

**A PRELIMINARY STUDY OF  
UNIDENTIFIED TARGETS OBSERVED  
ON AIR TRAFFIC CONTROL RADARS**

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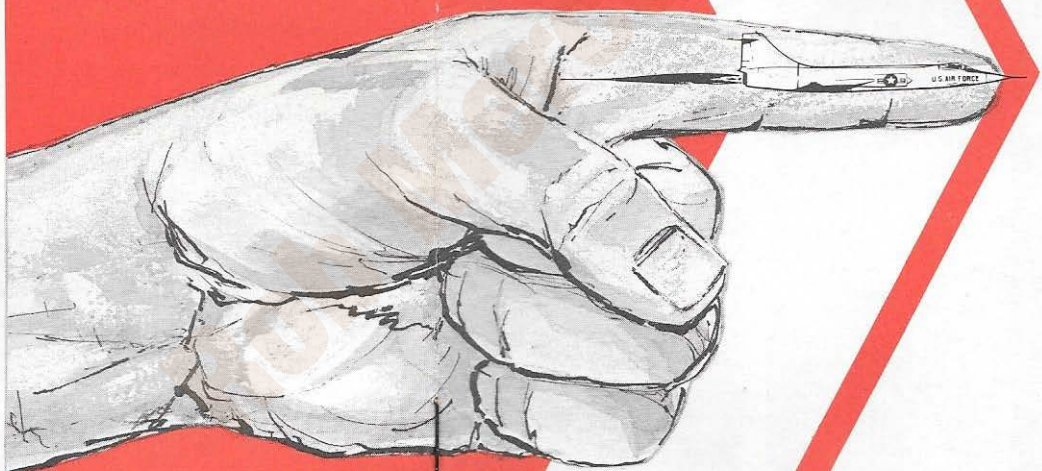






# SONIC BOOM

# SONIC BOOM



*THEY DO OCCUR . . .  
they are part of the jet  
age—and they can cause  
minor damage. If you are  
affected, contact the  
Claims Officer at your  
nearest Air Force installa-  
tion—he will help you . . .*

☆ GPO : 1966 O—228-349

**USAF** OFFICE OF  
INFORMATION





You probably have heard the sonic booms of aircraft flying faster than sound. But if you are like most Americans, you probably don't know what causes the sharp sound — what it can do — what it can't do — whether it is necessary. Since "booms" come without warning — they startle — they might even make you angry. You can hear and feel them, but you can't see them.

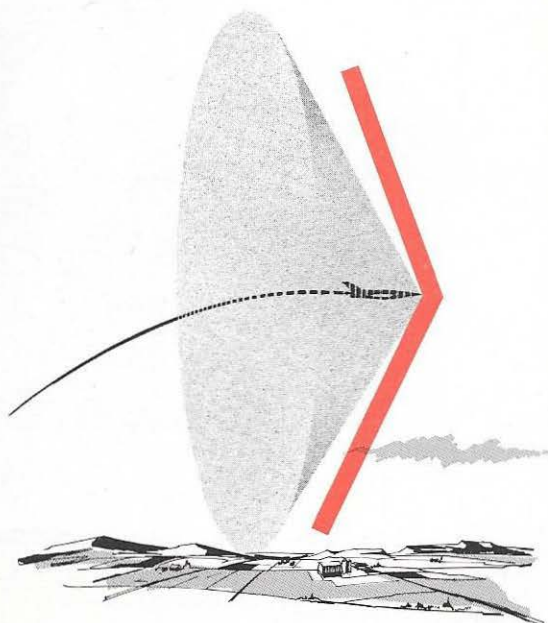
**SUDDEN NOISES**

## *the Sonic Boom*

Pressure waves build up around an aircraft flying faster than sound — spreading in all directions. If these sound waves are strong enough to reach the ground, you will hear a "boom."

