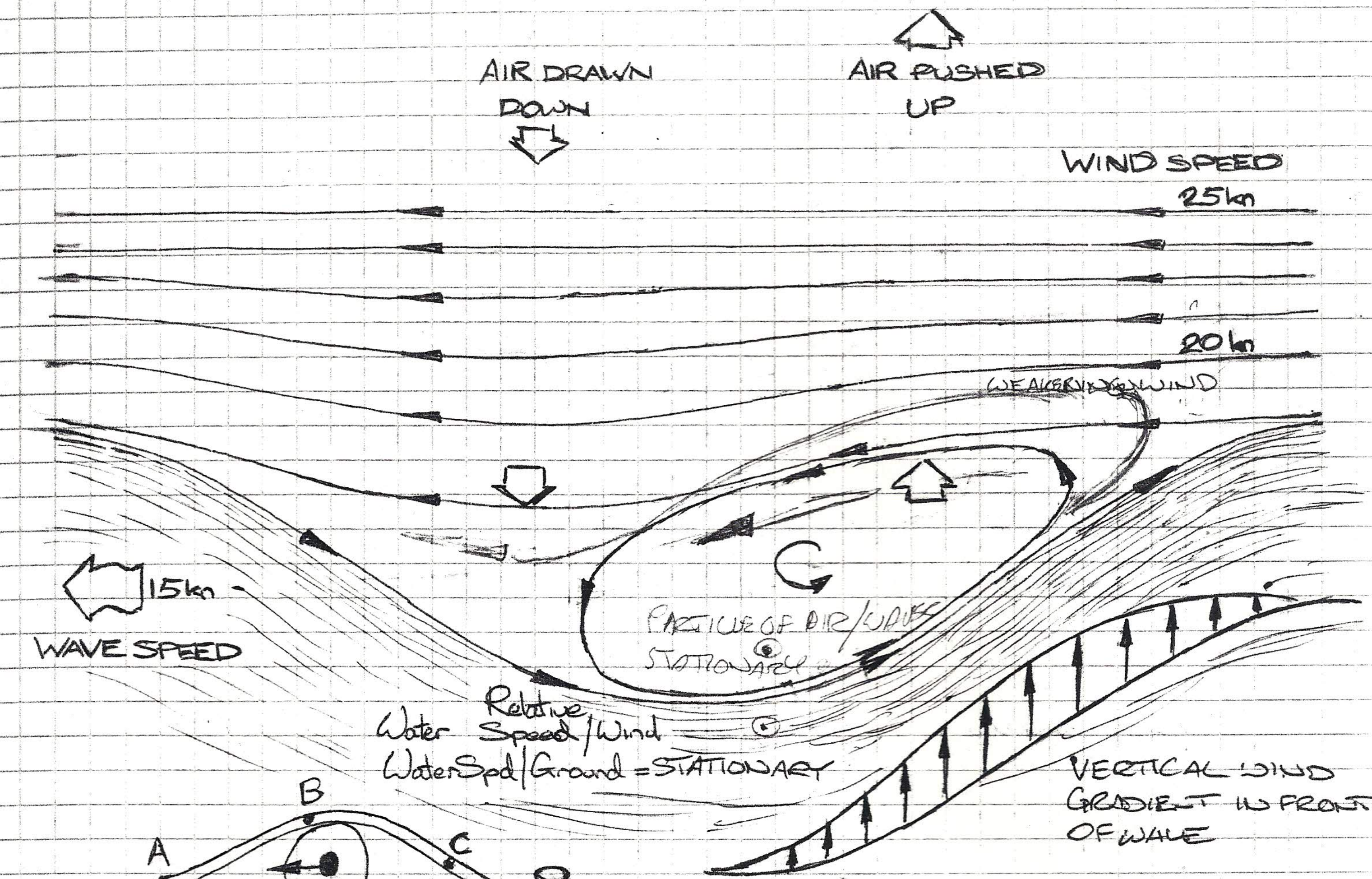


* VERTICAL CLIMB OF ALBATROSS IS STEEPER THAN IT LOOKS

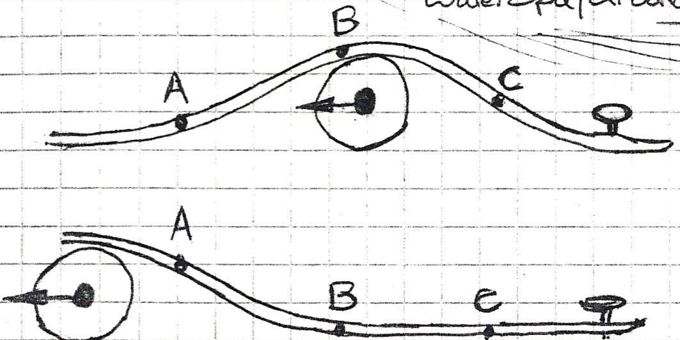
DESCENT IS SHALLOWER AND FASTER THAN IT LOOKS

∴ VT VA > QU'IL PAROIT

POSSIBLE AIR FLOW OVER WAVES.



