

Following the end of World War 2, the Australian inland continued to be a remote, very sparsely populated, and undeveloped area, with very poor road and rail networks. Any aircraft used for logistics, medical or communications purposes were either RFDS (being redundant, early generation ex British aircraft) or sometimes, tasked RAAF aircraft.

Although the Adelaide to Darwin telephone connection had been finalised years earlier, telephone connections were only available in towns (Marree, Oodnadatta, etc) or in very large, highly resourced homesteads. The rest of the outback community relied on RFDS and civil aviation (DCA) centred HF radio. Although quite good for most of the time, communication problems occurred.

“De Havilland Dragon Rapide”



“De Havilland Drover”



As the post WW2 1940s became the early 1950s, the two aircraft pictured above were typical examples of aircraft availability. 99% of the medical flying was by day. Night medical evacuations or night doctor interventions were not the norm. For a start, many of these aircraft were not even equipped with electric generators, or alternators. They were equipped with batteries for primitive external and cockpit lighting, but once the batteries were drained, recharging on the ground was required. Instrumentation was mostly restricted to the basic primary instrumentation for attitude control – partially sourced by external venturi (s) for gyroscopic instruments.

Night flying in these aircraft was, in practice, illegal; it needed to be flight planned / notified TO DCA / ATC as a “MERCY FLIGHT”. Depending upon aircraft type, engines were not necessarily fitted with starter motors, and their magneto ignition systems were independent of the aircraft electrical systems. As such, the pilot could “chock the wheels” and “hand swing’ the props for engine start. As a 17 year old trainee pilot, I was required to demonstrate the technique with my instructor already “strapped in” (Victa AT 100).

Then followed the progressive introduction to Australian aviation of mass produced American built Cessnas, Pipers, Beechcraft etc.

Oscar Jackson, the founder of PAGAS, was a pilot with the Broken Hill based company Silver City Air Services. He was deployed to Port Augusta from Broken Hill as a senior bush pilot, flying the single engine Cessna 180 "taildragger". He understood the potential of Port Augusta, less than 200 nautical miles north west of Adelaide, as SA's north-south / east-west "gateway to the outback".

Oscar Jackson was an extroverted "black sheep" from a wealthy English family. At the end of World War 2 he had qualified as an RAF pilot. The training, leadership and brash supervisory culture of PAGAS derived from his RAF background. As a fairly "driven" extrovert, he resigned from Silver City Air Services and secured the: Commonwealth Railways; SA Highways Department; and RFDS contracts necessary to start the airline with 2 PA32 – 300 Cherokee Six aircraft.



The 2 Cherokee 6's above were the initial aircraft of all company pilots. The PA 32 was an aviation "truck". It was good to fly, forgiving of very heavy loads (Commonwealth Railways), but had an inefficient wing in terms of converting a fuel thirsty 300 horsepower engine output to speed. It was not a STOL aircraft.



PA32 aircraft wings were much later fitted with leading edge "vortex generators" (above) to increase lift & reduce profile drag (think about a golf ball). The 12V battery was underneath the nose locker floor, which was always loaded for forward C of G. BIG ADVANTAGE! REAR DOOR. —>

When I commenced at PAGAS on April 12th 1971, it was after some time as a flying instructor at RACSA, Parafield Airport. I rode my motor scooter to Adelaide Airport, where it was loaded, intact and upright onto VH – PGB. I then flew the aircraft to Port Augusta under the supervision of the company pilot I was replacing. The company also had pilot accommodation ready in a friendly couple's house. The organization had a "benevolent military feel", and our collective social lives revolved largely around our workplace.

It must be remembered that the terrain between Port Augusta and Darwin was well known to be potentially lethal at the time. There had been a number of aircraft and motor vehicle deaths from heat stress and thirst, as a result of navigation or communication difficulties. I refer you back to Slide 1. During my 18 months at PAGAS, I accrued about 1000 hours on the PA32, but I was heavily supervised and checked out in the first few weeks. After that period, like all other pilots in the company, my supervision was "indirect".

LACK OF "BUSH PILOT AIRMANSHIP" AND KNOWLEDGE COULD BE FATAL. IT LED TO DISMISSAL OF SOME PILOTS.