### **many misconceptions**

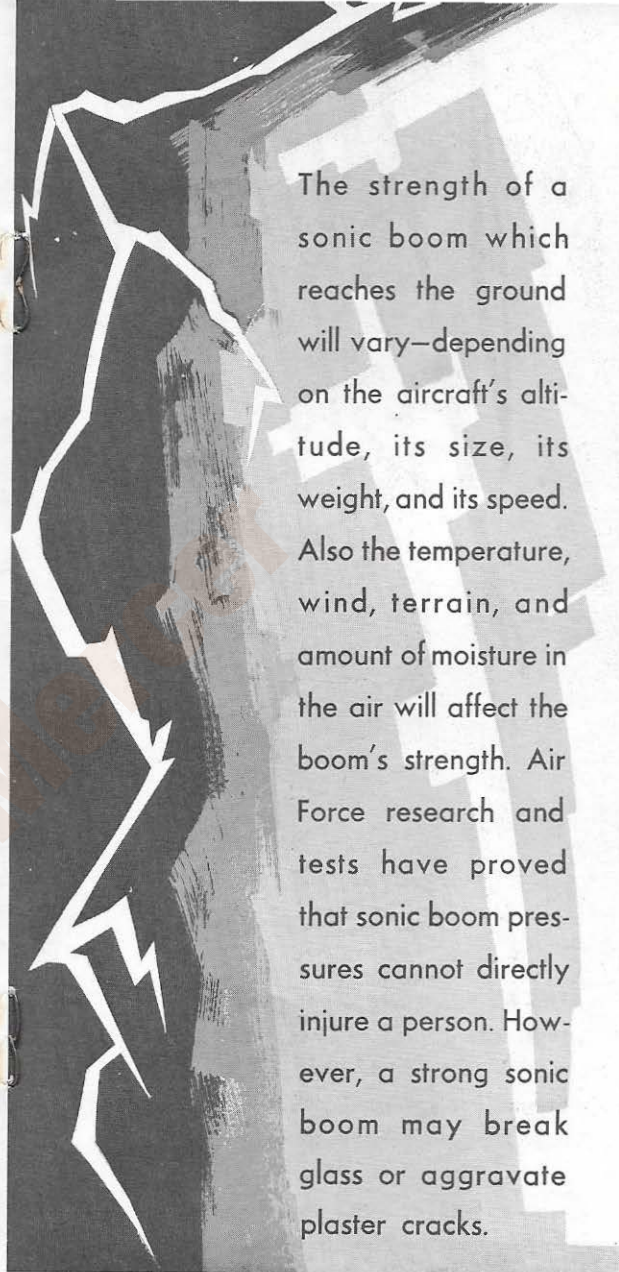
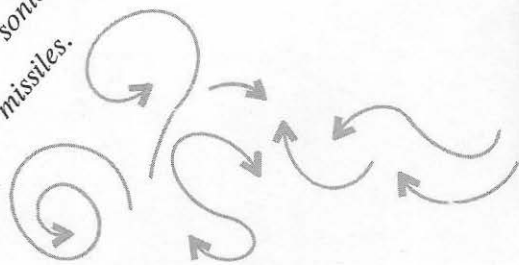
*It is widely believed that sonic booms are created only at the point where an aircraft exceeds the speed of sound. This is not true. An aircraft flying at supersonic speed "drags a cone of sound" along its path.*







Pressure waves created by a supersonic aircraft cause sound when they reach your ear. A sharply cracked whip makes the same sort of sound. Any object exceeding the speed of sound can make sonic booms — rifle bullets — artillery shells — missiles.



The strength of a sonic boom which reaches the ground will vary—depending on the aircraft's altitude, its size, its weight, and its speed. Also the temperature, wind, terrain, and amount of moisture in the air will affect the boom's strength. Air Force research and tests have proved that sonic boom pressures cannot directly injure a person. However, a strong sonic boom may break glass or aggravate plaster cracks.