VERTICAL WIND GRADIENT IN FRONT OF WAVE



VERTICAL WIND GRADIENT IN THERMAL

ABC. REMAIN STATIONARY (ALMOST) ON PASSAGE OF WAVE.

WAVE VELOCITY$^{(kn)}$ = 3 x PERIOD (SECONDS)

WAVE LENGTH (METRES) = (PERIOD IN SECONDS)^2 x 1·5

SUMS – FOR 20 KNOT WIND. ('FETCH' IS NOT CONSIDERED)

COLES:

HT. OF WAVES. $= \frac{1}{50}(\text{WIND SPEED kn})^2 = \frac{400}{50}$

$= 8$ FEET (3 m)

MOST ENERGY IS TRANSFERRED FROM WIND WHEN THE PERIOD $= \frac{1}{3}$ WIND SPEED $= \frac{20}{3}$

SAY 7 SECONDS

DANTON:

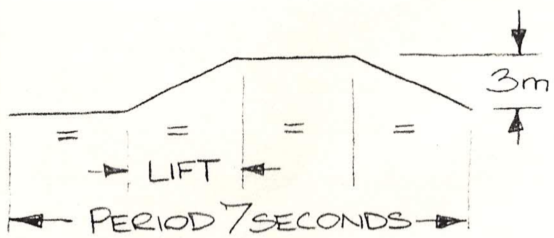
WAVE VELOCITY $\simeq$ 3 x PERIOD

WAVE LENGTH(m) $\simeq (\text{PERIOD})^2 \times 1{\cdot}5$

ie $49 \times 1{\cdot}5$

$\simeq$ 75 METRES.

CRUDE ESTIMATION OF LIFT:

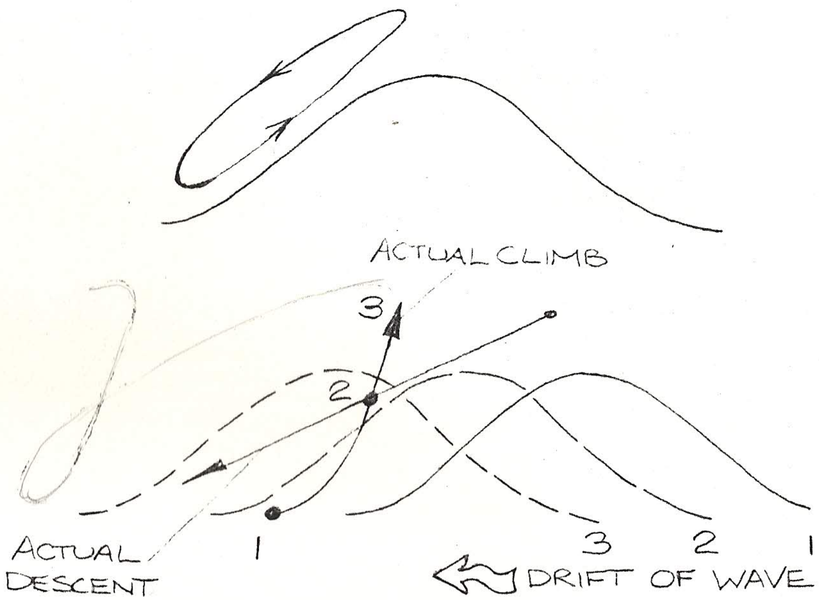


LIFT IS 3m IN $\frac{7}{4}$ SECONDS

SO SAY MAX LIFT IS:

