My career presentation is entitled ‘Muddling Through’. I would not recommend this as a career strategy, but that is how it sometimes felt. As you will see, things did not always go to plan and I did not follow my dream. Nevertheless, I had an enjoyable and successful career as an air traffic control engineer at various locations around the UK and I will share some of it with you.

Two things are of note on this slide. Firstly, I have included my post-nominals – the letters after my name. I do not use them very often, but they represent a great deal of hard work and effort.

BEng(Hons) is my Bachelor of Engineering degree level qualification, and took a great deal of effort to achieve because I did it the hard way as you will see. It would have been much more sensible to have gone to university straight from school. CEng is Chartered Engineer which is a professional accreditation and means that I can be formally accountable for and sign-off ‘designs’. This accreditation is issued by the UK Engineering Council and a visit to their website - https://www.engc.org.uk/ - is recommended for information about the 30+ member organisations together with links to their websites – it is a very useful teaching resource. MIET and MRAeS show that I am a member of two of these organisations, the Institution of Engineering and Technology (IET) and the Royal Aeronautical Society (RAeS).

The second thing to note on the slide is the aerial mast on the hill in the background – I shall return to that later.

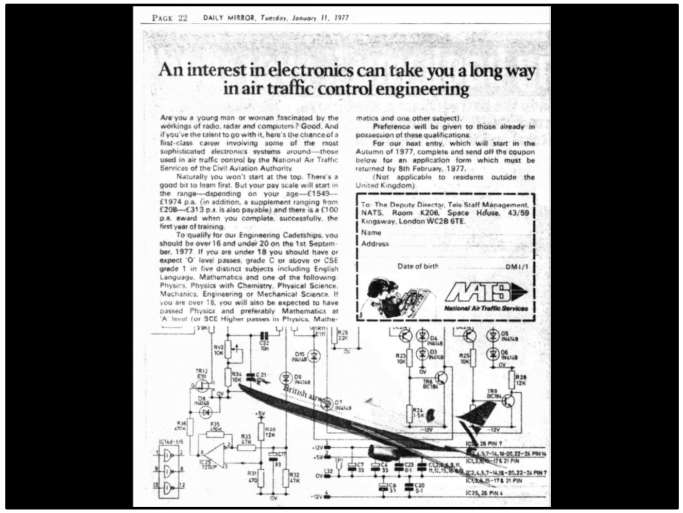
I was born in the late 1950s in Bushey in Hertfordshire and grew up in Hendon, a suburb of north-west London. The sky was always full of passing aeroplanes, most routing to or from Heathrow Airport, and I took more and more of an interest in them. In 1972, my father took me to Heathrow which at that time had an extensive roof-top viewing area – this was a typical view. I was hooked and decided that I wanted to become a pilot.

I joined the local air cadet squadron. I am third from the left, front row in this picture taken on a camp at RAF Marham in Norfolk. The aeroplane is the last of its kind – a Vickers Valiant. These days it lives in the RAF Museum at RAF Cosford.

I applied to join the Royal Air Force and attended the Officer and Aircrew Selection Centre, then at RAF Biggin Hill in Kent. I was not selected.

This was devastating for me. It was not just the disappointment, but I also did not know how to deal with it nor what to do differently to improve my chances. I would like to give some advice here based on my experience of life since. If you have a dream, you can achieve it. The right result will not necessarily come easily but if you set your heart on it, work hard, seek advice (and then heed it), and most importantly persevere – then you will get there.

Nobody told me that then, so I gave up on my dream and took different direction.



PAGE 22 DAILY MIRROR, Tuesday, January 11, 1977

An interest in electronics can take you a long way in air traffic control engineering

Are you a young man or woman fascinated by the workings of radio, radar and computers? Good. And if you've the talent to go with it, here's the chance of a first-class career involving some of the most sophisticated electronics systems around—those used in air traffic control by the National Air Traffic Services of the Civil Aviation Authority.