*the facts* **OF THE MATTER**



## *Your Contribution*

Air Force pilots flying supersonic aircraft are mature, dedicated, carefully trained men who daily risk their lives to perfect their ability to protect our country. They are on directed missions — not “stunting” or “hot rodding.” YOU can make your contribution to our nation’s defense by understanding the need for supersonic flights.

Everything possible is being done to reduce the effects of sonic booms — but . . .

The Air Force and other organizations are trying in every way to reduce the annoyance of sonic booms. For example, the Air Force now restricts supersonic flights to very high altitudes—which increases the distance the pressure cone must travel before it can reach the ground. The result is a much weaker sound heard at ground level.

SOUND MINIMIZED





## AIRCRAFT

Aircraft evaluations are made on the basis of description and flight characteristics. In the majority of reports attributable to aircraft no object is observed and the evaluation is made primarily on the time-motion sequence. The lighting and visual characteristics as well as the time motion sequence may differ with the type of aircraft and/or its mission. Local military installations are contacted for flights of military aircraft operating in the area of a sighting. ACIC provides the section with maps showing low and high level air corridors and flight restricted areas. They also publish the "Flight Planning Guide" which lists all refueling areas and their control agency. Special low-level military training areas are included in this publication and a map showing the routes is distributed periodically. ASD provides support on aircraft lighting configurations and the 17th Bomb Wing provides the project with local schedules. The 922 Air Refueling Squadron at WPAFB provides information of visual characteristics of night refueling operations. SAC recently photographed a refueling mission so that the visual characteristics of a refueling operation might be observed by analysis personnel. Civilian and military agencies known to be engaged in night photography are contacted in cases of suspected photographic missions. No case is evaluated as an A/C if the reported maneuvers are not consistent with aircraft flight.

### CONVENTIONAL

a) Regular scheduled airliners - Fly in air corridors, and are usually controlled by FAA. Lighting will probably be typical red and green wing lights with rotating beacon (Grimes). These A/C use landing lights on takeoff as well as while in landing pattern. Visual characteristics may include period of time reported as hovering or stationary if the aircraft is in a turn or approaching the observer. Total duration should be consistent with flight maneuvers. Not likely that duration will exceed 5 minutes unless some series of maneuvers is being performed. Most often reported at night and reported as single light (landing light blots out the red and green flashing lights). Lighting configurations are not necessarily standard. Experimental and unusual lighting effects can vary with the lighting configuration of each aircraft. (See attached letters from FAA and ARMC.) Color most often reported as white, can be red. Those objects in straight flight at altitude can be checked against local flight corridors. FAA can be checked if there is some doubt that the object is an aircraft or if positive identification as to a specific flight is required. May or may not have sound associated with the report. If near an airport, this type of object is not regarded as a UFO since moving lights in and around airports which could be caused by aircraft are regarded as aircraft (definition included in AFR 200-2).



## REFUELING MISSIONS

Differ from other missions in that lights on the tanker and multiple A/C engaged in the operation add visual characteristics not normally associated with aircraft flight. Reports are night time only since daylight operations can be recognized by the observer. May be both low and high altitude. Refueling missions involve multiple lights moving around, in formation, going on and off, etc. Flight of the basic light formation will be straight until the end of a specific run, then 180 degree turns can be made. Duration in an area may run as high as 15 minutes but each observed single pass should not run more than 4-5 minutes. Lights may appear going one way then appear on their return path at a later time. Operations are controlled and refueling is conducted in specific areas. ACIC planning guide contains the location of these areas and the agency to contact for use of the specific area. Phone calls to the controller of the area will provide information as to whether the area was in use or not. SAC at Offutt Air Force Base maintains refueling schedules for all areas used during a specific month, but these are destroyed on the first day of each month and new schedules maintained. Old records must be obtained from the squadron flying specific mission. The controller can tell which missions were flown, when, and by whom. Specific time of entry and exit must be obtained from the squadron flying the mission. The best procedure is to contact the controller and if the area was in use then contact the squadron for the number and type of A/C flown and their entry and exit times.

