

# David Cushman

Born 1946.

Extracted from the [www.dave-cushman.net](http://www.dave-cushman.net) website.

Available online at [www.livesretold.co.uk](http://www.livesretold.co.uk)



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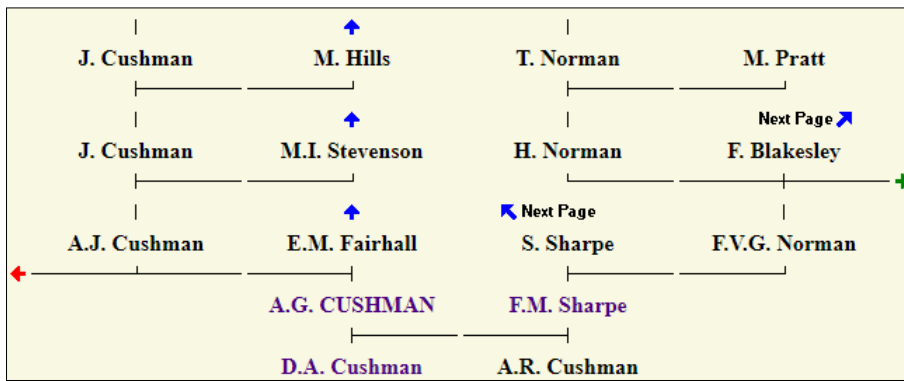
*This life story was extracted by Alex Reid, with acknowledgement and thanks, from the [www.dave-cushman.net](http://www.dave-cushman.net) website. It was added to the Lives Retold website in November 2020, when Alex Reid was seeking a beekeeper to add to the Lives Retold collection.*

# 1. My Parents



My parents Albert and Freda Cushman were married at the St.John the Baptist Church in Leicester on 5th May 1945.

Albert was a carpenter and joiner for most of his working life, but spent time in the RAF during the Second World War.



Extract from David Cushman's family tree.

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## 2. Early Life

David Albert Cushman is my formal name, Dave Cushman is the name I go by, g8mzy is my call sign, 'fat and ugly' is my nickname and I have previously been known as 'Bert' and 'flash'. I have always joked "that I was born at a very early age". The place was Bond Street Maternity Hospital in Leicester.

From 5 to 7 years of age I attended Knighton Fields Infant School, but owing to boundary changes I swapped to Avenue Road Junior School for the years 8 to 11. On passing my 11+ examination I finished my school education at Wyggeston Boys Grammar School. I was a bit of a rebel at school and left at age 15. However my education has been more or less continuous ever since!

I spent 6 months as a T.V. engineer with a local rental company and then embarked on a course at Charles Keene College (to get the GCE "O" levels that I would not have achieved in the school system).

I became a "Student Apprentice" at the Partridge Wilson {Davenset} company which I left in 1967 in favour of a degree course at Rugby College of Engineering Technology. Whilst at Rugby I was heavily involved with an Elliott 803 Computer and tuning 2 stroke engines.

from 13 years to 16 years I was an army cadet winning many shooting prizes. This kindled my interest in firearms and ammunition and led to many enjoyable years of shooting.

From age 16 till 25 I was an enthusiastic motorcyclist. I started out with small, Villiers engined, 2 strokes and ended up with a BMW R60. I would enjoy riding an old Villiers engined motorcycle today, but we have to be practical (it is very difficult to carry beehives on a motorbike).

I was a fairly successful competitor in clay pigeon shooting between 1967 and 1975. I have also been a semi professional darts player (but in those days the purse was never more than seventy five pounds). I spent some time in Berlin during the 1960's (on both sides of the wall).

In the summer of 1969 I had my first taste of the game of Petanque, which I have enjoyed continuously ever since.

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### 3. Career

In December 1969 I joined B.P.G. Engineering Co., initially as a draftsman, but later as a project engineer.

In the early 1970's I was a junior mechanic in a Formula Two Motor Racing Team. This was good fun, but also very hard work! I have had many fast cars, (souped up Jaguars and 12 cylinder Daimlers), in the past. However these days I make do with a Suzuki Super Carry. This is the second generation of this type of vehicle that I have owned. The first was a Bedford Rascal Van, non standard as it had only a 800 cc capacity engine.



A Suzuki Super Carry

In 1971 I was diagnosed as having "Hodgkins Disease", (a form of cancer of the lymphatic system), after a great deal of treatment, I was among the first ever to be declared 'cured' of this disease.

In December 1976 I passed my "RAE" (Radio Amateur's Examination) and in February 1977 I was licensed as G8MZY. My interest in Ham Radio is of much longer standing.

During 1979 I left B.P.G. and implemented Apex Enterprises on a full time basis (it had been a spare time business for some years).

In my youth I had some language skills:-

I was Bilingual in German. I was fluent in French. I could 'get by' in Italian and Switzerdeutsche. I even had a little Welsh. I also had an incredible vocabulary of about a hundred thousand English words.

I lost almost all of my language ability in 1993 when I had Pneumococcal Meningitis. Since then, although recovered in most respects, I have a little difficulty in finding the exact word for a particular circumstance. (Some would say I still talk too much!). I also lost most of my ability to read morse code at this point, some of

this skill is now returning and occasionally I have a few thoughts in German, so there may be further improvements.