Naturally you won't start at the top. There's a good bit to learn first. But your pay scale will start in the range—depending on your age—£1549—£1974 p.a. (in addition, a supplement ranging from £208—£313 p.a. is also payable) and there is a £100 p.a. award when you complete, successfully, the first year of training.

To qualify for our Engineering Cadetships, you should be over 16 and under 20 on the 1st September, 1977. If you are under 18 you should have or expect 'O' level passes, grade C or above or CSE grade 1 in five distinct subjects including English Language, Mathematics and one of the following: Physics, Physics with Chemistry, Physical Science, Mechanics, Engineering or Mechanical Science. If you are over 18, you will also be expected to have passed Physics and preferably Mathematics at 'A' level (or SCE Higher passes in Physics, Mathematics and one other subject).

Preference will be given to those already in possession of these qualifications.

For our next entry, which will start in the Autumn of 1977, complete and send off the coupon below for an application form which must be returned by 8th February, 1977.

(Not applicable to residents outside the United Kingdom).

To: The Deputy Director, Tels Staff Management, NATS, Room K206, Space House, 43/59 Kingsway, London WC2B 6TE.

Name

Address

Date of birth DM1/1

NATS National Air Traffic Services

In reality, non-acceptance by the Royal Air Force was not the end of the world. I had a job in quality control in a spectacle lens factory and was looking at career options in that industry.

My heart was set on working in aviation though. This advert which appeared in the Daily Mirror on January 11, 1977 looked interesting. I had never considered engineering as a job. I did not even really know what it was. I applied and changed my life forever.

Despite what the advert said, my new employer was the Civil Aviation Authority (CAA). I started with them on 7th November 1977 and would work for them and for its successor company, NATS for the next 32 years.

My initial posting was to the CAA's College of Telecommunications Engineering (CTE), then located at the famous wartime code-breaking location, Bletchley Park in Buckinghamshire at the south-west corner of what is now Milton Keynes.

This is 'The Mansion' at Bletchley Park, and the view that is usually shown in television programmes…

This is a view of Bletchley Park that is not seen often. The green dome of the Mansion can be seen just above the church in the foreground. The prominent railway is the west coast mainline with north to Glasgow to the left and south to London to the right. The wartime huts and accommodation blocks are clearly visible.

I show this particularly to point out the grassy field at the extreme left of the picture, with a white horizontal ellipse adjacent to its top edge. This was known as the Nav-Aid Field and is full of aeronautical electronic systems. The ellipse is a VOR radio beacon (see later), there is an instrument landing system (ILS), various radars and all the electronic equipment used in the provision of an air traffic control service. CAA CTE did not just train us newly recruited Engineer Cadets, it trained engineers from civilian air traffic control units from all over the UK, and occasionally beyond.

I spent 21 months at CTE, including 6 weeks 'field training' in Scotland. Three weeks were in the control tower at Glasgow Airport – which I thought I would like and did not, and three weeks at the neighbouring Scottish Maintenance Centre (SMC) – which I thought I would not like, but did. I decided that I would return to Scotland at some point in my career.

I left CTE with a good technical training and an appropriate technical qualification, a TEC Diploma in Aerospace Studies, Air Traffic Engineering. We could request our initial 'operational' posting, although there were no guarantees of getting it. I picked an unusual one and surprisingly got it!

My requested posting was to the Civil Aviation Authority Flying Unit (CAAFU), then at Stansted Airport in Essex and I started there in the summer of 1979. Amongst the tasks of this unit was to flight-check the radio navigation aids (like the VORs and ILSs seen earlier) all over the country to check that the radio beams led where they should, aligning correctly with runways for example. This is one of two Hawker Siddeley HS748 aircraft which were used for the job. They carried a crew of two pilots and two engineers who were known as Nav-Aid Inspectors.

I did not routinely fly with them, but did occasionally – it was exciting stuff.