## PHOTO AIRCRAFT

- a) A/C using flare drops--More often reported as flares rather than A/C engaged in photo work.
- b) A/C using strobes for illuminating the target. Can be low level or high altitude missions. Only the strobe light is visible and the A/C is reported as a series of evenly spaced flashes. Duration of these sightings usually less than two minutes, more frequently 30 seconds.
- c) Infra Red--These aircraft are specially equipped with turbine generators to drive the equipment. The generator makes a noise similar to a whine and can be heard above the noise of the aircraft. Many are on classified projects and the agencies doing this work are limited. The A/C utilized are relatively slow (less than 125 mph.) Much of the work is done early in the morning and landing lights are used because of the low altitudes flown. The A/C will be low, sound will be associated with the object and the landing light should be observed. No portion of the infra red equipment will be observed.



b) Private or non-scheduled flights - Same characteristics as conventional airliner. Speeds of light aircraft may be slower and the duration longer. Usually at lower altitude. Sound will not be heard if the wind is blowing away from the observer. Duration should not exceed 7 or 8 minutes unless maneuvers can account for additional time period. Normal flight is VFR from some local airport. Not carried on RADAR plots through FAA. Hardest type to check for positive identification. Evaluation made on flight characteristics consistent with A/C.

#### JET AIRCRAFT

Visual characteristics depend upon the type of mission:

a) Airliner and high altitude missions are similar to conventional flights in visual characteristics with the following exceptions: (1) The color is most often reported as red. (2) No sound is associated with the object. (3) Flight is usually straight or with one turn. Duration is about 3-5 minutes depending upon the degree of arc through which the object passes. The FAA has designated airways along which these flights are flown.

b) Special low level missions (military). - Mission flown at 2,000 ft. in known air corridors. Sighting is usually brief (one minute or less). description will consist of an object which may appear to be hovering if the approach is directly toward the observer. May include a sudden burst of speed. No sound if wind is away from observer. More than one light may be observed but object is usually reported as a single light. Flights are at night. These aircraft are not misinterpreted during the day since wings, tail, and/or other features can be noted. (Sample route attached)

c) Special tests or training missions - Characteristics will depend on the number of A/C, formation, type of A/C, etc. Can vary from a single A/C to multiple flights or major air operations. These lights can be determined by contact with local, regional, or major air commands.