More recently, January 1997, I had a heart attack, which left me physically very weak. The heart surgery that I underwent, in February 1999, as a result of this, was unsuccessful in several respects. Hence my new passion for cyberspace beekeeping!

I returned to dart playing in 2000. I give only a shadow of my former performance since in 1987 my right hand was "minced up" in a woodworking machine. The surgeons did a marvellous job of re-assembly, but my dart playing will never be quite so competitive again.

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## 4. Apex Enterprises



**APEX ENTERPRISES**

UNIT 2 GROUND FLOOR  
GATEWAY HOUSE GATEWAY STREET  
LEICESTER LE2 7DP Tel. 0533 557442

BRING your beeswax to us and exchange it for some of our high quality beekeeping supplies.  
Our exchange rate is £1.25 per lb for good quality rendered beeswax. Higher rates available for quantities above \$0lb.  
'A SERVICE BETTERED BY NO ONE'

PLEASE SEND FOR OUR PRICE LIST

Prior to forming APEX enterprises I worked as a project leader in an Electrical Engineering firm (BPG Engineering Co Ltd). I also worked as a freelance Photographer, in addition I supplemented my income by manufacturing and selling darts accessories to various public houses and other darts players.

I have had several other small businesses named APEX enterprises, including:-  
Printing, darts accessory manufacture and supply, trophies, trophy components, Custom Built Electronic Equipment, Beehives, Beekeeping Equipment, Mechanical Engineering and ammunition manufacture.

Apex Enterprises was involved in the manufacture of:-

Custom Built Electronic Equipment (mainly machine control gear for the food and knitting industries).

Darts Accessories.

Trophies and Trophy Components.

Beehives and Beekeeping Equipment



One of the strands of manufacture was a large range of wooden trophy components. We also manufactured a complete range of trophies and part of one of our large display windows can be seen above.

There were several connections between the different strands of my business. My main qualifications are in electrical and electronic engineering. The business was first conducted as Radio and Television repairs from home, when aged 14.

I played darts to a pretty high standard. I have qualifications as a silversmith and my passionate hobby is beekeeping.

We were a small outfit... usually about 3 or 4 full time employees with one or two part timers. We had a diverse set of skills between us that made us very flexible. The business went bankrupt in 1995 mainly due to expanding too quickly during a recession. The logo (right) was always strongly emblazoned on the front cover of our price list. We manufactured a vast range of beekeeping equipment, all of which we manufactured to very high standards. Some of these items were unique to our company, particularly... There were many items useful for bee breeding. A great many items to suit Top Bee Space National Equipment were also available. We would also make "special" items to our customer's designs and wishes.

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## 5. The Beekeeping Website

Apex Enterprises	Chemical Treatments	Traps and Trapping	Swarms and Swarming
Manipulations	Equipment Suppliers	Clearer or Escape Boards	Behaviour in Honey Bees
Queens	Beekeeping Tools	Making Beekeeping Kit	Non-Beekeepers
Queen Cells	Bee Breeding	Hive Design Parameters	Education for Beekeepers
Feeding Bees	Honey Production	Using Hive Products	Non B.S. Beehives
Observations	Honey and Beeswax Extractors	Foundation and Comb	Biology of the Honey Bee
Microscopy	British Standard Hives and Frames	Links to Other Websites	Anatomy of the Honey Bee
Uniting Bees	Hive Preservation	Hive Securing Methods	Beekeeper's medical problems
Forage	Hive Maintenance	Instrumental Insemination	Bee Improvement
Beginners	Queens - Poor Performance	Beekeeping Events	Beekeepers - Past and Present
Magazines	Queen Rearing	Polystyrene (Poly) Hives	Beekeeping Qualifications
Bee Types	Events. Help for Organisers	Frames and Spacing	Online Discussion
Gormanston	Help for BKA Organisers	Beekeeping Charities	Native Bees <i>Apis m mellifera</i>
Conferences	Bee Diseases and Afflictions	Candle Making	Hints and Tips
Comb Honey	Beeswax and its Uses	Protective Clothing	Requeening a Colony
Skep Beekeeping	Queen Problems	Colony Increase	Honey Bee Genetics

The Subject Index page from the [www.dave-cushman.net](http://www.dave-cushman.net) website.

The following description of David Cushman's beekeeping website at [www.dave-cushman.net](http://www.dave-cushman.net) is by Roger Patterson, the fellow beekeeper to whom David Cushman bequeathed the website.

