Evert Fluid – Technology

Part 2 Aero - Technology

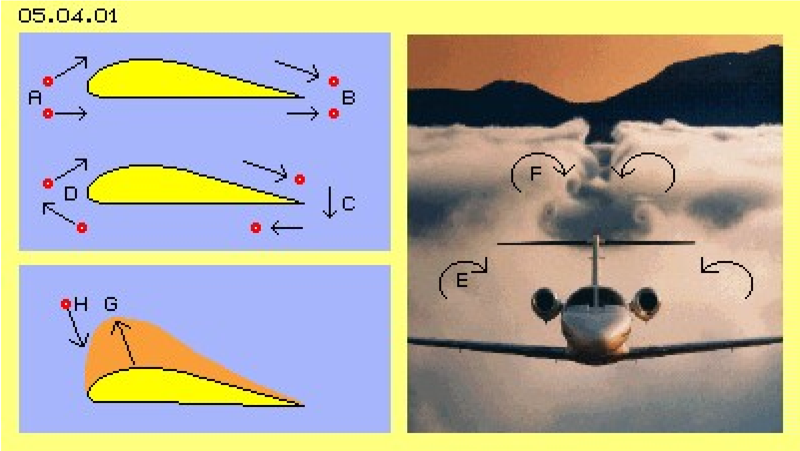
The chapters of the old website were reviewed, reduced to relevant points
and ordered by subjects.
a MUST for PHYSICS of FLUX, especially for AERONAUTICS and ASTRONAUTICS

Evert / 2016-01-31 File www.evert.de/ap06e.pdf

05.04. Lift at Wing

Phenomenal Flying
Flying is fascinating and today, practically everyone can afford that age-old dream of mankind. Even when airplanes did fly reliable, still some physicists reasoned that machines heavier than air could never fly. Really phenomenal however is, still no theory is commonly accepted. The question why airplanes fly is discussed on and on.

Everyone spontaneous answers this question: ´because the distance upside of the wing is longer, the air upside moves faster ...´ - like sketched at picture 05.04.01 from A to B. However likely long is also the distance from B to A - and wings installed back to front won´t fly. At the other hand, any waver-thin sail (with practically same length at both sides) produces a drive force most reliable.



Essentially more professional seams (commonly preferred) Circulation Theory: the air moves around the wing, at the rear end (C) down, downside ahead, at the front side (D) upwards and upside back again. However, continuously air masses can not circulate that kind. The air flows upward at the front of the nose and the air is moving down behind the rear end of the wing - however at the below side, by guarantee, the air will never flow forward, back to the nose.

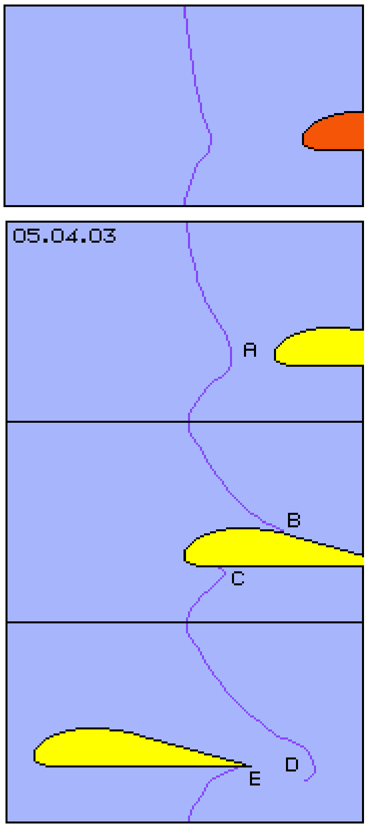
This theory is based on inevitably coming up vortices behind the aircraft, like clear to see at E and F. These vortices start at the outer end of the wings and reach far back. It´s assumed all vortex-threats must be closed loop, so these vortices would have to rotate around the wing, from its outer end to the body, and analogue at the other wing, so building a long stretched vortex ring. However, vortex threats not at all must be closed loops. That theory mixes up a (most hindering, secondary) side-effect with the primary cause of the lift-effect.

Contrary to Formula and Laws
All common theories can not really explain the phenomenon why most strong lifting forces (G) exactly affect where the particles (H) hit most strong at the wing, so should it press down most, thus affecting a force by just opposite vectors. The central point - most not spoken about - however is, that lifting costs nearly null energy input. The airplanes demand energy for drive i.e. to compensate resistance versus the motion ahead. The lifting of the weight versus the gravity however costs minimum or null energy (totally contrary to the common understanding of the law of energy constant).

Old Archimedes detected the law of lift and also his ships did swim ´for nothing´ at the waters, however only if lighter than the medium. Old Newton with his law of action and reaction is asked for explanations - however it won´t work as the air shows no mechanical beams. Laws and formula of many known physicists are mentioned, each describing a part aspects of flux-science rather sufficiently - however the lift exists not based on formula, but is based on real movements of real particles. So the cause and the essence of lift are only to detect by description of real processes.

Air Movement

This animation shows the motion of air particles. At the beginning, they are positioned vertical at that blue line. Below, the picture 05.04.03 shows three situations from that animation.



Already before the wing arrives, the air is ´sucked´ towards the nose, even from below areas (A). The particles fly fast along the upper side (B). At the rear end of the wing however, the particles do not meet with their previous neighbours, but the upside particles did fly much longer way into the areas behind (D).

The particles at the below side of the wing, at first are accelerated backward (A). Afterward, the particles stick at a small border layer at the wing and are dragged some ahead (C). At the rear end, the particles again are sucked backward (E). So no clear vortices are coming up (apart from the vortices at the outer ends of the wing) and not at all comes up any circulation.

At the following, the process of lift at wings is described in details. The wing moving through resting air represents some kind of ´disturbance´, affecting consequences and side-effects. These are important for any application with wing-like elements (e.g. pumps and turbines). So step by step now the causes and affects of lift are discussed.

Trigger Element

At picture 05.04.04 schematic shows a cross-sectional view of a wing (yellow). At first is interesting rear upside part, which in principle is a triangle (A-B-C). The height of that triangle is assumed 0.3 m (H = 0.3) and the length is assumed 1.8 m (L = 1.8). So the relation of length and height is 6:1. When the wing flies towards left that length (B-C), the air particles can fall down that height difference. That´s the trigger for all following processes.

The other numbers here are assumed rough for simple calculations. For example, at D the ´action-radius´ (red circle) of a particle (red central spot) is sketched (resp. its maximum way while one second). The molecular speed of that particle is some 450 m/s (VM = 450). The particles however won´t fly straight ahead all times, but in average they meet diagonal, e.g. when transporting sound. So here at first, the motions ahead are assumed walking zigzag lines and the possibility for moving forward is assumed by sound speed of some 300 m/s (VS = 300). The height H of 0.3 m thus takes one millisecond (TH = 1 MS).

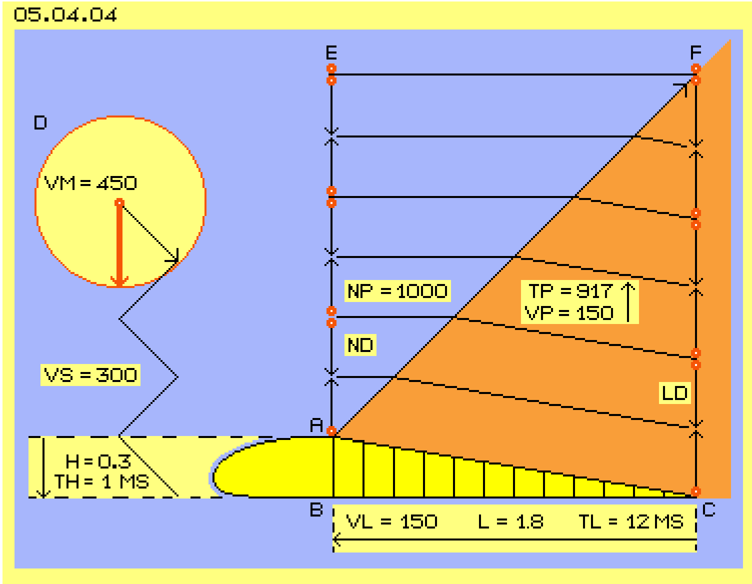
The speed of the plane respective the wing into longitudinal direction is assumed the half of sound speed, thus some 150 m/s (VL = 150). So flying that length of 1.8 m will take 12 milliseconds (TL = 12 MS).

Thin-out vertical

Upside of the apex of the wing, six particles (red points) are marked representing all air particles (between A and E). When the wing has moved 12 milliseconds towards left side, these particles have more space (from C to F). They can forge down by the distance of height H. Upside of A, collisions occur by normal distances (ND), however upside of C these distances between collisions become longer (LD).

Upside of that part of the wing thus comes up an area of less density. A likely amount of particles within a wider volume, same time stands for less pressure. Instead of ´normal´ atmospheric pressure of e.g. 1000 millibar (NP = 1000) thus there exists less pressure, theoretic a ´depression´ of only 917 millibar (TP = 917).

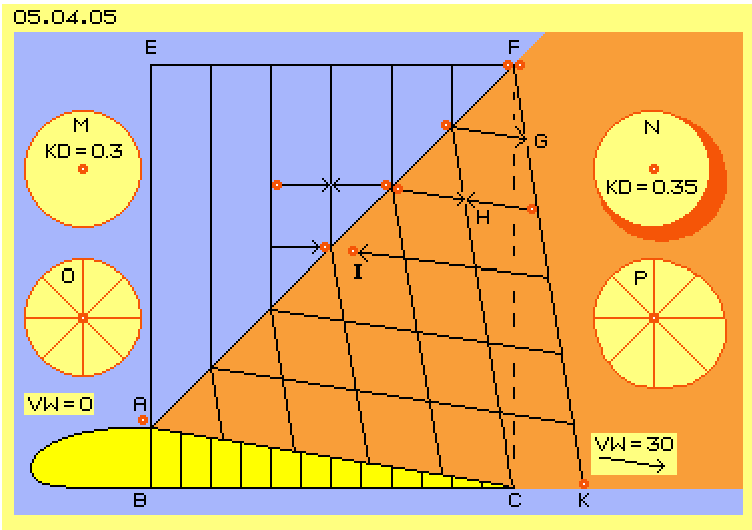
At an earlier chapter 05.02. ´Three Times Suction-Effect´ this process is described at picture 05.02.02, there by motions of horizontal direction into relative emptiness (while here the analogue process runs into vertical direction). In principle, a first particle falls into the void (as here the wing-face makes the way free for a downward motion) and comes back delayed for collision with next particle. After each two ´strokes´ one next particle follows, so the ´suction-area´ spreads upward.



Upward and downward movements not only occur into vertical direction but by zigzag, so with sound speed. After each two movements that ´information´ (more void) moves upward, i.e. by half of sound speed that thin-out of density resp. reduced pressure spreads upward (VP = 150). As here also the flight-speed (VL) is assumed by half sound speed resp. these 150 m/s, the border of thin-out wanders diagonal backward-upward. That area of less density here is marked red.

Horizontal Wind

Within that area of relative emptiness occur movements not only in vertical direction by longer distances between collisions, but naturally also into horizontal direction the movements occur similar, like schematic sketched at picture 05.04.05.



If a particle at the border of the thinned-out area occasionally is pushed towards right, it also flies a longer distances until next collision (e.g. at G), correspondingly one sixth longer. These particles return with delay to the next collision (e.g. at H), so all locations of collisions (e.g. at I) are shifted correspondingly towards right side.

A particle positioned at A has the chance for most collisions within the thin area until the rear end of the wing. This particle will finally not be positioned at C (based on its vertical falling) - but same time it will wander to K (based on shifted collisions). At this snapshot picture, the thin-out starts at A, however the empty area wanders with the airplane towards left side, so a particle momentary positioned at A indeed can fall into that rear end emptiness (which reaches further back behind the plane).

The horizontal movements occur by conditions likely to previous vertical movements. That´s why the line F-K shows an angle (to the vertical line) like wing-surface (to the horizontal level). Thus the angle A-C-B is identical to the angle K-F-C. That vertical triangle is one sixth (by H = 0.3) longer, so also the distance C-K is some longer than the height of the wing.

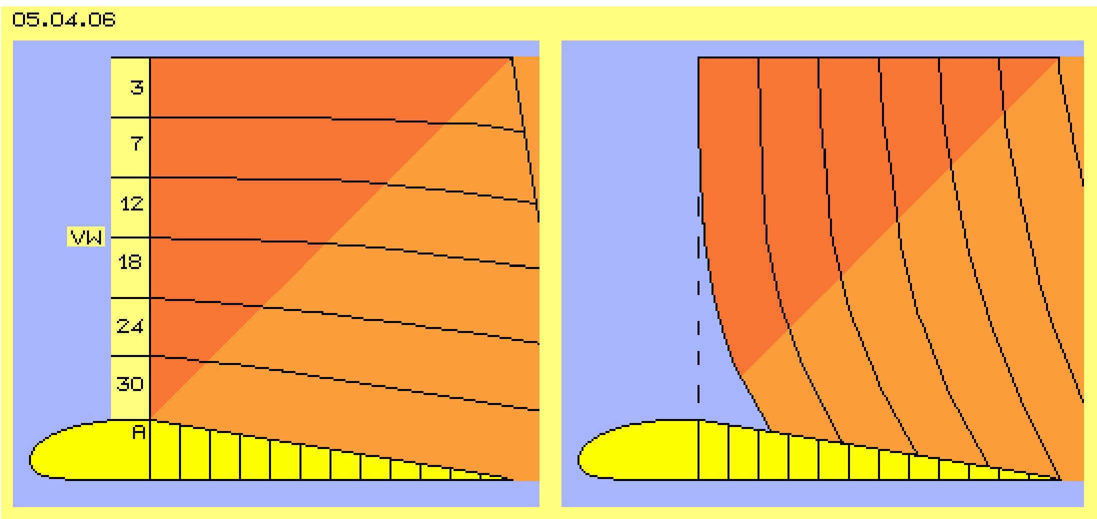
A particle at A wanders towards right side by these 0.35 m during these 12 milliseconds. So the speed of that movement is some 0.03 m each millisecond resp. 30 m/s (VM = 30). Thus based on the ´suction-effect´ upside of the slope-part of the wing, a wind of nearby 100 km/h comes up. Even no ´natural´ wind exists at point A (there VW = 0), an ´artificial´ flow comes up, into contrary direction to the movement of wing, at the rear end showing the strength of a remarkable storm.

At this picture at M is sketched the ´action-radius´ of a ´resting´ particle (e.g. far ahead of the wing), which shows the distance of 0.3 length-units until next collision (KD = 0.3, corresponding to the grid-scale used here). At N is sketched the corresponding action-radius of a particle within the area of less density, which is extended towards downside-back (marked as red sickle), because there the distances until next collisions are 0.35 units (KD = 0.35).

That graph is comparable with earlier used ´motion-pattern or -types´ for resting particles and particles within flows of different speeds. Analogue here, a particle within normal environment is marked as motion-type O (after collision positioned anywhere at the round circle). A particle upside-back of the wing is marked as motion-type P (after collision positioned anywhere at that curve reaching one sixth more towards right-side-down).

Real Wind
At the diagonal border line towards the thinned-out area thus the particles will accelerate from 0 to 100 km/h immediately. That´s no problem as all particles at frontal collisions ´accelerate´ form 0 far above sound-speed (e.g. normal molecular speed of 470 m/s * 3600 s = 1692 km/h). However that wind starts not just at the border line, because any particle flying over the wing leaves a relative void above the front side of the wing. In addition, the horizontal movement naturally results a progressive thin-out at the areas further in front of the wing.

At picture 05.04.06 left side, that secondary thinned-out area is marked dark-red up to a vertical line near the apex of the wing (A). The speed of the wind (VW) is noted for six layers of air. The speed is calculated by simple average of the particles ways before and behind the border line. So resulting are flows increasing faster from upside down by e.g. 3, 7, 12, 18, 24 respective 30 m/s.



Previous thin-out into vertical direction produces wandering movements, as all particles as a whole are moving some down. However that´s no real wind, because every particle inevitably is rejected at the face of the wing. None of these particles can leave that local area (these vertical movements can not escape into the wing).

Opposite however, the horizontal movement is a real wind as the particles wander out into areas behind the wing. They are not rejected at a certain point (like previous surface), but will mutually collide finally some later. Some particles probably escape in total from their original location, because far behind still exists a relative void resp. that wind is running further on far behind the wing. One also should remember, not only single particles are moving but real crowds are falling into inevitably existing ´empty bubbles´ (see earlier chapters).

This horizontal flow-component thus won´t end upside of the rear end of the wing and that wind does not start at previous border line. The thin-out-effect of that ´real wind´ spreads forward along the wing and far in front of the nose, not only with half of sound-speed (as the vertical thin-out spreads upwards). That ´information´ (collision partner wandering off rear end) is obvious just for any particle whenever it´s hit occasionally into rear-end direction, i.e. the information of new possible movement wanders ahead by speed of sound.

At this picture right side, the speeds of air layers are show as shifted-motions of particles which previously were positioned straight vertical line upside of the apex of the wing. This graph corresponds to the black line resp. the curve of upside animation resp. at picture 05.04.03. From upside down the wind becomes faster and the particles wander off rear end of wing (which same time moves towards left side), at below layers much faster and wider than at layers further upside.

Suction of fast Flow
Between neighbouring flows of different speed exists a suction-effect, described in details at earlier chapter 05.02. ´Three Times Suction-Effects´. Between involved movement-types (e.g. also concerning the ´action-radius´ respective type P at previous picture 05.04.05) occur ´rear-end-collisions´. At the one hand each faster flow is compressed (and/or becomes bended). At the other hand the particles occasionally fall into the faster flow without resistance, and thus they affect an increasing density and speed of the faster flow. At this process are involved not only single particles, but based on the void and uneven spreading of particles within gases in general, whole crowds or parcels fall into fast driving bubbles.

This effect occurs everywhere within the whole volume of these flows, thus also within that areas upside of the wing at all locations. Previous calculations concerning pressure and speed might theoretical be right, however can never mirror real the processes exactly. By known and most effective ´suction effect of faster flows´ (see hurricanes etc.) the flux alongside a surface becomes much faster and also the spreading of density is much more distinct.

Vortex-Train
At the rear end of the wing thus exists a storm-like flow backward-down. This flow meets the air from below the wing, which is ´resting´ resp. some turbulent because sticking at the surface. The flow from upside hits onto downside air masses and compression comes up. This process occurs on both sides of airplane body, so the increased pressure can expand only outward-aside.

Opposite, this downward-movement still ´drags´ air from upside down, same time previous thin-out spreads further upside. So an inflow of air can come only from relative resting areas aside of the plane. In addition all these flows are moving backward off. Resulting are these double vortices cylinder, like shown most impressive at previous picture 05.04.01 at E and F.

Also these vortices border on neighbouring areas of slower movements, so also far behind the plane that suction effect of each faster flow is working. These both vortices trains build contrary turning tornados inclusive their self-acceleration. Large planes mix up the air space for minutes. However, that occurrence is secondary side-effect, a most hindering appearance. Certainly, it´s not at all the primary reason for the lift at wings (as some theories assume).

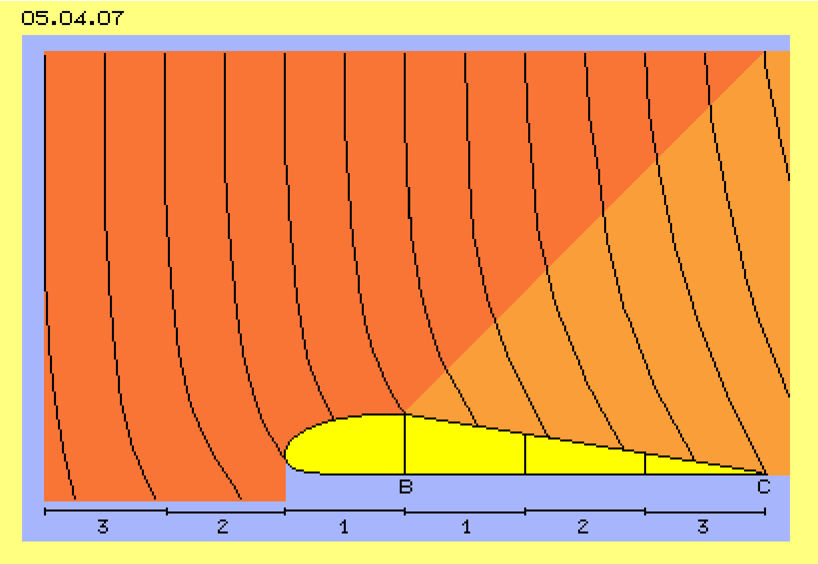
The lift really is affecting at that rear part of the wing. Downside of the wing, nearly normal atmospheric pressure exists. Upside of the wing, that wind glides alongside the surface diagonal down. The wind´s static pressure is much less and the pressure difference affects as an upward directed force. Nevertheless, the prevailing part of lift-forces appear at the front side part of the wing, so the processes there must be considered.

Information ahead

At picture 05.04.07 again the yellow wing is drawn and the primary (vertical) thin-out area upside-back is marked light-red. The profile of the wing at its rear part (in principle) is triangle-shaped and takes nearby three quarter (B-C) of the total length of the wing. The secondary (horizontal) thin-out area again is marked dark-red, now however drawn also further ahead.

Upside correctly was assumed the spreading of that thin-out (resp. upside in the figurative sense was also called ´information´) into horizontal direction occurs by sound speed. Valid as a clear approval is the fact, the lift at wings disappears if the plane flies ultrasound-speed. Each wing-profile shows a special characteristic graph concerning the relation of speed and lift. Increased speed results increasing lift force. However, each excessive speeds reduces the lift and finally it disappears in total.

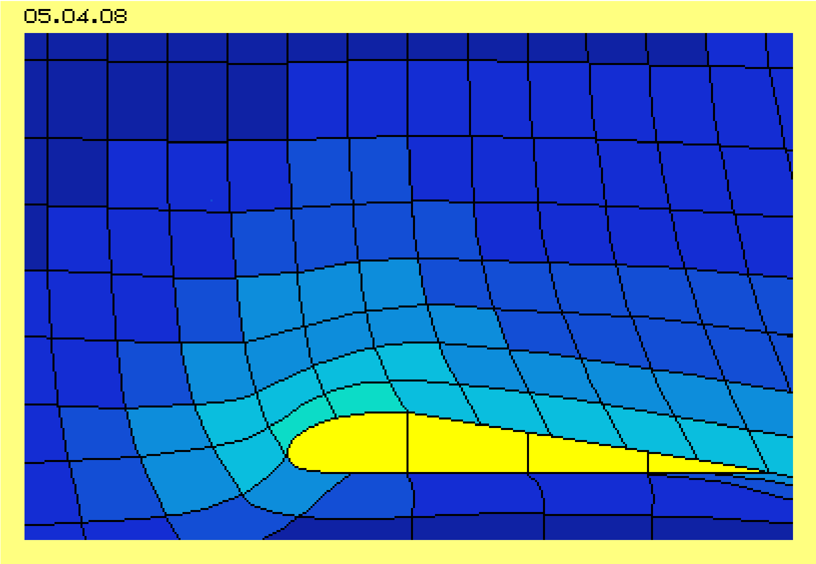
Starting point of these considerations was, the primary trigger for that lift-force occurs at the apex of the wing (B) and the effect is completely build out at the rear-end of the wing. At previous example was assumed, the plane is flying by half sound speed. As previous ´information´ is running by sound-speed within space, it´s running ahead of the moving plane (with its half-sound speed), also by half sound-speed. Here now at this picture is assumed, that information becomes affecting at least three of these quarters ahead of primary trigger-point B.



Right side are drawn again these lines of previous picture 05.04.06. They represent the shift of neighbouring particles by these winds of different speed. New curves right side are adjusted as differences to the vertical direction. However one must consider, stronger winds represent stronger ´suction´ (by shifting of their locations of collisions) and thus show stronger effects concerning particle further ahead. The higher ordered and faster the flow, the less negative collisions occur and the less resistance exists for following particles.

Suction by Void and fast Flow

The thinned-out space and speed of winds thus reach ahead not linear but the intensive movements affect correspondingly stronger into the space in front of the wing. Maximum speed exists alongside the wing upper surface, so its ´suction´ reaches also ahead of the nose towards downside-ahead. These winds still won´t drag any particles, but they only offer a void space for particles which occasionally were hit into likely directions - here even from below-ahead just over that nose.