My job involved working on the electronic systems installed in these aircraft. This was in the very early days of computers, when a small computer was the size of fridge. I learned a lot about avionics (aircraft electronics), aircraft wiring and electronics in general, knowledge which would prove invaluable later in my career.

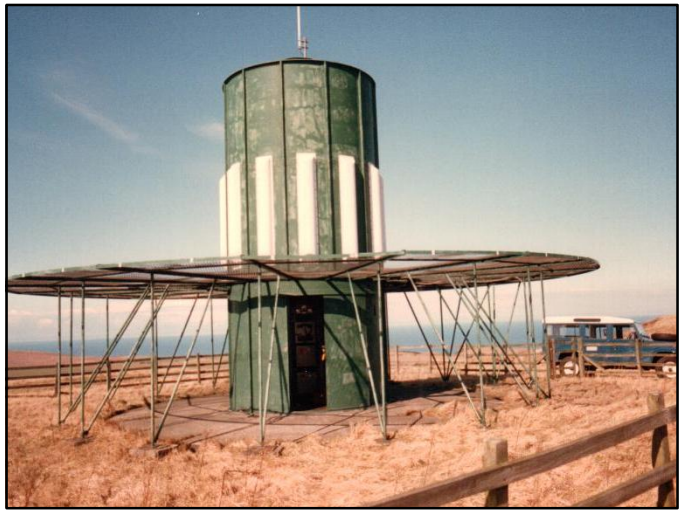
I spent three years with CAAFU at Stansted and it was a very enjoyable time.

Not all of our flying was in the noisy, ungainly 748 though. Sometimes we got a trip in something a little sexier like this Hawker Siddeley HS125 biz-jet.

Whilst at Stansted, I also went back to school, attending the Colchester Institute of Technology on a day release basis for two years. At the end of this I had expanded my technical qualifications to include a Higher TEC Certificate in Radio Systems.

Much as I had enjoyed my time at CAAFU, it was a very specialist outfit. Nobody else in the air traffic control world worked on avionics systems (nor needed to) and it was not really what my training at Bletchley had been for. I still wanted to work in Scotland too.

In October 1982 I got my wish and moved to the Scottish Maintenance Centre at Barnsford, near Glasgow Airport.

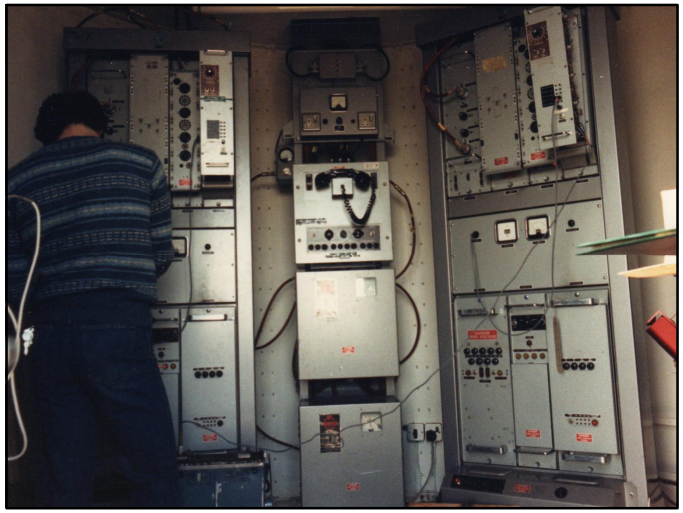


The work at SMC could not have been more different to what I had experienced at CAAFU.

In 1982 there was no satellite-based Global Positioning System (GPS), nor indeed any prospect of such a thing. Aircraft found their way around the skies using a network of ground based radio navigational aids. SMC's main (but not only) job was to look after them.

This is an example of a VHF Omnidirectional-Range (VOR) and was located at St Abbs Head on the Berwickshire coast – note the sea in the background. VORs, are co-located and used in conjunction with another piece of equipment, a Distance Measuring Equipment (DME). Together they lay down a polar co-ordinate system in the sky with the VOR providing magnetic bearing from the site and the DME providing distance from the site. Hence your position can be determined, referenced to a fixed, known reference.

