

# AERIAL PHOTO RECONNAISSANCE FLIGHTS . . .

## CAMROC

### ROCKET CAMERA

Patent Pending

#### Specifications

Diameter 1.6"  
Length 8.3"  
Wt. 1.26 oz.

Uses standard 135  
35mm camera film  
Prints about 2 1/2" dia.

Cat. No. 4112-3

**\$400**

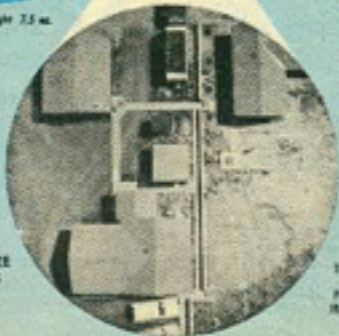
Shipping Weight 2.5 oz.

NOW YOU CAN  
TAKE AERIAL  
PICTURES FROM  
YOUR OWN  
ROCKETS

An ingenious space age camera which automatically takes pictures of the earth from your rocket hundreds of feet in the air as almost like being there yourself.

#### Recommended Engines

Multi-Stage Flight		
Engine	Upper Stage	
\$140	\$144	\$147
Single Stage Flight		
\$140	\$144	

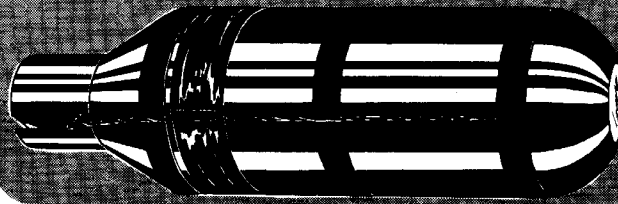


PRINT SIZE  
3 INCHES

PHOTO  
TECHNIQUES  
AND  
PROCESSING  
INFORMATION  
PAGE 34

**World's First Camera Especially for Model Rocketry!**

**NOW  
Your Own  
Aerial Photos!**



**High Strength  
Plastic!**

**Only**

**GAMROC**

**\$4.75**



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## The CAMROC... Its Parts and What Else You'll Need...

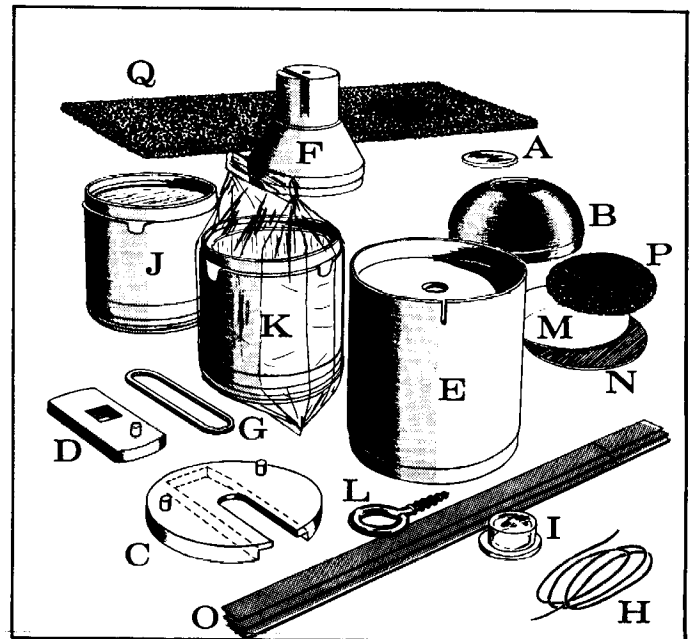
Your Camroc kit consists of the following parts as illustrated in the drawing at right:

- A 1 plexiglass nose cone window--Part #CW-1
- B 1 nose cone--Part #PNC-60T
- C 1 shutter guide--Part #CRB-1A
- D 1 shutter--Part #CRB-1C
- E 1 body section--Part #CRB-1B
- F 1 adapter--Part #TA-5060C
- G 1 rubber band--Part #CSB-1
- H 1 shutter release cord--Part #SLT-11
- I 1 lens--Part #CL-1
- J 1 empty film holder assembly--Part #FH-1
- K 1 loaded film holder assembly--Part #FFH-4
- L 1 screw eye--Part #SE-2
- M 1 frosted acetate disc--Part #CD-1
- N 1 exposed film disc--Part #ENF-1
- O 3 tape strips--Part #CTS-1
- P 1 felt disc--Part #CFD-1
- Q 1 Foam Padding - - Part # PSP-2

In addition to the materials included with your kit you will also need the following tools and supplies:

- 1) Modeling knife or single edge razor blade
- 2) Extra strong white glue
- 3) ~~Extra fine sandpaper~~ or an emery board

Read the entire instructions carefully before beginning construction. Try to visualize the function of each part and how



the pieces will fit together. Then start assembly, following each step in order, checking off each step as it is completed.