At picture 05.04.08 again are drawn these ´vertical wind-curves´, now in addition accentuated by ´horizontal curves´ of different air layers. Depending on the wind speeds, these partial areas are coloured, from resting air (dark blue) to most fast flow (light blue).

Like at flows of different speed at the rear part of the wing, strong flows alongside the front part of the wing were affecting strong ´suction´ to neighbouring flows. In addition, the surface there is bended and alongside curved surfaces that suction-effect is most effective.

Flow-threats are bended towards faster flow all times and also that flow by itself becomes bended - and now can fly that curve without resistance (like described in details at chapter 05.02 ´Suction´ at picture 05.02.05). By view from below of the nose, the surface steady turns aside and thus additional void appears with corresponding suction. The curvature of profile at this part is critical concerning the lift and the resistance. It must be adapted to the flight-speed wanted.

Order Factor Wall

Repeatedly I pointed out the function of walls at the characteristic of flows. The sloped end of the wing represents a relative void and was described as the trigger for the vertical thin-out. A corresponding wall does not exist for the horizontal movements, so a real wind comes up with shifting particles backward far off.

Within free space all local areas of relative void can be filled up from all sides. As described in details by basic chapter 05.02. at picture 05.02.05, the void aside of a wall however can only be filled up from outside and prevailingly alongside the wall. That´s valid here along the total upper face: behind the apex appears relative void, which spreads to the front side parts as strong winds. Any fast running particle appears like void for any following particle - and just that void never is filled up from the wall, thus exists continuously.

Minimum and maximum static Pressure

As ahead and above of the nose that ´suction´ can only be filled up from downside, and as the bended flow there can flow without resistance around the curved face, just at this part of wing´s upper surface exists maximum speed. Not only direct at the surface but also each upper layer of air shows its maximum flow just there. At these parts of light colours frontside-upward, thus within all layers exists minimum pressure cross to the flow directions. So there at the wing surface weights most less static pressure. The air indeed escapes upward in front of the nose, so the wing flies forward all times into an area of most less pressure – with relative few resistance.

Onto the below surface of the wing, in principle weights the total atmospheric pressure. However, the air of that region is not totally calm but is sucked back little bit, afterwards it´s dragged some ahead, finally sucked backward at the rear end. So also at the below surface affects the atmospheric pressure not by total strength. The difference of static pressures between upside and downside surfaces results the wanted lifting force.

Rough Calculation of Lift-Forces
Many formula are used for calculating these forces. The mentioned circulation-theory for example works with a factor ´circulation´ (deduced of backside vortices trails resp. representing practically speed differences between upside and downside surfaces of wing). Other calculations assume, the lift-forces should correspond to the air masses pushed down (so a pure mechanical view without any consideration concerning suction effects). Mostly are used Cw- and Ca-numbers (which however are determined empirical for every profile and angle of attack). Mostly is used the density of the medium (while pressure probably would be the factor more realistic). The factor of speed, all times is used by square (probably too simplistic view). Only the scale of the effective face is a clear factor at common calculations of lift-forces.

All common formula however do not fit to the fact, above sound-speed no lift is achieved (thus the factor sound-speed theoretically should be involved at any formula). So I offer an attempt for calculations, deduced from the real reasons of the processes producing the lift-force (using the data of pictures 05.04.04 and 05.04.05).

Behind apex (A) of the profile, the air can fall down at the distance H during the time TL (until the wing moved the distance L towards left). The horizontal wind corresponds to previous downward-speed plus an additional part corresponding to the relation H / L (previous one sixth), so the wind of this example achieves 30 m/s within the space.

This wind continuously fills up (by parts) the void alongside distance L. Based on suction, corresponding mass of air must come from front side, however alongside the shorter distance from the apex to the nose. The front part of the profile here was assumed one third of rear part, so in front of the apex the wind should move three times faster, for example thus by 90 m/s i.e. some 300 km/h. The average speed alongside whole upside face thus would be some 45 m/s ((3*30+1*90)/4).

Now the dynamic pressures are calculable (by Bernoulli formula), at the below face of the wing with flight-speed of 150 m/s and at upside face with the flight-speed plus the wind, so of 150 + 45 = 195 m/s. Instead of that relation resp. factor of 195 / 150 = 1.3 commonly the speeds are calculated by square, so the factor 38.025 / 22.500 = 1.7 would result for the dynamic pressures. As the remaining static pressures relate contrary, the factor of some 1 / 1.7 = 0.6 is resulting respective a difference of 0.4 in favour of the upside surface.

The atmospheric pressure weights by one metric ton each square-meter, so the lift-forces of that wing would be 1000 * 0.4 = 400 kg/m^2. The wing was assumed with a length of 2.4 m and a span e.g. of 20 m would result a surface of 48 m^2. So by that rough calculation would result a lift force of 400 * 48 = 19.600 kg – and qualified men are invited to check these data.

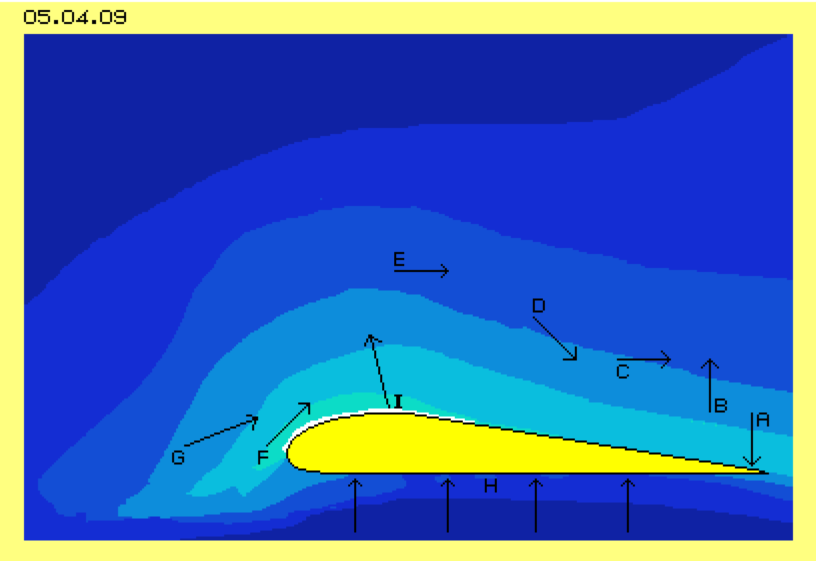
Sound-Barrier
At this example roughly was calculated a wind of 90 m/s at the front part of wing. This part is 0.3 m high and 0.6 m long, the flight-speed is 150 m/s, so the air in average already needs 75 m/s to escape upward. Only if these high wind-speed at the nose comes up, these extreme low Cw-values of wing profiles are possible (a rod with a diameter of only 3 cm resp.

7 cm^2 produces more resistance than that wing of 2.40 * 0.3 m resp. some 3.200 cm^2 cross-sectional surface).

If this plane should fly faster, the relation of height and length must be reduced, i.e. profiles more flat must be used. The wind-speed in front of the nose must accelerate already far ahead. The ´information´ of that wind resp. its suction-effect is running through the space by sound speed. Finally when the plane by itself flies with that speed, the wind no longer can escape the nose of wing. Suddenly a ´bow-wave´ of dense air comes up. The plane must push these masses continuously forward, i.e. must accelerate the air in front. Inevitably come turbulences, no longer exist ordered flows along the surfaces, so the prerequisite for the lift-effect got lost.

New Theory of Lift
At picture 05.04.09 once more are shown previous areas of winds and pressures, now by smooth colour-nuances. The movement processes and effects are marked by arrows. This new theory of lift here is summarized in brief, by different steps from the initiating cause to final the effect.

Preliminary is to state, ´suction´ never works any kind ´dragging or attracting´, but suction only offers longer distances until next collision, only for particles which got pushed occasionally into that direction, just by normal molecular movements. Above this, the particles there can fly more narrow aside each other and the flow shows a better structure and better order. The term ´suction´ here is used exclusive by that sense and understanding.



A. The trigger reason for lift is the sloped upside surface of the rear of the wing, which continuously produces a relative empty space while the plane is moving ahead. Into that void the particles fall down in vertical direction. They are rejected by the surface and return upward with some delay.

B. The region upside of that original void also becomes thinned-out, as the locations of all collisions are shifted some down. The ways between collisions become some longer. The area of reduced density spreads upward by half sound-speed.

C. Into that thinned-out area, the particles fall also in horizontal direction, and also these ways between collisions become longer. These backward showing motions are not limited by certain surface, so a real shift of particles exists. That wind does not stop at the rear end of the wing, but is steady flowing off, also behind the plane. As that thinning-out spreads from below upward, the wind near the surface can start earlier and becomes stronger than within air layers further upside.

D. At neighbouring flows of different speeds, each faster flow affects like a suction towards neighbour flows. The particles of the slower flow are integrated within the faster flow without resistance. The fast flows within below layers become more dense and accelerated.

E. These winds wandering over the wing backward, represent also suction for areas ahead. They leave relative void at the front. That void spreads above and ahead of the wing by full sound-speed. That void alongside the surface can only be filled up from upside and prevailingly along the face from areas ahead. Winds even exist far upside of the wing, however the motions along the surface are most strong.

F. The most strong flow at the front part of the upper surface affects correspondingly strong suction effect. Even the particles below of the nose-level are ´drawn´ up over the wing.

G. Areas far ahead show slow motions at the beginning. When they come to the nose, they affect bending, compressing and accelerating the fast flow near the face. As the face upside and behind the nose is curved, the bended flow can run without resistance.

H. Downside of the wing, the air keeps not totally calm, nevertheless is affecting nearby the whole atmospheric pressure onto the below surface of the wing.

I. At the upside surface the static pressure is reduced corresponding to the speed of that wind alongside the face. The difference of static pressures of upside and downside surfaces represents the lifting force, which in total shows vertical upward and some ahead. The ´production´ of that lift costs no corresponding energy-input, because the ´protection´ of the upside surface versus the atmospheric pressure exclusively is based on suction, the wind there comes up automatic, as particles fall into each relative emptiness by pure chance and based only at normal molecular motions.

The readers may judge whether my new theory of lift is a logic and understandable description of the real cause, the processes and effects of that ´phenomenon´ - and the readers may well compare these statements with other theories. Next chapter 05.12. ´A380 and Lift´ will show an approval by calculations of realistic data.

Evert / 2006-11-15

05.12. A380 and Lift

(Mis-) Calculations
At chapter 05.04. ´Lift at Wings´ I described the process of lift and made some calculations. As I don´t like that ´formula-caboodle´ I asked specialists to check these calculations. Past eight weeks that chapter was visited three thousand times and downloaded one thousand times. However I got no hint for mistakes, critic discussions came up only with some readers. ´Naturally´ my calculations were wrong and the formula were used most fuzzy. At the following I will show a most clear and simple procedure of calculation and correct results.

One physician did not examine my calculations however offered hints concerning formula and common opinion. At his institute of an high-ranking university, they teach the theory of common understanding: the lifting of a plane is achieved by pushing down the corresponding mass of air. He proved this conviction with data of the new A380. So at the following are mentioned some figures of that impressive plane (some values rounded).

05.12.01

Span	80 m
Length / Height	73 m / 24 m
Wing-Surface	850 m^2
Start-Weight	560.000 - 590.000 kg
Payload	83.000 - 152.000 kg
Fuel-Litre / -Weight	310.000 L / 270.000 kg
Range	10.000 - 15.000 km
Passengers	500 - 850
Freight-Volume	1.000 m^3
Optimum Speed	0,85 Mach
Start- / Landing Speed	270 km/h
Thrust (Start)	310 - 340 kN
Noise Level	100 dB

Data of A380
Eighty meters wide is that bird, eight 100-m^2-flats could be arranged at the surface of the wings, it weights as much as three hundred well build cars, each occupied with two or three passengers corresponds to its capacity. Like at land-vehicles, the payload is relative small, only one seventh or a quarter at pure freight version. That machine primary is a tanker lorry – the demanded fuel takes the half of the start weight.

More than 300.000 N thrust accelerate that airplane, which flies over a quarter of the globe at a half of day by 850 km/h. It´s most expensive to move seven times faster than a car. Each passenger ´consumes´ as much fuel as cars need (even there are four persons within car). Who believes it´s important coming to far continents within few hours, won´t bother about the noise level of 100 dB.

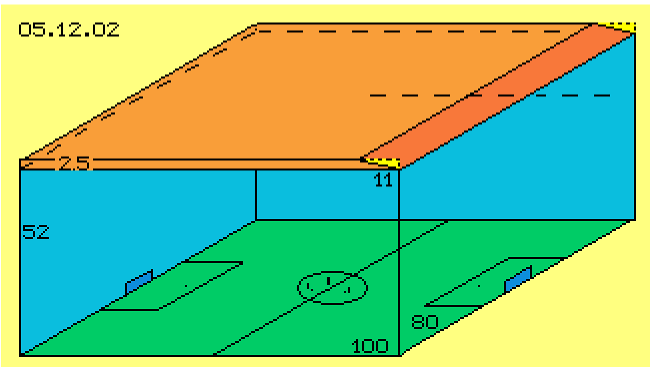
Flying by itself is great, that A380 by itself is a technical master piece - however it makes no sense for me. Nevertheless ´normal´ people seem not bothered by that stress and don´t suffer when ´flying off their souls´ and need days to ´find back to themselves´. However that´s not the subject here, because here are discussed only physical data and facts.

Classic Calculating
Previous highly qualified specialist made the following assumptions: mass m = 500 t (so 500.000 kg), wing face S = 850 m^2, speed v = 100 m/s (so 360 km/h), density of air rho = 1 kg/m^3. Resulting is demanded force of lift A = m * g = 4.905.000 N. By classic formula for lift A = 0,5 * rho * v^2 * S * Ca results the lift-factor Ca = 1,15. By the data of the wing further results the demanded angles of attack alpha = 13,3 degrees. Again results the induced resistance W = 237.600 N, demanding 32.300 HP for breaking the resistance of this speed. Indeed, these results are calculated correct.

That expert now takes the view of common understanding, the performance for producing of downward-wind corresponds to the force necessary for lifting the airplane (based on the classic-mechanic reliable principle of actio = reactio). Based on the angle of attack it´s easy to calculate, the wings have to push down air by about 24 m/s. Only the air direct below of the wing is accelerated that fast. The air some more below is accelerated less. So this expert assumes the average speed of downward-wind to be some 12 m/s.

Based on the constant of impulses – the airplane is affected by an upward-impulse corresponding to the downward-impulse of air - demanded downward speed needs the movement of mass m = 415 t/s (some less than the weight of airplane, because the air is moved down some faster than by gravity g). The acceleration of that air-mass-flow requires the performance of about 39.400 HP - and also that´s determined by the rules of physics absolutely correct and accepted as general understanding.

Not to grasp
Verbal statements I made at diverse texts, now are covered by real data and I say thanks for that service. However I still am astonished, how such results - obviously theoretic correctly determined - are not checked with obvious realities. By previous calculations the wing must push down air in extent of 415 t/s. These are 415.000 kg and by previous density rho = 1 kg/m^3 each kilogram corresponds with one cubic-meter. So an air-volume of 415.000 m^3 should be accelerated downward by about 12 m/s.



At picture 05.12.02 schematic is sketched that volume. The A380 shows a span width of 80 m and at previous example, the plane flies by 100 m/s, so within one second covers most exactly a football pitch (green). Previous volume results if a 18-floor-building (blue walls) is constructed at the total area, with a height of 52 m. The goals like the players at middle circle are drawn true to scale.

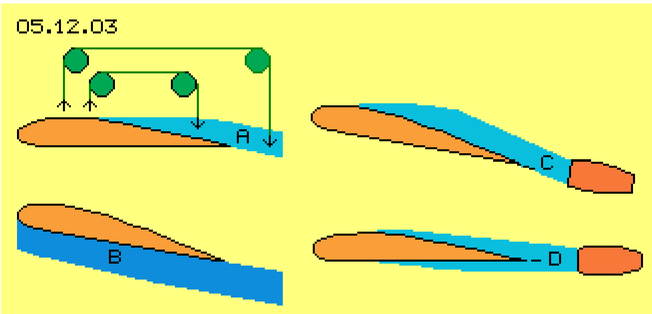
Upside right at this picture, also true to scale, the wing (dark red) with its surface of 850 m^2 is drawn, so with 80 m span width and about 11 m length. The wing is drawn diagonal corresponding to previous angle of attack (yellow), where the wing grasps a layer of air (light red) of maximum 2,5 m height. The airplane moves the length of wing within about one tenth of a second, pressing down a volume of 80 * 11 * 2.5 = 2.200 m^3 air downwards by the demanded acceleration. However, the wing should push down also the remaining air below of, so these 80 * 11 * 49,5 = 43.500 m^3, within that tenth of a second, down these 2,5 m. During one second, the whole volume of that ´church-tower-high-pitch-super-structure´ completely must be pushed down by the speed of 12 m/s. That´s absolutely impossible in reality.

Previous calculations are correct – however, here the air is handled like a solid body, where an impulse onto a (part-) surface immediately affects on the total mass of that body. The air however is not to grasp likely, it transmits a pressure not pure mechanically, but the air is compressible and escapes immediately into areas of less pressure, by sound speed, without affecting corresponding (mechanic) counter-pressure. That wing here just reaches not enough volume of air in order to produce downward winds in the extent demanded by that mechanical impulse-constant.

Clutch at Straws
This mechanistic point of view includes also – the wide spread – opinion, also the air upside of the wing is drawn down and also behind the wing goes on that downward motion of air – so it´s suspected the airplane correspondingly would move upward. At picture 05.12.03 at A likely naive is sketched: there are no ´green redirection-wheels´ hanging at heaven, balancing weights and forces.

There is no possibility to move down that volume of air demanded for lift. At most would be possible to compress some air by corresponding energy-input and to push up the plane upon an ´air-cushion´ B, again with corresponding mechanical energy-input. As long as the plane rolls on the ground or flies near the ground, some counter-pressure might exists. Downward- resp. compression-pressure spreads by sound speed down, however the counter-pressure returns only by half of sound speed. Flying the length of that wing (previous 11 m) takes one tenth of a second. Within that time-unit, the counter-pressure wanders some 15 m, so it´s missing the wing already by slow speed resp. few height.

So within free space or at normal travel-speed, the wing is affected only by an upward-pressure resulting of the air-layer directly grasped by the wing, so here only that layer of maximum 2,5 m height, the twentieth part of necessary air masses. In addition, that pressure naturally flows off aside and downside and backwards. Thus a continuous energy-input is necessary, which continuously gets lost for the system (like e.g. the energy invested in the bow-wave of ships spreads into ´infinity´).



Too less / too much Lift
For high or the travel-speed, the wings must show a rather flat profile in order to produce sufficient lift and same time showing most less resistance. For slow or start speed, the profiles must show stronger bending resp. at rear end of the

wings additional surfaces are extended. Nevertheless the ´natural´ lift is not sufficient for airplanes with full fuel tanks. After the take-off, the plane is steep inclined, so previous wedge-shaped air-cushion of high density comes up. Mechanical pushing-up upon that wedge is no original lift, but pure mechanical trust at an inclined face.

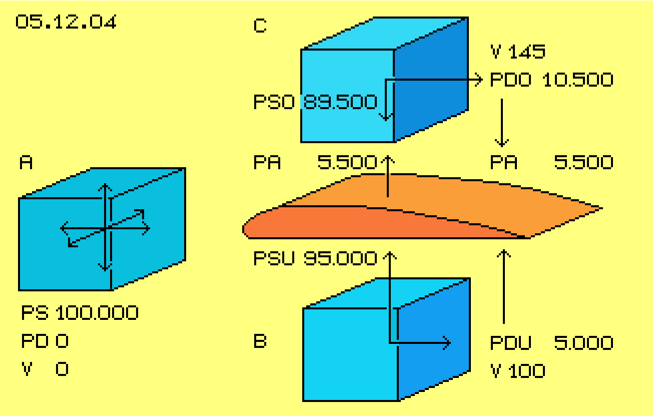
Like discussed at later chapter the engines should suck-off the air upside of the wing and should not be arranged below of wings, like common practise and also at previous A380. The dilemma however is, these engines would produce much too strong lift at high speed travel. Thus the engines should be installed behind of the wings (at C). If strong lift is demanded, the air is taken only from the upper side, controlled by flaps. At normal flight or few demand for lift, the air by parts could come from below of the wing (at D) - or the airplanes should be designed like described at later chapter by a New-Technology.

Artificial Wind

Now however back to the data of A380-plane and the calculation of ´natural´ lift, i.e. only these lift-forces based on the wing-profile by itself, resulting of normal molecular movement energy (plus some drive energy for balancing the resistance). Starting point are previous data: mass m = 500 t = 500.000 kg resp. 5.000.000 N, surface of wing S = 850 m^2, speed v = 360 km/h = 100 m/s and density of air rho = 1 kg/m^3. Each square-meter of the effecting wing face thus must contribute the lift force A = 5.000.000 / 850 = 5.882 N/m^2.

At chapter ´Lift at Wings´, based on the movements of observed air particles and resulting suction effects, I found a flow of 45 m/s relative to the wing at its upper side, as an average. That value could also be some higher because there was calculated without the optimum angle of attack (about 3 degree, for compensation of the air flowing from below upward over the nose). In addition, the calculations there assumed a sound speed only with 300 m/s (instead of usual 330 m/s). The speed of these ´artificial winds´ about 45 to 50 m/s could be valid in general, so also for the A380. So here is assumed, the air below of the wing moves along by 100 m/s, the air at the upper side however are flowing by 145 m/s relative to the wing.

Real Lift



Picture 05.12.04 visualizes following mode of calculation. Each blue cube represents one cubic-metre of air. At A this air is resting (V 0), the normal atmospheric pressure of 1 bar exists respective likely static pressure PS = 100.000 N/m^2 into any direction. This ´resting´ cubic-metre of air shows no dynamic pressure (PD 0).

Below of the wing (red) at B is drawn a corresponding air mass, moving relative to the wing by 100 m/s (V 100). This air shows dynamic pressure (flow-pressure, dam-up-pressure) at its right side (darker blue), corresponding to known formula PD = 0.5 * rho * v^2. So the flow-pressure at this downside face of the wing is PDU = 0.5 * 1 * 100^2 = 5.000 N/m^2. As the sum of all pressures is constant, towards the below surface of the wing affects a reduced static pressure PSU = 100.000 - 5.000 = 95.000 N/m^2 (light blue).

The analogue mode of calculation is used at the upper side of the wing (at C), there with some faster relative speed of 145 m/s (V 145). Resulting is a dynamic pressure PDO = 0.5 * 1 * 145^2 = 10.500 N/m^2 and corresponding the static pressure PSO = 100.000 - 10.500 = 89.500 N/m^2. The difference of both static pressures is the lift-force PA = 95.000 - 89.500 = 5.500 N/m^2. Based on the mutual dependence of pressures, this value also results directly as difference of both dynamic pressures). This lift-force of 5.500 N/m^2 is rather likely to the necessary lift of 5.882 N/m^2, like determined upside (especially as the ´artificial wind´ of 45 m/s is assumed a little bit too slow. E.g. 50 m/s would result a lift-force of 6.325 N/m^2, so some more than necessary for the horizontal flight).

The formalism becomes really simple if based only at the undisputed fact of the constant of dynamic and static pressures. Downward-winds and mechanistic actio=reactio not at all are involved, only the difference of static pressures raises an airplanes. This formula is also valid, if not only that ´natural´ lift is used, but the plane is pushed up by steep angle of attack. The air becomes dammed-up below of the wing and pushed forward, so that air becomes compressed. If the higher density and the slower relative speed are used, that formula will result the demanded, increased lift-force for the climbing-flight.

By the way: naturally comes up the downward flow behind the wings, started by the suction area upside of the wing - as a consequence and never ever as reason for lift! At the other hand: if the angle of attack is too steep, the flow at the upper side becomes turbulent. As soon as the suction there collapses, all lift-forces collapse too. So that pushing-downward of air, by itself never can result sufficient lift-forces. The ´natural´ lift comes up only by the pressure-differences and demands only few energy-input, while the ´artificial´ lift of a plane by mechanic pressing-up demands huge energy-input and still is only available in addition to the profile-based natural lift.