Along with BE-55 "Baron" VH-FMS (next slide), PA32-260 VH-FDY was owned by the RFDS and operated under contract by PAGAS. The 2 aircraft were backed up by the 2 company Cherokee 6 300s which had bigger engines than FDY (260). The stretcher system was completely different to, and incompatible with, what is now S.A. Ambulance Service. 4 pegs on the stretcher had to be lined up with 4 "keyhole" receptacles in the aeroplane, dropped in, then locked by sliding. IT WAS A NIGHTMARE, particularly with a heavy patient! The pilot was on the inside, with 2 helpers on the outside, loading through the left rear door as above. The BE-55 was RHS, rear cargo.

Similarly, in the case of the BE-55, the rear cargo door on the RHS, seen in the picture was the patient loading door. Needless to say, if the patient was sufficiently mobile, he / she was better climbing in to the aeroplane, onto the stretcher in situ behind the pilot. On many occasions we “retrieved” sitting patients while already returning with a stretcher patient on an evacuation, depending upon urgency.

Spinal cases were a nightmare. On those occasions when a spinal injury was retrieved, (often Coober Pedy) the patient stretcher was simply placed on top of the ambulance vehicle stretcher and secured as well as possible. In the event that the (almost always male opal miner) patient was not a quadriplegic or (more commonly) paraplegic before the evacuation, he would have been afterwards.

I was never endorsed as a BE-55 pilot. Instead, I was cleared to operate the Cessna 402A out of Katherine N.T. (later slide). Apart from my own ego, this was not too bad. “I was not the “doctor’s chauffeur”



In many ways the single engine PA32-300 operations were the ones that really made the company’s name so well known north of Port Augusta. We were considered developmental operations, rather than charter. As such, we were allowed to fly “Night VFR” in single engine aircraft. I loved night flying (especially single pilot with no check pilot) and flew as much as I could at night, albeit in single engine aircraft. This all changed with “reinterpretation of the rulebook” late in 1972, by which time I was en-route to Air Traffic Control. The flying variation was enormous, from foul weather operations at Penneshaw, KI, to flying just above the tops of the sandhills in the Simpson Desert, dropping emergency supplies after floods. I was checked onto my first twin in Nov 1971-below.

The company was authorised to conduct some conversion training during its RPT operations from Pt. Augusta through Pt. Pirie, Adelaide, Penneshaw (KI) and Woomera: the balance was conducted as dedicated base training at Pt Augusta. We were required to have a minimum of 25 hours on type before operating BN-2A, VH – ROV (right) as command pilot on RPT ops. The BN-2A was first produced by English company Britten Norman, but is currently still in production with the (Swiss) Pilatus corporation. I logged about 30 hours dual, and 185 hours command. Some flight time was night; mostly day.



VH – ROV was a very early version of the BN-2 series, and had some design bugs which were progressively improved with later versions. We needed to check every PK screw on the aircraft during daily inspections, because the aircraft had a very rigid semi-monocoque construction which created transmissible vibrations, compromising components. The aircraft had very good short field take off and landing characteristics and performed well with heavy loads. High wing, with good propeller / ground separation, I once landed in the “Penneshaw Cow Paddock”, rain saturated and muddy, in 40 knots crosswind with 9 passengers plus baggage – the aeroplane performed beautifully, just as it did during a later Penneshaw take off (on a good day) with a similar load. It was slow and noisy, but performed well; and was also quite good on a 4 week detachment at Katherine, NT. I returned from Groote Eylandt to Katherine empty on one occasion and, with the benefit of twin engine security, flew the whole trip at 500 ft. AGL. The aircraft “wallowed” somewhat in the thermal turbulence, particularly with no payload. Other twins could be similar, “wallowing” in turbulence.



The picture above shows the BN-2A brand new . If we refer to the previous slide we can see the wear and tear, notwithstanding the ongoing washing, polishing and vacuuming by non flying pilots. The 2 pictures at right show a very new Cessna 402A (top) and after a few short years (bottom). The C402A, VH-PAU was the real money earner of the fleet, semi permanently deployed at Katherine NT. It ferried Commonwealth Railways workers Darwin - Port Augusta – Darwin once per fortnight. Maintenance was performed at Port Augusta on the 48 hour turnaround, then the aircraft “lived outside” at Katherine.