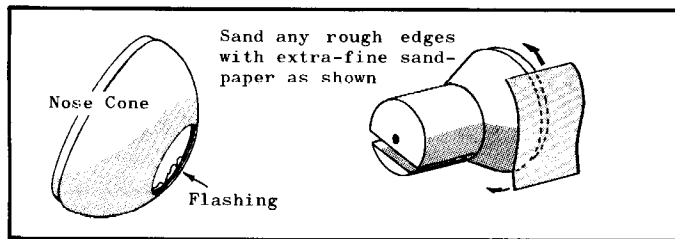
**CAUTION! The film holder in the plastic bag is LOADED. Read the instructions!**

The Camroc is designed to carry a single-exposure film disc in its special film holder. The film holder uses a metal slide to seal its forward end from light when the camera is not being flown. The film holder in the plastic bag is loaded with unexposed film and must not be opened except in a totally dark room (or when properly installed in the camera) to avoid ruining the film.

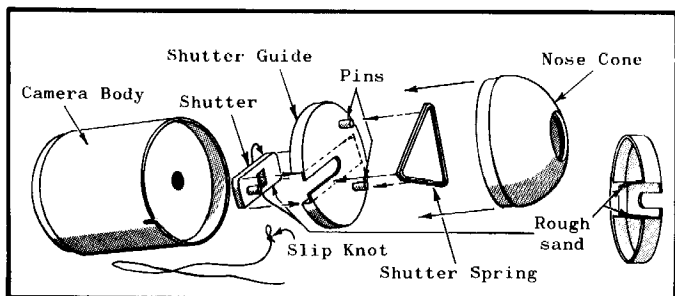
By changing film holders several pictures can be taken on the same day with the Camroc. The procedures outlined in this instruction sheet have been developed to enable the rocketeer to get the best results from his camera work. By following them carefully you will find that your Camroc is a very versatile and useful piece of equipment with applications which are both enjoyable and profitable.

# BASIC ASSEMBLY

- (1) Check all the parts for excess plastic flashing and remove such flashing with a sharp knife. Sand any rough spots with a piece of extra fine sandpaper or an emery board. Buffing the sanded areas with the felt disc will restore some of the gloss to the plastic.

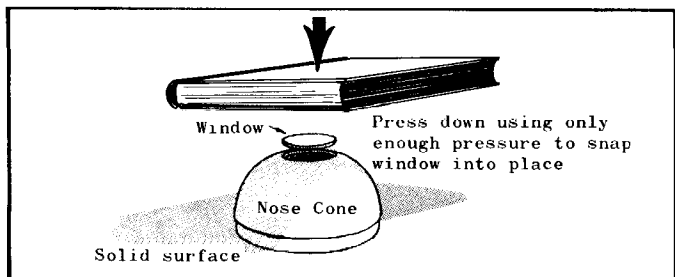


- (2) Sand to roughen only, the shutter stop wedge and the other side. Sand both edges of the shutter in the same way. Tie a slip knot in one end of the shutter release cord and pull it tight around the post on the shutter. Apply a spot of glue to the knot. Place the shutter in the shutter guide channel with the post through the slot. Hook the rubber "shutter spring" around the shutter post and around the two posts on the shutter guide. Press the shutter

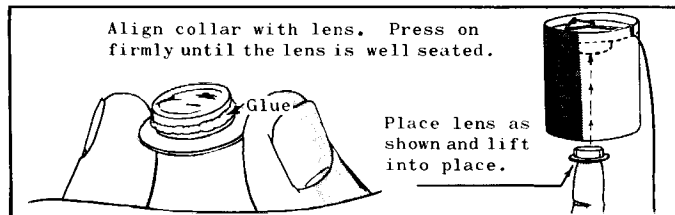


assembly into the front of the camera body. Center the slot of the shutter assembly on the small slot in the body so the shutter release cord comes straight through the body slot. Make sure the shutter guide assembly is seated into the camera body. Test the shutter. It should stick when the shutter is snapped.