Correction

Some critics mentioned, these ´Bernoulli-rules´ would be valid only for incompressible fluids, thus would be usable for air only conditionally. At the other hand, the ´energy-constant-rule´ is valid and any particles movement all times can affect completely ahead or completely aside or diagonal with according components. No matter whether the particle is ´resting´ or moving, it´s affecting pressure to all directions likely – or the ´static´ pressure by parts is directed into the flow direction. So in total the pressure-constant well is a constant fact, also within the air.

However the common formula do not pay attention to the fact, a flow initiated by suction is well ordered, its particles fly nearby each other rather parallel, so affecting ´excessive´ dynamic pressure. The ordered flow along a surface protects it better against atmospheric pressure as any flow produced by pressure. Common theories don´t mind that grave difference. So previous general calculation with the pressure constant is not more wrong than paying no attention to specific suction effects

At chapter 05.04. ´Lift at Wings´ an example of an airplane was mentioned with these data: wing surface 48 m^2, speed 150 m/s (half sound speed), additional flow at upper side 45 m/s (so the air passes the wing upside by 195 m/s). By previous mode of calculation thus results the dynamic pressure at the below surface PDU = 0.5 * 1 * 150^2 = 11.250 N/m^2 and at the upside surface PDO = 0.5 * 1 * 195^2 = 19.012 N/m^2. The difference is PA = 19.012 - 11.250 = 7.762 N/m^2. The lift of the total surface thus is PA = 7.762 * 48 = 372.576 N. That´s sufficient for plane of about 37 t, instead of 20 t by calculation more wrong than right at previous chapter). The following table shows these data at first row, below are shown the data of some further situations (Remark: U means German ´unten´ = below, O = ´oben´ = upside).

A380-Data
Second row of table shows data for lift of A380 with speed VU = 100 m/s, short time after start or at begin of climbing flight (analogue previous picture 05.12.04). At upper surface exists additional ´wind´ of 45 m/s, so VO = 145 m/s is assumed.

Situation	VU	VO	PDU	PDO	PA
1. Example 05.04.	150	195	11.250	19.012	7.762
2. A380 Start	100	145	5.000	10.500	5.500
3. A380 Climbing	200	250	20.000	31.250	11.250
4. A380 Optimum	280	330	39.200	54.450	15.250
5. A380 Power	300	330	45.000	54.450	9.450
6. A380 Limit	320	330	51.200	54.450	3.250

The dynamic pressure at the below face is PDU = 0.5 * 1 * 100^2 = 5.000 N/m^2 and at the upper face PDO = 0.5 * 1 * 145^2 = 10.500 N/m^2. The difference is the lift PA = 5.500 N/m^2. Upside were named 5.882 N/m^2 as the demanded lift. So at that speed, the generated lift-force nearby is able to keep the plane at its height. However, for raising up to higher level, still an additional thrust is necessary for pushing up the plane by steep angle.

The third row of that table shows the data of further acceleration of the A380, e.g. at 200 m/s and at the upper surface now some increased flow of additional 50 m/s. Resulting is an essential stronger lift PA = 11.250 N/m^2. So short time after the first climbing phase, the speed and lift-force is strong enough for further raise. Much less energy-input is demanded at this phase of the flight.

Row 4: the optimum speed of the A380 is stated with 0,85 Mach, which means VU = 280 m/s, if the sound speed is assumed with 330 m/s. Suction can not work faster than speed, so the air moves along the upper surface by its maximum speed VO = 330 m/s. That speed some below of sound-velocity is most economic for many airplanes and thus I expect, the remaining 0,15 Mach resp. about 50 m/s are the maximum speed of additional flow, which can be generated by suction at the upper surface of wings. At this border of 0,85 Mach, the A380 achieves its maximum lift PA = 15.250 N/m^2. That´s much too strong lift for conditions near the ground, however just enough at the level of 10 km height and its low density rho = 0,4 kg/m^3 up there. So the lift of PA = 15.250 * 0.4 = 6.100 N/m^2 is just right for the fast horizontal flight.

Row 5 shows the situation where the plane ´powers´ high speed of VU = 300 m/s. However that maximum VO = 330 m/s decreases the lift PA = 9.450 N/m^2 dramatically. At high level and low density, the PA = 9.450 * 0.4 = 3.780 N/m^2 would be too week, i.e. the airplane can hold that height only by mechanic pushing-upward. So that speed is no longer economic for travel-flight.

Row 6 marks the approach to the limit, as the speed of VU = 320 m/s produces only a lift of PA = 3.250 N/m^2, so tending to zero, especially at great height. It´s commonly not known, however a most clear fact: beyond sound-speed no longer exists a ´natural lift´ at wings, but the jet planes must be pushed by extensive power.

Result
Based on the data of A380-plane, that common theory of ´lifting-plane-mass by lowering-air-mass´ is disprove without any doubt. At its best only a ´mechanical pushing-upward upon a compressed air-cushion´ is possible - however only in addition to the ´original lift´. These natural lift-forces exclusively come up by suction-effect at upside surfaces, because generated flow affects less static pressure against upper sides. At the below face exists relative slow movement and thus nearby the whole atmospheric pressure of resting air affects the upward lifting of the plane. This original lift at wings demands few energy-input, only to overcome the small Cw-resistance.

Opposite, the mechanic pushing-upward involves heavy losses. The main part of fuel is consumed at the short start-phace. At the other hand, beyond sound-speed no longer exists that lift-by-profile, so the pushing-up is continuously necessary with corresponding high consumption of fuel.

So one must leave the (´impossible´) idea, one must push down air for lifting planes. It´s only necessary to organize suitable flows and quite new conceptions can be realized. All common considerations mostly are fixed on utilization of pressure and they totally ignore the enormous potential of normal molecular movement, easy to use, however only by application of suction.

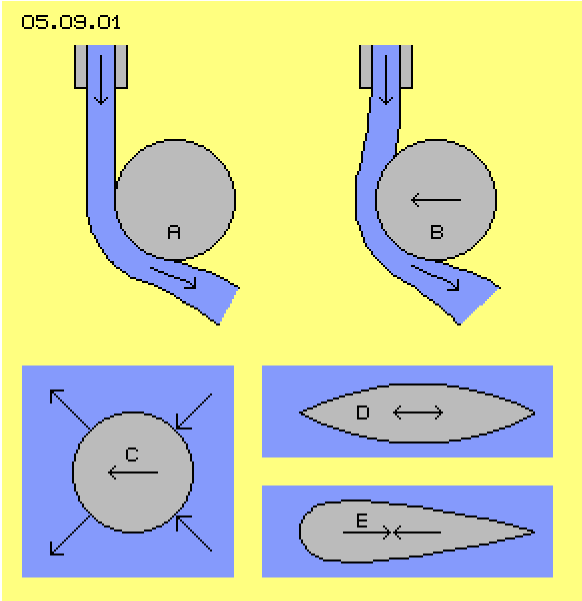
The sciences finally must leave the wrong understanding of limitations by the energy constant and the sciences of flows must consider specific differences between fluid- and solid-body-mechanics. If facts here described are integrated, real products can be build much more effective - and even flying could occur environmentally neutral.

Evert / 2007-01-31

05.09. Trout - Thrust

Impossible
Subject of this chapter is the resistance-free drive of bodies within fluids, so e.g. an airplane will go on flying without motor drive. By all rules of physics that seems impossible - however neither a bumblebee nor a brook trout did study natural sciences. And many other physical appearances appear impossible at first sight.

At picture 05.09.01 at A for example the ´Coanda-Effect´ is sketched: water (blue) flows off a pipe and meets a rounded face (grey) aside and is redirected along that surface - out of the original direction of its inertia like gravity. Physicians easy can explain that ´impossibility´ by theoretic formula (e.g. concerning ´circulation´), while I explained the real processes and effects based on normal molecular movements at previous chapters. One of my provocative statements now is confirmed: flows have no compelling inertia but particles all times move that direction where the distance to next collisions are most long - even right angle to previous direction of the flow.



At this picture at B the ´Magnus-Effect´ is sketched: a water jet not only is redirected below of a curved surface (here towards right) but the round body by itself is dragged into the stream (towards left), even thus far, the water jet at first is redirected towards left. That astonishing strong force is easy to detect by a simple experiment, when holding a spoon below a water tap. The atmospheric pressure is one kilogram each square-centimetre - and the water jet keeps off that strong force from the spoon.

Paradox
At this picture at C schematic is sketched the Paradox-d´Alembert: a body moves through fluid and affects pressure towards front side. As all pressures immediately spread into all directions likely, the pressure lastly affects also at the rear side of the body, by same strength (as a continuous process if the body moves steady through the fluid). Thus that motion should be without resistance and the body would go on moving without losses. This is valid not only for spheres but also for any flow-conform body, like e.g. sketched at D. No matter that profile moves towards left or right side, the forces are symmetric - however ´paradoxicial´ also these bodies show resistance.

That ´lapse´ is explained by the assumption, real fluids are no ´ideal gases´, i.e. lastly are compressible, collisions won´t occur totally elastic, pressures are not transported without loss. That´s valid for solid bodies within water or within air, without any doubt.

However, why can atoms and molecules of gases obviously move without loss? Two answers are possible: 1. because these particles move within pure Nothing - however for me still is paradox, why any Something at its outer borders won´t dissolve immediately into neighbouring Nothing. 2. because ´material particles´ move within a really ideal gas - and null-compression and null-pressure-loss and total-energy-constant only exist within a gapless medium, described in detail at my Aether-Physics and –Philosophy.

Here however the subject are movements within the world of particles, e.g. of a flow-conform body (E at previous picture) moving through the m medium of air. Based on all experiences, resistance will comes up. Only by the input of energy that body goes on moving.

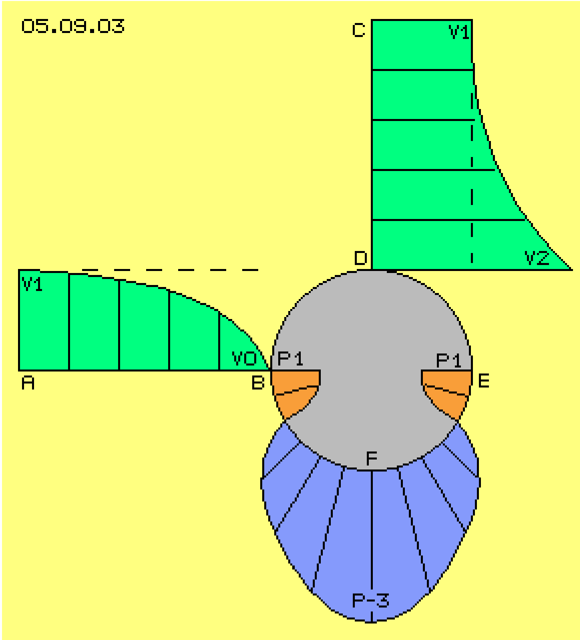
Incredible
Paradoxicial however some ´bodies´ are able to move relative to fluid obviously without resistance. Maybe someone was astonished when detecting fishes high up at mountain streams. The brook trout stand totally motionless within a flow and at dangerous situations flee like a flash - upwards against the flow. These fishes are born up there, however some of these species (e.g. salmons) wander down to the ocean - and back again, even through meter-high waterfalls.

These abilities are knows since hunters and anglers exist and everybody can know that ´phenomenon´ finally since many decades, as Viktor Schauberger described theses processes in details and developed a ´Trout-Motor´ (which probably didn´t really work). For me it´s phenomenon how cool physics (here especially bionics) take that ´paradox´ appearance instead of making it to the main issue of investigations, with all available resources. So I´ll try, by modest means, to offer some solutions.

Speed, Pressure and Suction
Picture 05.09.03 shows a drawing of textbook for description of previous Paradoxon-d´Alembert. A round cylinder (grey) is positioned within a flow. Far ahead of the cylinder, left side at A, the flow shows speed V1 (marked by vertical line). Towards front-side point B of the cylinder, the flow is dammed up so theoretic exists no motion (V0) at that ´dam-up-point´.

Aside of the cylinder, also are marked speeds, far outside at C again that basic-speed V1 (horizontal line). Towards the cylinder the speed becomes faster and direct at the surface D it shows ´over-speed´ V2, nearby double of the basic-speed.

Depending on the speed, a pressure weights on the surface of the cylinder. Front-side at the dam-up-point B exists the dam-up-pressure P1 (red), correlating by square of the basic-speed. Further aside of the cylinder, water flows increasingly faster, so the static pressure decreases towards outside. Most fast speed exists aside of the cylinder, so there comes up a suction-effect (blue), affecting each radial to the centre of the cylinder, e.g. at point F by scale of P-3.

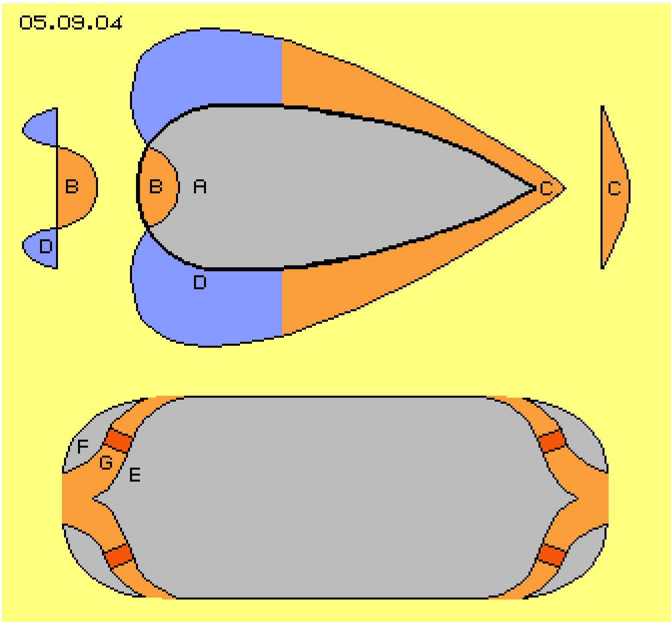


The flows and also the relations of pressures are symmetrical (like drawn here) at ´under-crucial´ speeds. At the rear end (at E) the waters meet and produce a corresponding dam-up-pressure P1, affecting towards left. Theoretical that cylinder would nearby (and a spheres in total) rest within the flow without resistance. As soon however the speed becomes ´over-crucial´, the water at the rear end can´t flow fast enough to the middle and can´t dam up, so the rear-end forward-pressure changes into backward-suction.

Redirection by Power

Thus in general, the resistance of round bodies is balanced, showing likely pressure and suction. However, a negative suction exists at the rear end. The flanks of a body must be long stretched in a ´flow-conform shape´ to reduce that ´rear-end-suck´.

At picture 05.09.04 such a flow-conform body A (grey) schematic is shown, e.g. the fuselage of an airplane. The body moves within resting air towards left, so the dam-up-pressure B (red) comes up at front side. Aside of exists accelerated flow and thus less static pressure resp. that suction D reaching back to the rear end C. The area of forces showing towards left are marked blue, forces showing towards right (thus against movement) are marked red.



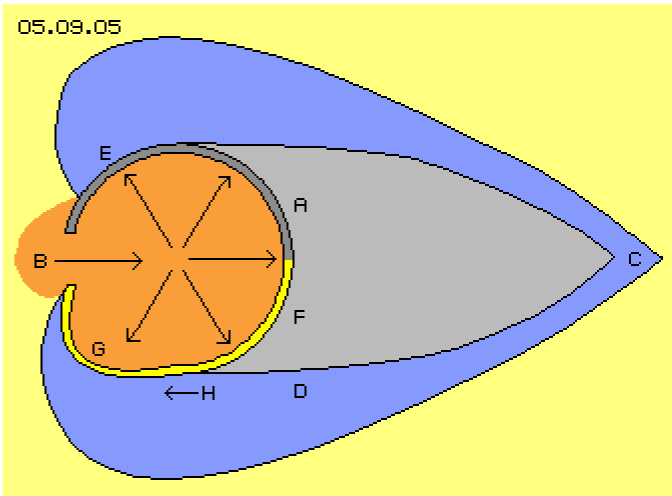
Suction forces affect right angle towards the face, i.e. the forward and back showing components mostly are only a parts of. These force-components of the bow-area are marked quite left side of the picture, dam-up-pressure B red and suction-components D blue. These longitudinal forces at the bow of the body are balance.

Inevitably however are the backward showing suction-forces C (red), which are marked right side of the picture by their components into longitudinal axis. No matter how long the body is stretched, that ´rear-end-suck´ can not be eliminated in total. So the real resistance of a flow-conform body primary does not occur by dam-up pressure at the bow but by sucking of the tail.

Picture 05.09.04 below shows an early drawing of my Fluid-Technology, a longitudinal cross-sectional view of a ship-body E (grey). The dam-up-pressure at bow F is eliminated as the water (red) is guided aside through canals G via props (dark red). At stern are installed corresponding canals and props, so the rear-end-sucking is also eliminated. This ship is well to maneuver - however that technique is only suitable for ´calm conditions´ e.g. at inland waters.

Mechanic Tension

The real solution of that problem might be solved by brook trouts. Obviously they can reduce the flow resistance to zero and above this, they produce a drive force relative to flow - without motor power. At picture 05.09.05 the body A of a trout is drawn schematic as flow-conform profile. The trout stands still within the flow with open mouth, so the dam-up-pressure B (red) also affects inside of the body. The areas of suction D aside, reaching up to rear end C, again are marked blue.



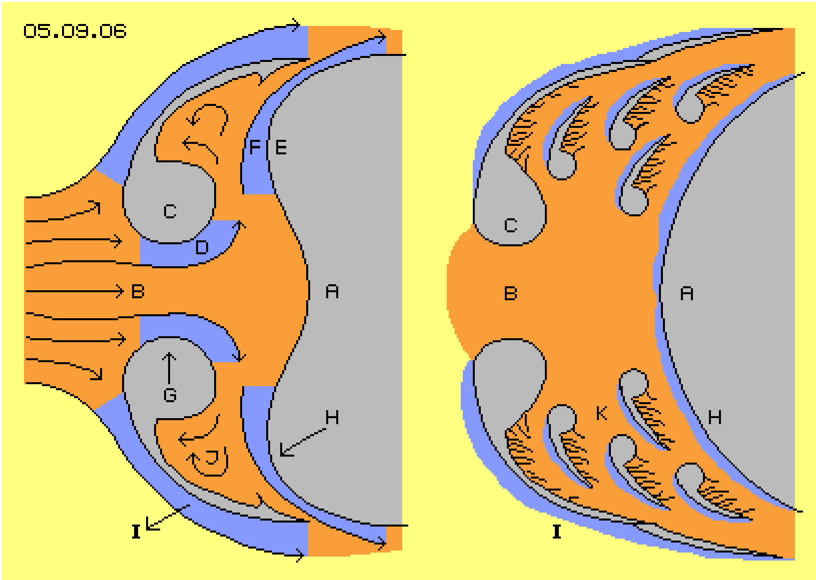
Arrows within the mouth-area represent the dam-up-pressure, affecting all around likely. That increased pressure thus affects also onto the upper wall (dark grey), which could be the inner side of a half sphere. From the rear side, i.e. from the body A, affects normal counter-pressure at this sphere. Opposite, at front side of that sphere affects much less pressure from the suction-bow-area. So that inner sphere would be pressed forward – a very smart solution of the paradoxon. ´Much too smart?´.

As an alternative, the below half of that hollow sphere (yellow) could be build by elastic material. From backside F again the normal body-pressure affects onto that ´balloon´, towards frontside-aside G however, this elastic wall would become beat-out towards the outside-suction (like the tarpaulin of lorries). That tension affects a drag at the supporting points, at the mouth cross to the flow and aside at H in forward direction. Is this the effect why trouts stand ´smart´ within flows?

Coanda plus Magnus

The dam-up-pressure is a positive occurrence as forces come up. Previous solutions however use these forces only static, so not according to the special behaviour of fluids. Remarkable and most effective forces only come up by flows, like e.g. by previous mentioned Coanda- and Magnus-Effect. Picture 05.09.06 shows only the front part of a body A. The areas of dam-up-pressure (respextive slow flows) are marked red and the areas of suction (resp. faster flows) are marked blue. At first is discussed the drawing left side of the picture.

The dam-up-pressure B gets into the body through the mouth. The border of mouth C is rounded, so (according to Coanda) the flow D is redirected aside. At the following that cross-flux again is flowing along a curved face E, so the flux F is redirected outward-back. The flux exits through slits into the flow outside of the body resp. is even pulled off by that flow.



Simultaneously with the redirections of flows, each surface is pressed to the flow (according to Magnus). At mouth C thus affect forces G into centripetal directions, thus neutral. At the second bending however, the surface H is pulled forward. So by that double redirection, the static dam-up-pressure is transferred into dynamic a drive-force. Behind the round mouth come up turbulences J, which inside affect stronger pressure onto the ´cheek´ (I), while outside exists only small static pressure at that suction area.

So the dam-up-pressure inside of the mouth, no longer affects only as ´resting´ water. That area of ´high density´ however produces a flow, which becomes increased by suction at the outlet of these ´canals´. Flows of different speeds are generated by smart organisation of flow directions and these differences generate the drive forces into the movement direction of the body.

Multiplication of effective Faces
At this picture right side now the basic construction of that ´Salmon-Drive-Engine´ is sketched. Again only the front part of body A is drawn and the elements are marked correspondingly. Additional ´constructional element´ of grills K schematic are drawn.

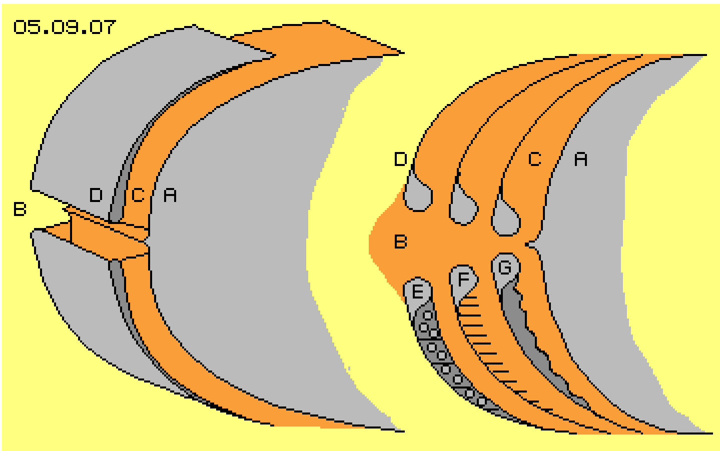
Fishes have grills aside within the head by which they take oxygen dissolved within water (and the water finally exits through grill-slits). Grills generally must show wide surfaces (like lungs) e.g. by tree-like branching. I never looked into the mouth of a living fish, however I am quite certain, special abilities of the brook trout and salmons are based at special shape of their grills (like also Viktor Schauberger assumed).

In principle, these grill-trees and -branches must show relative even and smooth faces at front-sides, while the rear-sides are uneven and rough, e.g. like here sketched by branches or ´hairs´. Along the even surface of front-sides exist fast flows, while at each back-side many turbulences exist with corresponding high static pressures. The pressure differences result ´suction´ into movement direction (here each marked blue). The grills probably are build by fractal structure, so at given space huge surface in total is installed and the pressure differences affect at these multiply surfaces.

Living beings often are build by most elastic materials and thus successful principles of nature sometimes are hard to detect and rarely to copy by total likely techniques. The basic principle of salmons for balancing the resistances against flows and the generation of drive however seems totally clear and simple: multiplication of surfaces opposed to flows and organisation of internal flows that kind, at each front-side face comes up a faster flow than at each rear-side face. That simple principle is easy to rebuild by many designs and techniques.

Principle of technical Solution
Picture 05.09.07 shows the fuselage of an airplane (moving towards left within resting air) with an example of the basic principle for a technical solution. Here the fuselage shows a broad nose (like used at the following chapter). In front of the fuselage A exists the dam-up-pressure B which enters the space inside of the body. A flow within canal C (between fuselage A and part D of the body) is redirected at curved faces and exits aside through slits. So at the one hand, the air is pressed into canals by the dam-up-pressure, at the other hand the air is sucked off the canals by flows along the outer surface of the body.

At this picture right-upside once more is shown the redirection at bended faces within three canals C, each showing two walls. Here, the ´back-side´ is called each surface showing to the tail of plane. The ´front-side´ is called each surface showing towards the bow of the plane. At this picture right side below schematic are drawn three possibilities for decelerating the flow at back-sides.