I commenced training on the C-402A on 14th Feb 1972. Neither myself nor any other pilot was given much warning that this would occur. PAGAS, “tending towards para military in management structure” published the roster a few days before my training departure, and I prepared. My selection “ruffled a few feathers” amongst my peers regarding seniority, but the company did not conduct debates with its pilots. 90% of my training was conducted dual, en – route, often with passengers, between Port Augusta and Darwin, Katherine, Gove and Groote Eylandt. The operation, as “the real money earner” for the company, cross subsidised the RPT operations between Woomera, Port Augusta and Penneshaw. Arriving in Darwin in the latter end of the wet season with no local knowledge, I found the operation difficult, and the humidity very tiring. The food bill in Katherine was probably higher than my weekly wage, and the accommodation was: two pilots sharing sleeping quarters, albeit with our own cooking facilities and fans (only) in the accommodation block. My command time commenced on 28th March 1972, and I did at least 2 x 2 week command deployments from Pt Augusta – Darwin – Katherine, also servicing Gove and Groote Eylandt.

The C - 402 was a big step up for me and I found it a total delight to fly.

By early May 1972, it was becoming apparent, even to all company pilots that the PAGAS financial position was precarious. The Katherine “money earner” contract was ending because of a slump in Australian metal exports to Japan. A liquidator was actually a passenger on the final C-402A Pt Augusta – Darwin flight, and he disembarked at Katherine. At the end of my two week stint, I went on leave, during which time the C-402A “disappeared”. The Katherine obligations were then finalised using ROV (the BN-2A).

During May 1972, I made the decision to apply to Air Traffic Control, and my application was submitted from Katherine, where I was flying the 2 week detachment on my own. Most of the pilots came from wealthy middle to upper class private school backgrounds. There were 4 pilots (including the chief pilot) who were not. Of the 4, the chief pilot and myself moved on at very different times, of our own volition. THE OTHER TWO ??? When I left as “a lower working class type”, my own financial position was “a bad joke” and did not show any signs of improvement until I entered Air Traffic Control in December 1972. In 18 months, I had flown about 1200 PAGAS hours, and left with a little over 2000 hours, hopefully somewhat wiser.

I continued to fly, with whatever means were available to a working class ATC person with a family, throughout my 26 years in ATC; returning to flying / lecturing after retirement at age 50. **IF YOU WANT TO MAKE A SMALL FORTUNE FROM AVIATION, START WITH A LARGE ONE!!**

PAGAS were taken over by a Victorian entity called CONVERE (John and Vera Considine, who had links to Burma Oil / BP somehow). Most of the other pilots from “the more upper class” backgrounds moved on to TAA, Ansett, Cathay or British Airways. David Hogan, the PAGAS chief pilot, became famous in South Australia as a helicopter pilot. One joined an executive airline, flying VIPs in jets.

As a (far too) young flying instructor in 1970, I was philosophical about my “general aviation” (G.A.) working conditions, and had high hopes for a future as an airline pilot. Although not totally universal, there was, however, a great deal of derision towards G.A. pilots. The chief pilot, David Hogan had some difficulty with the senior Flight Service Officer at Katherine, who seemed to think that the runway light electricity bill was not to be invested in G.A. aircraft – airline aircraft of F27 size minimum! David Hogan was a successful and fairly forceful personality. I was quieter, younger and less forceful, but was aware that this “jumped up bean counter” was playing a power game. I left Darwin at 4:00 AM, heading for Katherine, having organized lights (supposedly through Darwin ATC). I arrived at Katherine about 1 hour before first light, with 70 minutes fuel in the tanks. There were no lights, but I did have enough fuel to return to Darwin with some reserves. As pilots, we did have a company philosophy of “WHATEVER IT TAKES!” I flew over the town in the dark at about 800 feet above ground level, gently cycling one of the pitch controls to de-synchronise the propellers. I was about to start a second run when the town lit up like a festival – there were flashing lights in all directions – then the runway lights illuminated, and I landed. The Flight Service Officers accused me of not organizing lights in the appropriate manner. I GAVE THEM “AN ABSOLUTE MOUTHFUL”! I then told them that I would be incident reporting the occurrence to DCA / BASI through the PAGAS hierarchy. No more problems. My passengers were by now quite bemused and amused by my performance, as we carried on to Port Augusta.