I think it looks a bit like an upturned dustbin.



This is the view inside the ‘dustbin’. The equipment looks more Frankenstein then Microsoft, with hot, glowing glass valves, dangerous high voltages and spinning machinery. It was freezing cold in winter and hot in summer. I once fixed a fault here simply by sweeping the snow of the slot aerials - the white bits on the previous slide.

The St Abbs VOR equipment was old in 1982 and has been replaced with newer equipment since.

This is another of our VORs. This one is at Talla and is located on top of Broad Law, the second highest mountain in southern Scotland.

Accessing this site in winter required the use of a Sno-Cat.

This is the same type of VOR as was seen earlier in the aerial view of Bletchley Park.

It does the same job as the one at St Abbs, but in a different way – that's why it looks very different.

In this picture, the vertical aerial sticking up is for the DME.

Today, the VOR network is being retired as aeronautical use of GPS becomes the norm.

We didn’t only work on VORs and DMEs.

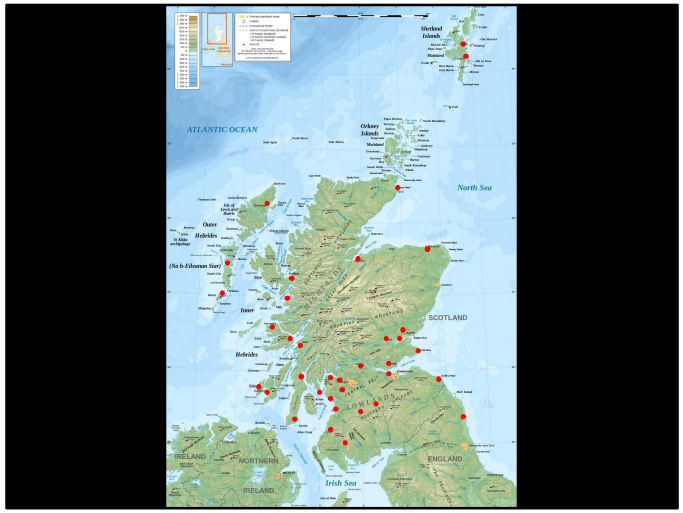
This is a 75MHz fan marker, located at a very remote site on the far side of Loch Indaal from Islay Airport.

This is another type of aeronautical radio navigation aid, albeit a very crude one, known as a Non-Directional Beacon (NDB). The large aerial indicates the use of a low radio frequency and these operated in the medium frequency band. While very simple, there were some very dangerous high voltages.

I helped install this one, and it is at a very special place….

…at the famous beach airport on the island of Barra.

This is the view behind the photographer in the previous picture.



I spent five years at Barnsford on all sorts of tasks the length and breadth of Scotland. The red dots show locations where I have worked. The pulsing red dot shows the aerial on the hill from the very first slide at Suidhe Hill on the Isle of Bute. This facility was a remote radio site for HM Coastguard. Much of our work at that time was carried out under contract to them.

I also went back to school again, spending another four years on day release, and gaining a Batchelor of Science degree in Electrical Engineering from Glasgow College of Technology (now Glasgow Caledonian University).

Having sponsored me through this qualification, the company was not going to allow me to continue with the maintenance work that I had been doing. I needed to move again, but not quite so far this time.

In October 1987 I started work at the Scottish and Oceanic Area Control Centre (ScOACC, now NATS Prestwick) and would remain there for the remainder of my NATS career.

Just as with my previous move, the work at Prestwick would be very different.

My whole time at Prestwick was spent working in support of the air traffic control service provided to aircraft crossing the North Atlantic.