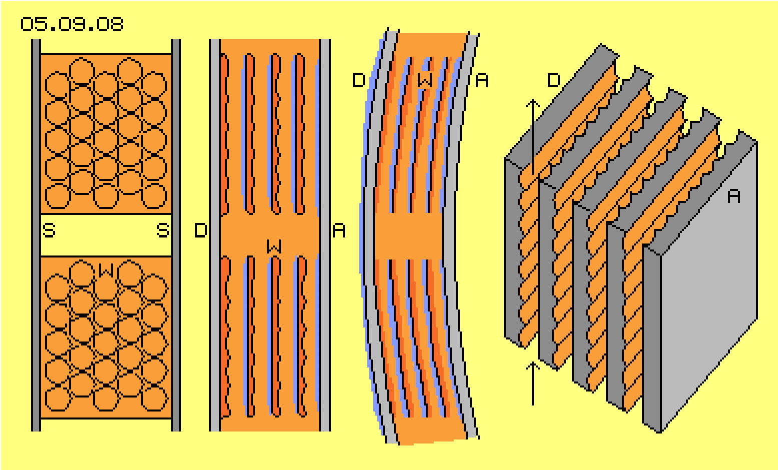


At the back-side E are installed sheets in horizontal and vertical direction. The sheets are covered with holes, so the air is hindered to flow fast along that surface. Based on slow movement resp. turbulences, a strong static pressures weight at that surface (thus pushing the airplane forward).

At F is shown a construction which corresponds somehow to previous ´grill-hairs´: the back-side is build like a ´nail-bed´, i.e. many round sticks reach out of surface. The air can move within, however only rather slow and turbulent. Probably elastic elements (like long-hair rough fur or feathers) would work well for producing the wanted high static pressure at the back-sides of the canals.

At G now is sketched a construction of most simple technique, as the back-sides simply show a waved surfaces. The air moving cross over these waves can not flow laminar but only by turbulent vortices. So at any case front-side surfaces of the canals should be most even and smooth, while all back-sides should hinder the flows alongside its surfaces.

Dents and even Surfaces
Previous pictures are pure schematic drawings and much too ´macroscopic´. Certainly, fluid needs enough space to move, e.g. sufficient diameters of pipes and here of the canals. Otherwise the system will stop the throughput by itself. On the other hand these grills show, the effect comes up only by an enormously increased surface, i.e. at microscopic small structures. As here the flow is pushed by pressure and same time it´s dragged off the canals, also relative narrow canals should work.



At picture 05.09.08 previous ´back-side with waves´ is shown some more detailed, as the waves here are replaced by small dents. Left side of the picture shows a view onto the back-side W, which is mounted between two beams S. The circles represent small round dents, or also a honeycomb pattern would work likely. The air moves along these holes by much turbulent flow.

Further right side, a cross-sectional view is shown and four walls W between the fuselage front-side D and fuselage inner wall A are drawn. Each back-side shows that dent pattern (also right side of the fuselage outer wall) while each front-side is even (also left side of fuselage inner wall). Along the even surfaces, the flows move without resistance, resulting suction (marked blue) respective the difference of static pressures pushes the airplane forward.

Once more further right side, that cross-sectional view is sketched once more, now however the whole ´sandwich´ of sheets is bended corresponding to the curvature of the fuselage bow. Through these canals thus shall move flows with quite different characteristics at both faces. The laminar flow at the front-sides however can not keep at surface very long, but only ten or fifteen times the distance between the surfaces. That´s why here the length of ´sandwich-blocks´ is limited and arranged with some free space between.

Grooves cross- and longwise
At picture 05.09.08 quite right side is sketched a sandwich-block by diagonal view, which might be easy to construct and might be most effective too. The air flows downside up through canals, each back-side shows grooves cross to flow, each front-side shows grooves into direction of the flow. So each wall has grooves at both side, at one side longitudinal and at the other side cross to the flow.

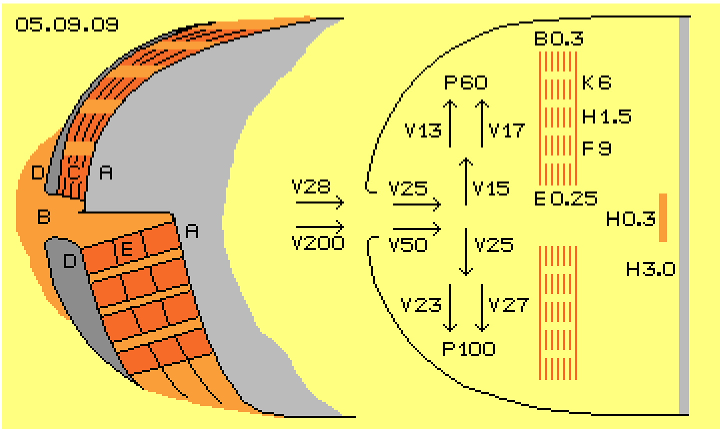
At back-sides exist turbulent flows as the cross-grooves won´t allow a continuous flux. Opposite at the front-sides, the flux will run pretty well as the longitudinal grooves protect against disturbances from aside (like known at wings). However also these sandwich-blocks should not be too long and arranged with some distance between, so the wanted flow-pattern can regenerate. In general, laminar flows keep longer at bended surfaces, so curved sandwich-blocks could be some longer (where the bends naturally should always back away from the flow-direction).

Examples of Arrangement
At picture 05.09.09 left side, again the bow of fuselage A is drawn inclusive the front part D of the body and canals C between. At the bow exists a dam-up-pressure, so the air is pressed into the canals (and also pulled off aside). Upside at this drawing, previous sandwich-blocks (dark red, with each distances between) are arranged corresponding to the curvature of the bow.

Downside at this drawing is shown, the dam-up-pressure well could enter further inside the fuselage, so the canals resp. sandwich-blocks E are arranged also aside each other. At any case exists high pressure resp. relative high density within that inlet area, from which the air is pressed into the canals. The inlet of the canals are arranged stepwise.

Diverse measurements are possible for increasing the effective faces. Theoretical that technique should also work by micrometers of groove-depth and distances between the walls, practical like ceramics with ordered structures. At the other hand, compressed air becomes relative ´viscous´ and dirt particles will close canals with too less size. So a reasonable scale will be some millimetres or centimetres.

Examples of Data



At picture 05.09.09 right side are mentioned some data as an examples, upside of the start-phase and below the flight-phase. When starting, the airplane e.g. moves only by 100 km/h, thus by about 28 m/s (V 28) relative to the resting air, respective the air comes to the inlet with this speed. At that area, the air becomes dammed up and the speed is reduced e.g. to 25 m/s (V 25). Into the relative narrow, upward showing canal the air will flow again some slower, e.g. only by 15 m/s (V 15).

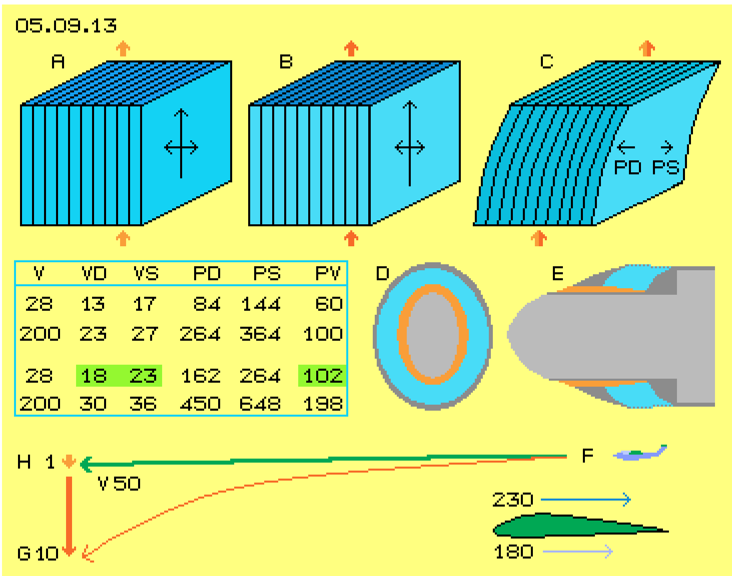
Now it´s assumed, the flow at the cross-grooved back-sides moves by speed of only 13 m/s, while the flow at longwise grooved front-sides moves by 17 m/s (V 13 resp. V 17). The difference of the kinetic energies of both ´part-flows´ results about 60 N/m^2 (P 60). Correspondingly behave the static pressures at both faces and the difference functions as thrust force.

Six canals (K 6, red lines) are installed here, each wall about 1 cm thick and the distance between the walls some 4 cm. The inlet area of the canals in total thus is about 25 cm (E 0.25) wide and the constructional element in total about 30 cm (B 0.3) wide. The height of the fuselage is assumed 3 m (H 3.0, grey), effective usable height for the sandwich-blocks however is only the half of (H 1.5). A fuselage segment of 1 m widths thus has 6 times 1.5 equal 9 m^2 effective surface (F 9). Onto that total surface now affect previous 60 N/m^2 * 9 m^2 = 540 N as drive-force.

Downside at this drawing, the data of the flight phase are mentioned as an example. The flight speed is assumed with 720 km/h resp. 200 m/s (V 200). However only a part of the dammed-up air shall enter the inlet area, e.g. by 50 m/s (V 50), because the rest of the air must cause the redirection of the flow outside along the bow). Within the canals, the speed again will be reduced, e.g. to 25 m/s (V 25). If again the flows at pressure- and suction-side differ by +/- 2 m/s, the motions will be 23 m/s resp. 27 m/s (V 23 and V 27), the pressure difference now is about 100 N/m^2 (P 100). Related to previous 9 m^2 total surface, the acceleration forces shows 900 N.

Drive for any Demand
That thrust of 900 N naturally is rather small, e.g. in comparison with the 300 kN for starting the A380 plane. At previous chapter were discussed the lift-forces at wings by speeds and pressures within one cubic meter of air. Analogue data are shown at picture 05.09.13, now concerning that trout-thrust.

At A is sketched a ´canal´ of 1 m length and 1 m^2 cross-sectional face. If the air within is resting, the quite normal atmospheric pressure will weight equal at all side-faces. If air is flowing through that canal (here from below up), upside will come up increased dynamic pressure and at the side-faces corresponding less static pressure. Stronger flows will increase the dynamic pressure once more and the static pressure will decrease even more (see arrows at A and B). If that wide canal is divided into ten narrow canals, the static pressure will weight at ten times wider faces of the walls between.



Now it´s important, the canals are curved, e.g. like drawn at C. Already this will result a difference of flow-speeds: the flow will hit onto the concave (pressure-) face, friction will come up and a reduced flow. Along the convex (suction-) face, the air continuously can fall into relative void, resulting an ordered and accelerated flow. In addition, naturally the faces should be rough at the back-side and most even at the front-side. Resulting will increased static pressure at the (pressure-) back-sides and reduced static pressure at the (suction-) front-sides (see arrows PD and PS at C).

At this table the dyamic pressure again is calculated by common formula P=0.5 * m*rho*v^2, for each speeds at pressure- and suction-sides (VD and VS). The pressure-difference between pressure- and suction-side (PD und PS) is the thrust-pressure (PV). Both two upside rows show previous 60 N/m^2 und 100 N/m^2.

As these canals are rather wide (with the distance of 10 cm between the walls), also higher throughput could be achieved. Same time, the difference of speed at both sides could be wider, e.g. at the start already with 18 and 23 m/s (see third row), resulting a thrust of 102 N/m^2. At high-speed travel (see forth row), the air could move e.g. by 30 and 36 m/s, resulting the thrust-force of 198 N/m^2.

The available total thurst depends on the total available face. For example, the cross-section of the A380-fuselage is about 80 m^2. Some 50 m^2 could be used for the Trout-Thrust-Engine. At the middle right side of picture 09.05.13, schematic is shown a cross-section (D) and a longitudinal cross-sectional view (E). The cockpit (light grey) could be arranged at the center. The inlet for the dam-up-pressure is ring-shaped and marked red. As a thrust-face (blue) is available a ring of about 50 m^2. The outlet of the canals is done via ´gill-slots´ al around the fuselage (dark grey).

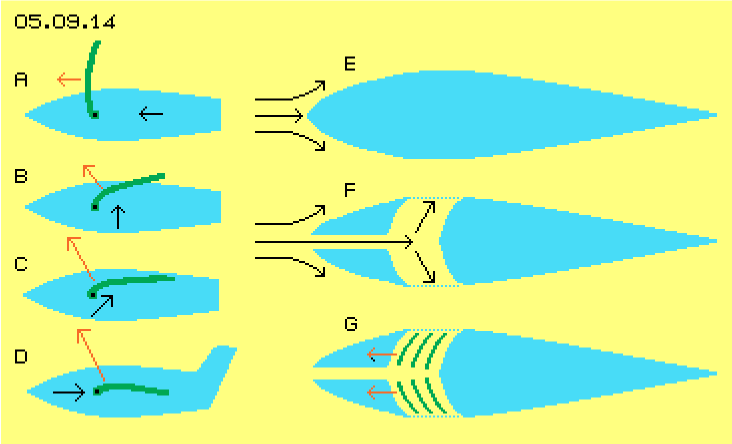
At a length of e.g. 3 m could be installed 25 canals. So an effecting face of 50 * 25 = 1250 m^2 will be available (much more than the surface of the wings). Assuming a pressure of about 100 N/m^2, the thrust in total would be 125 kN – or at a pressure of 200 N/m^2 would result the double thrust with 250 kN. At high flight-level with less air-density, the real usable thrust would be some 100 kN. That´s enough for flying over the Atlantic completely autonomous. The jet-engines are only necessary for the acceleration of the start-phase. The start-weight of the plane is much less, because only the half of commonly demanded fuel must be tanked. And by the way, that airplane will fly without much noise.

One Tenth for Drive
Below at picture 05.09.13 is sketched a glider F, flying towards left by 50 m/s. Without the lift-force of its wings, it would fall down with the gravity acceleration of about 10 m/s^2 (red curve from F to G). That glider is build most streamlined, nevertheless it´s decelerated by air-resistance, becomes slowed down, loosing corresponding of lift-force. In order to balance the resistance, the glider must fall down at an ´inclined plain´ (see line F to H), e.g. 1 m height at a distance of 50 m. So one tenth of the gravity, here 1 m/s^2, are necessary for keeping the speed constant.

A wing is sketched below right side. At the below face of the wing, the air wanders along with previous 50 m/s = 180 km/h. The curved upper face of the wing generates an additional, ´artificial´ wind of about 50 km/h. So the air sweeps across the upper face with some 230 km/h. By that rough considerations, a relation on 18 to 23 km/h within the drive-canals would be necessary (marked green at that table). These roundabout 100 N/m^2 would be sufficient thrust, if applied at sufficient large faces, at least corresponding to the size of the wings.

Sailing into the Wind
Left side at picture 05.09.14 are drawn some sailing ships, showing some well known facts. At A the wind (black arrow) is blowing from astern, the sail stands cross to the wind, driving the ship forward (red arrow), against the water-resistance, some slower than the wind is blowing. At B the ´real wind´ is blowing from aside. In addition with the airstream of the ship-speed, the ´seeming wind´ comes some diagonal-forward. That faster flow results stronger forces at the sail. Only a part of that force is forward directed, nevertheless pushing that ship faster ahead. If the wind blows even more from forward direction (at C), in addition with the ships airstream, much heavier forces come up, e.g. tilting the ship aside. Nevertheless that ship will run much faster through the waves than the energy of the original wind by itself could achieve.

Also the upper face of a wing (at D) works like a sail. However here the airstream comes direct from ahead. The lift (directed some upward-forward) exclusively is generated by the accelerated air flow above the wing. Motor power is only demanded for producing the airstream.



This picture right side at E shows a cross-sectional view through the flow-conform body of an airplane fuselage. When that body is moving through ´resting´ air, a dam-up-pressure comes up in front of the bow. Finally however all air flows off alongside the fuselage (marked by arrows). It won´t produce more resistance, if the dam-up-pressure is allowed to enter into the fuselage and the air may flow off aside some later (like sketched at F).

If now some ´sails´ are installed within the canals, their ´lift-force´ will show straight ahead, driving the fuselage forward (like sketched at G). These ´sail-walls´ must be build by suitable material and in suitable shape with most large surface. So that fuselage will ´sail´ just into the wind direction and produce the demanded airstream autonomously by itself (at least by major part).

Naturally this sounds incredible - however that´s just what each trout does: standing still within a flow and if it looks dangerous tit flees like a flash, up into the flow direction. They also do some turns within a basin below a water fall until jumping up for meters. Only these beings obviously are able tor transfer the dam-up-pressure into drive-forces. Specialists of flow-techniques and especially of the air- and space-sciences should take up that challenge and they will be able to realize these techniques.

Some students and members of the institutes for air- and space-sciences at the university of Stuttgart already achieve a similar solution: they installed a prop respective a ´wind-mill´ at a simple car, generating autonomous drive from its own airstream. Only for starting the system, some manual push was necessary, afterward that car did move forward continuously (lat. ´perpetuum mobile´). That´s not possible or at least not welcome by common understanding (and probably that´s why that most successful experiment is merely to find within open literature).

However that process does not injure the law of energy constant: the energy of molecular motions is only temporary organizes that kind, a usable side-effect comes up. Just that´s the idea of that Trout-Thrust-Engine, in direct manner, without any rotation elements, but based only at the shape of walls and the organization of suitable flows.

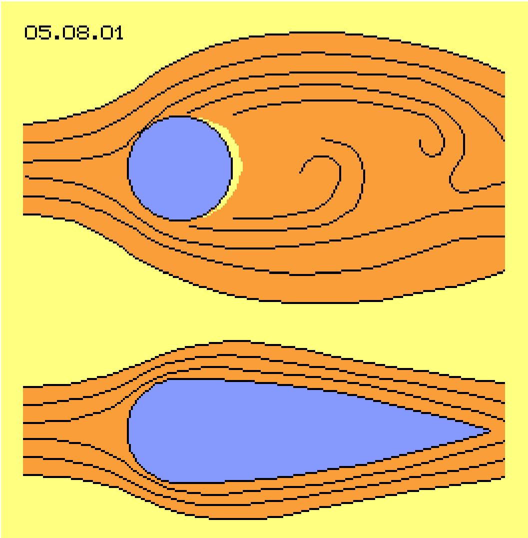
Evert / 2006-12-21 and 2015-11-30

05.08. Airplane NT

Objectives
Previous chapter did show how dam-up-pressure at the bow of an airplanes can be transferred into thrust. As an example was shown, how sufficient pressure- and suction-faces can be installed at the A380. Up to now, most fuselages were build in shape of a thin and long pipe with a sharp bow, in order to minimize the air-resistance. As now the Trout-Thrust is based on the dam-up-pressure, also planes could be build with a thick bow. So that new thrust-technology will allow also a new design of the airplanes.

A second problem is the differing demand for lift. At the start-phase, the wings deliver too less lift, so the machine must be pushed for raising up with huge energy input. At the other hand, at the horizontal flight with travel-speed even too much lift is available. A general solution might be possible only by generally new conceptions.

Third problem: flying all around the world is enormous harmful for the environment. At high heights the sensible air-layers become polluted. Especially at the area of airports the combustion exhaust gases and soot is an enormous pollution. Unbearable are the noises at wide environment. Here now are discussed proposals for the solution of these problems.



Vortices Street
Building airplanes is a great achievement of today´s techniques. The development demanded great efforts until that high standard was achieved. Today, everybody can fly to any destination at any time. However, that huge flight traffic is a gigantic waste of resources and environment pollution. The problems can only be solved with quite new technologies – e.g. like the following. At first however, some simple facts:

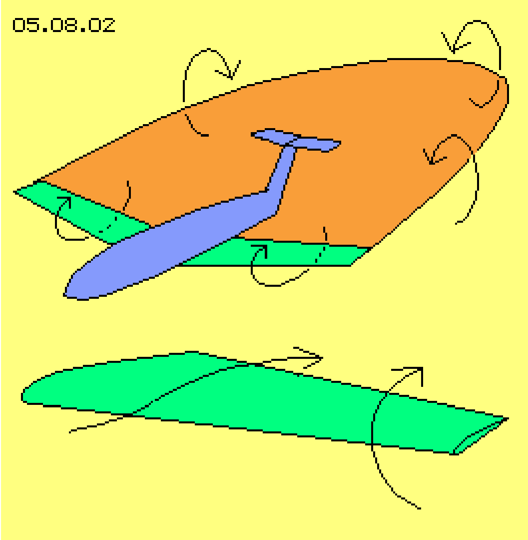
At picture 05.08.01 upside is drawn the round cross-section (blue) of thin wire, which is resting within a flow (red) respective is moving towards left within resting air. Behind the wire comes up the well known ´street of vortices´, i.e. turbulence and strong resistance. That resistance against the movement is not based on these backward vortices, not at all, like wrongly told often.

Decisive for resistance exclusively are pressures direct at the surface of that body: at the front side affects the pressure of dammed up fluid, aside affects a relative small static pressure (based on relative fast flows there), to the rear end however, the fluid can´t flow fast enough (if the speed is not quite slow), thus at the back of the body comes up a relative emptiness (marked yellow). Only the pressure difference direct at the surface of a body results that resistance - here practically a ´negative drive´ - while these vortices are only secondary side effects.

At this picture below, schematic is sketched the known solution for the reduction of resistance. As the walls aside of the body are curved smooth back, the air no longer must flow fast behind the body and the area of very small density no longer exists.

These ´flow-conform´ bodies affect only a part of previous resistance. However, the resistance is not reduced to zero, because the dam-up-pressure of the front side has no corresponding contrary pressure from the rear end.

Vortices Train



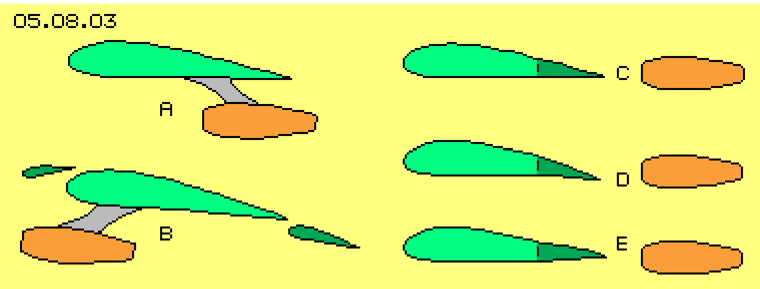
Today´s favoured theory for lift probably is the ´Circulation-Theory´ (as long as not removed by my explanations of chapter 05.05. ´Lift at Wings´). Commonly thus a ´circulation´ of air is assumed around the wings (below ahead, upside back) and in addition is assumed these two vortices at both outer ends of the wings are turning right-angle back, thus building a large closed ´vortex-ring´, like schematic shown at picture 05.08.02 upside.

It´s further deduced, the ´strength´ of that ring-vortex-system determines the strength of the generated lift-force. That´s analogue to the wrong understanding, previous vortices streets would cause the resistance. At the other hand, generally is assumed the vortices and turbulences affect negative for any forward movement. That´s why e.g. ´winglets´ at the end of wings are used in order to reduce these side-vortices.

That´s total nonsense because ´damage´ does not occur at the rear end of the wing but much further ahead. At this picture below schematic is drawn a wing. Based on the suction area back-upside the air is accelerated and drawn along the upper face (see arrow left side). At the other hand, air from frontside-aside (see arrow right side) also flows into that area of relative emptiness. That flow is really negative because filling up that area with additional air. That effect is only to avoid effectively if the wings are shaped ´like arrowhead´ (the nose of wings shows outside-back), so the flow from aside ´comes too late´ for parts of the wing near the fuselage.

So if the wing produces lift-forces, inevitably come up these vortices trains resp. turbulences behind. It makes no sense to get rid of these secondary side-effects (see previous mentioned chapter). Nevertheless all causes for turbulences without corresponding profit must be avoided at its best.

Too much Lift



Lift increases by square of speed (as commonly assumed). At start phase and its low speed thus (too) less lift force exists. When the flight-speed is achieved, a surplus of lift exists. Only this can explain, why the engines are mounted at the wrong side, below of the wing, like schematic sketched at picture 05.08.03 at A (wing green, engine red). Actually, the air upside should be accelerated and not below of the wing, like sometimes done even by engines mounted ahead of the wing (like sketched at B).

In order to achieve sufficient lift at the start phase, the effective faces are enlarged, e.g. by additional ´wings-ahead´ or ´rear-flaps´, like also sketched at B. However, the complex mechanics of these units obviously show, these are only ´stopgap measures´ which do not solve the central point of that problem directly.