Two of the most realistic and best people in DCA were 2 Bureau of Air Safety and Investigation Branch (B.A.S.I) superintendents – Doc Whitburn and Charles Roper AFM. Both were ex WW2 pilots, with extensive, actual combat time. This produced understanding and humility. Another who impressed me was Bruce Bretherton DFC; MBE. Apart from anything else, he endorsed me on a Piper Aztec. I had not flown a twin for years, but Bruce removed all of the “macho garbage”. WITH HIS BACKGROUND, HE HAD NOTHING TO PROVE.

In the event of a flat battery "jumper lead" start from a vehicle, the locker contents and floor were removed. With the engine / propeller running at about 1200 rpm, jumper leads were removed, floor and locker contents replaced, and the locker door secured. Later versions of the aircraft were fitted with jump start kits and 12 V jump sockets on nose LHS. I always did it myself to avoid injury to others, with a reliable assistant in the cabin.



PA-32 nose locker, hinged on its top edge. Nose locker floor: a piece of aluminium alloy carpeted, and secured with spring loaded PK screws. Battery under the floor.

The Piper Saratoga pictured (PA32R – 301) is a direct derivation of The PA32 - 300. The obvious changes are: 3 bladed propeller (also fitted to some Cherokee 6's); and retractable undercarriage (beautifully engineered). THE BIG DIFFERENCE IS THE WING DESIGN.

The Cherokee 6 wing (unflapped) was symmetrical – 0 degrees angle of attack –zero lift!

It was a thick wing with maximum thickness 40% aft of the wing leading edge; therefore 80% “laminar flow”.

If maximum thickness was at 50% aft of the leading edge, it would be 100% laminar flow.

Laminar flow is supposed to reduce form drag (shape drag), but it doesn't work with a thick wing (FAST JET YES).

I had the luxury of being paid to fly one of these to Darwin and Gove from Parafield for Air Traffic Control. It was absolutely beautiful.

(PROVIDED SOMEONE ELSE PAYS THE BILLS!)



AIR TRAFFIC CONTROL (A.T.C. 50 Short Term Course Commenced Melbourne December 1972)

The ATC course which I undertook as a probationary member of the Commonwealth Public Service was Number 50 Short Term. This means that the course was 22 weeks in length, with roughly 21 ATC theory and knowledge examinations. (For novices, 24 months.)

After roughly 4 weeks, we commenced ATC simulator training. The simulator was very old technology, but it worked. When I look back, it was closely aligned to the ATC work I subsequently carried out at Alice Springs.

The instructional staff did their best to create realism, and were quite effective for the time. They “loaded us up” to the point where serious flaws and mistakes started to surface in the exercises. We swapped roles continuously to make the simulator work.

I found that all facets of the simulator work were very useful for my later career, but the one that stood out for me was a “nose to nose” between 2 “virtual” jets, both doing 485 knots in opposite directions on the same route at 33,000 feet. *I learnt from the “gut wrench”.*

The simulator was entirely non radar in setup and focus and, in addition to being a teaching tool, was also an effective aptitude test. The non radar environment in the terminal area was a forerunner of many strategies I would later use in Alice Tower.

My new wife and I were adjusting to married life, which didn't make things any easier, (although I very privately absolutely loved Melbourne myself). There were five or six graduated Qantas second officers, who had completed the Boeing 707 conversion before being retrenched from QANTAS. This turned out to be temporary, after acquiring ATC licences. There were also a number of ex air force / navy aircrew, along with at least one very experienced GA pilot (with a family) who made my experience look very low.

Two candidates failed the course, and the rest of us were returned to our designated capital cities for 3 - 4 months field training. I volunteered for Alice Springs Tower, and was “frog marched” to Alice (with family) by train in June 1974 for 2 years. The job in Alice as an aerodrome approach controller / small scale en-route controller / tower coordinator was extremely good basic ATC *non radar* work.