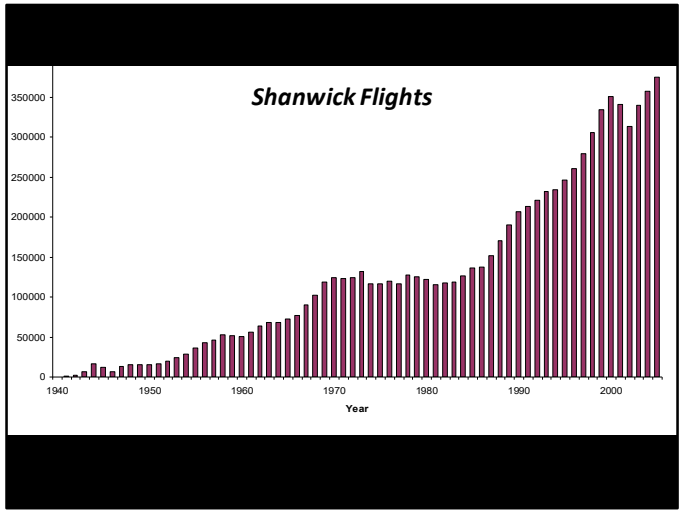
The piece of airspace controlled by Prestwick is known as the Shanwick Oceanic Control Area. This is very strange name because there is no such place as Shanwick. The title is a contraction of SHANnon and PrestWICK, reflecting the fact that the service is jointly provided by the UK (providing the Air Traffic Control service from Prestwick) and the Republic of Ireland (providing the High Frequency Communications service from Ballygirreen, near Shannon).

This all sounds a bit strange, so let's look closer at Shanwick.

Shanwick is a large volume of airspace – the edges can be clearly seen on the slide. It is the world's busiest piece of 'Oceanic' airspace.

It could easily swallow the British Isles. To the north, above 61N is Iceland's airspace. Down the right hand side there is (from north to south) UK, Irish and French airspace. Below 45N, from right to left is Spanish and then Portuguese (Azores) airspace. To the left, beyond 30W, is Canadian (Gander) airspace. It is a very international environment.

With no land on which to locate radars or radio stations, air traffic control is very different from the traditional view of the task. That is why the specialist 'long-range' communication task at Ballygirreen is required.



This chart shows the annual increases in Shanwick traffic from 1940 until around 2005.

I started at Prestwick in October 1987, just after introduction of 'new technology' aimed at coping with the anticipated increase in demand. The new technology was problematic and my first years at Prestwick were spent as part of a team striving to make it work properly.

We also enhanced the systems and added new capabilities. Traffic more than doubled between my arriving at Prestwick in 1987 and leaving NATS in 2009. I think that we must have been doing something right.

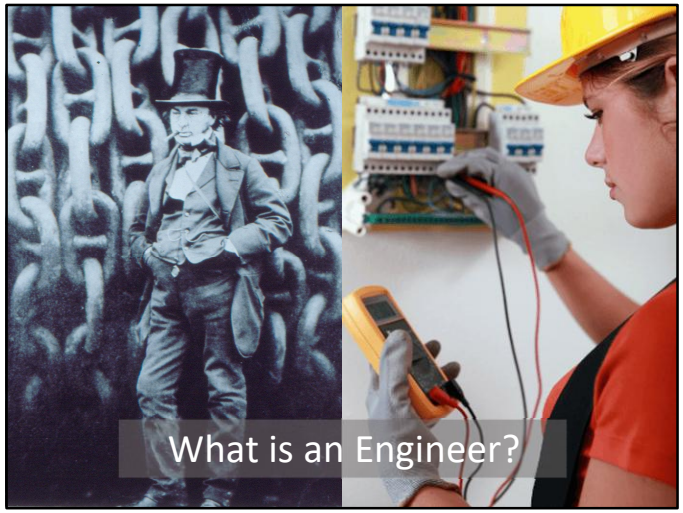
Note the dip in traffic following the 9/11 attacks on New York in 2001.