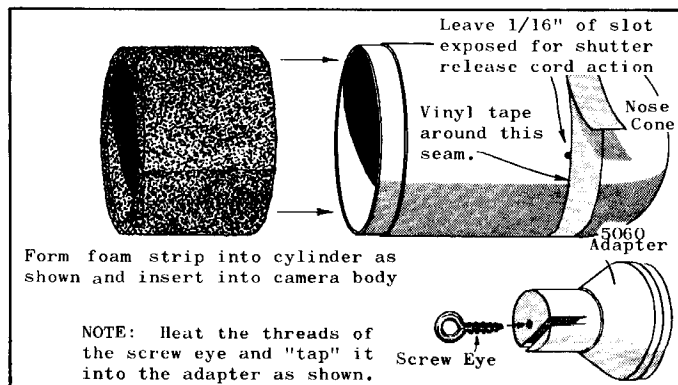
- (3) Press the plexiglass window into the forward hole in the nose cone from the front so it locks in place. Avoid scratching it or getting grease or dirt on it. (The window may be cleaned with a soft cotton cloth and a mixture of one part toothpaste and one part water.)



- (4) Hold the lens by its flange to avoid getting fingerprints on it. Apply a thin line of white glue around the side of the lens. Insert the lens into the collar on the inside of the body. Press it forward firmly to seat it in place all the way forward in the collar.



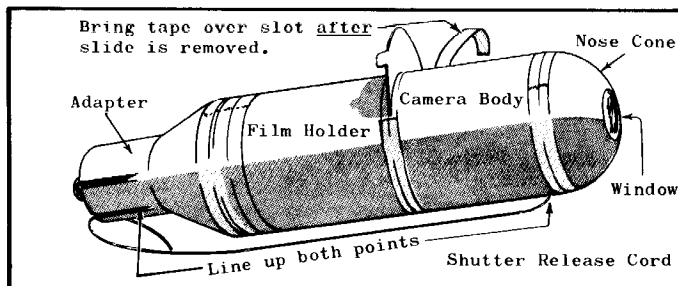
- (5) Form the foam strip as shown and insert into the camera body. Press the nose cone into the forward end of the body. Strip a yellow vinyl tape from the backing sheet and wrap around the body-nose cone joint leaving 1/16" of the shutter release cord slot showing as illustrated. Insert the screw eye into the hole in the base of the adapter.



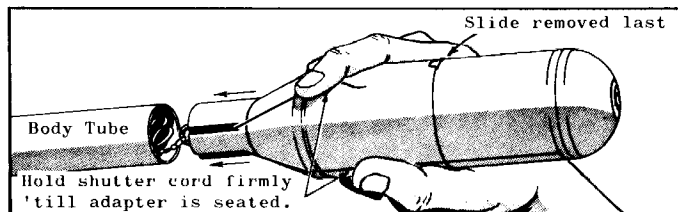
## Preparing for Flight

- (1) Install the engine(s) in the launch vehicle. Pack in the recovery wadding, parachute and lines. Attach the snap swivel on the recovery system to the screw eye on the adapter.