The “*gut wrench*” in the Melbourne simulator was reinforced 1 month before I left Adelaide for Alice. A QANTAS Boeing 707 and Air New Zealand Douglas DC-8 passed “nose to nose” at the same level (almost over Alice), missing by 100 metres (luck). The 2 aircraft were at 33,000 ft (FL330) where depth / distance / height perception is difficult. I BECAME VERY CAREFUL BEFORE I STARTED! Conversation in Alice about the incident was a “NO NO!” I think that the controller was moved to Melbourne for peer / supervisory support.

For a great deal of the time at Alice, we worked alone. I thoroughly enjoyed that aspect, and it served me well later in Adelaide on the upper level climb/cruise/descent area control roster. I returned to Adelaide and to my substantive position at the “bottom of the pile”. I trained as a ground controller (GMC) in Adelaide Tower which I loathed, although some short detachments to the tower were unavoidable. I then trained in the radar room as a (non radar) sector controller / area controller which I loved, and found interesting.

Area control above 20,000 ft. from the WA border to the VIC / NSW border; and from the NT border southwards was a large area with a huge number of traffic conflicts of: opposite direction; same direction; crossing direction; but 99% on fixed, pre determined routes. There was some interaction with radar controllers, and I processed descending arriving traffic at night without radar. BRILLIANT!

Along with the shift supervisor (SAAC), who was legally able to provide ATC services using radar, area controllers (called Sector 1) worked a 24 hour roster, along with 1 flight data controller (base entry level). On a midnight to 7:00 am shift there were thus 3 controllers rostered, but the morning shifts started arriving from 6:00 a.m. At least 2 of my supervisors were ex RAAF aircrew combat seasoned veterans. They had a humility which was not widespread in ATC. Some of the SAACs / SOC's were into their 60's when I qualified, and they went for a sleep for about 3 hours to "freshen up", and then provided effective radar services from 3:30 a.m, as appropriate. I would generally suggest to the flight data that he / she go and have a sleep – they did. I LOVED WORKING ALONE!

Because of my experience in Alice Springs terminal work, and my instrument rating training for night flying etc, I could legally process arriving traffic without radar. (JUST KNOW THE RULES !!) I loved working on my own, but enjoyed some of my human interactions.

Brief mention was made above of the abbreviation SOC. This stood for Senior Operations Controller, with oversight of flying operations within controlled airspace: also Search and Rescue operations outside of controlled airspace, but within the jurisdiction of various units (i.e. Adelaide, Melbourne, Alice Springs, Perth, etc). Among the SOC's qualifications was the ability to coordinate a (sometimes protracted) effort to assist or rescue occupants of an aircraft in distress or even simply a difficult situation. The SOC was assisted by an Operations Flight Controller (OFC) who was rated, inter alia, as an "Assistant Searchmaster" (ie SAR); and an Operations Controller (OC) who checked flight plans for fuel calculations / weather requirements etc. At the entrance level, was an Operations Flight Data (OFD) who performed as an entry level "dogs body" to the S.A.R team. CONTROLLERS TRANSFERRED BETWEEN THE TWO DISCIPLINES, HENCE OPS WAS NOT JUST A "DEAD END FOR DEAD HEADS". (EG SYDNEY / MELBOURNE OFTEN CALLED ADELAIDE ATC "DEAD HEADS").

One of the senior SOC's at Adelaide was an (ex RAAF) Pathfinder (NAV), with extensive WW2 Lancaster / Mosquito flight combat experience over Europe; and a DFC to prove it all. He successfully supervised (inter alia), "nasty" Simpson Desert SAR operations. The Supervisor Air Traffic Control (Adelaide) was an (ex WW2 RAAF) Squadron Leader, with extensive Hudson Bomber combat time north of Australia. His supervisor (initially) for the entire SA / NT region was similarly, (an ex RAAF) Catalina captain.

