LET THERE BE LIGHT

I have been modelling for many years, and over those years, I have built some great models and some not so great ones. To help building better models, there are 2 key elements to help us achieve that goal;

- Good workstation
- Excellent Lighting

A workstation is a must in our field. If you work on the dining room table all the time, you will have to set up and put away everything each time therefore the chances of breaking parts or losing them is multiply by 10. Plus, it takes time to get organised and we all know that we don't have lots of free time for our hobby, I know I don't!! With a workstation, all your accessories are nearby, and you don't need to move anything and so the chances of losing or breaking parts are minimized to the minimum.

Lighting is the other crucial element we all have. There is never sufficient lighting to see all the tiny intricate details or trying to see the finest of all scratches so that when you are ready to paint, it will go on smooth and hopefully flawless. I have 2 articulated lamps on my desk and even though they are mounted, they do take a lot of room, I bump into them, bang my head on them or have to swing them away so that I can look for my paint or my drawers for parts.

Over the years, lighting as evolved dramatically and it has helped us getting better, brighter workstation so that we can see more details. The years of the Incandescent Bulbs burning the top of our head are over. I simply remember having a desk lamp with a 100W bulb burning many time the top of my head when building, and using that same light to help smooth out the enamel paint on the freshly painted model. Ah those were the years!

Then the Fluorescent Light (Neon) started illuminating the desk, drafting tables, offices and workplaces because of their brighter light, longer longevity and not as hot as the Incandescent bulbs were. They were big articulated arm that could be placed where you needed it. They were very expensive but they didn't burned the top your noggin. Fluorescent light are still used today, with different warmth from warm white to cool white and even daylight. They helped modelling a lot by not changing the colours as much as incandescent bulbs did. But the fluorescent bulbs are slowly fading out to newer technology.

For a short span, we had the Compact Fluorescent Bulb (CFL) commonly known as spirals. It was a fluorescent spiral lamp designed to replace the incandescent light bulb; some types fitted into light fixtures designed for incandescent bulbs. A CFL had a higher purchase price than an Incandescent lamp but could save over five times its purchase price in electricity costs over the lamp's lifetime. Like all fluorescent lamps, CFLs contain toxic mercury which complicates their disposal. In many countries, governments have banned the disposal of CFLs together with regular garbage. White LED lamps now compete with CFLs for high-efficiency lighting, and General Electric as stopped production of domestic CFL lamps in favour of LEDs.

Today we have the LED (light emitting diodes). Appearing as practical electronic components in 1962, the earliest LEDs emitted low-intensity infrared light. Infrared LEDs are still frequently used as transmitting elements in remote-control circuits, such as those in remote controls for a wide variety of consumer electronics. Modern LEDs are available across the visible, ultraviolet, and infrared wavelengths, with very high brightness. LEDs have many advantages over Incandescent light sources, including lower energy consumption, longer lifetime, improved physical robustness, smaller size, and faster switching. Available in a huge range, colour, style and brightness, they can be complicated to determine which one is best suited for your needs. I will try to help out as much as possible on which one are more suitable for our modelling.

When looking at an LED package, and what's written on the box, nowhere it said the "wattage" like we have been used of seeing over more than hundred years. Back then, we had 40w, 60w, 100w and so on, we knew that the higher the numbers were, the brighter the bulbs were and the hotter they got too!! Let me explain the LED a bit.

HOW MUCH POWER DO LEDS USE?

LED Bulbs use up to 90% less energy than an Incandescent or Halogen bulb of equivalent brightness. LEDs are far more efficient at converting electricity, measured in watts, into light, measured in lumens. As such, a typical 4 watt LED bulb can easily achieve a light output comparable to a 50 watt halogen, sometimes higher due to its high lumen to watt ratio.

HOW LONG DO LEDS LAST?

One of the biggest benefits of using LED is its outstanding life time expectation due to very efficient thermal management. LED Bulbs are able to remove heat through heat sinks to help prolong the life expectancy of the bulb by slowing down lumen deprecation. A well-built LED with good thermal management should last up to 50,000 hours.

