

THE ROYAL



OBSERVER CORPS

RECOGNITION

Journal
and R.O.C. GAZETTE



Vol. I NOVEMBER 1959 No. II

T.38 Talon: combat trainer for the U.S. Air Force



THE ROYAL



OBSERVER CORPS

RECOGNITION JOURNAL AND R.O.C. GAZETTE

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The "Freedom Fighter"

THE great number of F-89 Scorpions which have seen years of service across the United States, Canada and Greenland in every kind of weather has probably given the Northrop Corporation as wide an experience of bad weather flying problems as any single company. They are thus particularly well qualified to produce a new all-weather fighter embodying all the latest technological advances and backed with this great experience.

This they have done in the Northrop N-156F, or "Freedom Fighter" as it has been dubbed. The N-156F has been developed in parallel with the T-38 Talon trainer now in production for the United States Air Force, and the family likeness is apparent from the photographs below and opposite. It was built ("from the ground up", as the company put it) as an all-weather weapon, whereas its operational contemporaries, the "Century Series" of fighters, were only adapted to it later in their careers.

The N-156F is unique in that, for the first time, the U.S. Department of Defense is financing the development of an aircraft which it does not intend to put into U.S. service. The object was to design an easy-to-build machine, with first-class performance and a wide choice of weapons, which would suit

both the needs and the pockets of smaller friendly nations overseas—notably the NATO and SEATO countries.

A choice of new jet engines offering high thrusts for low weight greatly assisted the design of this high-speed, low-weight aeroplane while still allowing ample space for a wide variety of essential radar and electronics (some 40 cubic feet of "black box" space is available in the N-156F). Following current U.S. military policy it is twin-engined, a valuable safety factor in any case but of paramount importance in an aeroplane whose job is to fly in bad weather.

Fully developed, the N-156F will be able to fly at twice the speed of sound, have a range of more than 2,000 nautical miles, and the capacity to carry advanced air-to-air or air-to-ground weapons as well as conventional ordnance loads—an impressive performance by any standards, but the more so when contained in an airframe able to use short fields or be shot off standard "zero-length" launchers with a take-off weight of only 5½ tons.

Aerodynamically the N-156F is a clean-cut craft and very easy on the eye. It has the current vogue in wasp-waisted fuselages and the neat tapered wings are set well back behind a large canopy and a long smooth nose. No sales had been announced at the time of writing, but it appears to be a most promising venture: we wish it well.



The N-156F "Freedom Fighter" over the Californian desert

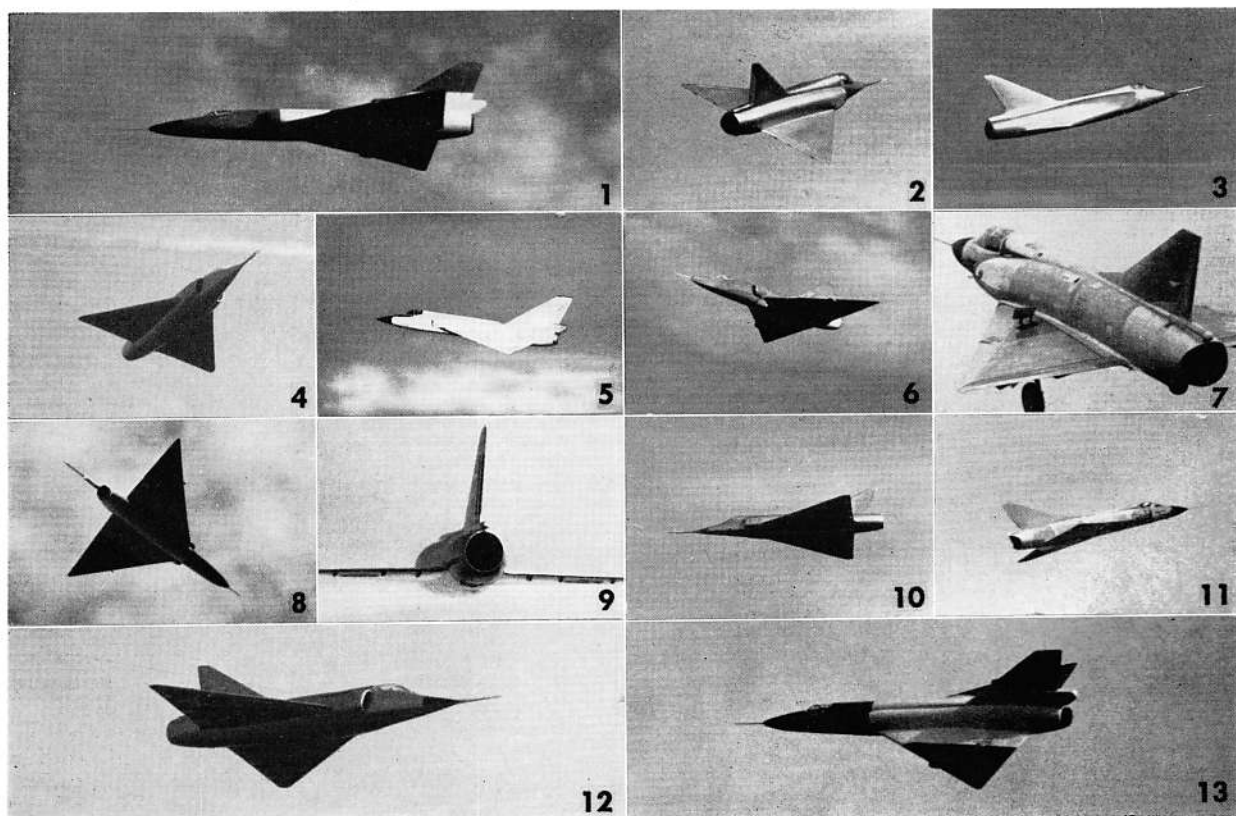
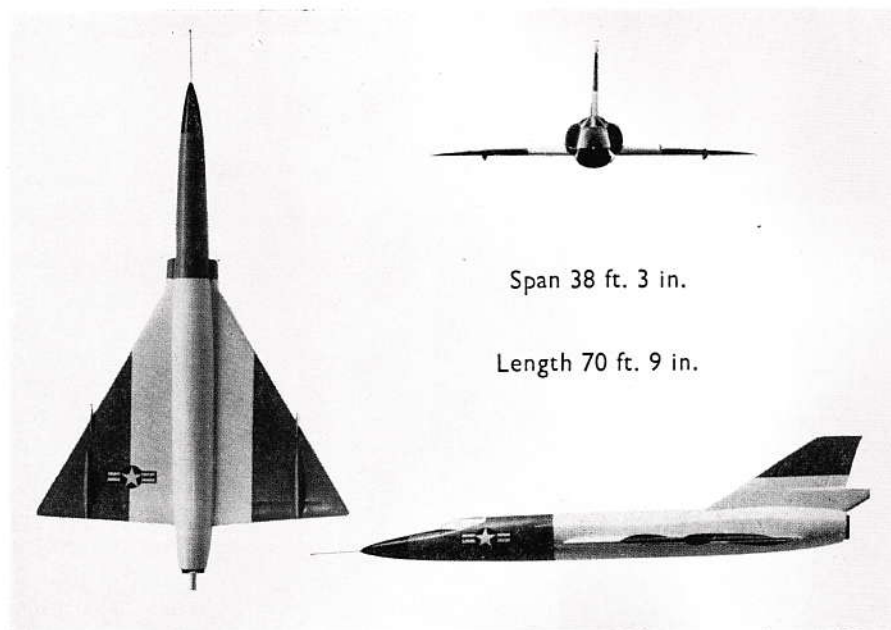
“You Can’t Tell Them Apart Unless They’re Together”