THE "PROCEDURAL" (NON RADAR) AIR TRAFFIC CONTROL METHODOLOGY WAS BECOMING EXTREMELY OUTDATED IN THE EARLY HALF OF THE 1980S. The introduction of what were then very new and sophisticated independent aircraft navigation systems such as: Inertial or OMEGA / V.L.F.; and later G.P.S. systems, put pressure on controllers to take aircraft off known predetermined routes, and send them direct to destinations from a random departure point, after the radar controllers had finished with them. The mix of routes became chaotic across many regions such as WA, SA, NT, VIC, NSW, but SA did not interact with QLD. I input "110% EFFORT TO SORT OUT THE SHAMBLES" as a supervisor, with some success. I followed a "convoluted" supervisor's path, doing as much as I could for the system (with some limited success), before achieving a transfer and qualification at Parafield, where I spent the last 8 or 9 years of my career as an aerodrome controller. FOR ME, PARAFIELD WAS "LIGHT YEARS" AHEAD OF ADELAIDE! By the time I took an early retirement / voluntary redundancy package at age 50 years, I had revalidated my flying qualifications in preparation for the transition. This included flying instructor and instrument ratings. I also became an aviation lecturer in (mostly) aerodynamics / principles of flight, with some other core aviation subjects. "General Aviation" was worse paid and more undesirable than it was in 1972, BUT I HAD ALWAYS LOVED FLYING.

100% Resistance due to Form Drag

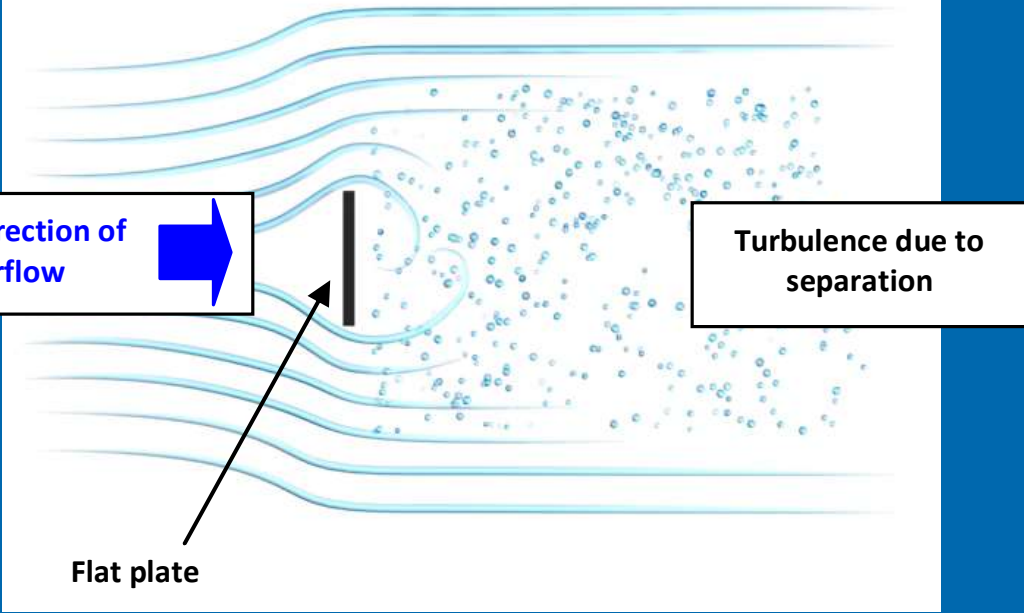
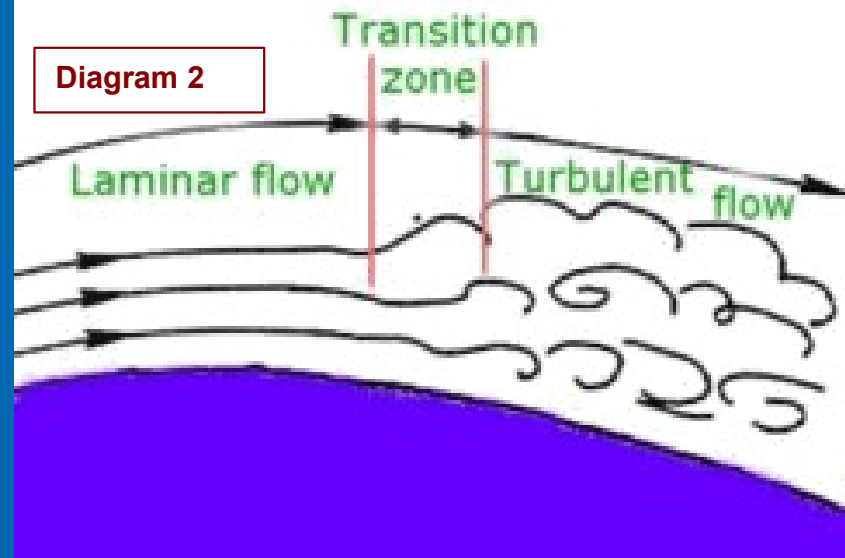