*Dave Cushman died on 22nd February 2011 and shortly before he died he asked me to take over his beekeeping website. I subsequently discovered he bequeathed it to me, along with all his others. Dave's health declined rapidly in the last few weeks of his life. He was only able to talk for short periods because he tired very quickly, so I was unable to obtain as much information as I would have liked.*

*Dave had a number of medical problems, making it difficult or impossible for him to work. Ironically his poor health led to the existence of this website, with the incredible amount of information on it when I took over being compiled in only about 10 years. He had an incredibly sharp mind right to the end and he was very frustrated that he couldn't get upstairs to access his computers in his last few weeks.*

*I knew Dave well and was aware of what he was trying to achieve. This was quite simply a website that would help beekeepers worldwide, where they could source good sound information. He was very forward thinking and didn't always accept what is often put forward as "fact". In these pages you will see some alternative views, some not his own theories, but most of them are as sound as the common line. Like Dave, I often question what is taught, especially by those who are not passing on the benefit of their own experience, but the words of others. I urge the visitor not to dismiss the "alternatives" just because they are not what is normally*

*written or taught, but to consider them carefully before making judgement. This is best done by sticking your head into a beehive, not a book!*

*Dave specifically asked that all non-beekeeping websites and pages stay exactly as they are and I promised I would maintain them as long as I could. I understand his reasons and will respect them. They will be archived, but still accessible. He told me I could develop the beekeeping website how I liked. In general I see little I would disagree with and I fully intend to retain his basic principles. I will try to maintain the high standards that Dave set, but it must be accepted that I am unable to spend 15-16 hours a day in front of a screen like he did. I will try to keep the website largely in the same format that visitors are used to, but inevitably there will be changes, as of course there always has been. Any changes are not a criticism of what Dave did, but more likely an attempt by me to achieve the same result with a lot less technical knowledge of building and maintaining websites than he had.*

*Of the regular users I have spoken to, around 50% thought the format should stay exactly the same and the other 50% thought it should be altered to make it easier on the eyes. I have decided to leave all the pages Dave started largely as he left them, but make changes to any new ones. I know this is a compromise and in my experience a compromise rarely works, but I hope this one will.*

*My role will be that of editor with the technical side being handled by someone who wishes to remain anonymous.*

*Although Dave created probably the world's best beekeeping website and was rightly proud of it, he was always just an ordinary person and didn't think himself above others. He was always accessible and willing to help anyone, whatever their experience and knowledge and of course a lot of it was through providing the information on this website.*

*Progress will dictate there will be regular additions and updates and the further we get from Dave's passing the less there will be of his original material, but whatever the changes I still want it to be known throughout beekeeping as "Dave Cushman's Website". I am keen that future generations should be aware of the huge contribution Dave made to beekeeping by starting one of the world's finest beekeeping websites.*

## Alphabetical Listing of Articles

The following extract from the alphabetical listing of articles (for the letter A alone) is indicative of the range of topics covered by the website:

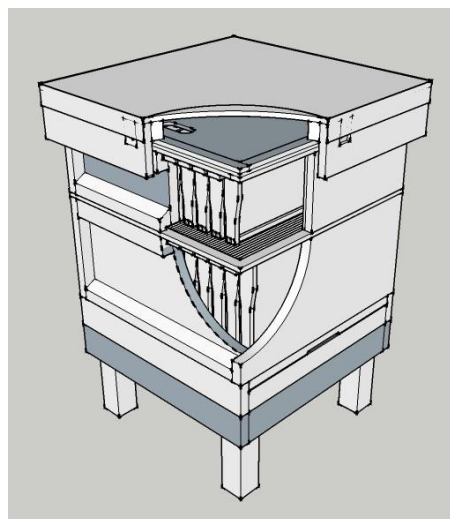
(Abbott Frame.) . (Acarine Mite.) . (Acarine Mite Treatment.) . (Acetic Acid.) . (Achroia grisella.) . (Acid Alcohol.) . (Adhesives.) . (Aerodynamics of Bee Flight.) . (AFB.) . (Aggressive Colony - Requeening.) . (Ailments of Beekeepers.) . (Air Flow in Beehives.) . (Albert Knight Double Screen Queen Introduction Method.) . (Albert Knight/Steve Taber/John Dews Introduction Method.) . (Alley Method.) . (Allotment Beekeeping.) . (Alternative Hanging Section Frame.) . (Alternative Horsley Method.) . (Alternative Swarm Box Lid.) . (Alternative view of Varroa Spread.) . (Aluminium Comb.) . (Aluminium Cored Foundation.) . (Aluminium

Frames.) . (American Foul Brood.) . (Amitraz.) . (An Beachaire (the Irish Beekeeper).) . (An Englishman Goes To Gormanstown.) . (Anaphylactic Shock.) . (Anarchic Behaviour.) . (Anatomy of the Honey Bee.) . (Understanding Bee Anatomy - Ian Stell.) . (Anatomy of the Sting.) . (Anti Robbing Screen.) . (Ants.) . (Apiary-Siting of.) . (Apiary Vicinity Mating.) . (Apidea Frames.) . (Apidea Mating Hives.) . (Apidea Two Storey Adaptor Board.) . (Apidictor.) . (Apiguard Diary, Ruary Rudd.) . (Apiguard Thymol Gel.) . (Apimondia.) . (Apis mellifera - Meaning.) . (Apis mellifera mellifera.) . (Apiservices Website.) . (Apistan.) . (Apistan Precautions.) . (Apple Corer.) . (Appraisal of stock.) . (Artificial Queen Rearing.) . (Artificial Swarming.) . (Artificial Swarm for Varroa Control.) . (Ashforth Feeder.) . (Assessment Criteria.) . (Assessment of Colonies - Advanced.) . (Assessment of Colonies - Basic.) . (Assessment of Colonies.) . (Atomiser Pump.) . (Auctions.) . (Auramine 'O' Staining.) . (Auramine Rhodamine Staining.) .