THIS headline is nonsense, of course. You can tell the Mirage from the Delta Dart any time you like if you know what to look for. And if you don't, here is your chance to find out. Once you can do this you have only one problem left—to be able to name each one swiftly and positively whenever you encounter it in future. You will find that writing down—in full—your own answers to the lesson targets as you go along will help you achieve this as well. One cautionary word: don't set too much store by their different nose shapes. Indications are that by the time it reaches service next summer the Mirage's nose may well have been fattened up with a larger radar installation, but that won't change its character.

Convair DELTA DART

U.S. Air Force Fighter

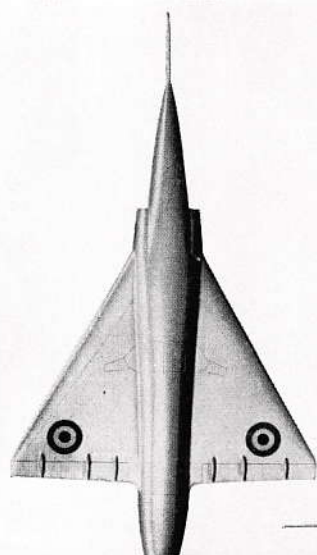
WITH a more stretched-out body than the Frenchman, the DELTA DART looks slimmer—and is a bigger aircraft anyway. The large parachute brake box above the tailpipe is often a good clue, and the wing fences also show up from several angles.