Diagram 2



Free air stream

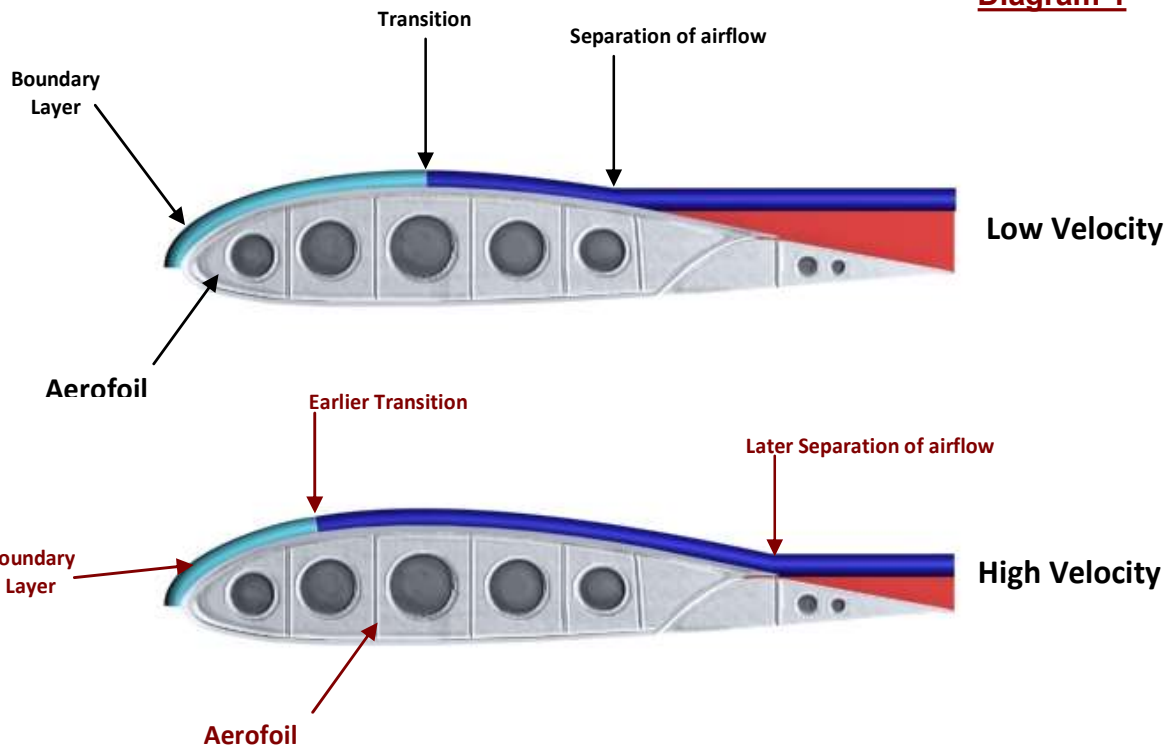


Diagram 1

Edge of boundary layer

$\leq 100\%$ FAS

Low Velocity

High Velocity

Diagram 1

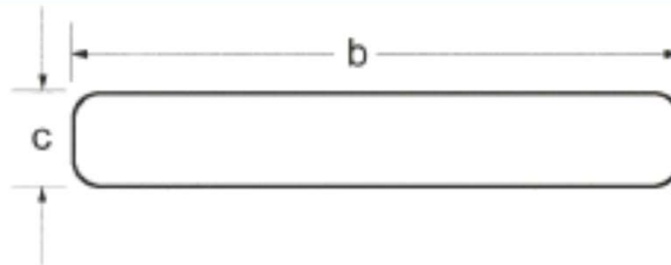
Surface

WING DEFINITIONS RELATED TO THREE DIMENSIONAL AIRFLOW AND LIFT DEPENDENT DRAG

S = WING AREA, sq. m (b x c)