## The National Hive

As an example of the hundreds of useful beekeeping articles on the [www.dave-cushman.net](http://www.dave-cushman.net) website, there follows an article about The National Hive. It is by Roger Patterson, David Cushman's successor as editor of the website.

The British Standard National hive is the most commonly used beehive in the U.K. and Ireland. The history is a bit vague, but it seems to have been introduced in around 1920 or slightly before as the "Simplicity" hive, later becoming the "National Hive". When I started beekeeping in 1963 an old beekeeper who was probably in his 70s referred to the National as the "Universal" hive, but as he was the only beekeeper who I recall using that name it may have been as the result of confusion.



The original National had straight sided boxes with handholds machined in the sides in the same way as other single walled hives. To accommodate the British Standard long lugged frames the original was double walled at each end and single walled at the sides. Although I can find no reference, I was told that in the late 1930s/early 1940s (possibly due to timber shortages) a beekeeper simplified the design to give a single wall on the ends, but larger handholds. This eventually became known as the "Modified National" that was included in the British Standard 1300 (1946), that was updated in 1960. It was the subject of the MAFF Advisory Leaflet 367 of 1961, reviewed 1970.

The original National is no longer manufactured, although there are still plenty in use. I still have a lot of them, some of them well over 50 years old and still in very good order. The changes were only to the boxes, all other parts stayed the same, with full compatibility between the two types. They are now all referred to as "Nationals", as they were in MAFF Advisory Leaflet 367.

Although the 14x12 frame was introduced before the B.S. 1300. this does not appear to have been included in the British Standard. It has become popular in recent years, but is not favoured by everyone.

External dimensions are the same as the Commercial hive. The standard for the National is bottom bee space, the Commercial can be top or bottom. If the beespace is the same Commercial parts can be used with National hives. It is quite common to use National supers on Commercial brood boxes, or Commercial supers on National brood boxes. The former popular in England the latter is popular in Ireland!

The standard floor is sloping and reversible. This is handy when spring cleaning because all you need do is turn the floor over and the floor will be cleaned by various creatures. There have been several roof depths manufactured, varying from shallow to deep.

There are three common depths of frame manufactured and these are referred to as:-

Shallow. 5.5ins (140mm) for supers and known as "shallow frames".

Brood. 8.5 ins (215mm) for standard depth brood boxes and known as "brood frames". These are sometimes erroneously referred to as "deeps".

Deep. 12.0ins (304mm) for deep brood boxes and known as "14 x 12" or "B.S. deeps"

The National is popular with both amateur and commercial beekeepers because:-

The standard brood box is well suited to non - prolific bees, where a colony can survive all year on a single brood box. The capacity is adequate for queens during the summer and enough food can be stored for the winter, without emergency feeding being needed.

If prolific queens are used there are several options to make the brood area larger, including the "14 x 12", two brood boxes known as "double brood" or a super and a brood box that is known as "brood and a half".

Being popular, secondhand parts are easily bought or sold. Being square they can be used warm and cold way. It is economical to buy, especially the "seconds" which are typically about 50% of the cost of premium grade. There may be some knots and imperfections, but they are perfectly adequate and will last a lifetime if cared for. It is easy to use and lift for one person, with the light weight and large handholds. Bees can easily be bought on B.S. frames. The frames are compatible with WBC hives.

The "Hamilton Converter", when placed on the top of a National brood box allows the use of ten 16 x 10 Commercial brood frames running at 90°, making it a useful piece of kit for those who use both frame sizes.

There are some polystyrene "nationals" available, but not all are compatible with wooden parts. The "Rose" and "Rational" hives are variations on Nationals and are compatible.

I have handled bees in most hives and I much prefer Nationals to anything else. I know those who are used to short lugs will disagree, but I think the long lug is a huge bonus. It also allows the use of castellated spacers in the brood box, which is my favourite method of spacing brood frames. It must be remembered that a hive is simply a tool of the beekeeper, so it's whatever suits you that matters.

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## 6. Other Interests

David Cushman described on his website some of his many other interests aside from beekeeping. These include Petanque, motor cycle rallying, and the types of balsa wood used in rubber-band powered model aircraft. They are described in the following extracts from his website.

### Petanque



Although widely played in France and often considered to be a French game, this game started in several different parts of the world at more or less the same time. It started because cannon were becoming a defence tool and associated with these were stacks of cannon balls. Originally these balls were only about the size of a baseball ball or an English cricket ball. The balls were stacked near to the cannons on ramparts that were often gravelled. It was a simple step for bored soldiers to start playing about with these handy objects. Thus the game arose spontaneously in places where the cannon proliferated.

During July 1969 I was in France. I was astonished to see a group of people that blocked off a portion of public road using several rather battered 2CV cars. Then they started to play boule on the slightly molten tarmac surface of the road. They were a friendly crowd, (much wine was consumed), and they showed me the rudiments of the game and allowed me to 'have a go'. I have played the game ever since that occasion in all sorts of places and I have thoroughly enjoyed every minute of it.