Right side of picture 05.08.03 schematic is shown how the wings and engines are to arrange in principle: the engine is to position straight line behind the wing (C). Stronger lift results, if the air moves faster upside of a face, thus the flap (D) should be turned down. The engine sucks in the air only from the upper side, while below of the wing comes up an area of higher density same time.

Opposite, if the wing should represent only a neutral flow-conform body, that flap (E) is turned a little bit upward. Around the wing at both sides thus exist faster flows, sucking off air from the nose, thus reducing the resistance.

Lift results exclusively by the difference of static pressures and these by themselves correlates with the speed of flows. Engines produce fast flows towards backward, however suck in the same volume of air same time. Thus it makes sense to coordinate the functions of both constructional elements. Depending on the demanded lift forces, the profile of wings must be variable. However this should be done much simpler than by today´s commonly used techniques.

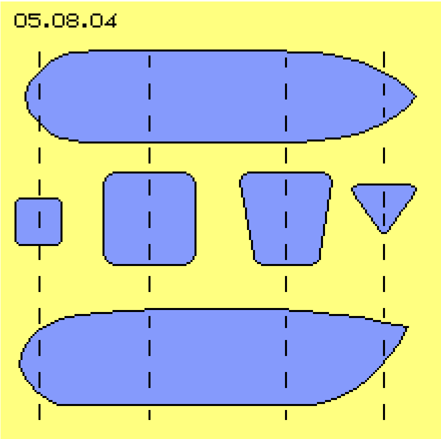
Dam-Pressure-Motor
Resistance against movement ahead depends on the shape of the body, i.e. on the relation of height and length and the contours of faces. The resistance increases by square of speed and naturally also by increased projected face, just because a wider surface must redirect corresponding more air masses. Thus suitable are elements of ´flow-conform´ shape. At the other hand, each application naturally has to include additional points of view.

Nachfolgend werden nun Rümpfe vorgeschlagen, die nach heutigem Stand völlig untauglich wären, weil sie viel zu viel Angriffsfläche bieten. Diese ´plumpe´ Formen sind jedoch höchst effektiv, wenn der ´Forellen-Motor´ des vorigen Kapitels eingesetzt wird, um aus Staudruck eine Vortriebs-Kraft zu generieren.

At the following now are discussed fuselages, which are totally unsuitable, by today´s understanding, because showing much too wide surfaces of attack. These ´clumsy´ shapes however are most effective for the ´dam-pressure-motor´ of previous chapter.

Square Boxes
At picture 05.08.04 is shown a ´stiff-shaped´ fuselage as a starting point, upside by view top down onto the fuselage, downside by view from aside, at the middle some cross-sectional views according to each area of dotted lines.

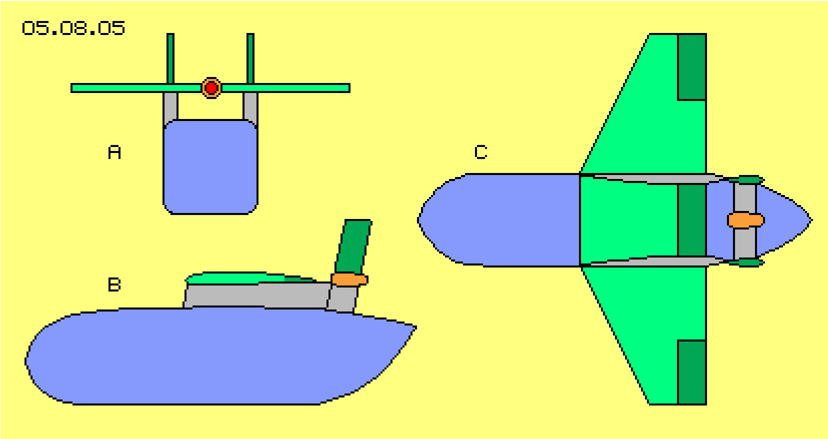
In principle that fuselage has right-angle cross-section, only the edges are rounded a little bit. Towards the rear end, the upper side keeps most wide, only the below face decreases V-shaped.



Compared with common shape of fuselages, this shape is really ´awkward´, however advantageous for using trout-thrust. Above this exists an essential advantage as the ´right-angled´ space inside is much better usable than within the narrow and long ´pipes´ of common airplanes.

Upside mounted Wing
At picture 05.08.05 now the arrangement of additional constructional elements schematic is sketched, at A by cross-sectional view of the airplane, at B a vertical cross-sectional view of longitudinal axis and at C by view top-down onto that airplane. An essential characteristic of that new technology is, the wings are installed upside of the fuselage and the engines behind the wing (here of single-engine airplane).

Previous square fuselage (blue) here is drawn once more. At the upper edges are installed ´poles´, long stretched and shaped flow-conform, here called ´long-posts´ (grey). Cross upon these long-posts is mounted a one-piece wing (green). The central part of the wing thus is positioned upside of the upper face of the fuselage, which there is rather wide and flat. Only short parts of the wing reach out aside. The front edges of these outer parts of the wing are arrow-shaped in order to avoid negative flows from aside (like mentioned upside). Normal elevator-flaps (dark green) are installed at the outer rear ends of the wings.



Both long-posts reach out further backward (behind the rear end of the wing), each building a rudder-elements (dark green). Beams are installed cross to these long-posts for supporting the engine (red). The inlet of that engine is positioned at the level of the wing. By flap (dark green) at rear end of the wing is controlled which part of air is sucked into the engine along the upper or below side of the wing.

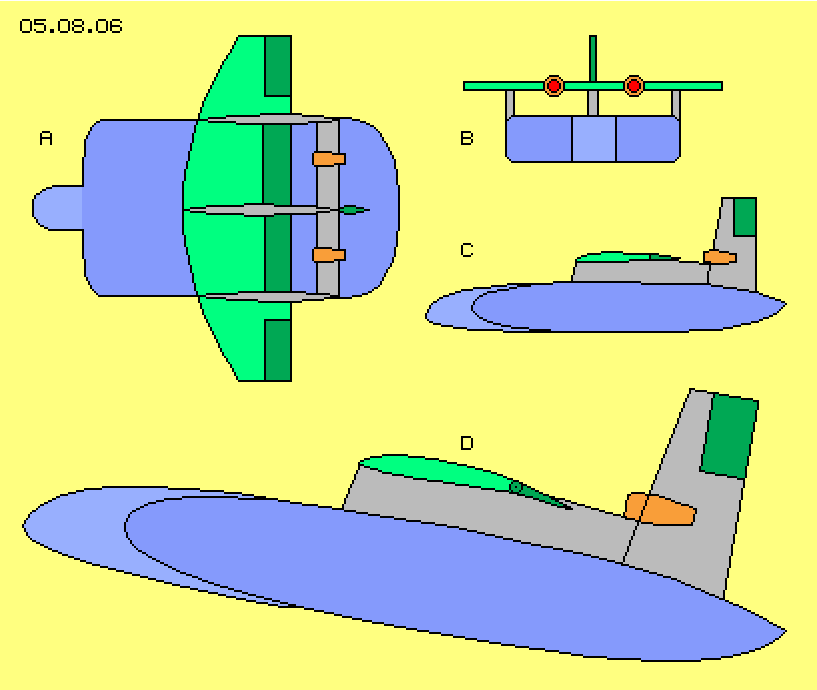
Already that side view (B) obviously shows, the lift-force is not only produced at the upper side of the wing. The wing and the fuselage practically build a nozzle, so also at the surface of the fuselage exists fast flow. As the long-posts protect that area against flows from aside, the suction effect of that closed canal reaches far ahead over the fuselage upper surface. So the fuselage by itself essentially contributes lift-forces. Much less span of wing is necessary, compared with common airplanes.

Wide Fuselage
´Length makes running´ is a basic rule of fluid sciences: if the fluid at front is pushed aside, a body behind can follow nearly without additional efforts, no matter how long that body is. This rule is valid, no matter concerning trains or boots or ships or airplane fuselages. ´Width makes pulling´ however is the essential rule of that new technology, and the width in addition contributes essentially to the lift forces at that conception.

Analogue to previous picture, now at picture 05.08.06 a double-engine machine is sketched with a fuselage much wider, at A by view top-down, at B by cross-sectional view and at C by cross-sectional view through the longitudinal axis.

By view top-down (A) the fuselage (dark blue) shows nearby a right-angle surface. The rear end is some rounded, while the front runs cross to the longitudinal axis, rounded a little bit only outside. The cockpit should allow free view, so it´s installed at a central ´nose´ (light blue) some in front of the fuselage.

The cross-sectional view (B) now shows the fuselage (dark blue) inclusive the central cockpit-nose (light blue) as a flat rectangle, only the edges some rounded. At the edges upside-outside again two long-posts (grey) are installed, now in addition a central long-post (grey). Only that middle long-post builds a rudder (dark green) at its rear end. Between the rear end parts of the long-posts, cross-beams are installed (grey) for the support of two engines (red).



The longitudinal cross-sectional view (C) shows, the fuselage (dark blue) like the cockpit-nose (light blue) now have flow-conform contours, almost symmetric, i.e. thus they are neutral concerning lift. This body thus affects relative few resistance, comparable with the pipe-shaped common fuselage. Here however, the fuselage is stretched towards both sides. The faces upside and below are rather flat and also the surfaces aside are curved only little bit.

Picture 05.08.06 below at D, once more shows the longitudinal cross-section, by some larger scale, at a position of climbing flight. The flap (dark green) at the rear end of the wing is pointed out, directly ahead of the inlet of the engine. The flap shows down, so the air for the engine is taken only from the upper side of the wing.

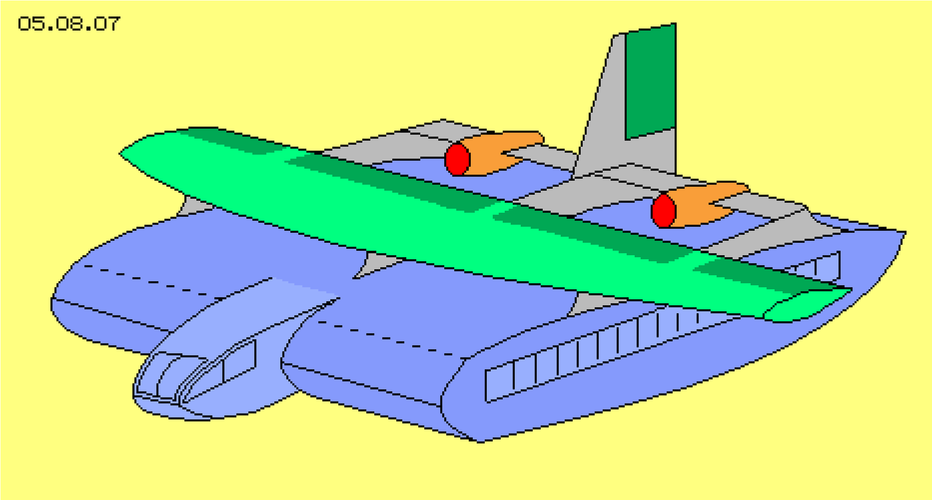
Same time however cross-section surface between flap and upper side builds a bottleneck. Such nozzles do not increase the resistance but the increase the speed of flow within. The air flows off accelerated - however that acceleration by itself affects back into flow, i.e. affecting like suction further ahead at the fuselage upper surface. So again the lift is not only produced upside of the wing but also upside of the total surface of the fuselage.

When common airplanes are climbing, the air is dammed up downside of the wings and upon that ´air cushion´ the plane is pushed up by its motors - with huge fuel consumption. Here that wide downside face of the fuselage naturally builds a wide and stabile area of high density. Because the surfaces are completely flat, the air softly flows off at the rear end, resulting much less turbulence than common planes.

Decisive however is, here that airplane is not pushed upward above that air-cushion, but the fuselage inclusive the wing build a wide surface by angle of attack, i.e. at each front side curved surface now exists the maximum lift - pulling upward that plane. Lastly that plane is also pushed up, however not by motors but by the atmospheric pressure. As the inlets of the engines take air only from the upper faces, the laminar flow won´t cut off even along these rather long distances.

New Appearance
At the beginning of flight-development, machines of most strange shapes were checked. Also today, planes of most different conceptions are flying around. Nevertheless some basis principles resulted, which at the one hand cover diverse demands and at the other hand allow to build production series. Preferred measure e.g. is using likely techniques within fuselages of different lengths. Instead of variable lengths now here is preferred to build planes of different widths.

Picture 05.08.07 shows previous airplane by diagonal view, in order to visualize that unusual appearance of planes. However like this, future machines will look like.



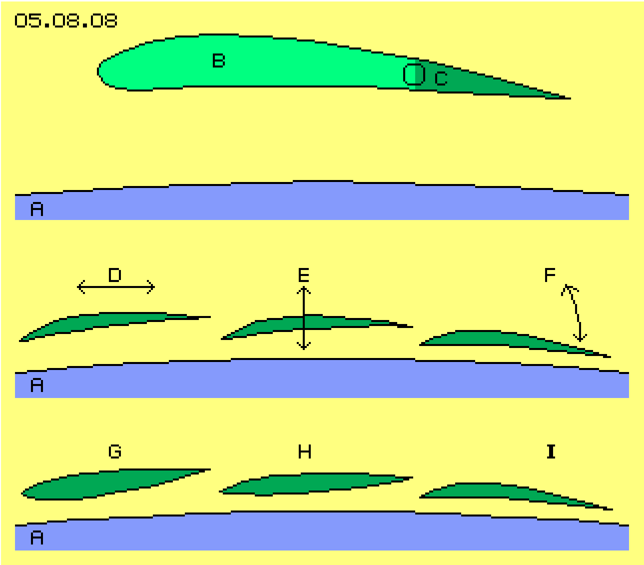
Remarkable at first is the cockpit reaching out of the body, so the pilots have free view ahead and aside (however that nose well could show some rounded design).

Remarkable is the broad front side, cross to flight direction, showing wide projected surface, only slightly curved - most advantageous for previous dam-pressure-motor. At a whole, the fuselage is characterized by flat surfaces, nearby symmetric decreasing towards the rear end. The space within that plane offers quite new ´feeling of room´ and all necessary units are much easier to install than within the ´narrow pipes´ of today´s airplanes.

The continuous wing is supported several times, thus can be constructed with few technical efforts. These elements will be rather ´thin´ and light and the wing must reach aside only short a distance, because additional face for lift now is represented by the total surface of the fuselage. The engines (and thus the source of noises) are arranged upside of the fuselage, easy to reach for maintenance etc. Decisive now is, the engines are not isolated and serving only for drive but same time they are used for controlling the airflows along the faces. The engine´s additional suction is important for starting, as long as the plane by itself has not achieved sufficient speed.

New Control-Techniques

The wing plus flap sketched at previous picture 05.08.06 at D, now at picture 05.08.08 upside are shown once more by larger scale. Upside of the fuselage (A) with some distance is positioned that middle part of the wing (B) and at its rear end is installed that flap (C). These constructional elements are conventional, however could be replaced by elements better fitting to functions demanded.



In general, these elements are guided between each two long-posts, so the whole techniques for changing the position are installed within long-posts. These elements by themselves thus are thin and easy to build, while same time much more possibilities for control are available.

At second part of that picture, at the middle, previous wing is replaces by three segments (D, E and F), each can be shifted into horizontal and/or vertical direction and/or turned somehow (see arrows).

At third, at the below part of that picture is demonstrated, these segments (G, H and I) well could show different shape of profiles. Generally, these elements should be positioned near to the upper surface of the fuselage.

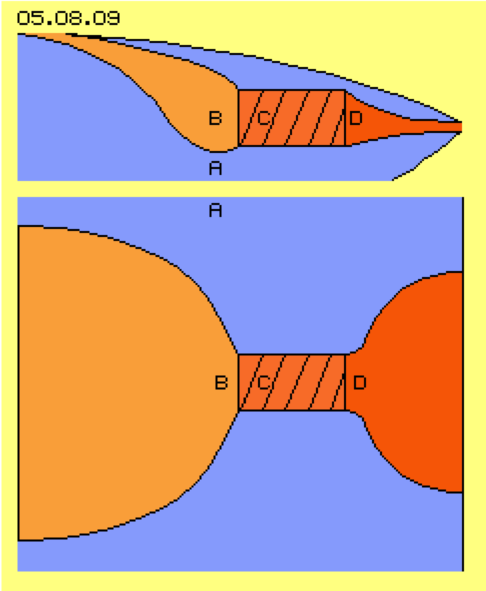
These segments no longer must function primary as wings - but they serve for fast flow directly alongside the fuselage upper surface, in order to produce lift at that wide face. Here for example the arrangement is sketched ´lamella-like´. At the one hand, the air upside of the segments is accelerated and at the other hand air, the air is drawn off the fuselage upper surface. Thus an area of relative emptiness respective a maximum lift is generated. For other situations, the segments e.g. could be moved upward and shifted together in order to represent only one flow-conform body without much lifting effect.

So depending on the position of each segment, more or less ´nozzle-effect´ is achieved, i.e. the force of lift is controllable without resistance losses. In addition, the centre of the lift-forces can be shifted to and fro. At least, one segment could be turned up so far, it will function as landing-flap. That new technology offers multiple possibilities for balancing the airplane at different phases of the flight.

New Engine-Technology

Also arrangement of engines at previous pictures is much too conventional. One must get off the fix idea, turbine engines must be anywhere round and symmetric. Up to now it was aimed to produce a concentrated reaction at the turbine outlet to achieve the demanded strong thrust for starting the airplane. If now already at that phases reasonable lift force is generate at curved wide faces, the suction effect at the turbine-inlet can be organized for an additional function.

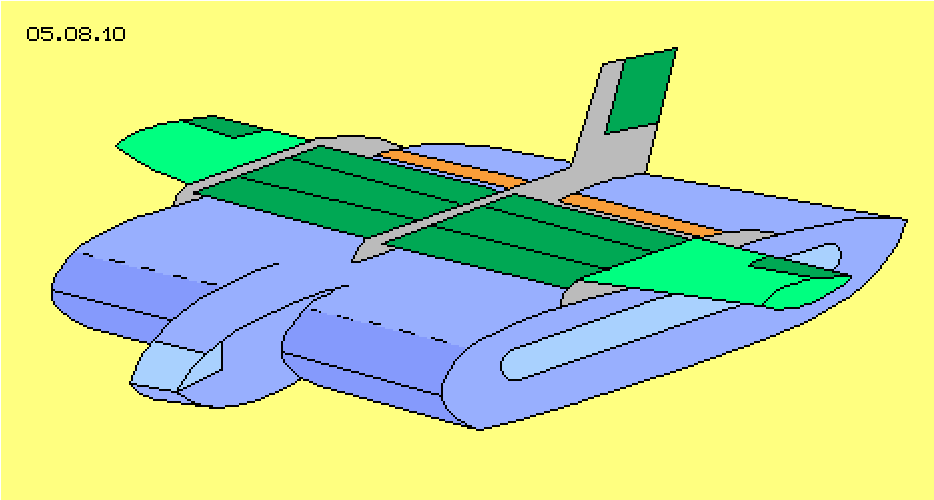
At picture 05.08.09 schematic is shown a suitable arrangement by a sectional view, upside by vertical cross-sectional view, below by horizontal cross-sectional view. The fuselage (A) is marked blue and the general way and areas of the air (B, C and D) are marked by different red colours. The engine is integrated within fuselage in total.



Generally, the air at the inlet of a pump already should be a twisted flow, e.g. through snail-shaped inlet walls. As long as air is guided alongside curved surfaces, suction will draw air also from areas far away. So here the intake-area takes the air through a narrow and wide slot, just below previous control-segment. Just there the air should ´disappear´ from the fuselage upper surface, in order to produce suction and fast flow at rear part of that ´fuselage-wing´. Especially at start-phase, when the engine works at its maximum, the fuselage-lift forces becomes maximum strength.

At this picture schematic is drawn also the outlet (D) of that engine. Also there the jet should exit via a flat slot at the rear end of the fuselage. Accompanied by that flow, also the air upside and below of the fuselage can leave the airplane by an ordered stream. Details for new engines are discussed at the following chapter. At any case however, that arrangement of engines will remarkably reduce the noise-level.

New Drive-Technology
Picture 05.08.10 again shows that airplane by a diagonal view, which now is ´tidied up´ and thus free of any useless turbulences. The central part of the wing now is replaced by two times three ´nozzle-segments´ (dark green) which are movably installed between each two long-posts (grey). By changing the positions of the segments, the speed of the flow and the suction at the fuselage upper surface are controlled, so the fuselage by itself becomes an important ´wing´ - with variable lifting forces.



Behind of the nozzle-segments, the inlet slits (red) for the engines are marked. The engines by themselves are not visible because completely integrated within the fuselage. The airplane as a whole now shows only flat and curved surfaces.

Analogue to this example, single-engine planes could be build. For lager planes however, some more and smaller engines should be preferred. Only at the starting phase, all engines are demanded – same time producing the most strong lift-forces at the upper fuselage. At normal flight-phase, one working engine will be sufficient – because the main thrust now is produced by the trout-engines. At this picture is only marked the slot for the dam-up-inlet (the line at the bow) and the outlet (dotted line upside of the fuselage).

The fuel consumption at its maximum will be one third of comparable conventional airplanes, just because the maximum weights at the start phase no longer are lifted by motor-power but prevailingly by the power of the atmospheric pressure. At flight phase, again much less fuel is consumed - because the major part of drive is done by dam-pressure-motor, totally for free.

So these are the main principles of these new technologies for airplane construction. Specialists are asked to check intensively the diverse possibilities and advantages of that new conception. I think it´s lot to do at wind-canals, until previous points of view become optimum products. My job is done – however new aspects must be discussed concerning prop- and jet-engines, as described next chapter.

Evert / 2006-12-15

05.15. Prop- and Jet-Engines

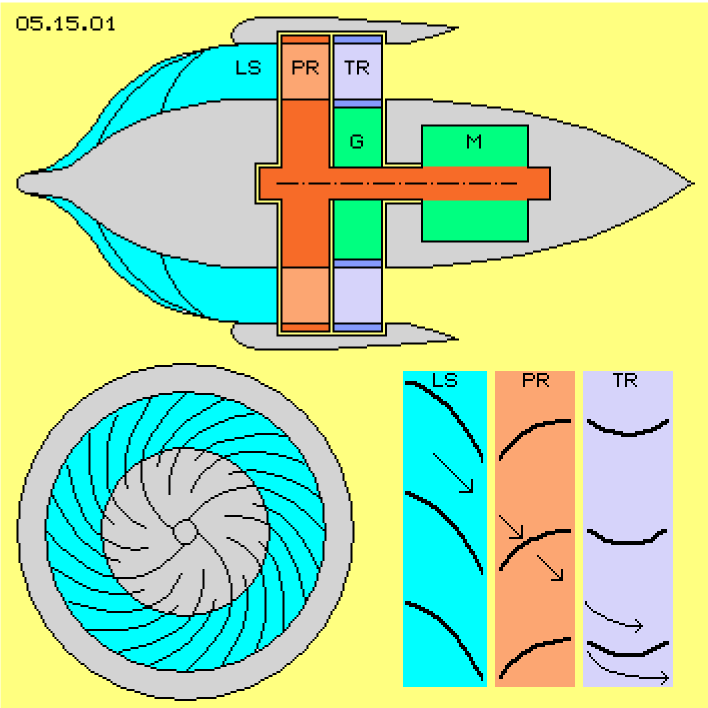
Problems
Some discrepancy exists at the aeronautics: the fuselages and wings are build as most flow-conform bodies in order to achieve most view air resistance. Opposite, the drive engines often show flows and processes rather insufficient.

For example, the prop-engines whirl around the air building long vortices rear off. Every prop-blade affect suction resulting a spiral air motion, into which the next blade hits, finding merely resistance and thus producing merely thrust. So energy is invested for the rotation of air – completely fruitless. Air becomes accelerated by suction – however its kinetic energy is not used.

For example, the jet-engines are pushing air to and fro within the rotor- and stator-blades, so merely can come up a clear flux. Prevailingly pressure is produced with inevitably coming up of strong counter pressure, demanding high energy input. The processes of jet-engines are too much oriented at combustion engines – with their well known bad efficiency. Here even more energy is wasted by (only partly effective) reaction technique.