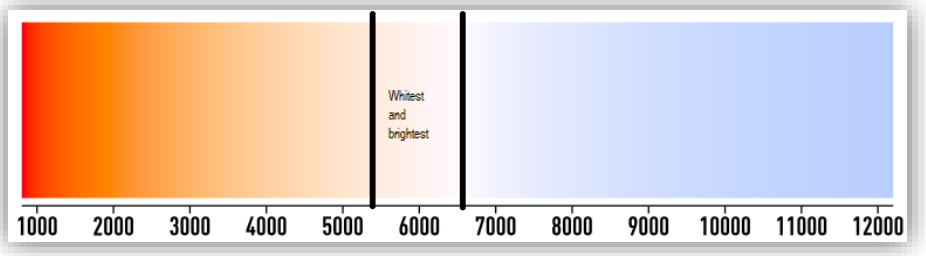
HOW BRIGHT ARE LEDS?

The brightness of a bulb is measured in lumens (Lm), the higher the number of lumens, the brighter the bulb. Despite using very low wattages, LEDs are able to emit the same brightness as traditional light sources. We use to look for WATTS (energy), now you look for LUMENS (brightness).

WATTS (Energy)	LUMENS (Brightness)
150 W	2600 Lm
100 W	1600 Lm
75 W	1100 Lm
60 W	800 Lm
40 W	450 Lm

WHAT COLOURS ARE THE LED ARE AVAILABLE?

Light output is mostly commonly found in one of three colours, Warm White, Cool White and Daylight. Color temperature is conventionally expressed in kelvin, using the symbol K, a unit of measure for absolute temperature. Color temperatures over 5000 K are called "cool colors" (bluish), while lower color temperatures (2700–3000 K) are called "warm colors" (yellowish). The best light and the brightest is between 5000K and 6500K. That is where the light is at its whitest.



DIFFERENT LIGHTS WE CAN USE ON OUR WORKBENCH:

There are plenty of lamps we can use to illuminate our workbench for building our plastic models. Some people are very satisfied with a simple desk lamp, but I'm always looking for more lighting. The brighter it is, the better it becomes.

For our hobby, here are some type of lamps we can use and what are the "PROS" and "CONS" for each:

1. TRADITIONAL DESK LAMP:

   a. PRO:
      1. Timeless look
      2. Fairly cheap depending of which type of bulb used
      3. Small size
      4. Every stores have them
      5. They can be Incandescent, Fluorescent, Compact fluorescent even LED

b. CON:

1. They take up precious space on the work surface when you have a small surface to work on.
2. Been smaller and lower, they tends to illuminate only a very specific place so you need to move it closer to your work and it obstruct with your model.

2. SWING ARM DESKTOP LAMPS:

a. PRO:

1. Being bigger, the lighting is a little better than a traditional desk lamp.
2. It can be located closer to your model without moving the base of the lamp.
3. Some lamps can take a higher wattage bulb to improve the lighting.
4. They can be bought with a built in magnifying lens so that you can take a close look at your work.

b. CON:

1. Because of their greater size and swing arm, the base is much bigger, taking even more room than a traditional desk lamp.
2. Manipulating the swing arm to have the light closer to your work creates the danger of tipping over, resulting in damaging your model.
3. Because it can be swing closer to your work, you have a tendency to hit your head on it or feeling your hair burning because of the high heat generated by the incandescent bulb.

3. CLIP-ON DESK LAMPS:

a. PRO:

1. Excellent for desk or workspace too small to accept traditional desk lamp.
2. Compared to a traditional desk lamp, they attaches to the edge on the side of the table with a clamp, clip or by drilling a hole in the desk to insert the peg of the lamp into it.
3. They take less room because there are no base on your workstation.
4. Almost no chances of tipping over.
5. Similar to the swing arm desk lamp, they can be equipped with a magnifying lens to take a closer look at your project.

b. CON:

1. Some of these lamps can be very expensive if you are looking for a good quality lamp.
2. Even if they can be brighter, they still create shadows on your model requesting you to constantly shift the light around.
3. Clamping them can be an issue when you have very confined space or you have an IKEA desk. Their top are constructed of laminated cardboard, making them pretty hard to have a strong anchor point to mount or screw the bracket without breaking the surface of the desk and if you have to drill a hole to mount your lamp, the inside been cardboard, make it impossible to mount.