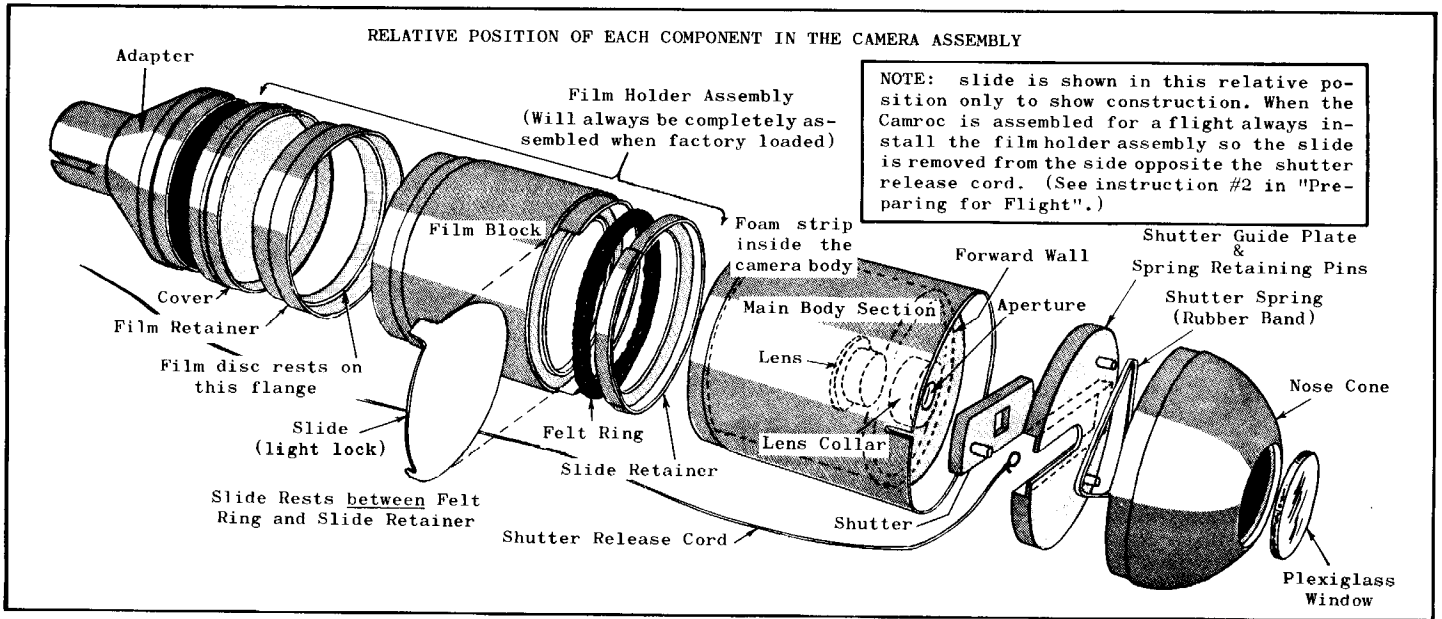
- (2) Place the loaded film holder on the adapter so the slots in the base of the adapter are on the opposite side from the slide on the film holder. Press the two pieces together firmly and wrap a strip of the vinyl tape around the joint between the film holder and the adapter.



- (3) Place the camera body on the forward end of the film holder and align them so the slot in the forward end of the body is directly in line with one of the slots in the rear of the adapter and the two parts fit together snugly. Wrap a strip of tape part of the way around the joint beginning at one side of the slide on the side opposite the one in which the slide fits. Do not cover either the shutter release cord or the slide. Pull back all the way on the shutter release cord so the shutter is in its cocked position. Holding the cord tight, bring it through the slots in the adapter and slide the base of the adapter all the way into the forward end of the rocket body so the body tube holds the cord in place. Pull the slide out and press the loose end of the tape down over the remaining joint area.



- (4) Place the rocket on the launcher and adjust the launching rod for the desired flight path. Connect the micro-clips to the igniter, alert recovery crew and trackers, give the countdown and launch.



As soon as possible after recovery the tape around the joint between the film holder and the body of the camera should be peeled back just enough to uncover the slot for the slide. Immediately insert the slide all the way. The less time the Camroc spends out in the sun without the slide in place the better, since the chances of a ruined picture are reduced considerably when it is in place. (For additional protection, keep the camera shaded from the sun when the slide is being removed or re-

placed.)

When the slide is in place the film holder may be removed from the rest of the Camroc and a fresh film holder mounted.

When changing film holders be careful to avoid disturbing either the slide or the black plastic tape that holds the retainer and the cover on the film block section.

## FLIGHT INFORMATION

By selecting the proper engine types for the launch vehicle and adjusting the angle of the launch rod carefully the Camroc can be programmed to take pictures from different angles and altitudes. The launch vehicle must be built with extra-large upper stage fins to achieve proper stability when it is travelling at low speed near the peak of its flight path. The fins must be perfectly straight so the rocket will not spin and blur the picture. In addition, the shock cord on the model must be attached to the body tube at least one inch behind the front of the body tube so that it will not interfere with the fit of the adapter in the tube.

For best results the Camroc should be flown on a clear, calm day. Wind will make it difficult to control the flight path of the rocket, while cloudy skies will result in poor picture quality. A dirty nose cone window will also reduce picture quality. The engines in the rocket should be centered carefully so that they do not produce off-center thrust which will cause the rocket to leave the desired flight path.