A Group of like minded individuals started to play on various pub car parks local to where I live... A league was formed... (Melton & District) we had six teams originally, Gaddesby (The Cheney Arms) was one of them. The league grew and



became 'The Leicestershire Pétanque Association' (LPA). Owing to dwindling numbers in our particular team we moved to play at Saddle Inn at Twyford. During my time at the Saddle many players became disgruntled with the way the league was administered. A number of teams formed a new League...'The 1990 Pétanque League' (named after the year of it's first competitive season). When I heard that Gaddesby were re-forming a team I decided to join it to lend my experience to the newly formed team... Gaddesby has always had a place in my affections as well.

After a few years of playing at Gaddesby, I found it difficult to get a game as the captain favoured his friends, rather than picking a winning team, so I sought another group to play with and found a newly established team at the Prince of Wales at Thurmaston, where my experience was considered useful. A couple of seasons were played there, until the landlord took over what was the 'Unicorn and Star' Pub in Thurmaston, Renamed the 'Top House'. All of the teams decided to move to the new venue and a set of three new pistes were laid down in 2005.

## The Dragon Rally

The Dragon Rally is a motorcycle rally that was organised by the Conway and district motorcycle club, it is a non competitive camping event for motorcyclists. It generally takes place in February each year and made a big impression on me, when in 1965, I went for the first time.

The camaraderie has to be seen to be believed. Let me explain...



I had a Frances Barnett 'Plover 78' 150cc two stroke (above) that had a pair of pannier bags. My friend, Eddie Collingham had a 350cc AJS, but his machine was only fitted with a carrier. So I ended up with quite a sizeable proportion of the camping equipment. My family had also loaded me down with extra clothing owing to the fact that it was the middle of February.

To complicate matters further, I was leaving from my home in Leicester and was due to meet Eddie at his term time digs in Birmingham so that we could travel together to the rally.

I left home in good time at about 2:00 PM. I was travelling through Earl Shilton when I had a sudden puncture in the rear wheel. I managed to manhandle the rather heavily loaded bike, on it's flat tyre, to a garage that mended the puncture for me (I was 'green' and not equipped with a puncture kit at that time). I was also given a lecture on overloading the bike and the need to increase the tyre pressure (the cause of the puncture). By this time it was 4:00 PM and I continued my journey until I reached the A5 just the other side of Hinckley. Luckily my friend found me at that point, as he had come to investigate my non-arrival.

We continued along the A5 towards Wales, but the pace was very slow... By this time the evening traffic leaving Birmingham was cutting across our route (there were no Motorways at that time and the A5 was mostly only two lanes). The journey became quite a grind, but we were in good spirits, as by this time we found that every motorcyclist on the road gave a wave of recognition and acknowledgment and had a bedroll on board.

The progress was so slow that it was about 10:00 PM when I had my second puncture. We were half way between Llangollen and Corwen, so I leaned my bike against a wall in a sort of alcove and jumped on the back of my friend's bike to go in search of bed and breakfast. This we found in Corwen and were greatly relieved to find the last bed in the Crown Hotel.

The next morning we returned to my bike and found that the valve had pulled completely out of the inner tube (again due to the excess load). There was nothing for it, but to jump back on my friend's bike and go to Llangollen to buy a new tube. This was accomplished and we got back to my machine to see a couple of chaps examining it. They had a BMW sidecar outfit that was parked in another alcove a few yards away. They insisted on completing the repair and pumping up the tyre to an incredible 45 lbs per sq. inch to cope with the overweight gear.

The rest of the weekend was reasonably uneventful, but I learned a great deal. I was struck by the comradeship and friendliness and vowed to return to the 'Dragon' every year. I did go several more times, but I have not been since some time in the 1970s. I have my badges of this and other rallies, somewhere, and will post pictures when I locate them.

The following white panel is a facsimile of a press cutting taken from the 'Radio Times' in 1967... Wheelbase was a motoring program shown on BBC 2. It is thought that 'Wheelbase' was later renamed 'Top gear'.

Wheelbase covered the Dragon Rally thus:

*If you drove along the upper reaches of A5 last Saturday you must have spotted an endless procession of determined-looking motor cyclists, heading purposefully into the North Wales mountains. Nothing but a travel-stained bike and a bedroll lashed to the luggage grid marked them out as a fraternity, yet each had a smile and cheery thumbs-up sign for his fellow. Who were they? Where were they going?*

*That weekend was the time of the Dragon Rally at Llanberis, the biggest motor cycle rally in this country.*



*Over 4,000 riders, many of them teenage boys, from the Continent as well as the farthest corners of the British Isles, braved the midwinter. Some of them made round trips of 1,000 miles and more, through sub-freezing weather and over ice-bound roads. At journey's end, beneath the shadow of Snowdon, they slept rough in tents and ramshackle huts on the bleak mountainside.*

*Yet no lavish prizes, no entertainments lured them there. The only qualification asked was enthusiasm enough to ride a motor cycle into the heart of the North Wales mountains in Winter's foulest weather.*

*What is the secret of the Dragon Rally? Why should it capture the imagination of young riders everywhere?*

*A Wheelbase team followed a party of teenage motor cyclists from their homes in Liverpool to Llanberis, and tonight you can see the adventures that befell these teenagers on the expedition. You'll meet the friends they discovered along the A5 highway, and hear the experiences of the British, French, German, and Belgian enthusiasts who joined together beneath the red dragon flag.*

I enjoyed all the 'Dragons' that I went to and would have no hesitation in recommending anyone to go to this event, but pick your camping gear carefully and avoid the excess weight that I carried all those years ago.