With LEDs getting very popular and available at more reasonable cost, we can achieve pretty much any type of lighting we can imagine.

3 years ago, I started looking around for a light that I could bring to our monthly build sessions at Canadian Space and Aviation museum (CASM) that; didn't take too much room, easy to carry and bright at the same time. I started searching for ideas on the web and saw a post that had and arch light installed over is workspace and it caught my attention. What if I could build something similar to this, it would be light to carry, brighter than having a swing arm lamp that blocks the view when a person is trying to have a conversation with you about your interest. So I started researching the web for what I would need to build this type of lamp.

SMD/LED strip light comes in many types and sizes.

An LED Strip light (also known as an LED Tape or Ribbon light) is a flexible circuit board populated by surface mounted light-emitting diodes (SMD/LEDs) and other components that usually comes with an adhesive backing.

WHAT ARE THE DIFFERENCES BETWEEN LED CHIPS?

LED chips (SMD, surface mounted diodes) are all identified by a four-digit number. These codes are less complicated than it looks. It simply indicates the size of the LED chip. For example; the dimensions of SMDs on 5050 LED strip lights are 5.0mm x 5.0mm.

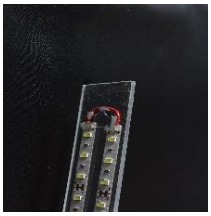
LEDs like 3528s, 5050s, 2835 and 5630s aren't really different types of chips at all, they're simply different sizes. Each has its own spec: different power requirements and output brightness. The best choice depends on what's right for your project. Again, 3 years ago, there weren't a lot of types of strip light available, so I chose the number 5630 for the only reason I choose them was because they were the brightest one of the only 2 available.

Type of chip	Dimension	Voltage	Wattage	How many chips	Brightness
3528	3.5mm x 2.8mm	12 volts	4.8W/M	60 or 120 chips/M	330-360 Lm/M
5050	5.0mm x 5.0mm	24 volts	14.4W/M	30 or 60 chips/M	500-1000 Lm/M
2835	2.8mm x 3.5mm	12 volts	14.4W/M	60 or 120 chips/M	1300-2600 Lm/M
5630	5.6mm x 3.0mm	12 volts	14.4W/M	60 or 120 chips/M	2000-2700 Lm/M

After receiving my strip lights, I needed some sort of object to build the arch. I drove to my local hardware store and looked around and found an Aluminium bar that was 1 inch wide x 1/8 inch thick in 8 foot length. Well it would have worked fine if my lamp didn't need to be moved around, because it is long. So I started thinking, how could I make mine portable from my place to CASM? One thing led to another and the project handed up on the shelf like a lot of my ideas unfortunately. Earlier this year, a member of IPMS Ottawa started posting on Facebook the idea of building the same type of lamp and we started sharing ideas left and right and within a couple of weeks, his light was done, up and running. Mind you that his lamp is permanently installed on is workbench, therefore a tad easier to do.

He got me motivated to get mine finished, therefore I went back on my lost and found items and dugout the LED lamp project. Once more, how can I do it portable? The piece of Aluminium that I had was great because you can achieve a perfect arch by bending it until you reach the preferred shape. But, the problem was that the Aluminium retained its shape and would be kind of awkward to carry a 4 foot long arch around. With the Aluminium out of the equation, I needed something to replace it and taught about plastic. Eh, we work with styrene all the time and I think that this could work. Lucky for us, we have a store in Ottawa called CANUS Plastic. Drove to the store to see what they had for my requirements. After discussing with the assistant about my plan, he subjected using Lexan plastic. It's lightweight, resilient and malleable. He also subjected me to install a hinge on the top portion so that I could fold it in half for easy carrying. They also have hinges made of the same material which can be glued to the Lexan. Bought everything that I needed, went back home to start working on the arch by calculating how long I needed the lamp to be. I wanted it to be 4 feet wide and 2 feet high at the uppermost, so I needed to work my common sense a tiny bit to determine the length of Lexan required. I calculated that 2 strips of 37 inches long would create the desired arch needed.