1–2 METRES/SECOND

APPARENT CLIMB/DESCENT

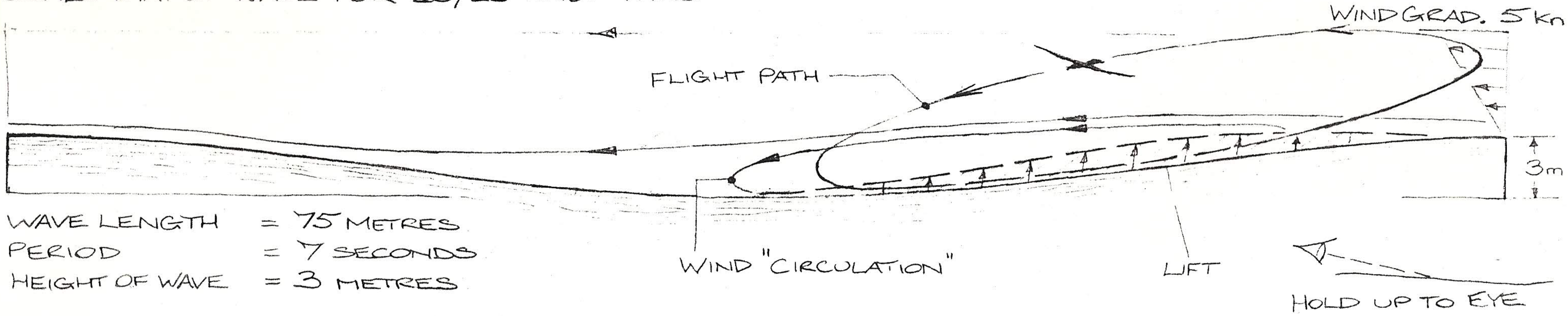


* VERTICAL CLIMB OF ALBATROSS IS STEEPER THAN IT LOOKS

DESCENT IS SHALLOWER AND FASTER THAN IT LOOKS

INFO PROBABLY FROM GUENANS
CLIMB CONTINUOUS BOTH FOR
BIRD + MG – VERY SIMILAR

SCALE DIA. OF WAVE FOR 20/25 KNOT WIND



WAVE LENGTH = 75 METRES

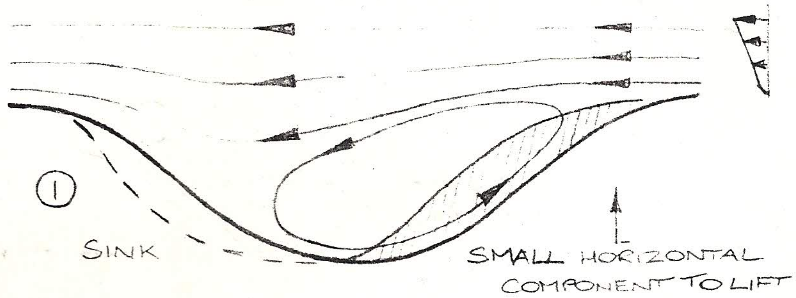
PERIOD = 7 SECONDS

HEIGHT OF WAVE = 3 METRES

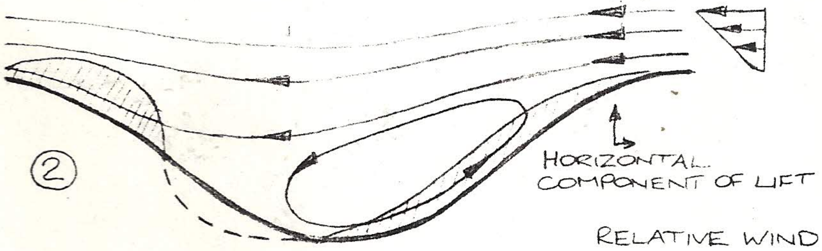
EFFECT OF INCREASING / DECREASING WIND ON LIFT

(NO ALLOWANCE HAS BEEN MADE FOR ANY CHANGE IN SHAPE)

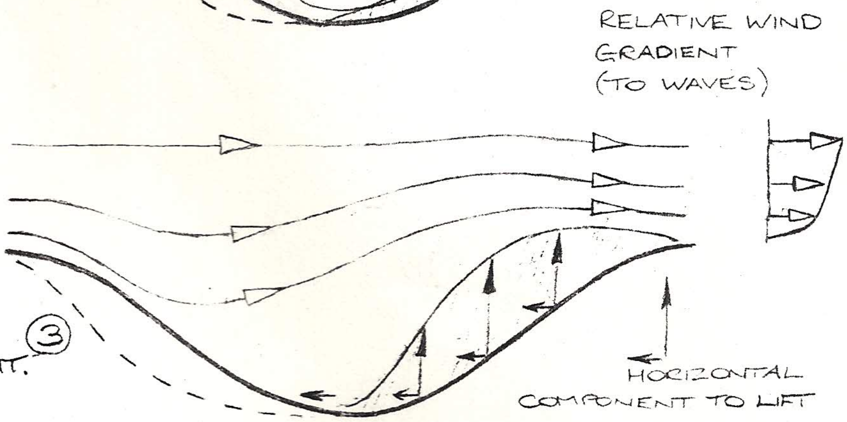
1) WIND SPEED = WAVE SPEED.
- LIFT REACHES THE WAVE CREST.
- GENTLE WIND GRADIENT OVER WAVE.