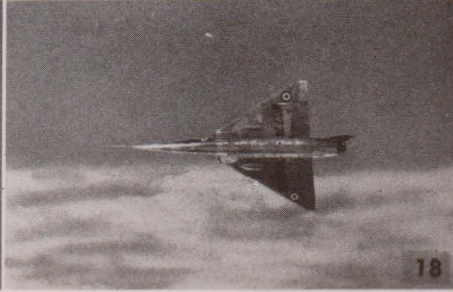
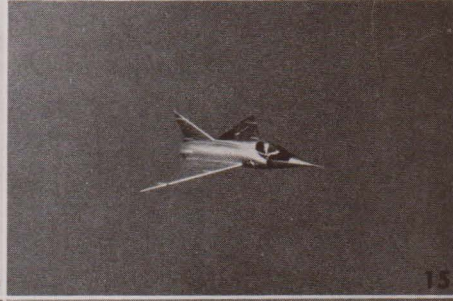
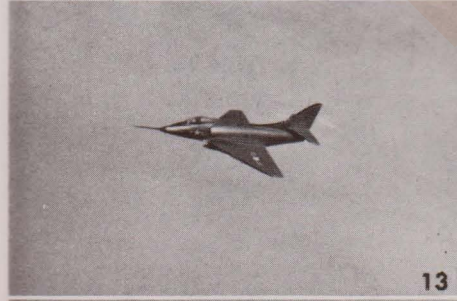
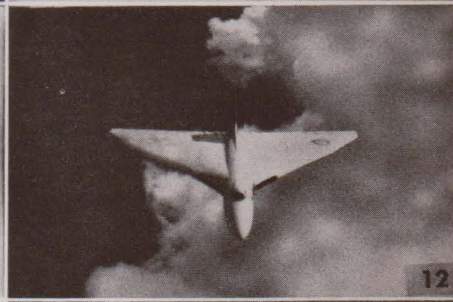
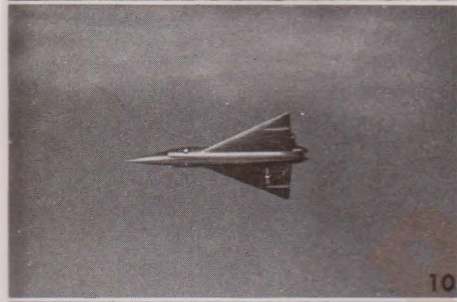
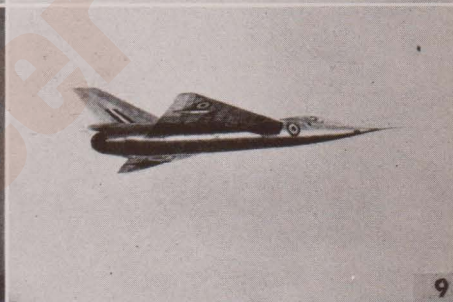
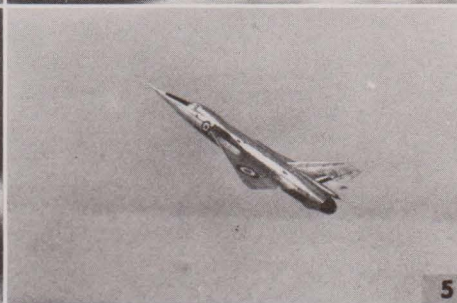
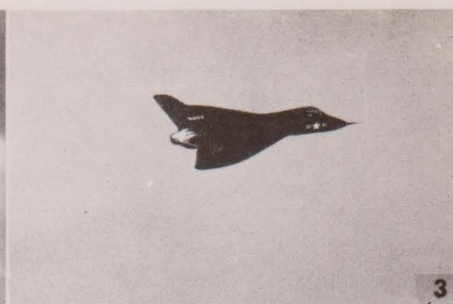
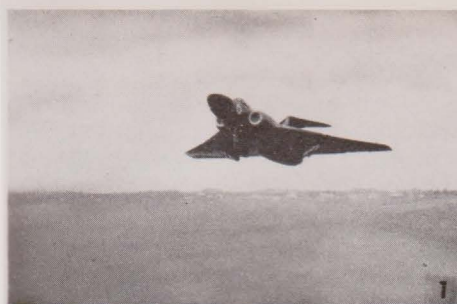
d) Jet with afterburner - Afterburner operation viewed from the side may give the appearance of a short flame. Color usually reported as blue, shape tapering. If afterburner is cut off object may be reported as disappearing completely by just vanishing or the witness may believe that the object zoomed off into space. Duration usually brief. Object frequently in a climb. As viewed from the rear as the object is going away from the observer the color reported may be red or orange with some yellow and shape will not be ascribed to the object. Again disappearance may be sudden. If at high altitude may be reported as a light only, and characteristic same as for other A/C except that motion is faster.