My time at Prestwick coincided with the deployment of VHF and satellite-based data communication (consider it like exchanging text messages) with pilots, thus avoiding Ballygirreen and other communications agencies altogether. I was heavily involved in initiatives which led, around 2003, to Shanwick becoming the first airspace in the world where suitably equipped aircraft could operate without the pilot actually speaking (by voice) to anybody for air traffic control purposes. That made me very proud.

During my 22 years at Prestwick, I spent another year at school to upgrade my degree to Honours level and became a Chartered Engineer. My role changed from that of working engineer to being a quite senior engineering manager. I became NATS Engineering Design Authority for its Oceanic systems and for all (not just Shanwick) of its air-ground en-route data communications. My work in support of Shanwick had taken me to France, Belgium, Spain, Iceland, Canada, USA and the Republic of Ireland.

I had an enjoyable and rewarding career as an engineer in air traffic control, working in some fascinating projects and visiting many unusual places. After 22 years at Prestwick, it was time to do something else, so when the opportunity came to move on in 2009 I took it.

I mentioned right at the start that, before joining the CAA, I really didn't know what being an engineer entailed. I have a better idea now of course, but the answer to the question 'what is an engineer?' is still a tricky one. Perhaps I should try and answer it.



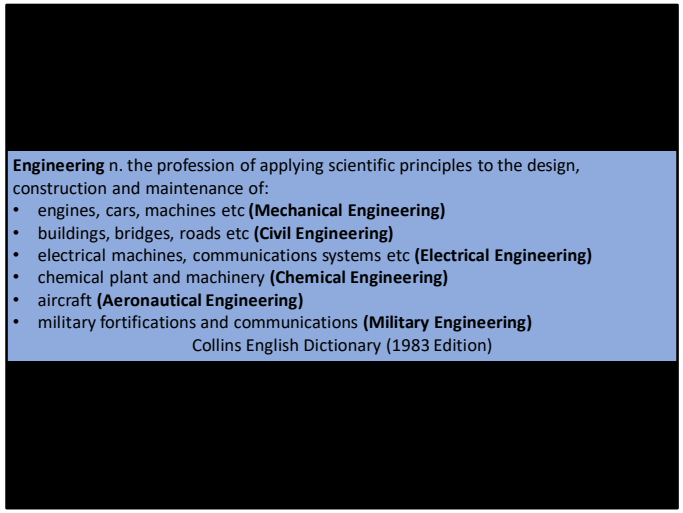
When people speak about engineers, they often mean different things at different times.

At left is Isombard Kingdom Brunel, often quoted as Britain's greatest engineer and seen here shortly before his death and standing beside the massive anchor chains of the 'Great Eastern' steamship, then the biggest ship the world had ever seen.

At the other extreme, we talk about getting an engineer in to fix a fault with a central heating system or with a washing machine.

The picture at right shows a typical modern engineer at work, presumably on a construction or industrial site, given the hard hat. More often, modern engineers are seen working away at their PCs.

That is quite a broad spectrum. So, what do we mean when we talk about engineers and engineering?

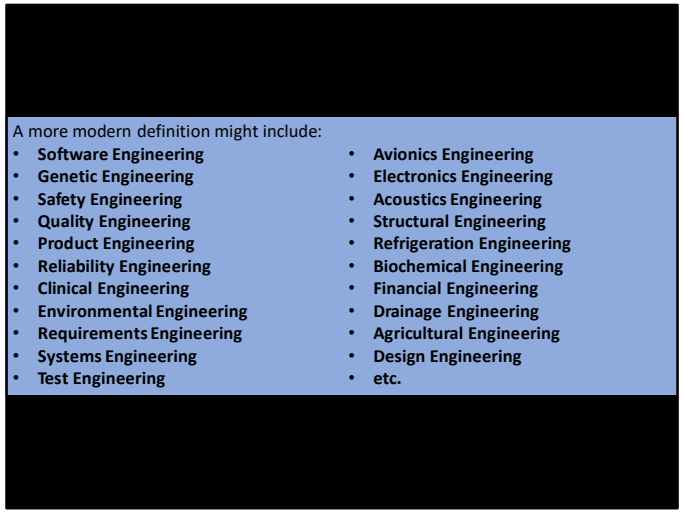


I started by referring to my trusty 1983 Collins English Dictionary, which provides this definition of engineering.