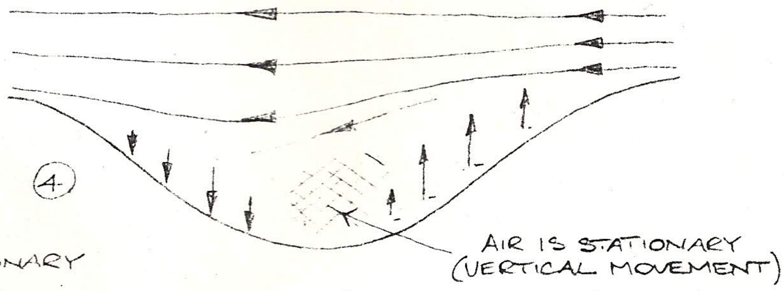
2) INCREASING WIND.
- WIND SPEED > WAVE SPEED.
- DEPRESSES LIFT SLIGHTLY IN LEE (CREST BUILDING UP WILL RESTORE IT)
- WIND GRADIENT ABOVE CREST INCREASES SHARPLY. A SUDDEN GUST IS THE ONLY TIME THERE WILL BE A WIND SHEAR (FLYING DOWN WIND)
- DYNAMIC LIFT WILL APPEAR ON THE WINDWARD FLANK OF WAVE.
- EVENTUALLY WAVE SPEED WILL CATCH UP WITH WIND SPEED AND RE-ESTABLISH THE SITUATION IN 1



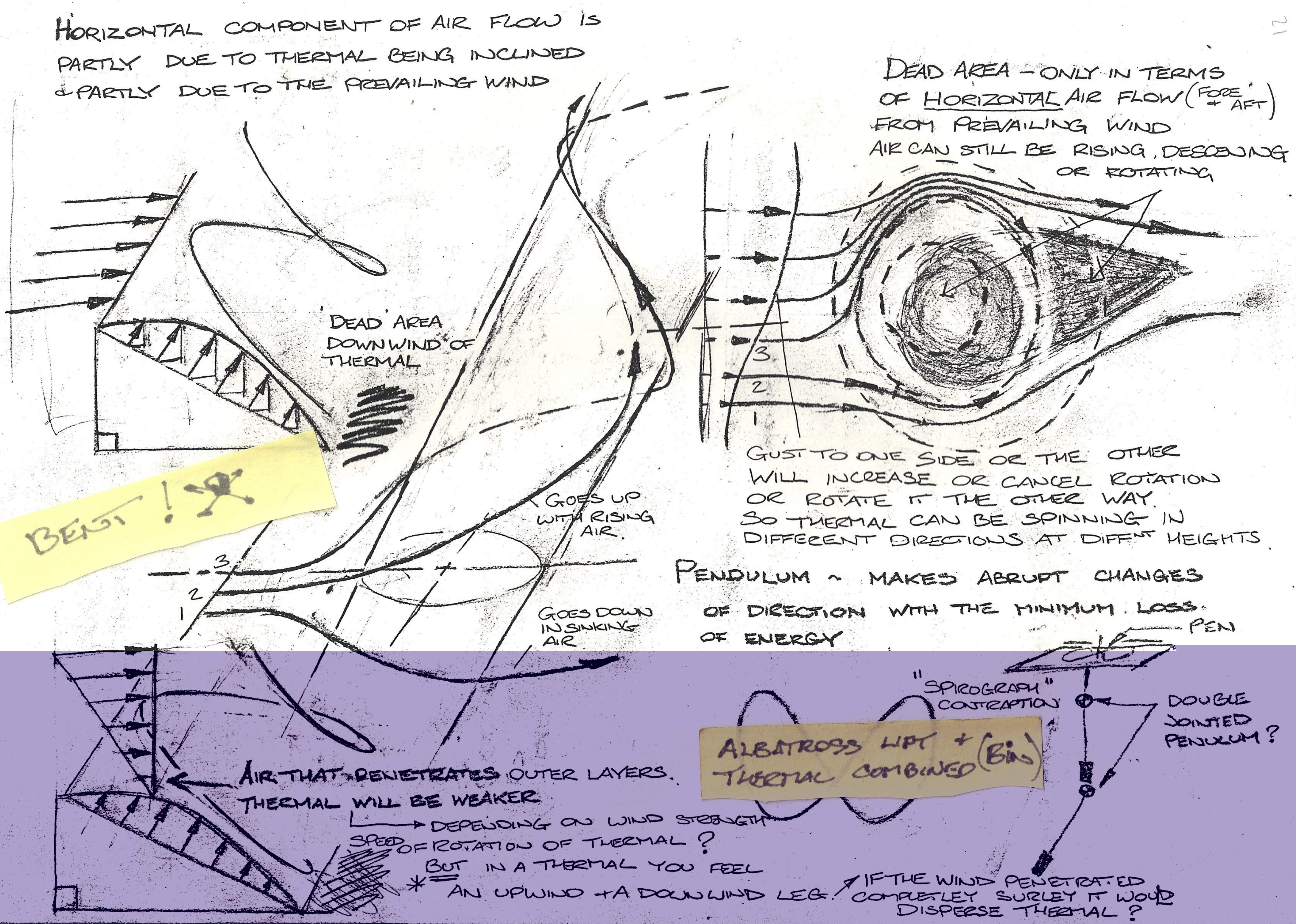
3) DECREASING WIND.
WIND SPEED < WAVE SPEED.
- EXTENT OF LIFT RISES TEMPORARILY UNTIL THE WAVES SLOW DOWN, BUT NOT THE STRENGTH OF LIFT WHICH DEPENDS ON WAVE SPEED & HT.
- WAVES WILL GRADUALLY SLOW TO MATCH WIND SPEED AND THE SITUATION IN 1 WILL BE RE-ESTABLISHED. WITH WEAKER LIFT AND WIND GRADIENT, UNLESS THE WIND CONTINUES TO DROP IN WHICH CASE THE WAVES WILL EVENTUALLY BE DAMPED DOWN