Without any doubts, the airplane engines are ´high-tech-products´, only specialists are able to build and maintain. Nevertheless the considerations of a layman might help for a general think over.

New Prop-Engine
Based on its relative simple construction, by majority the props are used at small machines. However, also the complex turbo-props or –fans are suitable and economic engines for large airplanes. For example, they are less endangered by collisions of birds. Nevertheless, previous problems exist for all these engine types. Only a general new design can avoid theses problems.



At picture 05.15.01 are sketched the constructional elements of a new conception: the body (dark grey) has a cone-shaped part at its front side, where guide-fins (LS, light grey) are mounted. The prop-wheel (PR, red) has many blades (light red). Its drive is done by a shaft (red) and the motor (M, green). A turbine-wheel (TR, blue) has many blades (light blue). A gear (G, green) makes it turning some slower than the shaft and the prop-wheel.

Below left side, that picture shows a view at the front side. Below right side, sections are sketched form the guide-fins, the prop- and turbine-blades.

The front part of the body could even be longer than drawn here. The air flows aside along its surface. The air becomes turning (here clockwise by view at the front) along the spiral curved fins. At the one hand, these fins affect pressure at their concave side, prevailingly the air however is sucked along the convex face. That vortex soaks up also air from outside.

So the air comes to the inlet of the prop-wheel already turning with an ordered structure. Many prop-blades increase the rotation of the air. At their front side, the air is accelerated by pressure, probably by halves into the turning sense and same time into backward direction. At the other hand, the back face of each blade represents a ´back-stepping wall´. The air-particles follow that face ´by themselves´, as an ordered flow, up to sound-speed (see arrows below right side). So the invested energy is transferred into kinetic flow-pressure (in diagonal direction, same time rotating around the longitudinal axis and moving towards rear). Remarkable is the fact, about half of the air masses and the speed of flows is generated by suction, i.e. without corresponding energy input.

At common props, the thrust comes up only by the counter-pressure at the pressure side of the prop. However, effecting is only that part of force pushing the air straight backward. The remaining, most wider part of kinetic energy disappears fruitless. So for using the complete flow-pressure, it´s necessary to redirect the whole flow completely parallel to the longitudinal direction.

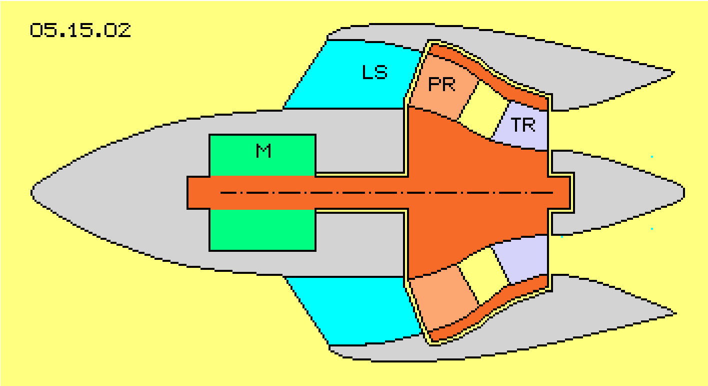
Additional Power
This redirection here s done by the turbine wheel. Thrust comes up by pressure at the concave side of the blades. However, the air is redirected also at the convex side of such blades (see arrow below right). So these masses of the air change their direction without affecting pressure. The energy of that flow escapes fruitless – if the blades are stationary. At that convex side, the air is even accelerated by the suction effect. The pressure difference at both sides thus increases. Resulting is a ´lift-force´ like at wings – however only usable as turning momentum at a turning wheel.

That turbine-wheel should turn some slower than the prop-wheel. When both wheels are coupled by a gear, according profiles will allow an optimum throughput at any revolution-speed.

It might seam a rather strange idea to mount a pump and a turbine at one shaft. The turbine can regain only a part of the invested energy (respective reduce the necessary energy input). In comparison with common props however, this conception achieves real surplus-benefits: the commonly unused energy of the rotation now is used completely. The considerable part of flows generated by suction, now is transferred into additional thrust. By the way, the demanded energy input is reduced.

Simple Concept – high Efficiency
Picture 05.15.02 shows a variation especially suitable for installing behind the wings or aside / upside at the rear end of a fuselage. Previous constructional elements are drawn once more, only arranged other kind.

The motor (M, green) is positioned in front of the engine-body (grey). At the shaft (red) are mounted the prop-wheel (PR, red) an the turbine-wheel (TR, blue). Again some guiding-fins (LS, light grey) are spiral arranged in front of the prop-inlet. The prop-blades (light red) press / suck the air some towards the axis. The air flows (rotating) through a canal (yellow) to the turbine-blades (light blue). At their short radius, these blades are moving slower within the space, so no gear is necessary. The prop- and turbine-blades could even be installed at one rotor-element. The geometry of both blades is rather easy to coordinate. They will work efficient at any revolutions.



Conventional props produce such a disordered whirling at the air, only two prop-fins are used by majority. The central part of these blades is rather ineffective. So here are installed many blades, working only at effective lever arm, generating a continuous and well ordered flow. The energy-input is transferred completely into thrust – plus the energy of flows generated by suction (for free). That new conception of prop-wheel-engines will work much more effective and economic than the common old units (inclusive turbo-versions).

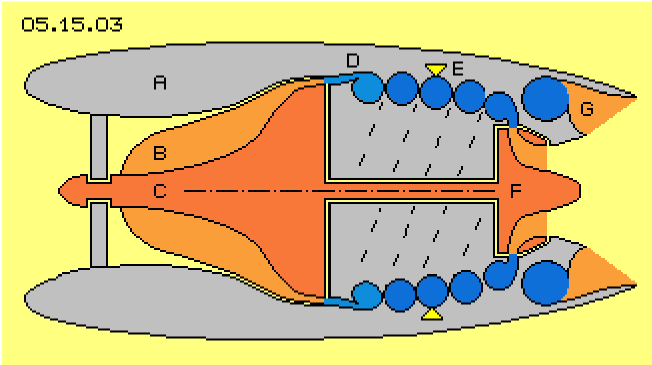
Problems of Jet-Engines

The drive for transport vehicles is mostly done by combustion engines working by different stroke phases. Two third of the invested energy diffuses without usable effect, however with huge environmental pollution. The jet-engines are working with continuous production of pressure and combustion. Theoretical, such a process is more economic. Theoretical, the invested energy would be completely transferred into thrust, if the air (and gases) behind the airplane would be as calm and cold as before. Instead of, the jet-engines release a ´red-hot ray´. As four fifth of the energy evaporates without useful effect, the procedure might really be no optimum solution.

The exhaust fumes could be cooled down e.g. by injection of water. Ecologically sound however could combustion finally be, if H2O splitting and ignition is done ´on-board´ and ´on-demand´, direct at the injection nozzle. Generally however, the production of pressure makes no sense as the counter-pressures are increasing by square. Also the production of heat, by itself, is unsuitable as the particles whirl around even more chaotic.

Modern jet-engines are real masterpieces. However they are expression of the idea, one must transport backward the air, so the plane flies forward, the more pressure and heat, the more thrust is achieved automatically. For explaining the reaction-effect, often is quoted Newton´s ´actio = reactio´. However practically, one is far away from that 1:1-relation. For example, the double thrust often demands four times more fuel consumption. Only by certain revolutions the throughput is at an optimum, differing only five percent decreases the performance drastically. Jet-engines practically are used at all passenger- and freight-planes – nevertheless as suboptimum solution.

Following point of view could be an alternative: effective thrust comes up only if the kinetic energy of an ordered flow is redirected at a flat wide face. So the main aim must be the generation of suitable movements. Most few pressure should be applied. Simply by suction, a flow can be initiated up to sound speed. The air should be accelerated all times into likely turning sense. The motion should be twisting within round pipes. The combustion of fuel must accelerate once more that twist flow. Finally at the rear end, the redirection of gases parallel to the longitudinal axis will completely transfer the energy into thrust.

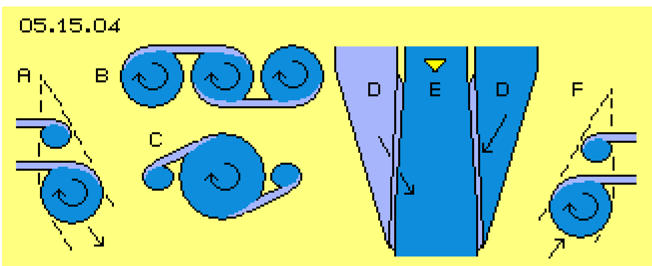


Flow-conform Conception
Picture 05.15.03 shows a rough sketch of that new conception. At the housing (A, grey) is turning a rotor (C, red). Diverse guide fins are mounted spiral at its surface. They press and suck the air into a small canal. The air rotates within that flat ring diagonal backward. The air tangential is guided into pipes (D, blue). Four (or more) pipes are installed, spiral arranged around the longitudinal axis further back. So the air is turning around the system axis with these pipes and in addition, the air is rotating within the pipes, so it builds an intensive curved twist flow.

These movements affect like a ´check-valve´ for the following combustion. The fuel is injected and ignited, here marked simply by yellow triangle E. The creation of pressure and heat must be organized that kind, previous twist flow is accelerated. For cooling down the combustion-unit, the cool air of additional pipes must be merged, again with accelerating effect. So decisive is generating a most fast and ordered flow. That´s running through the pipes in the compact and stable shape of a potential vortex, without resistance.

The rotor demands only few drive (in comparison with common engines). Only a small part of the generated flow must be transferred into turning momentum at the blades (light red) of the turbine-wheel (F, red). The remaining major part of the forward and the twist flow within the pipes must be redirected as a flat ray (G, light red) parallel to the longitudinal axis. Finally that redirection results the thrust force, based on the mechanic energy input of the pump and based on the produced heat energy, however also based on the self-acceleration of suction effects and also within the potential-vortices at these pipes.

Continuous Turning likely Sense
At first part, at the basics of that Fluid-Technology were discussed the motion processes and effects of potential vortices, e.g. at whirl-winds. There was also shown a ´Potential-Segment-Pipe´ with its central fast flow, running without friction and even self-accelerating. At picture 05.15.04 now is sketched, how these effects could be used here.



At the outlet of the pump, the air moves diagonal into a flat canal (at A, light blue). This air must be guided tangential into a ´snail´, from the beginning of a narrow pipe until its maximum diameter (afterward follows the next pipe into turning sense). The friction at the walls affects accelerating onto the central fast turning and forward moving flown (details see mentioned chapter of these ´Potential-Segment-Pipes´).

At least four pipes should be used. The flows are merged some later. As an example, at B the air is guided from both pipes aside into the middle pipe, all times by tangential direction. Both delivering pipes end here sharp, the diameter of the central pipe is enlarged correspondingly (see C).

This technique could be used for ´cooling´ the combustion unit (as sketched right aside). The fuel is injected and ignited (E, marked yellow) at the middle pipe. Its cross-section must become wider. Same time, the cool air from the left and right pipes D is added (again tangential), integrated as flat layers along the wall. Also here comes up the tornado-effect: the cool air moves slower and affects stronger static pressure aside. That air compresses and accelerates the central rotating flow.

It´s a well known fact (and the cause is explained at the basics), a slow flow curves towards a faster flow. By other words: the faster flow affects like suction, integrating neighbouring particles without resistance. Normally, any combustion increases the chaos of the molecular movements. Previous measurements however result a concentrated and ordered flow – and thus high kinetic flow-energy.

At this picture right side at F, once more is shown how the gases must leave tangential the outlet of the engine. Like wood exists a pencil-sharpener, the twist flow must be ´peeled off´ the pipes. That flat ray must be completely redirected parallel to the longitudinal axis. No matter how strong the pressure, how fast the flow in forward and rotating directions within these pipes, this technique achieves an optimum thrust.

Suggestion
Naturally it´s totally presumptuous, a layman telling high qualified specialists how to build jet-engines. Admitted, this new conception will never achieve the performance of usual turbines (because consciously abandoned producing high pressures). It will suit only for limited flight speed (because consciously accepted the limit of sound-speed for (self-) acceleration by suction effects). At the other hand, this construction is most easy to build and rather light (in comparison with known jet-engines). This machine works really fluid-conform: motions all times along curved faces, all times rotating, also by overlays, all times into same turning sense. Even the problem of cooling around the combustion unit is solved by optimum shape of flows.

Only by such ordered flows, high density and speed is achieved economical and thus with most better efficiency than by common motion-chaos of conventional engines. Only that final sharp redirection into axial direction can transfer the kinetic energies completely into thrust force. Specialist might check, this machine could by an economic interesting alternative to commonly used technology.

Evert / 20015-12-31

05.16. Air-Pressure – Bowl-Engine

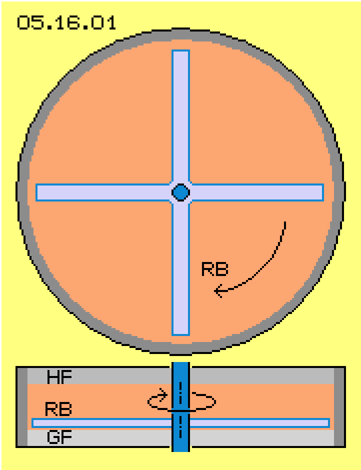
Problems and Objectives
Thrust by props is problematical, as props prevailingly produce a twisting flow. They also produce an air flow by suction. However both components are not transferred into thrust. The prop-mechanism of conventional helicopters is even less effective. They produce stormy winds by heavy noises and consume much fuel. They can not fly far distances. their performance is most limited; already at the high mountains.

Instead forcing down the air, one should use the atmospheric pressure for gaining lift forces. At a normal wing, the air is accelerated at the upper face, in average floating 50 km/h faster along than at the below face. The difference of air flow speeds results a difference of static pressures at both faces and thus results the lift force.

One can create air movements also within a closed box. As an example, the air can rotate continuously within a round and flat cylinder. The speed of flow can differ at the upside and below inner-faces. That will be an autonomous system for generating lift forces, independent from external air movements. The forces will be sufficiently strong for helicopters (and for the draft of other vehicles).

The air weights with 100000 N/m^2 at each square meter. If this pressure is reduced only by one hundredth, the difference will be 1000 N/m^2 (actually common wings achieve a multiple of). In order to lift a helicopter of e.g. 3.5 tons, that force must be applied at 35 m^2 (a circle face of about 3 m radius, exact calculations see below). In place of the rotor of a conventional helicopter, thus one must install a wide, round and flat box of corresponding size. As an alternative (respective preferred) diverse smaller unit are shifted one above the next.

Following is the description of essential characteristics of my invention. This invention is not applied for a patent. These ideas are open-source for everybody. This could allow fundamental approaches for the aero techniques.



Construction Elements and Air Movement
At picture 05.16.01 are sketched general construction elements, upside by cross-sectional view and below by longitudinal cross-section through the system axle. A hermetic closed box (grey) has a round cross section, much wider than high. At the centre, a shaft (dark blue) is rotating (here clockwise). Diverse (here four) rotor blades (RB, light blue) are mounted at the shaft. All the air (light red) within that hollow cylinder thus is rotating around the system axis.

The rotor blades are moving short distant above the below inner face. That surface here is called the ´slide-face´ (GF, light grey). That surface is most smooth, so the air can glide along with most few resistance.

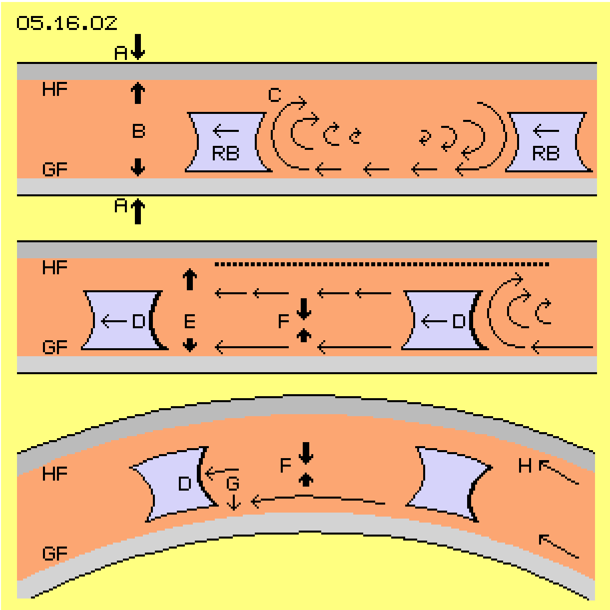
Opposite, the inner face upside is called the ´stick-face´ (HF, dark grey). It´s most rough, so the air is delayed respective can flow along only with reduced speed.

The following picture 05.16.02 shows sections of the area between the stick-face and glide-face (HF and GF). The rotor blades (RB, light blue) are rotating above the glide-face rotate, here moving from right to left. The profile of these blades is flat upside and below, the left and right faces however are concave.

These boxes are hermetic closed. The normal atmospheric pressure weights at all outside surfaces (see arrows at A). So that force is neutral concerning that unit. At the inner faces however, the static pressure towards the stick-face should be much stronger than towards the glide-face (see arrows at B).

This is achieved, if the air flows along both faces with different speeds. Here, the air moves along the glide-phase with few resistance. Based on the relative high speed, that flow shows high dynamic pressure into direction of its motion (kinetic flow-pressure) and corresponding reduced static pressure (aside of the flow-direction).

Also the air near the stick-face is moving into likely direction. Its motion however is hindered at the rough surface. Based at its relative low speed, that flow will show less dynamic flow-pressure and corresponding stronger static pressure aside, thus towards the stick-face.



Air Circulation
Here, the right rotor-blade (RB, light blue) is shifting the air towards left. Pressure is merely necessary, because the air follows the left rotor-blade ´by-itself´. Each back-moving wall releases a relative void area, into which the air particles fall, up to sound-speed, simply based at their continuous molecular movements.

A stick-friction comes up rear-upside of the rotor-blade, here marked as area C. The ´resting´ air at the stick-face holds up the faster flow. Air-particles are pulled out of the rear face of that rotor-blade. Thus also there comes up an area of relative void. Thus some air from below follows that void. That suction reaches far back. Thus the air is moving fast along the glide-face, faster than the rotor is moving. In front of the right rotor-blade, the air is sucked down. So between both rotor-blades the air is circling around, like marked with the round arrows at this picture upside right.

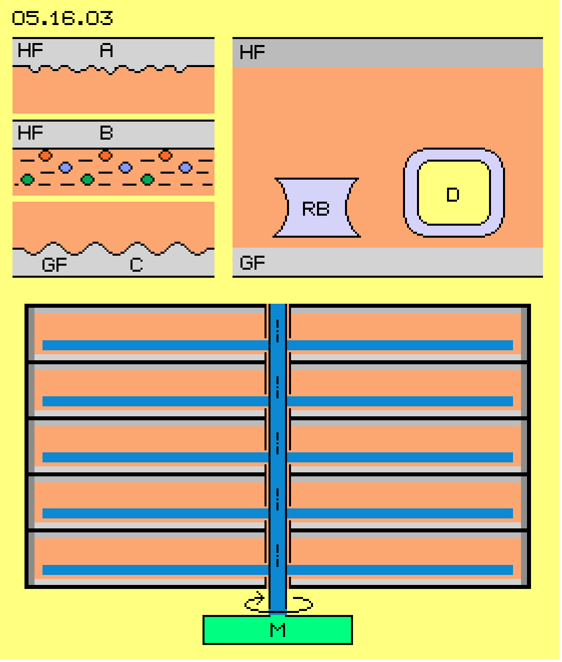
This motion process is comparable with a car wheel: the tire keeps resting at the road for a short moment. Afterwards, it rises up and accelerates to the double speed of the car. Finally that piece of tire falls down again at the road. A chain-link of a tracked-vehicle rests long time at the road, is pushed up and is moving high speed long distance. Finally at the front of the vehicle it´s laid down at the road again. Here, the stick-face works like the rough asphalt and the high-speed motion is running along the glide-face.

Suction and Pressure
The air motion within the cylinder prevailingly comes up via suction at the rear face of the rotor blades. That suction-side D is pointed out once more at the middle row of the picture. A row of black points represents the nearby stationary air direct at the stick-face. Below of, the air is moving forward, however slower than the flow direct above the glide-face (see arrows of different length). Both flows have different flow-pressures, resulting the difference of static pressures at the stick- and glide-faces (see vertical arrows at E) and thus resulting the wanted lift-force.

The remaining static pressure affects versus both faces. However, the different pressures are affecting also between both flows, like marked by the arrows at F. Resulting is the well known bending of flows, all times towards the faster flow. This again effects the appearance, the air is moving around round faces with especially less resistance. This effect is shown at the below row of that picture.

The stick- and glide-faces here are curved. The pressure-difference F pushes the fast flow ´around the corner´. So at that smooth surface will exist well ordered laminare flows. At the one hand exists that relative void at the suction side D of the rotor-blades. At the other hand, the convex curvature of the glide-face represents also a ´back-stepping wall´, by view of the tangential motion direction. This affects an additional suction (see arrows at G), so the air particles fly around the curved face without resistance, self-accelerated. So from outside towards inward, the air is moving faster, thus building a potential vortex. The air between the rotor-blade and the glide-face is moving even faster than the rotor.

Right side below at H, an other advantage of the curvature is sketched: as the air movement generally is directed tangential, the air particles of the inner track fly outwards and relieve the glide-face. Opposite, the air particles at the outside track crash at the wall, affecting stronger pressure at the stick-face.

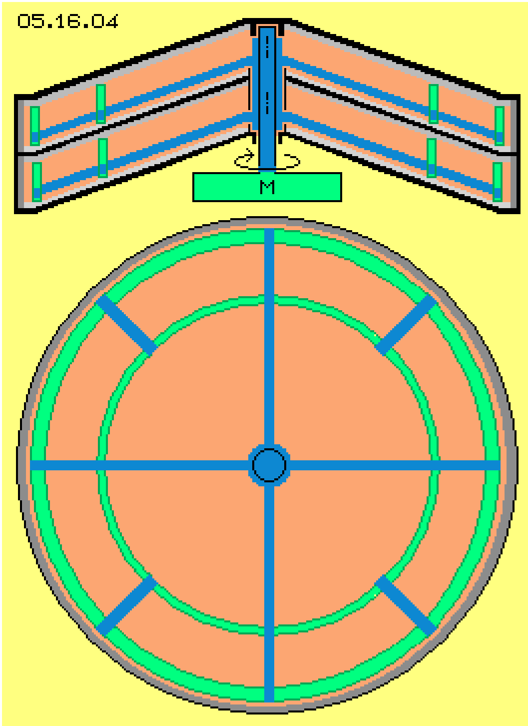


Constructional Characteristics
Picture 05.16.03 shows some details. The stick-face (HF) should be rather rough, e.g. like a sandpaper (see A). Thin wires produce high air resistance, so that surface could be covered with a grid of thin wires, even by multiple shifted layers (see B). One must search for suitable, stable sheets. The glide-face (GF) must be most smooth. If necessary, concentric grooves could be more stable (see C).

This picture upside right once more shows previous profile of the rotor-blade (RB, light blue). The air flow is most fast relative to the stationary glide-face (GF, light grey). At the other hand, the air is moving only some slower / faster relative to the rotor-blade. So a simple (and stable) profile could do, e.g. a rounded square like sketched at D.

These dimensions could be suitable: the gap between the glide-face and the rotor-blade with 1 cm to 2 cm, the rotor-blade about 2 cm to 4 cm height, its distance above towards the stick-face 6 cm to 12 cm. The whole hollow cylinder thus will show the height of only 10 cm to 20 cm (also by most different radius).

Below at this picture, some flat cylinders are piled up. The rotors are mounted at a common shaft. This simple shape of rotor-units can be build easy and light. The masses of involved air is less than one kilogram. This system can accelerate fast (and a ´wiper-engine´ will do). Such small units might fit e.g. for control-functions of a helicopter.



Cone-Engine

All lifting forces push the even stick-faces upward, so they must be build rather stiff. Much more stable are faces of a truncated cone. So it would be advantageous to build these boxes in shape of cones. Picture 05.16.04 upside shows a longitudinal cross sectional view through the system axis. Several layers can be piled up also at this version, all rotors mounted at one shaft and driven by one motor (M, green).

In order to resist the centrifugal force, the rotor-blades should be connected by rings (green) running all around. These rings could be guided at some slide- or ball-bearings (here marked only rough).

Below this picture shows a view top down. Between the rings could be installed additional blades, keeping the air in constant motion.