## Balsa Wood

As part of his involvement with rubber-band powered model aircraft, David Cushman developed a keen interest in the varieties of balsa wood, described in the following section of his website:

Balsa wood (*Ochroma lagopus*) has been one of the main materials for model aeroplane construction since about 1920. Balsa is light, but with high strength, it absorbs the shock and vibration of heavy landings quite well and can be easily worked with hand tools. It's lightness is due to the microscopic structure of large water filled cells, that when dried become empty lignin skins holding nothing but air.

Balsa trees grow rapidly in the humid rain forests of Central and South America. Ecuador has the ideal geography and climate for growing balsa trees, situated on the western coast of South America, it has become the primary source of model aircraft grade balsa wood.

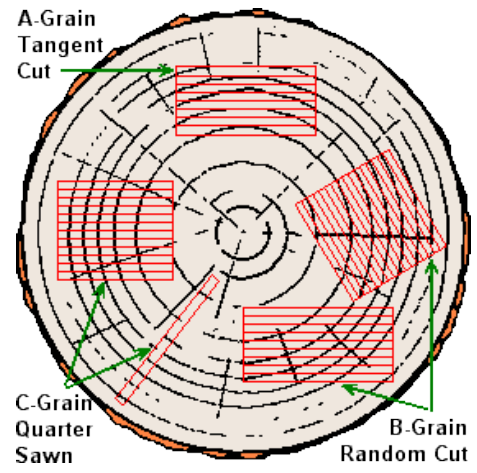
The balsa wood business started during World War I, when a substitute for cork life jacket floats was required. The drawback in harvesting balsa is the need to manually harvest each tree as it only grows as individual specimens within fairly thick jungle.

Green balsa wood has to be kiln dried to remove most of the water before it can be sold. The kiln drying process is slow (2 weeks) and removes the excess water down to a moisture content of only 6%. The action of the kiln drying also kills bacteria, fungi, and insect grubs/eggs that may have been in the original balsa wood tree.

Finished balsa wood, like you would use for model aeroplane construction, varies considerably in density and grain. Balsa can be found weighing as little as 4 lb per

cubic ft up to 24 lb or more per cubic ft (65 to 360 kg/m<sup>3</sup>). Commercially available balsa for models will weigh between 6 and 18 lb per cubic ft (95 to 285 kg/m<sup>3</sup>). Eight to twelve pound balsa (120 to 192 kg/m<sup>3</sup>) is most plentiful and is considered medium or average weight. The six pound (95 kg/m<sup>3</sup>) or less is considered "contest grade" owing to good lightness, although durability due to inherent weakness is not a priority and such light examples can be rare or even impossible to obtain. Light grade balsa is nominally 6 to 8 lb per cubic ft (95 to 135 kg/m<sup>3</sup>). The denser the balsa wood, the stronger and harder it is, so sometimes a trade off can be made by using a more dense material that is thinner, but weighs about the same for a given strength.

Grain type and direction determine the rigidity or flexibility of a balsa sheet more than density does. The image at right shows how a log is converted into planks with different properties, an A grain sheet, cut from the log so that the tree's annular rings run across the thickness of the sheet it will be fairly flexible from edge to edge.



On the other hand, if it is C grain, cut with the annular rings running parallel to the surface of the sheet, it will be stiff and rigid edge to edge. If the grain direction is less clearly defined as in B grain, the sheet will have properties intermediate between A and C types. B grain is the most abundant and is suitable for most jobs.

As B grain is most common, it can be available in surplus quantities quite cheaply, so the model builder may have a surfeit of this type of grain... This can be overcome by making formers and wing ribs from this type of grain and then lightening the items by cutting circular holes, then covering with thin tissue that can be shrunk and doped to give a much stiffer item that is resistant to splitting.

Whenever you come across good examples of A-grain or C-grain sheets, learn where to use them to take best advantage of their special characteristics.



A-Grain, also known as Tangent Cut, (above) has long fibres that show up as long grain lines against a smooth creamy background and is very flexible across the width of the sheet, it warps easily and readily bends around curves, but lacks stiffness. Use for sheet covering tightly rounded fuselages and curves and fabricated

wing leading edges (D-boxing), forming tubes, strong yet flexible spars that can withstand 'hard landings', hand launched glider fuselages.

Don't use for unsupported sheet balsa wing or tail surfaces, ribs, or formers. To make A grain balsa wood more pliable and easier to bend without breaking, soak it overnight in a bucket of water with a small amount of ammonia (or bleach) added. It should be bent or shaped while wet, and then clamped in the correct shape over a former until it is completely dry.