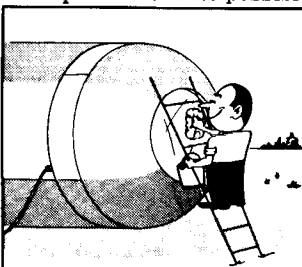
The recommended engines for use in a rocket carrying the Camroc are the B 3-6 for single stage flights and the B 3-0 and B 3-7 for two stage flights. The long delay charges allow the rocket to coast over its peak altitude and point at the ground before the ejection charge activates the shutter and the recovery system. Series I and III engines should not be used with the Camroc as they do not provide enough acceleration for a straight and controlled flight path. Too short a delay period in the engine will result in a horizontal picture or even a picture of the sky, both of which can be obtained from the ground without using rocket engines.

A spotter-recovery crew of two or more persons is recommended. The job of following the booster stage will not be very popular, but should be carried out faithfully to avoid having to build a new booster after every flight. The person who recovers the Camroc should be instructed to handle it carefully, to shield it from the direct rays of the sun whenever possible and above all to not play with the shutter release cord.

## CARE & MAINTENANCE

### Keep It Clean

To keep your Camroc in perfect working condition it should be kept as clean as possible. When dust collects on the plexiglass window it should be removed by wiping it off with a soft camel's hair brush or clean cotton cloth.

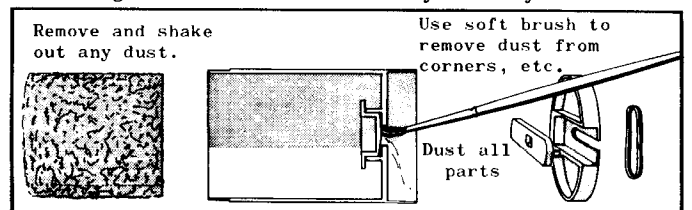


### Removing Scratches

If the window becomes scratched it may either be polished with a piece of soft cotton and a mixture of equal parts toothpaste and water or replaced with a new window.

### Lens Care

Although the lens is well enclosed by the body and the nose

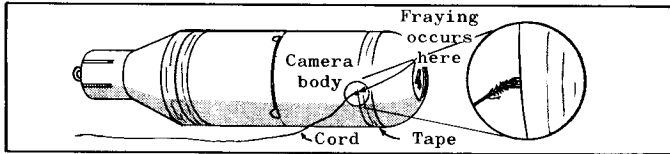


cone, it will eventually collect dust. To clean it, remove the nose cone, shutter guide and shutter and brush off the forward side of the lens with a soft camel's hair brush. Remove the

dust from the rear of the lens in the same manner. When the lens is cleaned all other parts of the camera should be cleaned thoroughly also.

### Release Shutter when Storing

The rubber band that controls the shutter will deteriorate eventually, resulting in overexposed pictures. To retard this deterioration the Camroc should always be stored with the shutter in the closed or released position. If it will not be used for a month or more the band should be unhooked from its posts and left free inside the nose cone. To maintain consistent pictures the band should be replaced with a new one each year. The recommended replacement type is the B. F. Goodrich size 8.

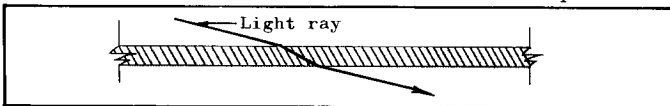


### Renew Cord at First Sign of Wear

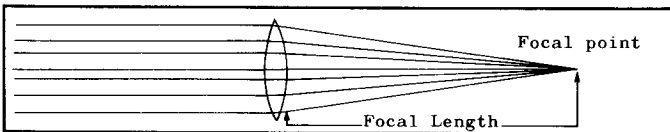
The shutter release cord will eventually become frayed at the point where it enters the nose of the camera. After about 50 flights or when the cord shows signs of excessive wear it should be replaced with a new piece of carpet thread or shroud line cord.

### How It Works

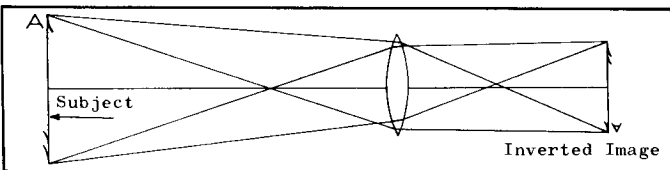
The basic parts of a camera are the lens, shutter and negative. The lens makes use of the principle that when light travels from one substance to another it is refracted or bent at an angle corresponding to the difference in the speed of light in the two substances. This action is illustrated below. The special fea-



ture of a convex lens is that it directs the light reaching it from one point ahead of the lens to another point behind the lens. If we hold the lens above a sheet of paper so that the sun's rays pass through it we will find that at a certain distance from the paper the lens will bring together all the light striking it in a single, sharp image of the sun. The distance from the lens to the image is known as the focal length of the lens.