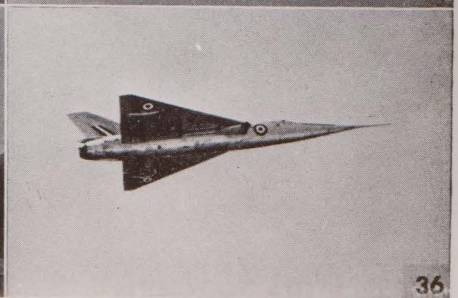
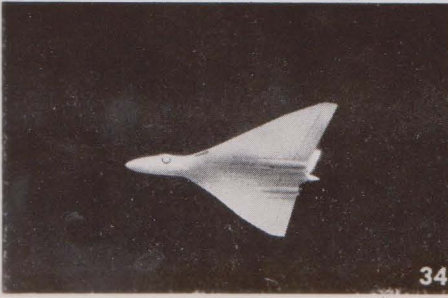
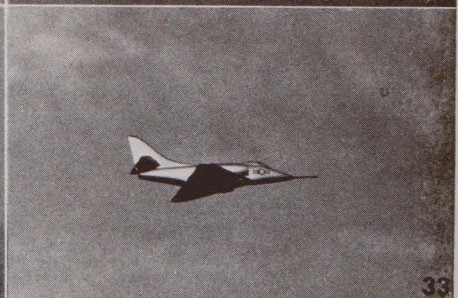
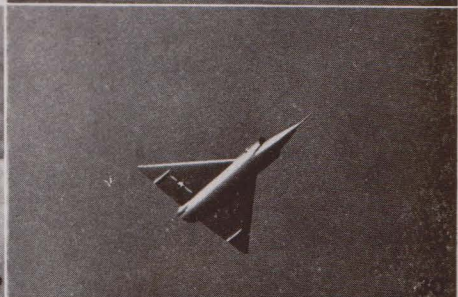
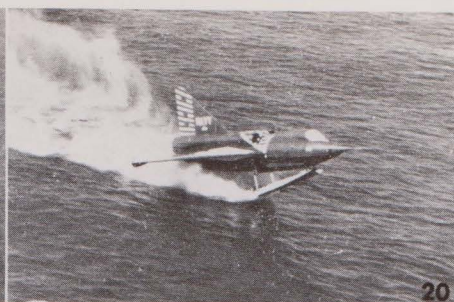
Information on brightness of aircraft lights

A 1000 candlepower light confined to a 30 degree beam will appear of magnitude -6 to an observer at 10 miles. It would be about the same brilliance of Venus about 30 miles away.

Rob Mercer









You can check meteors by looking for accounts of them in the newspaper, or consulting local astronomers. This next slide, through the courtesy of our friend Walt Disney, emphasizes the number of meteors hitting our atmosphere every day.

(Slide 13 - Target Earth.

#### Radar Sightings:

Since ADC has the vast majority of the radar that is operating 24 hours per day, we often receive UFO reports from them. ADC Regulation 200-2 covers such reporting. This regulation states what information is to be forwarded. ADC uses a well designed questionnaire, specifically for radar UFOs.

Although relatively new as a cause of UFO sightings, we are well aware of the fact that certain weather conditions and interference between two radars can cause wierd effects. Our problem is to determine methods of more positively establishing the cause of certain effects and even being able to predict when these effects may take place.

When reporting a radar sighting, the exact weather data are extremely important. Plots of the temperature, pressure and moisture vs. Altitude should always be reported.

#### Radar Scope Photos:

A large number of ADC radar stations are equipped with special radar scope cameras. ADC Regulation 200-2 authorizes the use of these cameras for photographing abnormal returns. These scope cameras should be ready to operate at all times since scope photos are an absolute necessity for the accurate evaluation of reports involving radar. As intelligence field units, you should insist that they use these cameras whenever they verbally report unidentified blips doing wierd things on their radar scopes.

(Slide 14 thru 21 - Examples of radar scope returns - anamolous propagation)

#### Other Causes of Reports:

Naturally balloons, aircraft and astronomical bodies do not account for all the sightings. We have a smaller percentage of other things, such as ducks and geese flying over drive-in theaters at night, searchlights on clouds, unusual cloud formations, blimps, pieces of paper caught in an updraft, and many other things that cause reports. These are very difficult to check and to check them we normally go back to old sightings. For example, sometime back, a certain Western city was somewhat disturbed by glowing objects that flew over the city on various nights. Finally, after considerable investigations, interviews and scientific study of the phenomena, it was determined that it was flocks of ducks or geese reflecting the city's newly installed lights. We will take a case like this and file it, both mentally and physically. When we come across a similar report, we will go back and make a comparative

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