b = SPAN, m

c = AVERAGE CHORD, m

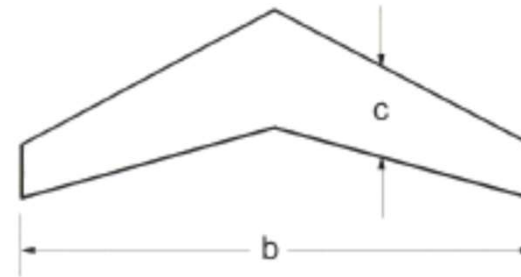
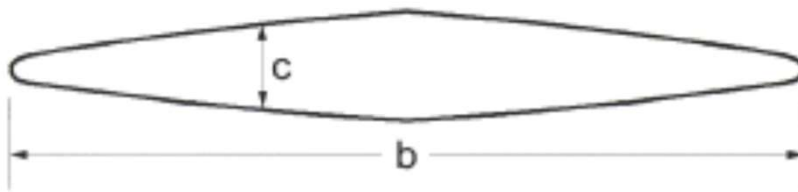


AR = ASPECT RATIO

$$AR = b/c$$

$$AR = b^2/S$$

Diagram 1 $AR = b^2/s$ for a non rectangular wing: approximately 35 for a modern glider; 12 for a modern jet transport; can be as low as 3 for a fighter.

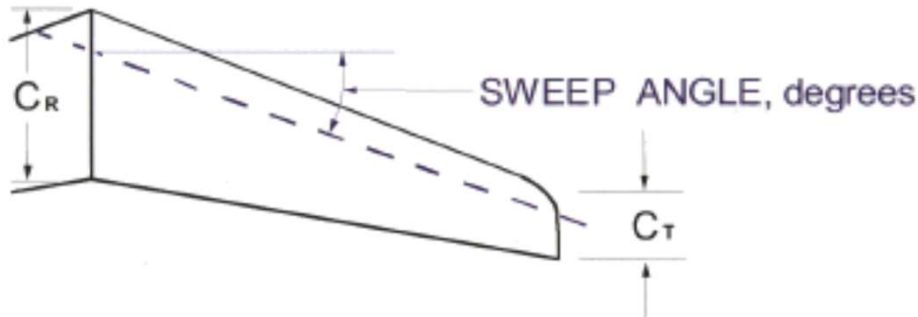


AR = ASPECT RATIO

$$AR = b/c$$

$$AR = b^2/S$$

Diagram 2 above & below: Taper Ratio (C_T/C_R) is 1 for a rectangular wing; 0 for a pointed tip delta: taper ratio affects wing lift & weight distribution.



C_R = ROOT CHORD, m

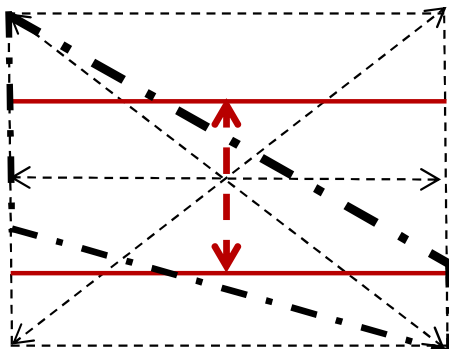
C_T = TIP CHORD, m

C_T/C_R = TAPER RATIO

Diagram 3 Sweep Angle

The angle between a line through all 25% chord points of a swept wing and the perpendicular to the root chord. Sweep angle changes lift curves, C_{Lmax} and induced drag curves, in addition to stall characteristics.

Diagram 4 MAC



The chord drawn through the geographic centre of the wing plan area. A rectangular wing of this chord and the same span would have broadly similar pitching moment characteristics. The MEAN AERODYNAMIC CHORD is located on the reference axis of the aircraft and is a primary reference for longitudinal stability considerations.

