General Note on Aircraft Development 1929 - 1947

The period covered by this Chronology was a time when many of the advances in science of the 19th Century were bearing fruit in terms of new methods and inventions. Never before had the power of mankind to change his world changed so quickly or with such great effect and power. The three main sources of power which had for centuries limited mans ability to move or build (wind, water and animal strength) had given way to machines powered by coal and oil. Wind power and the horse were replaced by the steam and the internal combustion engine. Powered land transportation, already revolutionized by trains, was now freed from set tracks. Developments in physics had given rise to electricity as a way to power machines, provide light, and speed communications, and promised a future of transmitting unlimited energy, while chemistry was developing new drugs to treat illness, materials that could be mass produced in complex shapes, chemicals that could fight disease carrying insects or improve the yield of crops.

One of the machines that rode on the crest of this age of invention was the airplane, realizing the long held dream of man to imitate the birds and fly.

The advantages of flight were many. Speed and accessibility were obvious; suddenly oceans, mountains and pathless forests which made travel difficult could be leapt across with relative ease in a short period of time. The view was important, for from the air features of the earth could be seen that had been obscured before. They could be photographed and mapped, and new resources discovered. Militarily this meant armies or fleets could no longer hide from the eyes of their enemies, so other means of concealment or deception had to be found. Alternatively, the searching aircraft could be met with other aircraft to prevent them discovering what others wanted hidden. Larger aircraft could also carry a load of explosives and attack military formations, preventing them from acting, and it was a short step from using aircraft to overleap the military completely to attack the factories that made their weapons, or the workers themselves.

Many people believed that aircraft had made war itself impossible as the cost was now too high.

All this was new and had occurred within living memory. The first powered heavier-than-air machine capable of sustained controlled flight had flown in 1903 just 11 years before the First World War in 1914, and that occurred just 3 years after its first military use as a bomber in 1911. Although development during the First War had proceeded at an astounding pace, once the war had ended that slowed as the need ended and funding became harder to find.

To fly, an aircraft has to very light, yet be a very strong structure. It needs to be the correct shape to generate lift, yet provide space for it's crew, power plant, fuel, to carry out whatever task it was intended to do, such as carry cargo, passengers, a load of bombs, or weapons to attack another aircraft. It needs an engine powerful enough to pull that load into the sky using it's lift and sustain a speed compatible with it's mission while being reliable and not prone to sudden breakdown.

In 1929 development of aircraft had shown steady progress since the end of the war in 1918. Competitions such as air races led to improvements in power, structures, drag reduction and speed, and these were about to come together so that aircraft at the forefront of development, when flown, might be superseded by another design within a year or so.

The biplane structure, or the externally braced monoplane, still made up the bulk of designs at this time as these methods made it easy to produce light, strong and relatively cheap airframes. The advantages of replacing wood as the primary structure with metal had become near universal as it was less expensive, requiring less special skills, and was more durable, although wood has great advantages in weight and the ability to absorb vibrations, and would continue to be used in special applications like spars and propellors even to the present day, while some manufacturers would continue to specialize in all wooden aircraft especially in England and the Soviet Union during this period.

Covering of aircraft was commonly done with fabric, cut, fitted and stitched to the airframe, then treated with chemical dope to tighten it, then painted. This was very light weight and metal covering was uncommon, used by some pioneering manufacturers for durability and for special purposes like engine panels to reduce fire risks. The development of the stress skin

method, where a metal panel was riveted directly onto the formers and spars to become a load bearing structure itself, was just being developed. Using this method the skin itself became part of the load bearing structure, allowing great reduction in the overall weight.

Engine power had risen from about 200 hp of the end of the war to a plateau of around 600 hp by 1929, and reliability had improved as well. Development of higher powered engines was continuing. A limit to the desire for speed, however, was the propellor. It's pitch was critical to the performance an engine could give an airplane. A propellor set to a fine pitch could give thrust to lift an airplane quickly into the air, but not provide speed when there. Set to a coarser pitch to give it a better 'bite' when flying fast meant it could carry less when taking off, or need excessively long runways. A propellor that could be set in flight to provide the best power for the conditions was the solution and this was being developed. And always there was the fact that the faster a propellor engined aircraft flew, the less efficient its propellors became.

Engine types were either inline engines with external cooling radiators using water to transmit heat, or air cooled engines using fins on their cylinders to dissipate heat directly. The most powerful of the air cooled type were round or radial engines, with their cylinders arranged around a short crankshaft to reduce weight and increase exposure to passing air. Although powerful the need for air across their cylinders caused drag, and for high speed it seemed the inline engine was the path to follow, while the radial provided increased reliability. However as the power of inline engines increased the size of their radiators also led to limitations of drag. Other methods of cooling were tried, finally coming to the use of chemicals with higher rates of heat absorption and dissipation to reduce the size of radiators.

That was 1929. By 1947 when this narrative ends virtually all aircraft were stress metal skin construction with few fabric covered parts. Piston engine power had increased to 2,500 hp, and commonly used propellors that automatically changed pitch to meet a preset power setting. A new form of engine had been developed, the turbo-jet, which became more efficient the higher and faster it flew, revolutionizing aircraft development. And rocket engines had been developed that could carry instruments above the air

itself, and into space.

And physics had found it could unleash power never before imagined from the chain reaction of few kilograms of solid metal in a container an airplane could carry to a city.