The first two lines provide a succinct definition – 'the profession of applying scientific principles to the design, construction and maintenance of….', but the list of specialisations seems a little bit traditional and limiting for today's world.

Apart from 'Military Engineering', the others in the list look like the standard courses at a university.

Perhaps taking a broader look at engineering specialisations will provide more clarity.

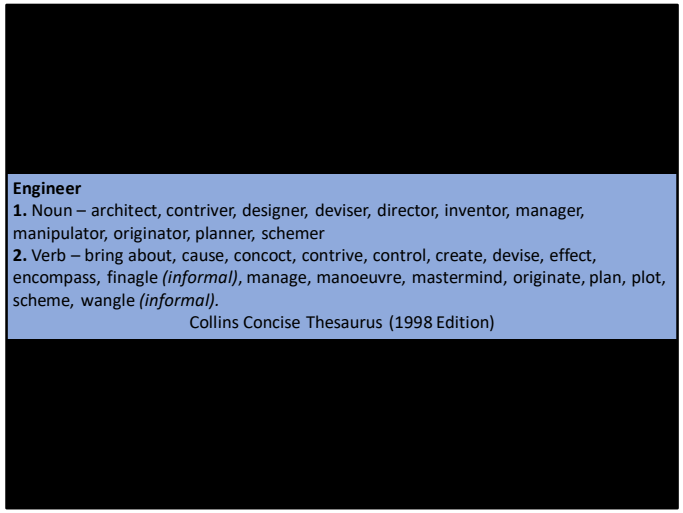


An internet search for types of engineering produced a much more comprehensive, but certainly not exhaustive, list of engineering specialisations.

'Financial Engineering' perhaps has overtones of fraudulent practices, but in reality banks and other financial companies make significant use of all sorts of engineered systems.

Looking at this list shows a huge range of subjects. In fact, I would go as far as to say that engineering now encompasses virtually every sphere of human activity. There are lots of career opportunities.

So what is it that engineers actually do?



To answer this I consulted another of my ancient reference books, my 1998 Collins Concise Thesaurus.

It provides synonyms for 'engineer' both as a noun and as a verb.

Looking at the noun case first, I am quite happy to be an architect, a designer, an inventor, a manager, a director or a planner. I am not quite so sure whether I want to be a contriver, a manipulator or a schemer though. It seems that being an engineer is perhaps a double-edged sword.

Similarly with the verb. I am happy to bring about, cause, create, devise, effect, manage, mastermind (cool!) or originate but I am less happy contriving, finagling or wrangling.

These words provide an interesting and valid contrast in views about engineering. What some consider creative and ethical, others consider damaging and evil.

So what sort of things will engineers be involved with?

Here is a long list of things that engineers may be required to think about during the course of their work. Not everything all the time of course, but more than you might expect more often than you might imagine.

Perhaps a good definition of engineering is something like:

'Doing whatever is necessary to deliver whatever is specified within the stipulated timescale, budgetary and quality constraints'.

Engineering is certainly an interesting and varied career. There are a vast array of topical and often cutting edge projects to work on. It is usually well paid and there are opportunities to develop yourself and widen your knowledge and experience.

I would certainly recommend considering engineering as a career option.

Back at the start, I indicated that I really wanted to become a pilot. I never quite gave up on becoming a professional pilot, but neither did I do much to make it a reality. Eventually I decided that I would at least learn to fly, and in 1987 gained my private pilot's licence. I have continued to fly ever since and in 1996 became the owner of a light aircraft.

I often think that, as I only fly when I want to, and then only when the weather is good, perhaps that is not quite such a bad place to be.

I hope you enjoyed hearing my story and will perhaps consider engineering a career.


Questions?
G-BIID