

The initial assignment for flow visualization is design to help students to become more familiar with how to use a camera depending on the situation. There are a number of settings on even the average camera that most people don't know about. The main three are exposure, aperture and shutter speed. Taking pictures of flames in any environment can be difficult and fine adjustments are usually necessary to produce a clean image. Igniting a flammable liquid from a compressed aerosol-can will produce a large flame with excellent flow mechanics.

The flame is produced by a simple apparatus consisting of an aerosol can containing a flammable liquid and a long handled lighter which can be seen in figure 1. This is a three man job, if you want to be safe, where one person is holding the lit lighter, the second is spraying the flammable liquid and the third is taking pictures. The high velocity of the liquid coming out of the can somewhat causes a mist which enables it to ignite. This would appear to be very turbulent flow with eddy currents. The flow just a few inches from the can nozzle is laminar flow meaning the Reynolds number is around 2,500 to 3,000 but after a few inches the flame spreads out.

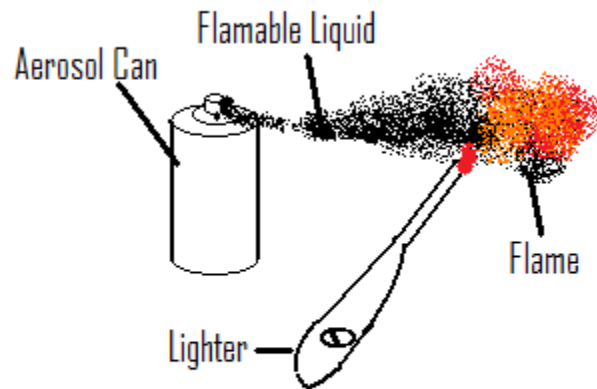


Figure 1

A can of WD-40 is used to make the flame with an everyday Bic grill lighter. There was a little bit of wind which may have helped the flame spread out. This picture was taken at night with a small amount of ambient fluorescent lighting. No flash was used in order to keep the surroundings as dark as possible.

The picture was taken about 2 feet from the flame with the flame itself being about the same length in the picture. The original picture was altered slightly using the curves setting under Image Adjustments. Figure 2 shows the digital camera settings that were used to take the picture.

Camera Data 1			
Make:	PENTAX Corporation		
Model:	PENTAX *ist DS		
Date Time:	8/6/2005 – 12:28:52 PM		
Shutter Speed:	1/1500 sec		
Exposure Program:	Aperture priority		
F-Stop:	f/4.5		
Aperture Value:	f/4.4		
Max Aperture Value:			
ISO Speed Ratings:	800		
Focal Length:	48 mm		
Lens:	smc PENTAX-FA 28-80mm F3.5-4.7		
Flash:	Did not fire		
	No strobe return detection (0)		
	Compulsory flash suppression (2)		
	Flash function present		
	No red-eye reduction		
Metering Mode:	Pattern		
Camera Data 2			
Pixel Dimension X:	3008	Y:	2008
Orientation:	Normal		
Resolution X:	240	Y:	240
Resolution Unit:	Inch		
Compressed Bits per Pixel:			
Color Space:	65535		
Light Source:			
File Source:	DSC		

Figure 2

In my opinion this is a great flame picture which sure a simple apparatus. There are a number of areas in the picture showing this is very turbulent flow. I would have preferred to capture the entire flame but this is the type of image I was shooting for when the project was given.