4) IS THE SAME SITUATION AS 1 DRAWN A DIFFERENT WAY SHOWING AIR THAT IS BRIEFLY STATIONARY IN TERMS OF VERTICAL MOVEMENT



EVEN THOUGH IT REQUIRES WIND TO START THE WAVES BUILDING UP, THE VERTICAL LIFT IS NOT DEPENDENT ON THERE BEING WIND. IT WILL BE THERE AS LONG AS THERE IS A WAVE, SO THE LIFT WILL PERSIST AFTER THE WIND DROPS, UNTIL THE WAVES DIE AWAY.


HORIZONTAL COMPONENT OF AIR FLOW IS PARTLY DUE TO THERMAL BEING INCLINED & PARTLY DUE TO THE PREVAILING WIND
DEAD AREA – ONLY IN TERMS OF HORIZONTAL AIR FLOW (FORE + AFT) FROM PREVAILING WIND
AIR CAN STILL BE RISING, DESCENDING OR ROTATING
'DEAD' AREA DOWNWIND OF THERMAL
BENT !
GOES UP WITH RISING AIR.
GOES DOWN IN SINKING AIR
3
2
1
GUST TO ONE SIDE OR THE OTHER WILL INCREASE OR CANCEL ROTATION OR ROTATE IT THE OTHER WAY. SO THERMAL CAN BE SPINNING IN DIFFERENT DIRECTIONS AT DIFF^NT HEIGHTS
PENDULUM ~ MAKES ABRUPT CHANGES OF DIRECTION WITH THE MINIMUM LOSS OF ENERGY
PEN
"SPIROGRAPH" CONTRAPTION
DOUBLE JOINTED PENDULUM ?
ALBATROSS LIFT + THERMAL COMBINED (BIN)
AIR THAT PENETRATES OUTER LAYERS. THERMAL WILL BE WEAKER
DEPENDING ON WIND STRENGTH
SPEED OF ROTATION OF THERMAL ?
* BUT IN A THERMAL YOU FEEL AN UPWIND + A DOWNWIND LEG.
IF THE WIND PENETRATED COMPLETLEY SURLEY IT WOULD DISPERSE THERMAL ?