B-Grain also known as Random or Mixed grain cut (above) has grain lines are shorter than type A, and it feels noticeably stiffer across the sheet. These B grain sheets vary a great deal in properties, often a single sheet will vary from A to C grain across it's width. This cut of balsa wood is useful for general purposes... Use for flat uncomplicated fuselage sides, trailing edges, wing ribs, formers, planking of soft gradual curves, wing leading edge sheeting (select the softest portion of sheet for the tightest curvature).

Generally, try to avoid buying sheets that change grain type dramatically across the surface (which can cause warping). If A or C grain is not available, you can sometimes find a portion of a B grain sheet that will make the part concerned. Occasionally, a variable grain structure may suit a particular part that requires different characteristics in different areas, but such occasions are rare. Don't use if type A grain or type C grain will do a significantly better job.



C-Grain also known as a Quarter grain or Quarter sawn is shown above. This grain type has shorter, more mottled grain and is the most pleasant in appearance, sometimes looking like fish scales (occasionally the fish scales are of 'shot silk' iridescent appearance). It is very stiff across the sheet, is brittle and splits easily (sometimes too easily) longitudinally. This is the most warp resistant type, but it is difficult to sand effectively. Use for sheet balsa flying surfaces, fins, flat fuselage

sides, wing ribs, formers, trailing edges. Don't use for curved planking, rounded fuselages, rounded tubes, hand launched glider fuselages, or wing spars.



End Grain also known as a Cross grain is shown above. This is a fourth way of cutting balsa wood which involves cutting thin slices perpendicular to the run of the grain, this has very little application in model aircraft apart from the very largest models that may be a quarter scale.

The cross grained pads are used as fillers between stiff outer sheets to form laminated composite materials that are light and yet stiff.

Model supply outlets will have a large display of balsa sheets, sticks, profiles and blocks that you can choose from if you are going to build a model from scratch. When you select the pieces you wish to purchase you should keep their final use in mind. The lightest grades should be reserved for the lightly stressed model parts... Nose blocks, wingtip blocks, fillets, etc. and the heavier grades kept for important load bearing parts of the structure. Spars, stringers, motor peg mountings and so on. To a large extent, this selection process is already partly done for you by the materials supplier, who will purposely cut the lightest raw balsa into blocks and the heavier grades into sticks and strips. Sheets can be cut from the whole range of possible densities.

When selecting balsa sheets for use in your model, it is important to consider the way the grain runs through the sheet as well as the density of the sheet. The grain direction governs the rigidity or flexibility of a balsa sheet more than the density does.

For example, if the sheet is cut from the log so that the tree's annular rings run across the thickness of the sheet (A-grain, tangent cut), then the sheet will be fairly flexible edge to edge. In fact, after soaking in water some tangent cut sheets can be completely rolled into a tube shape without splitting.

If on the other hand the sheet is cut with the annular rings running through the thickness of the sheet (C-grain, quarter grain), the sheet will be very rigid edge to edge and cannot be bent without splitting. When the grain direction is less clearly defined (B-grain, random cut), the sheet will have intermediate properties between A and C types. Naturally, B-grain is the most common and is suitable for most jobs.

Laminating Balsa sheets can change the properties significantly as can laminating balsa with other materials like birch ply or plastic foam. Ply structured from sheets that have the grain direction alternating at right angles for each layer can have two different characteristics depending on whether the part concerned is cut with the long axis along one of the grain lines or cut on the bias. Bias cut parts will be somewhat more flexible and able to resist shock without cracking or splitting.

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## 7. Eulogy

The following eulogy was given by fellow beekeeper Roger Patterson at David Cushman's funeral in 2011.

*I knew Dave Cushman through beekeeping, which was one of his many interests. Although he made a huge contribution to the craft I am only going to concentrate on the small part I am involved in.*

*I consider I knew Dave very well and my memories of him will always be positive. Due to the electronic age he was well known and well respected for his beekeeping website that was largely developed during a long period of illness, which is a remarkable achievement. The website has become a tremendous resource for beekeepers and researchers worldwide and is often the first source consulted by beekeepers of all abilities. It is seen as the leading resource by some distance and is probably the most linked. I once asked Dave why he had instructions for the use of a chemical treatment for bees that is not registered in the U.K. His response was that his website was accessed by many non U.K. beekeepers and he was trying to provide a service for everybody.*

*It is a credit to him that although he had strong views on some issues he was willing to include material that he didn't agree with, providing it was technically sound and it would help someone somewhere else.*

*It was typical of his generosity that virtually all his material was free of copyright and he encouraged others to use it, all he asked for in return was a credit.*

*I have no need to discuss the details here but several weeks before his passing he asked me to take over his website. He had done no work on it for some time because the physical effort involved in simply keeping going was as much as he could manage. He couldn't even get upstairs to let me have the information I needed in order to transfer it. I could tell he was frustrated, which is understandable considering some days he spent 15-16 hours at the computer, and he was no longer able to do so. In many ways Dave was a perfectionist and if he did something he wanted to do it well, probably as a result of his engineers mind. Everything in his websites was meticulously hand coded. The amount of work he got through was phenomenal and he was always doing something. How he managed to find the time to do what he did is amazing. Very often an email to him would be answered within an hour, and I know other people can tell similar stories.*