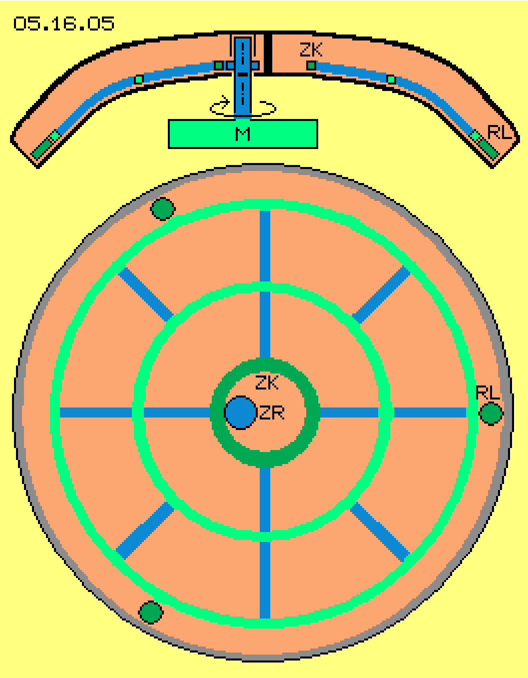
At this cone version, the rotor-blades do not only move the air at a circle track of a horizontal level. Here, the rotor-blades are sucking the air along the curved surface of the cone mantle. So here, that additional suction effect come up like discussed at upside picture 05.16.02 at G. Without any resistance, the flow follows that curvature. Even a potential vortex comes up with its self-acceleration effect.

Previous flat version is suitable only at small systems. At wider systems, the faces must be build cone-shaped and also these supporting rings must be installed. These measurements achieve stiff faces and stiff ´rotor-cages´, even with relative thin profiles, even for high revolutions. Such (multiple-layer) units e.g. are suitable for the draft of helicopters (and other vehicles too).

Bowl-Engine

The air flows are relative slow at the central areas, so there won´t come up strong lift forces. The speed increases linear with the radius, the dynamic flow pressure by square. Also by square increases the surface, so the main lift forces come up at the outer regions. So the cone could be rather flat at the centre, however should be inclined at wider radius. That´s achieved by a bowl-shaped construction.

Picture 05.16.05 shows that principle, upside by a cross-sectional view through the system axis, below by view top down.



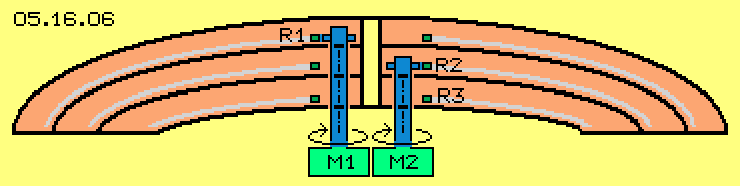
In order to build a most stable and light construction, one should avoid a central shaft. The bowl-like stick- and glide-faces can be build throughout over the centre. The rotor no longer reaches to the system axis, but ends at a gear-rim (ZK, dark green). A gear wheel (ZR, dark blue) is installed at a shaft, driving the rotor.

The rotor-cage is build light with these curved profiles (blue) and connecting rings (green). However, the outside ring of this construction needs ball bearings (RL, dark green, preferred three) for suspension. Also the middle gear rim must be guided by suitable suspension.

This version of bowl-engines is used at large systems, e.g. for creating the lift forces for helicopters. Also multiple layers can be installed one above the other. Most interesting is also the possibility to shift one bowl within the other.

Multiple Bowl

Picture 05.16.06 shows this variation with a schematic cross-sectional view. Here are assembled three rotor layers (R1, R2 and R3) with different radius, one within the other. The stick- and glide-faces of the middle layer are direct connected with the faces of the upper and below layers. All boxes are connected below-outside. Also at the middle, all faces are fix connected with a pipe (yellow). These round and curved sheets build a most stable body.



Three rotor-cages (light blue) are installed, each ending with a gear rim (dark green) at the middle. Each rotor is driven by a gear wheel at a separate shaft (dark blue) with a separate engine (here only shown for R1-M1 and R2-M2. The R3-M3 is at a shifted position). This measurement allows each rotor running with different revolutions corresponding to the demands.

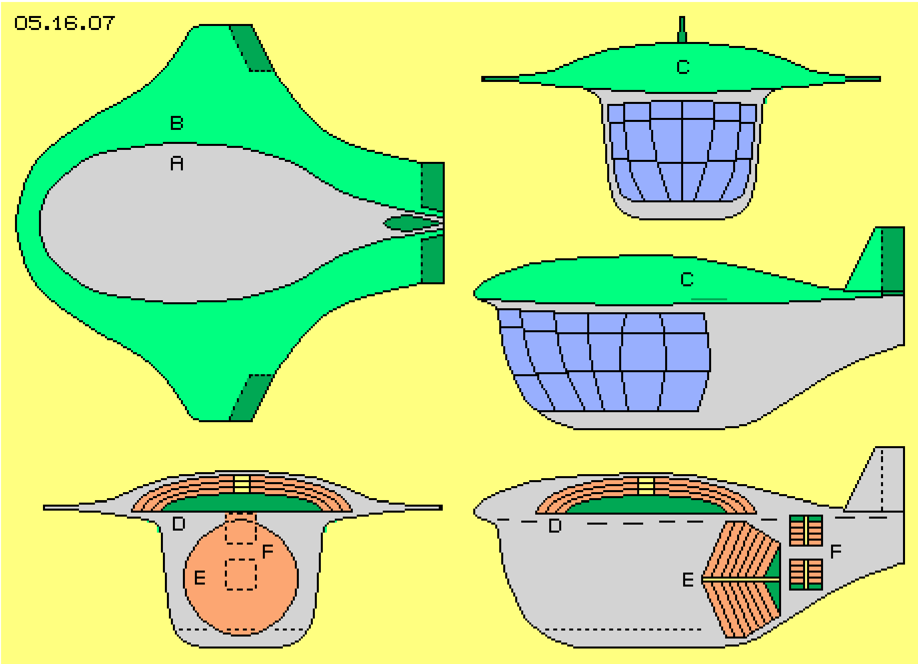
For example, the wide rotor R1 could take the basic weight of a helicopter. The middle rotor R2 could take the current payload. The small rotor R3 can accelerate fast, suitable e.g. for take-off and rising up. The capacities should be dimensioned with sufficient reserve, so even the failure of one part-system is covered. Electric engines should be preferred for driving the rotor-systems. Usual emergency generators will do (also twice redundant). High demands occur only for starting the system or for acceleration (where part-systems can speed up one after the other). At running mode, only friction losses must be compensated.

New Helicopter Design
Previous air-pressure machines in shape of disks, cones and bowls can be combined in diverse modes. The design of aircrafts in general will show new and different characteristics. As an example, at picture 05.16.07 is sketched a new conception of a helicopter, upside left by view top down, right side by view at the front and from aside.

The contour of the cabin (A, grey) has a round bow and becomes smooth narrowed to the rear end. The contour (B, green) of the helicopter reaches far out of the cabin, in front above the bow, flattened aside and to the rear end. As a whole, the upside face builds a dome C.

At the front, this dome is build like the nose of a wing. Towards both sides, the dome smoothly passes over to short wings. Control-flaps (dark green) are mounted outside-back at the wings. Horizontal tails and a rudder (dark green) are installed at the rear end of the dome. That flat dome with its wing-profile will contribute lifting forces at horizontal flight. So that shape shows the characteristics of a (compact) airplane.

Below of that ´dome-wing´ hangs a rather high cabin. The view at the front side shows the maximum width. The cabin has a round bow and becomes smaller to the rear end. The wide usable room still is shaped flow-conform.



At the below row of that picture are drawn the positions of different engines. The lift-engine (D, red) is installed within the dome, here e.g. with three bowls integrated one within the other. The area for the drive-units of the rotors is marked green.

Instead of the complex rotors of common helicopters, the draft here is done by a separate unit, with a horizontal shaft and separate engine, here in shape of a cone-machine (E, red). As an example and for optimum usage of the available space, the radius of the rotor-layers are different long.

Instead of conventional service-rotors, here also the control-units are integrated within the fuselage. Here are drawn two units (F, red). These are simple disks with relative short radius, so the rotors can accelerate fast. When starting that system, both units are directed at opposite position, so their thrust forces compensate each other. These units are suspended to turn and swivel around two axis. If both are turned back, forward thrust comes up. If both are directed towards the front, the helicopter will fly backward. If both units are turned aside, the helicopter will turn around its vertical axis.

That helicopter, for example, could have dimensions like these: total length and width about 8 m, the height some 4 m. The usable space of the cabin could be 3 m long, wide and high (with electric generator, starter battery and tanks at the double-floor). The lift-rotor (D) has a diameter of about 4 m, the draft-rotor (E) up to 3 m, the control-units (F and G) about 1 m. Now it's the question which forces might be achieved at which revolutions.

Calculation of Forces
The following calculations are based at these general points of view: prevailingly is used the suction effect which works only up to sound speed. Important are most clear flow structures. Thus only speeds up to 150 m/s are used here (or much less). The maximum speed is assumed to correspond with the rotor revolutions, the surplus effects of previous air-circulation and the self-acceleration by potential vortices is neglected. It´s assumed, the flow at the stick-faces will be slower than at the glide-faces by 10 %. Suitable forces however come up already at 5 % difference.

The difference of dynamic flow pressures corresponds to the difference of static pressures. These weight at circle faces. The surface increases by square with the radius. The speed rises linear, however it´s affecting by square. So the major part of forces come up at the outer areas. Exact data must be calculated by integral. However, usable values are achieved, if the pressures at the rim of the disk are applied at two third of the circle-face. Simplistic can also be assumed, the speed-difference of previous 5 % results a similar difference of forces (as these values can only be measured empirical).

05.16.08

Control-Unit	Radius m	Face m^2	Rim m	ρ kg/m^3
	0,4	0,50	2,50	1,25
RPM	1800	2400	3000	3600
Vmax m/s	75	100	125	151
P N/m^2	3549	6310	9860	14198
P at the face	1783	3170	4953	7133
P at 2/3 of face	1189	2113	3302	4755
P 10 %	119	211	330	476
P 5 %	59	106	165	238
P 10 % * 8	951	1691	2642	3804
P 5 % * 8	476	845	1321	1902

Forces at the Control-Units
Table 05.16.08 shows data of the control-units sketched at previous helicopter (picture 05.16.07 at F). The rotor radius is 0.4 m, two units with each four disks are installed, thus eight pairs of effecting faces. The table shows results of 1800 up to 3600 rpm (thus with 75 m/s up to 150 m/s). Suitable thrust-forces come up already by 5 % differences (marked green). Double revolutions increases the forces by square, certainly sufficient for this helicopter.

At normal flight phase, that helicopter can be controlled by flaps and rudder. The internal control is only necessary for hover flight and landing for keeping a certain position. At normal case, both units are directed towards each other, so their thrust forces compensate each other. If the units are swiveled or turned, previous thrust forces are available spontaneous. Such air-pressure-controlled aircrafts produce no external air movements, they start and fly and hover and land quite silent. They can even float into their hangar by itself.

Thrust Forces

A cone-shaped thrust-unit was used at previous conception (picture 05.16.07 at E). The table 05.16.09 shows corresponding data. Seven rotor-layers are installed with partly different radius (from 0.9 m to 1.4 m) at one shaft. Again the pressure at the rim is applied on 2/3 of the face. The speed-difference between stick- and glide-faces is assumed with 5 %. Revolutions between 600 and 900 rpm result thrust-forces of about 4000 N up to 9000 N (marked green).

05.16.09

Thrust-Engine								
Disk	1	2	3	4	5	6	7	Sum
Radius m	0,9	1,0	1,1	1,2	1,3	1,4	1,4	
Face m^2	2,5	3,1	3,8	4,5	5,3	6,2	6,2	31,6
RPM	600							
Vmax m/s	57	63	69	75	82	88	88	
P 5% N	170	259	380	538	741	996	996	4.079
RPM	900							
Vmax m/s	85	94	104	113	122	132	132	
P 5% N	383	583	854	1.210	1.666	2.241	2.241	9.178

Air Resistance	Cw = 0.4		A = 12 m^2					
V km/h	50	100	150	200	300	400	800	
V m/s	14	28	42	56	83	111	222	
P N	579	2315	5208	9259	20833	37037	148148	

Below the air-resistance is calculated for different speeds, based on known formula F= 0.5*A*rho*v^2*Cw. The face A is assumed with 12 m^2, the density rho with 1.25 kg/m^3 and the specific resistance-value Cw with 0.4 (a high value, as e.g. a glider has Cw=0.15). The previous thrust of about 9000 N would allow that helicopter to travel with a speed of 200 km/h (marked green).

This table also shows, double speed (at 400 km/h and 800 km/h, below right side) increases the air-resistance by square (4-fold and 16-fold). That's why airliners fly at great height within thin air (density about 0.4 kg/m^3), where the air-resistance is reduced to one third. However, up there also the performance of common thrust machines is corresponding reduced.

Opposite here, the boxes are hermetic closed and the air pressure within is constant. The performance is independent from external conditions. These machines can even drive with a density some higher, e.g. with rho = 2 kg/m^3. The thrust increases by one half, here e.g. up to about 13500 N.

At these cone-engines, the air is pulled around curved faces. As described upside, the convex glide-face is released, at the other hand, the flow ´scratches´ along the concave stick-face. Here is assumed a difference of only 5 %, e.g. from 132 km/h a reduction to 125 km/h. Quite realistic, the flow at the stick-face could be only 119 km/h or even 112 km/h ´slow´. The thrust force increase double or three-fold, here up to 18000 N or even 27000 N. So that air-pressure-cone-engine will deliver more thrust than necessary for that helicopter.

Lift Forces

At previous conception was used a bowl-shaped engine for creating lift force (picture 05.16.07 at D). Table 05.16.10 shows corresponding data. Three rotor layers are installed, one including the other, with radius of 1.4 m, 1.7 m and 2.0 m.

The rotors are not connected with a common shaft, but all rotors have a rim gear at the middle. The drive of each rotor is done by a separate shaft and a separate engine. So each rotor can drive different revolutions, independent from the others, even contrary turning.

At this table, the lift forces are calculated for speeds of each 94 m/s and again one third faster (123 m/s, 128 m/s and 126 m/s). Resulting are lift forces of about 5000 N up to 9000 N (marked green). So a helicopter of five tons could hover. Even if the big rotor would fail, both smaller rotors could produce sufficient lift.

This engine could be build some smaller or could produce much more forces, like mentioned upside. Instead of the normal air pressure, it could drive with ´thick´ air (e.g. with rho=2 kg/m^3, factor 1.5). At this advantageous bowl-shape, the difference of speeds will not be only 5 % (like calculated here), but also 10 % or even more (factor 2 to 3). Resulting would be forces up to 40 kN – opening quite new possibilities.

05.16.10

Lift - Engine					
Disk		1	2	3	Sum
Radius	m	1,4	1,7	2,0	
Face	m^2	6,2	9,1	12,6	27,8
RPM		640	530	450	
Vmax	m/s	94	94	94	
P 5%	N	1.133	1.690	2.334	5.157
RPM		840	720	600	
Vmax	m/s	123	128	126	
P 5%	N	1.952	3.118	4.149	9.219

Energy-Source

Naturally now it seems mysterious, from which energy source these forces might come. The technique of conventional helicopters is quite natural: the chemical energy of the fuel is transferred into mechanical motion and via rotor-blades the air is pushed down, so the weight of the aircraft is lifted. If the rotor of a helicopter is 6 m long, it covers a circle-face of 113 m^2. Its weight of 3500 kg corresponds to an air volume of 2800 m^3, an air-pile of 25 m height above the rotor-face. Permanently these air masses must be accelerated downward with hurricane speed. However, the air escapes any pressure, so the efficiency is once more minor than at common energy transformations.

The air-volume of all radial-, cone- and bowl-boxes of previous new helicopter conception are only 12 m^3 in total. Each particle of that air-mass of 10 kg is steady flying around with its molecular movement speed of some 500 m/s. Based on known formula E=0.5*m*v^2 this corresponds to the huge energy of 1.250.000 J. The particles hit on a wall, however not right angle all times but in average by 45 degree, so only with 0.7 of the perpendicular force. The static pressure at a wall is (with rho=1.25 kg/m^3 and v=500 m/s), based on known formula P=0.5*rho*v^2 thus 156250 N/m^2. Factor 0.7 results the ´normal´ atmospheric pressure of roundabout 100000 N/m^2. Only one hundredth part of, these 1000 N/m^2, are necessary for suitable lift- and thrust-forces – like achieved at all engine-variations discussed upside.

The air rotates within the disk-shaped boxes. The particles scratch along the walls by flat angle. The perpendicular pressure is reduced. Valid is the strong law of energy-constant: if a particles affects stronger pressure towards front side, it can affect only less pressure aside. Here, the force of kinetic flow pressure is not used, it´s idle running just around circled tracks. Indeed, here is used only the ´side´-effect: fast flows affect less static pressure aside than slower flows. Only that secondary appearance is used here – and that usage does not lessen the primary appearance of the idle running flow.

The enclosed air masses are put in rotation at the start of the system. However, at the slow starting, no ´heat´ is added, the molecular speed of particles is not accelerated as the particles follow the suction of rotor-blades by themselves. The energy of the air mass is still constant. Only the original chaotic motion of the particles becomes ordered a little bit.

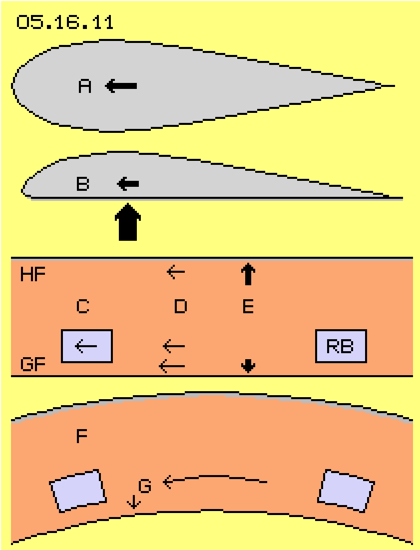
However even within a flow of 100 m/s, the particles crash around still by 500 m/s, only some more into a certain direction, preferably circling along curved faces on and on.

Some energy-input is demanded for starting the system (or following accelerations). At the running mode however, only the friction losses must be balanced. The energy-input is only the trigger (and not the energy-source). Only the (reduced!) static pressure-forces coming up aside of the glide- and stick-faces, only that secondary side-effect is used. These effecting forces correlate not with the energy-input. At running mode, the rotor and the air nearby are moving same speed. Even the machine delivers full performance, the energy-input is a minimum – at least in comparison with common techniques of aircrafts.

These effects come up at the upside and below faces of every wing. These motion processes are rebuild (inverse) here within a closed system. This principle can be realized by know techniques in multiple variations. It´s a clear example for using given energies without consuming and exhausting the energy-source.

Basic Principle

For all sceptics, the basic principle is summarized once more. If the profile A of picture 05.16.11 is moved through the air, a thrust force is demanded corresponding to its air resistance. The profile B shows only the half of width, the air resistance is less and thus also the demanded thrust. Based on the asymmetry, now comes up a one-sided force. Based on the difference of static pressures results the lifting force. That force is multiple stronger than the demanded thrust. At the optimum conditions of gliders, e.g. at speed of 180 km/h, the air resistance (respective demanded thrust) is less than one tenth of its weight.



The motoric thrust at airplanes is necessary for compensation of the air resistance. The resulting lift force is based exclusive at the atmospheric pressure respective its manipulation at the upper and below faces of the wing. The suction effect back-upside makes the particles fall backward-down, resulting a flow. The suction spreads forward, however only up to sound-speed. Based on the difference of speeds at all surfaces, results the difference of static pressures and thus the wanted lift forces.

This factum is theoretically and practically approved and here rebuild within a closed box C. Between two faces, the stick- and glide-face (HF and GF at C), an ´artificial wind´ is generated by the rotor-blades (RB, blue). Once more less thrust is demanded, because only a small volume of air must be kept rotating steady. The air is moving nearby same speed like the rotor, along the glide-face some faster, along the stick-face some slower (see arrows at D). Resulting are different forces affecting aside of the flows, resulting the thrust force upward directed (see arrows at E).

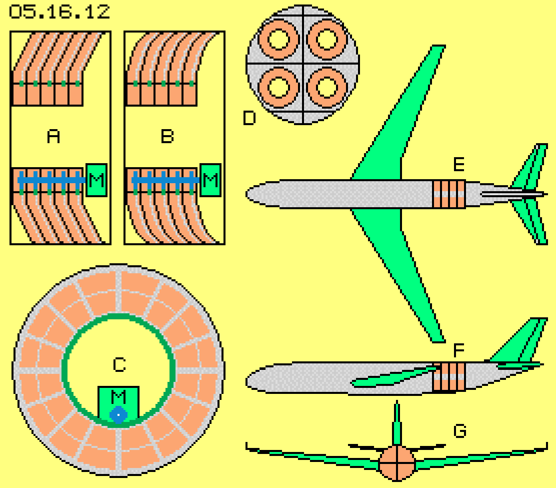
The difference of speeds comes up, if the distance between the rotor-blade towards the stick-face is longer than towards the glide-face. That difference increases, if the stick-face shows most rough structure, and opposite, the glide-face is most smooth Most intensive stronger are the different pressures at the cone-shaped and bowl-shaped engines (at F). The rotor-blades suck the air around the convex curved glide-faces (G) without any resistance, while the flow is strongly hindered at the concave stick-face.

These effects come up at each wing without any doubts (and also at each curved surfaces). Here these motion processes are organized within a closed system. This principle can be used for multiple purposes, by simple and well known techniques.

High-Performance Thrust-Engine

At picture 05.16.12 are sketched relative large engines, at A and B by longitudinal cross-sectional view through the system axis. A view at the rotor-cage is shown at C. As an example, D and G shows how four units could be installed side by side within the fuselage on an airliner. Four units could be arranged one behind the other at the rear part of an airliner, like marked at E and F.

05.16.12



At the central part of these machines, the air is moving slow above small surfaces, so that space contributes merely to the performance. This area is used better for stabile mounting the stationary boxes. Also the shaft (blue, eccentric arranged) is well suspended there. The ring-shaped disks can be shaped like truncated cones (at A) or in shape of bowls (at B).

The rotor-cage (grey, see C) now is also ring-shaped. The radial ´rotor-blades´ are connected with concentric rings, outside and at the middle (possibly also between). The rings must be guides by each three ball bearings. At the middle, the rotor-cage has a gear rim (dark green). The drive is done by a gear wheel (blue) at a common shaft and one motor (M, green). Several rotors (here e.g. five) can build one unit. For service functions, each autonomous thrust-unit can be exchanged completely (´plug-in´ respective like baggage container, see D).

Table 05.16.13 shows the data. A small version (left) has an inner radius of 0.5 m and an outer radius of 1.0 m. A larger version (right column) has radius of 1.0 m and 2.0 m. The ring-shaped faces are 2.4 m^2 respective 9.4 m^2.

The small version is running 1200 rpm and the large version only with 450 rpm. The maximum speeds at the rim are (suitable) 126 m/s resp. 94 m/s. The weighted average is assumed at 2/3 of the radius, thus the average speeds are calculated with 105 m/s and 79 m/s.

05.16.13

High Performance Engine			
Radius inside	m	0,5	1,0
outside	m	1,0	2,0
Ring-Face	m^2	2,4	9,4
RPM		1.200	450
V max inside	m/s	63	47
V max outside	m/s	126	94
V fast at 2/3	m/s	105	79
V Difference	%	5	10
V slow at 2/3	m/s	99	71
F fast rho=2.0	N/m^2	10.955	6.162
F slow	N/m^2	9.887	4.991
F Difference	N/m^2	1.068	1.171
P at Ring-Face	N	2.515	11.029
P at 5 Rotordisks	N	12.577	55.146
P of 4 Units	N	50.309	220.584

The speed difference of flows along the stick- and glide-faces was assumed with 5 % at previous calculations, and also here at the small version. At these cone- and bowl-shapes, a difference of 10 % is quite realistic, and used here at the large version. So the kinetic pressure of the flows is here calculated with 105 and 99 m/s respective with 79 and 71 m/s.