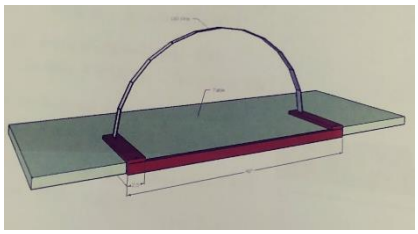
After cutting and gluing the hinge to the Lexan (*Lexan can only be glued using Methylene Chloride, available at Canus Plastic, but it's extremely volatile and smelly*), After the hinge



was glued and dry, I installed the strip light by cutting the strip to length and removing the adhesive backing and sticking it to the Lexan. Simple as that. For the connections, I decided to weld them together because been portable, it will move around and I wouldn't want it to get loose. When doing the connections keep an eye on make sure you connect the negative to the negative and positive to positive.

At that moment I started thinking about how was I going to make the light stand up? Being a part time woodworker, I went in my shop and tried options and came up with 2 pieces of wood with a mortise in them so that each piece of Lexan could fit in them to create the desired

arch. But, the arch didn't stay like I wanted. The pieces of wood were sliding with the pressure the Lexan was exerting on the 2 pieces of wood. I needed something that could prevent the 2 pieces of wood from moving. What if I put a piece of wood the desired width and screw the 2 pieces of wood unto it. Eureka it worked! Only needed to perfect it so that when I bring it from place to place, I didn't need a screw driver or drill.



Came the "Sex Bolt" also known as (Chicago screws or Barrel Nut), it consist of a male and female that screw into each other. Simple as that. This way I

could install the female part into the long piece of wood and have a tread to work with, while the male portion would be in the 2 pieces that lay flat on the table holding the Lexan arch. Now, I needed the 2 pieces of wood to stop swaying on the table, to prevent that, I had to install an additional dowel beside the female sex screw to lock everything together in one piece.

Finished the assembly to test it out revealed one minor problem. Having a hinge on the top portion of the arch, flexes under the pressure creating somewhat of a pointy arch instead. Oh well, I have a lamp in the shape of a Taj Mahal.

Now that the lamp was done, I needed a way to carry it without too much problems. Having studied in architecture, I had many drafting tubes laying around the house and decided to use one of them but to my dismay, I didn't have one long enough to fit my light in it. Looked online to buy a longer one and found out that a 48 inch long drafting tube can be very expensive!!! So time to build one using PVC plastic plumbing pipes. Fairly cheap and almost impossible to break, I bought everything I needed. Again, I just can't build something that simple. I needed to make it differently. Why not make it look like a Bazooka!! ☺ Painted it in Khaki green, installed a shoulder strap to it and made some decals to complete it.

HERE'S A LIST OF MATERIAL USED FOR THIS PROJECT

1. LED light strip, SMD 5630 white 6000K, dimmable, non-waterproof, DC12V 600 LEDs at 15Lm/LED, including power supply.
2. Optional IR remote control with dimmer.
3. Lexan strip of 1.5 inches wide x 8 feet long x 1/8 inches thick
4. 2 pieces of wood of 14 inches long x 2 ½ inches wide x ¾ inches thick
5. 1 piece of wood of 48 inches long x 2 ½ inches wide x ¾ inches thick
6. 2 pieces of Table leaf alignment pins 8mm x 21mm (metal dowels) available at Lee-Valley
7. 2 x ¼" x 20 x 30mm long quick connect "Sex bolt" available at local hardware stores
8. 2 x ¼" x 20 x 17mm long connect inserts "Sex bolt" available at local hardware stores
9. 1 Allen key of 4mm
10. 1 PVC tube of 49 inches long x 3 inches in diameter
11. 2 PVC cap of 3 inches
12. PVC Glue