*I am dealing with the family regarding the website transfer which I hope will go fairly smoothly. I am unable to spend the time Dave did on it, but I will do my best. He was an exceptionally good friend of mine and from the messages I have seen he was a friend of many others too, most of whom never met him. I don't like the word "Memorial" because so often it is seen as just a piece of wood, metal or stone with a few words on. As far as I'm concerned it will always be Dave Cushman's website and permanently on display where future generations of beekeepers can enjoy the benefits the rest of us have taken for granted. He will not be quickly forgotten.*

*Dave maintained and hosted several other websites, some not beekeeping and to the best of my knowledge he didn't accept payment for any of them.*

*I never saw him handle bees, but considering his caring attitude towards them I guess he was good. He certainly had a huge amount of knowledge about them. I heard several of his lectures and they were never the same, always something different. The last one being at the Bee Improvement and Bee Breeders Association (BIBBA) Conference in Cahir, Tipperary, in September, where despite his obvious declining health he still put up a good performance. Although his movements were slow his brain was incredibly sharp right to the end.*

*He was a regular contributor to many internet beekeeping discussion groups where his knowledge was well respected. There were no silly pointless posts with Dave, that was not his style.*

*On one such discussion forum the following was written by a beekeeper from California:-*

*"Definitely sad news. Like hearing of the passing of other bee giants like Brother Adam, Richard Taylor, Steve Taber, Harry Laidlaw in my beekeeping generation.*

*He was a pioneer in the beekeeping field as one of the first to use the power of the internet to share his love of beekeeping with others worldwide. Might be said he was the first to aggregate so much information and make it so readily available without charge to so many folks who were interested in bees.*

*Even after many years of beekeeping I would find myself gravitating back to his website whenever I had a question about anything "bee" related. If I was looking for something "new" or trying to recall something I had forgotten on a subject I would search his knowledge database.*

*He laid things out in a way that conveyed the information in a manner one could easily understand. Very helpful for those of us not fit for a PhD behind our name.*

*A truly gracious beekeeper who loved the bees and obviously loved sharing what he knew with others. Also, he lived as poignant example proving that no matter what your physical condition is in life, you can still make a grand contribution to the betterment of society if you are willing."*

*There are others with a similar content.*

*Dave was well thought of in Ireland and a regular attendee at the annual beekeeping summer school at Gormanston, where he lectured on several occasions and his wisdom was eagerly sought.*

*Dave was an authority on our native bees and did a lot to publicise them. He was a trustee of the Bee Improvement and Bee Breeders Association and at their meeting on 13th February the committee voted to make Dave an Honorary Member. A certificate was to have been presented to him at the AGM in April. He was an Honorary Life Member of the Galtee Bee Breeding Group based in the Republic of Ireland and in a message I received from the Chairman, Micheál Mac Giolla Coda*

*I quote "He was a great friend of GBBG and held a special place in his heart for this group.*

*Those who were lucky enough to spend time in conversation with Dave would quickly realize what an incredibly knowledgeable man he was about a lot of things you wouldn't expect. There seemed to be hardly a subject he knew nothing about. If he didn't know something he would be happy to say so, and if he was interested he would research it and let you know. Conversations were never one way and I never detected an air of superiority, he was just happy to chat, gaining and imparting knowledge.*

*Dave did not suffer fools and being of similar nature I can fully understand that. I would be fooling you if I didn't say there were some he didn't take to and some who didn't take to him. He was outspoken and although I don't consider that a fault some do, especially if they are told something they would rather not hear. He may on occasions have appeared abrupt, but considering his condition, those who knew him understood and forgave him. He was obviously in a lot of discomfort and considering how active he had previously been, it must have been very frustrating to be so handicapped. He was very open about his condition but I never once heard him complain. In fact he often poked fun at himself, often with a bit of help!*

*Overall I found Dave very fair minded and he certainly put the needs and understanding of honey bees above personal glory, something he objected to most strongly in others, who were trying to make a name for themselves when they had no right to do so.*

*At the 2009 National Honey Show we spent a lot of time together manning the stand of the Bee Improvement and Bee Breeders Association. We were next to the stand of the largest beekeeping equipment supplier, who had a small polystyrene queen mating hive for sale for around £10. I showed it to Dave who had a good look at it, we had a bit of a discussion and I put it back. I then went off to introduce a lecturer at one of the seminars and when I got back an hour or so later I saw this item on our stand. I said to him "I thought I put it back, and picked it up to return it". "I've bought that" said Dave. My reply was "What for, you haven't got any bees?". "I've been thinking about it and I've got an idea to help the ordinary beekeeper make better use of it". Soon afterwards an article from Dave appeared in the Bee Improvement Magazine and subsequently on his own website. He had spent his own money he could probably ill afford on something he was never going to use himself just to help others.*

*Along with many others I'm going to miss Dave Cushman. He sought no personal glory, but he was well known and respected, simply because he did a lot of favours for a lot of people and he did them well. He earned and deserved their respect. Thanks for your contribution to my life Dave, and those of many others worldwide, most of whom weren't fortunate enough to have met you.*