At great height, anyhow the boxes must be hermetic closed, so these machines can also work with density some higher. Here for example the density rho = 2.0 kg/m^3 is assumed. The kinetic flow pressure is calculated for both versions, each with the fast and reduced speeds. The difference of kinetic flow pressures is 1068 N/m^2 at the small version and 1171 N/m^2 at the large version. That difference of roundabout 1000 N/m^2 same time is the difference of static pressures at the stick- and glide-faces.

Quite upside, that one hundredth of the atmospheric pressure was aimed (1 kN/m^2 of 100 kN/m^2). This is achieved with both versions and realistic achieved by most versions. In order to achieve wanted thrust forces, only sufficient large faces must be installed. Here, the small version has a surface of 2.4 m^2, five rotor-layers are mounted at one unit, Four times these units produce about 50 kN. The large version has a surface of 9.4 m^2, resulting 220 kN as a whole – the size e.g. of an A320.

Consequences

These air-pressure-bowl-engines demand drive at a range of common service-functions of such airplanes. Small fuel tanks will do. Complex external jet-engines no longer must be build and maintained. These new machines are much lighter and easier constructions. They behave like (very large) gliders with according few noise pollution and air disturbances. Everybody might reason about the consequences, e.g. for airports and about other points of view.

Analogue to previous conception of a helicopter, all kind of helicopters will come up, designed for most different usage. Some cars already are driving autonomous based on assistant systems. Analogue the heli-flying might become everyday reality – with diverse consequences, positive and possibly negative. Traffic exists also at the land-, rail- and water-roads and even within airless space – and autonomous thrust would be welcome.

That´s no science-fiction. It´s only a smart usage of side-effects of known behaviour of the molecular movements of air particles. I make no patent application for this invention. Everybody may use these open-source ideas.

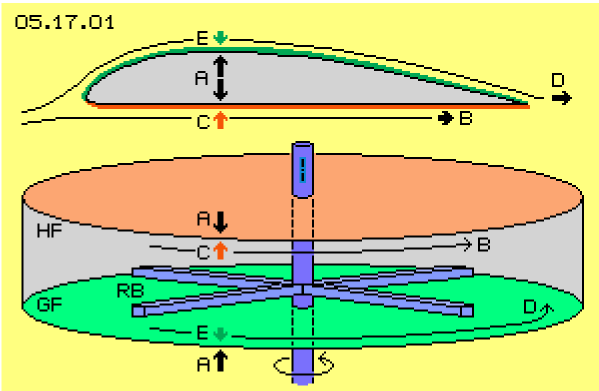
Evert / 2015-12-31

05.17. Aero-Statics of Bowl-Engines

Basics and Principle
At the previous chapter ´Air-Pressure Bowl-Engine´, the motion processes and force-effects at wings were transferred into a closed system. Basis of that principle is the well known effect of lift, like used by any airplane. However, the real cause of that appearance is contested by about ten different hypotheses. My considerations and comprehensive theory were published at chapter ´05.01. Lift at Wings´. Upside at picture 05.17.01, the air movements and affecting forces are sketched once more.

Within the profile (grey), the air is resting, so ´normal´ atmospheric pressure exists. This pressure affects from inside at the upper and lower face, thus it´s force neutral (see arrows A). The air at the below face (red) is resting, however the wing is moving relative to the stationary air. This is equal to an air-flow (see arrow B) along the below face with the airplane´s speed. The air particles hit not perpendicular onto the face, but by a flat angle. That´s why the static pressure onto the below face is some reduced (see arrow C).

Along the upper face (green), a real air-flow exists, because the air particles fall into the relative void upside-rear. That suction is spreading also toward the front, especially along the upper surface. That´s why that ´artificial flow´ starts far in front and some below of the wing´s nose. The suction affect spreads by sound speed, i.e. that wind relative to the wing exists only below sound speed. That real air motion of about 50 m/s adds to the airplane´s speed. So in comparison with the face below, the relative flow at the upper face is faster (see arrow D). That flow has stronger dynamic pressure and thus it can effect only reduced pressure onto the upper face (see arrow E).



The difference A-C presses down the below face. The difference A-E presses up the upper face. More simplistic: the total construction is pressed upward by the difference C-E. That resulting lift-force corresponds to the difference of dynamic pressures of these two air movements different fast.

Reconstruct at closed System
These processes are rebuild within the closed system of the air-pressure bowl-engine. Its general shape is a round hollow cylinder, like sketched at picture 05.17.01 below. The normal atmospheric pressure weights at all outside faces, force neutral in total (see arrows A). A rotor (blue) produces and maintains the ´artificial wind´. Its rotor-´blades´ (RB) are a right-angle profile, working not like normal props. They only keep the air steady rotating. The rotor-blades are moving above the below inner face by a short distance. This surface is most smooth, here called ´glide-face´ (GF, green). The distance to the inner face above is some larger. This surface is most rough, here called ´stick-face´ (HF, red).

Based on the different distances and the different quality of the surfaces, the flows along both faces show different speeds (see arrows B and D, upside slow, below faster). The flows show different dynamic pressures and correspondingly, they affect different static pressures onto the inner faces (see arrow C and E, stronger towards up, weaker towards down). Analogue to the forces at previous wing, here the lift-force comes up by the differences A-C and A-E respective direct by the difference C-E.

The lift force affects on the inner faces GF and HF, in total directed upward. The cylinder is fix mounted at the fuselage of the aircraft, so the lift force affects onto the whole body. All parts are stationary constructional elements, only the rotor is a turning part. The rotor blades are moving at horizontal level and they produce air movement only at the horizontal plane.

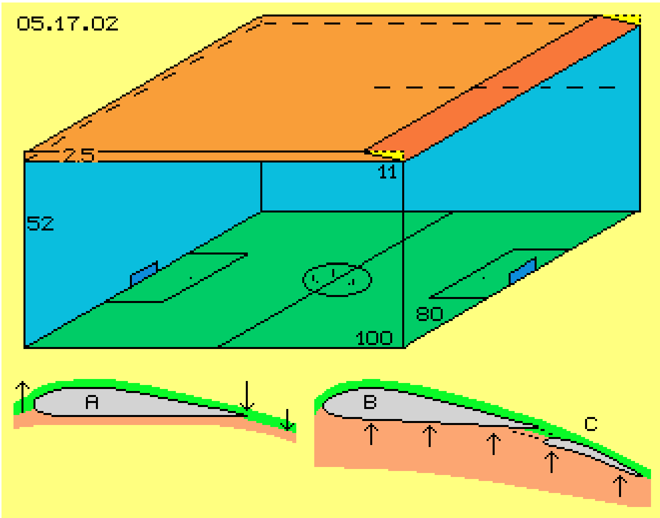
Force without Counter-Force
Normally, nobody might understand why that stuff could work anyhow. The scientist knows exactly: these ideas contradict the law of actio=reactio, because no force can exist without counter-force. Since long, that´s a fundamental knowledge, deduced already from simple mechanical processes. That´s completely right – however fluids are no solid bodies and within fluids are valid quite other rules.

Previous model of the bowl-engine is transferred one-by-one from the motion processes and force effects at a wing. So this criticism same time concerns the common hypotheses of lift at wings quite generally. It´s common understanding, the different speeds are the trigger for lift force coming up. However, one does not agree in the assumption, why that difference is coming up. For example, it´s still told the naïve idea: the way upside is longer than the way below (no comment, the true cause is discussed comprehensive at previous mentioned chapter about ´Lift at Wings`).

Undisputed are the formula of dynamic and static pressure relations. Consequently applied, they deliver previous clear results. Nevertheless, they do not fit with the mechanical law, any action needs a corresponding counter action. Based on this common idea, air masses must be pushed down so strong, corresponding to the lift work for keeping an airplane at its momentary level – like e.g. it´s practice at helicopters.

Air-down / Aircraft-up
Just this is the assumption of the prevailing hypothesis. At chapter ´05.12. A380 and Lift´ were presented the calculations of a scientist (of a prestigious air- and spacecraft-faculty at a German university). The data for the A380 resulted in brief (for details see that chapter):

Based on the law of impulse-constant – the aircraft is affected by a lifting-impulse corresponding to the downward-impulse of air – a mass of 415 t must be accelerated down by 12 m/s. The acceleration of that air-mass-flow demands about 39.400 PS – correct determined by physical rules and common accepted result.



I wonder why these (mathematical consistent) results are not checked versus obvious reality. Based on the assumed density rho = 1 kg/m^3 that air-mass is equal to a volume of 415.000 m^3, sketched upside at picture 05.17.02. The A380 spans 80 m and it takes one second for crossing a football pitch (green) with the assumed speed of 100 m/s. An 18-floor-building (blue walls) of 52 m height would have likely volume. Upside right is marked the wing (dark-red) with its face of 850 m^2, 80 m wide and 11 m long, with an extreme angle of attack (yellow).

Really Impossible
The wing can grasp a layer of air (light red) of 2,5 m height at its maximum, during that one second only 2.5*80*100=20000 m^3, not even 5 % of the involved volume. There is no chance for pushing down the remaining 95 % volume respective masses by 12 m/s.

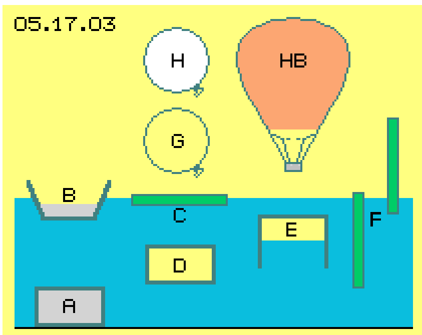
Indeed, that´s a real impossibility. Previous calculations are correct. However it´s assumed, the air would show the properties of a solid body: an impulse on a (part-) face immediately would affect the whole mass. Opposite, one can not ´catch´ the air, the pressure is not forwarded mechanically, the air is compressible and escapes immediately into areas of less density, by sound speed, without feeding back (mechanical) counter-pressure. The wing simply can not reach enough air-masses in order to produce downward-current of that size, demanded by the view of impulse-constant respective the law of force / counter-force.

This mechanistical view is most common and it´s also suggested, the air upside of the wing would be drawn down, and behind the wing even deeper – so the aircraft correspondingly would rise up. Picture 05.17.02 once more shows previous profile A: the air is lifted at the front side, before falling down at the rear end (see arrows). Might be the air later will go on falling down, however with no importance for the lift (because up there are no mechanic lever-arms for balancing forces).

Dam-Up-Air / Push-Up-Aircraft
Below right side, this picture shows a situation, where air indeed is pressed down: if the wing (B) is tilted and rear-flaps (C) are extended. Again however the downward-motion of air is without importance, but the air is dammed up, compressed, building an ´air-cushion´. The counter-pressure is pushing upward the faces (see arrows). However this works only near the ground. The downward pressure wave spreads with sound speed. The counter-pressure comes back only by half speed. It takes one tenth of a second for moving the wing-length of 11 m. The counter-pressure is running only some 15 m, so will miss the wing already by slow speed and short distances.

That ´pushing-up´ above the tilted plane of an air-cushion demands much thrust (and that´s why the rear-flaps are retracted short time after lift-off). That work of lifting by pushing-up of the airplane masses occurs corresponding to the mechanical laws. One must differ strongly the ´natural lift´ of wings – because that occurs by the totally different rules of hydro-static buoyancy.

Buoyancy at Water and Air
That well known process is sketched at picture 05.17.03. Within the water (blue) all bodies (A) with heavier specific weight sink down to the ground. A body (B and C) is swimming at the surface, if its mass is some less than the water displaced. If both are equal, the body (D) will glide anywhere within the water. If a box (E) is open below, the enclosed air is compressed until the pressure is balanced at the below border-face. If the inside pressure is stronger than the water-pressure at the upper face of the box, that body will rise up.



Decisive for that buoyancy, all times is the difference of water-pressures onto the faces below and upside. With every meter of depth, the water-pressure increases by on ton, i.e. by 10000 N/m^2. For example, this becomes obvious if a wooden stick (F) is holt vertical within the water. If it´s released, the pressure vehemently catapults the stick out of the water.

We are steady exposed to the atmospheric pressure. However we merely register it´s weighting with about 100000 N/m^2, so corresponding to a water-pile of ten meter. The airs seams light, however the buoyancy is working like at the water. A balloon (G) filled up with air is nearby as heavy like the displaced air and is gliding around anyhow. A balloon (H) filled up with a light gas will rise up.

Accelerated molecular Speed
An interesting case is a hot-air balloon (HB): below it´s open so the air pressure inside and outside is balanced. Different however is the molecular speed of the air particles, which inside is accelerated by the heating. Some ´fast´ particles indeed are rising up within the balloon. Above this, anywhere the direction and speed of particles is exchanged at each collision, so the fast speed is forwarded from one particle to the next. The hot gas demands wider space, it´s lighter and thus rising up.

The normal atmospheric pressure weights outside at the balloon-shell, as the particles hit onto the material with their normal molecular speed. The particles inside hit some stronger versus the material as they are moving faster. Resulting is a difference of static pressures.

The air pressure is calculated by formula P=0.5*rho*v^2*0.7 = 109375 N/m^2 (density rho=1.25 kg/m^3m, molecular speed 500 m/s, factor 0.7 because the particles in average hit onto a face by an angle of 45 degree). If the added heat increases the molecular speed only by 3 m/s, a difference of more than 100 N/m^2 comes up. A balloon with 8 m radius has an effecting face of 200 m^2. The small difference of static pressures can keep gliding a cross-weight of 2000 kg. Further heat will rise up the balloon. The balloon will go on rising without further input of energy. Occasional heating must only balance the heat-losses.

Hydrostatic and Aerostatic Buoyancy
That´s the grave distinction to previous mechanic lifting: that pushing-up of the airplane-mass above the tilted plane of the air-cushion demands steady input of energy. Opposite here, only once must occur the heat-input and afterward, only the heat-losses must be compensated (comparable with friction-losses).

Here, the buoyancy force is caused exclusive by the difference of static pressures at the effective faces, e.g. based on different water-pressure at different depth. This difference can be increased ´artificial´, e.g. at that hot-air balloon with accelerating the molecular speed. Decisive all times are the pressure-relations direct at the border faces, here inside and outside the balloon-shell, quite near to the material.

A difference naturally come up also with air-flows, e.g. if a storm razes over the flat roof of a building. The wind has strong dynamic pressure and can affects pressure onto the roof corresponding weaker. The normal (now however relative stronger) atmospheric pressure within the building catapults the roof off.

At the other hand, that wind can be created ´artificially´, e.g. via suction effect above the face of a wing. The inevitable resulting difference of static pressures, direct at the border-layers above and below the wing, generates the lift-force.

Energy input is only necessary for the forward motion of the airplane, thus only for balancing the air-resistance. The ´buoyancy-force´ is resulting exclusive from the difference of static pressures, by the laws of hydro-statics respective rules of fluid-dynamics (and certainly not by the laws of solid-body-mechanics). Just corresponding with the processes at any wing, the effects are rebuild within the closed systems of bowl-engines.

Data of the A320
Previous statements are supported by A320-data shown at table 05.17.04. Three columns show the phases of starting, rising-up and travel-flight, at heights of 0 m, 4000 m and 8000 m, where the density is 1.2 kg/m^3, 0.8 kg/m^3 and 0.5 kg/m^3. The speeds are 280 km/h, 560 km/h and 840 km/h, respectively 78 m/s, 156 m/s and 234 m/s.

It´s realistically assumed, the flow along the upper face is faster by 50 m/s than along the face below. The dynamic flow-pressures are calculated for the upper and lower faces (PDO and PDU, O=oben=up, U=unten=below). The PD-difference is multiplied by the wing-face of 122 m^2, resulting the lift-force (P-Lift).

Already at the start-speed of 280 km/h sufficient lift-force (resp. buoyancy) exists for rising-up the A320 with its start-masse of 70 t (700 kN).

For the following climbing up, the mass is rising up alone by the surplus of buoyancy forces (e.g. at 560 km/h with 883 kN). Also at travel-speed within ´thin´ air, the lifting-force of 790 kN is stronger than demanded (the profile-example at chapter ´Lift at wing´ had an additional flow of 45 m/s, which here would result even better matching data).

05.17.04					
Lift-Force	PD = PDO-PDU		P=0.5*rho*v^2		
Height	m	0	4000	8000
Density rho	kg/m^3	1,2	0,8	0,5
V	km/h	280	560	840
VU	m/s	78	156	234
VO=VU+50	m/s	128	206	284
PDO	N/m^2	9.830	16.974	20.164
PDU	N/m^2	3.650	9.734	13.689
PD Difference	N/m^2	6.180	7.240	6.475
Wing-Face	m^2	122	122	122
P Lift	kN	754	883	790
Start-Acceleration				
Mass m	kN	700		
Wb=0.5*m*v^2	kNm	212.940		
Length s	m	2000		
Fb = Wb / s	kN	106		
Air Resistance		F=0.5*A*rho*v^2*Cw		
Face A	m^2	40	25	25
Cw		0,3	0,2	0,2
Fw	kN	44	49	68
Fb + Fw	kN	150		
Trustforce	kN	210	140	87

The mass m = 70000 kg is accelerated with a = 1.5 m/s^2 at a runway of s = 2000 and after the time t = 52 s the speed v = 78 m/s is achieved, demanding a thrust Fb = 106 kN. Same time, the air-resistance must be overcome. With extended rear-flaps, the cross-section face might be A = 40 m^2 with Cw = 0.3, demanding up to 44 kN thrust. So at the end of the runway, 150 kN thrust force is necessary, available by the installed power of roundabout 210 kN.

If the rear flaps are retracted, the face will be reduced to A = 25 m^2 and also the Cw = 0.2. Decreasing density but increased speeds results stronger air-resistance, demanding stronger thrust (e.g. of 49 kN and 68 kN). The performance of the installed engines decreases linear with the density (e.g. at 140 kN and 87 kN). Finally these facts determine the optimum flight-level and travel-speed.

Force and Counter-Force
These data confirm, energy-input is used for the acceleration at the start and up to the travel speed. Additional energy-input is necessary for balancing the air resistance, however not for the lifting of the aircraft. Previous critical question about action / reaction now has an answer most clear:

A wing does not float within air-less space. The wing is ´clamped´ by the atmospheric pressure, from upside and below with 10 t/m^2 respectively 10000 kg/m^2 respectively 100000 N/m^2. Caused by the relative flow direct at the border faces, a difference comes up at a size of about 6000 N/m^2 (row PD-Difference). So the pressure differs only by 6/100 between the upper and lower face – resulting lift-forces sufficient for lifting heavy aircrafts.

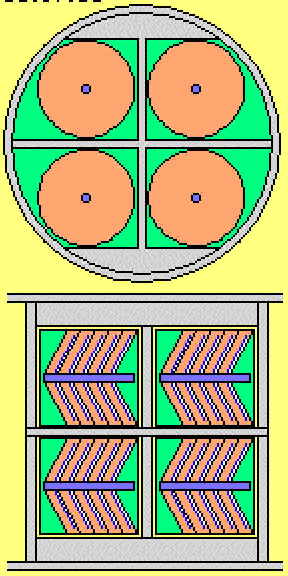
That´s the decisive difference: the air-resistance is compensated by the jet-engines via reaction (see row Fw with 44 kN, 49 kN und 68 kN). At great height and low density, the performance of the engines is very reduced. They are just able to compensate the strong air resistance (increased by fast travel-speed). Opposite and quite different, the buoyancy is generated by (hydro-) static rules (see row P-lift with 754 kN, 883 kN und 790 kN).

It´s clear stated: the thrust is only demanded for acceleration of the aircraft and its forward motion. That´s only the trigger for generating the buoyancy. It´s clear stated: the generated lift-force (row P-Lift) is stronger than the invested thrust-force (Fw) by factor 11 and up to 18.

Some people mix-up these facts with a ´Perpetuum Mobile´. Realiter however, it´s only the clever usage of given forces of an open system. All pressure-forces used here, finally are based on the omnipresent gravity.

Horizontal like Vertical
This process and the effects of pressure differences can also be realized within a closed system. The wings produce forces in vertical direction. Likely forces can be directed horizontal within a closed box. A bowl-engine thus can serve for the drive of an aircraft, e.g. like sketched at picture 05.17.05 and shown by data for an A320 airplane.

05.17.05



Thrust-Bowl-Engine		A 320
Radius	m	0,65
Face	m^2	1,33
Circum. R0,45	m	2,83
Density 10	kg/m^3	3,00
RPM		2.400
V-Diff. GF/HF	%	10
V-GF	m/s	113
V-HF - 10 %	m/s	102
PD-GF	N/m^2	19.167
PD-HF	N/m^2	15.525
PD-Diff	N/m^2	3.642
P 1 Disk	N	4.831
P 5 Disks	N	24.157
P 4 Units	N	96.626
P 2*4 Units	N	193.253

The fuselage has a diameter of four meter. At the rear area of the fuselage are installed the engines with total length about four meter. Each four units are installed at two levels. Each unit has fife round hollow cylinders at one shaft with one drive-motor. The boxes here are shaped like cones. The rotor can draw the air around convex glide-faces without resistance and same time, the air affects stronger pressure onto the concave stick-faces.

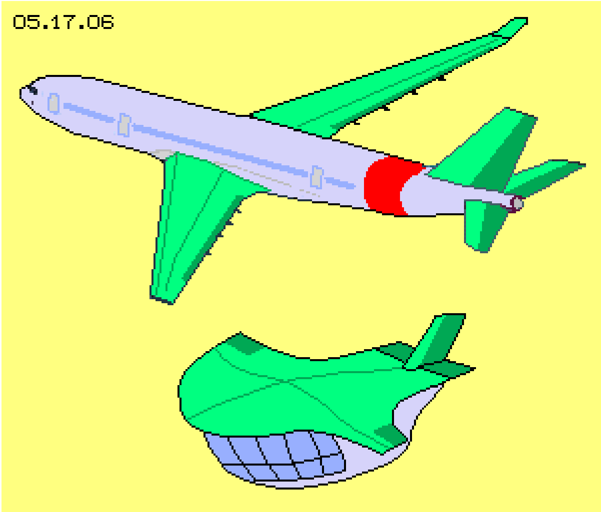
The radius of the rotor-blades is 0.65 m, covering a face of 1.33 m^2. Weighted averages are given at a radius of 0.45 m, respective at the circumference of 2.83 m. The performance can be controlled by the density, e.g. the system is driven with rho = 3 kg/m^3. The performance naturally is also controlled by the revolutions, here e.g. with 2400 RPM. The difference of the flow speeds along the glide- and stick-faces (GF and HF) is only to measure empirical. At wings the differences are 60 % to 25 %, here only 10 % are assumed.

The weighted speeds are 113 m/s and 102 m/s, the difference of dynamic flow pressures is 3642 N/m^2. Same time that´s the difference of static pressures (here about half of the lift-pressures at a wing). Multiplied by the effective faces, one unit will deliver a thrust force of about 24 kN and in total the eight engines about 193 kN (i.e. a size comparable to the present installed jet-engines).

Advantages of Aerostatic Thrust
When the thrust is done by reaction-principle, many tons of hot gases must be accelerated up to 300 m/s, on and on, demanding steady energy input. The weight of necessary fuel is one quart (at least) of the cross-weight at the start phase.

At this bowl-engine, the thrust is done by the hydro- respective aero-static principle, which is much more effective. For example, all cylinders of previous engine in total contain only 10 kg of air, which is once accelerated up to about 100 m/s. Afterward the rotors must only keep the air rotating, all times running around, along cone-shaped faces. Much less fuel is necessary (probably less than one tenth). The start weight is reduced, so the acceleration demands less thrust.

The internal installed bowl-engines replace the external jet-engines, so the air-resistance will be reduced (see picture 05.17.06). The performance of the bowl-engines is constant at all heights. The new engine is much lighter and easier to build with corresponding advantages of costs and for maintenance. Last but not least, these airplanes are silent like gliders.



These advantages are valid also for the new conception of helicopters, as described at previous chapter. There, not only the thrust is done with bowl-engines, but also the lift and the control functions. All units are integrated within the fuselage. This new helicopter causes no external air movements, flying and hovering quite silent (details see that chapter).

That´s no science-fiction. That´s only the clever usage of side-effects of the known behaviour of molecular movements of air-particles. The air-pressure-bowl-engine is tremendous effective because working by the rules of hydro- and aero-static buoyancy. Its background is the enormous energy of the atmospheric pressure, which by itself is an appearance of the omnipresent gravity. No patent application is done for this invention. Everybody may use these open-source ideas as he likes it.

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