The action of the lens in producing an image may be observed by placing the sheet of translucent acetate in the rear of the empty film holder, inserting the film holder into the Camroc and opening the shutter. The rough side of the acetate should be towards the lens and the rear cover and the slide of the film holder should be removed. By aiming the Camroc at a well-lighted object it will be possible to see the picture on the plastic "screen." Notice that the image is upside down. Fig. 2 shows how the image is projected on the screen.

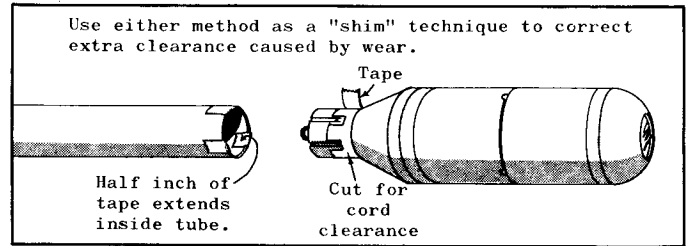


In operation the sheet of plastic is replaced by a disc of film. Where the light strikes the film it causes a reaction in the light-sensitive coating of the film. When the film is processed the portions which have received light turn dark--just how dark depends on how much light the coating (or emulsion) has absorbed. In this way the image on the film is brought out or "developed".

To control the light reaching the film we use a shutter. The shutter allows light to pass through the lens to the film for a short period only (for example, 1/50th second). If all other

### Correcting a Loose Adapter

If the fit of the adapter in the rocket body tube becomes loose and sloppy the rocket may not follow a perfect flight path since the camera will angle slightly to the side and deflect air passing by it. To correct this, wrap tape around the base of the adapter and cut the tape off 1/16" from the slot in the adapter on each side. Do not leave tape in or over the slot.

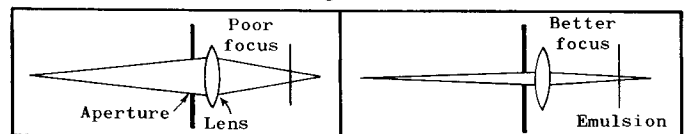


### Printing the Pictures

The rocketeer who has his own darkroom will be able to print pictures from the Camroc with no difficulty. Any standard contact printing or enlarging outfit may be used. For enlarging a cardboard adapter should be made to hold the negatives. For those who do not wish to do their own printing, Estes Industries offers enlargement services. Consult the current price list for further details.

things are the same a longer shutter opening will result in a darker negative, a shorter opening in a lighter negative.

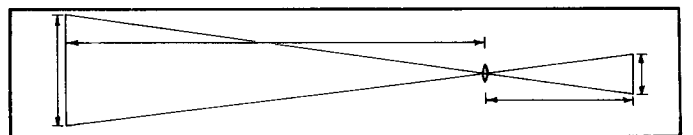
An additional control on the amount of light reaching the lens is the lens opening or aperture. This is the hole through which light must pass to reach the lens and film. The smaller the hole, the less light will strike the film at a given shutter speed. A second effect of the lens opening size is on the sharpness of the picture. Unless each point on the negative is the same distance from the lens there is a tendency for parts of the picture, either at the center or at the edges, to be blurred or "out of focus." The smaller the lens opening, the less blurring will occur. The difference in blurring between a large lens opening and a small one is shown in fig. 3.



### Basic Experiments

#### 1. DETERMINE DISTANCE FROM CAMERA TO OBJECT

When an object of known size is included in a picture it is quite easy to find the distance from the camera to the object if the focal length (distance from lens to negative) of the camera and the size of the object on the negative are also known. For example, if a 15 foot long automobile is included in the picture and its image is 0.125 inch long on the negative, we would, in the case of the Camroc, divide 3 inches (the focal length) by 0.125 inches and then multiply the result by the length of the car (15 feet) to find that the camera was 360 feet away.



#### 2. APPROXIMATING SIZES OF OBJECTS

There are two easy methods of determining the approximate size of objects in a photograph. If the distance from the camera to the object is known the length of the image on the negative is divided by the focal length of the camera and the result is then multiplied by the distance from the camera to the object. If the size of one object is known, the size of other objects may be determined by dividing the length of any known object by the length of its image on the negative and then multiplying the length of the image of other objects by this number. Both of these techniques are recommended for vertical or near vertical photos only.