Dassault MIRAGE III

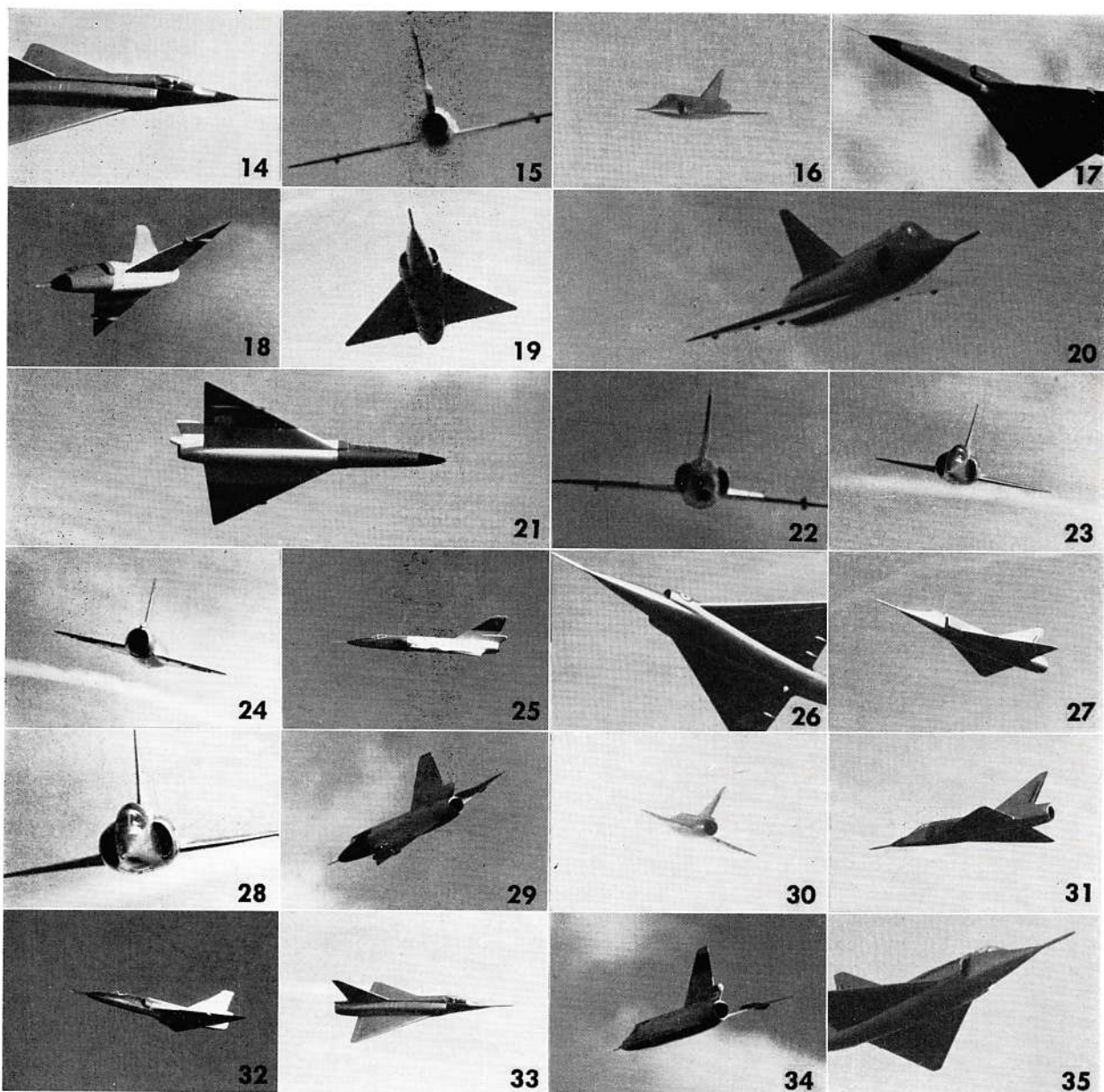
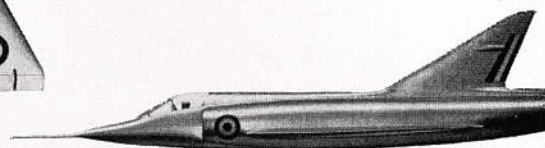
French Air Force Fighter

THE MIRAGE presents a rather more compact little shape than the Delta Dart, being not quite so long in relation to its wing span. The finer-pointed tail fin with its forward-reaching frontal edge is one useful clue, though you will find others.



Span 24 ft. 11 in.

Length 41 ft. 6 in.



A PLAIN MAN'S GUIDE TO THE SUPERSONIC AGE

Modern high-speed flight, besides bringing many new technological problems, has also given rise to a wide new vocabulary of aeronautical terms. An attempt is made below to simplify for the layman the broad meaning of some of the terms in more common usage today. The aero-engine drawings are reproduced from SHELL AVIATION NEWS.

Aerodynamic Heating (colloquially "Heat Barrier" or "Thermal Thicket"). As an aircraft flies through the air, heat is generated by virtue of the work done upon that air; the temperature rise is proportional to the speed, and as speeds become high the temperature rise becomes significant. For example, at Mach 2 (twice the speed of sound) the temperature rise is over 300 deg. Fahrenheit. The strength of normal aircraft materials starts to deteriorate at these temperatures: at Mach 3.5 the temperature rise results in aircraft temperatures of the same order as the turbine temperature in a jet engine.

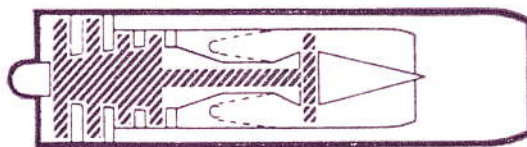
Area Rule. This is a formula applied in the design of an aircraft to refine the total cross-sectional area in order to reduce wave drag at a particular supersonic speed. One of its more familiar applications results in the "waisting" of the fuselage at the wing root (in such aircraft as the Convair F-102A Delta Dagger, for example), at which point there would otherwise be an increase in air turbulence, and thus more drag.



Athodyd. A more technical term for ramjet, it is a contraction of Aero-Thermo-Dynamic Duct. See under *Ramjet*.

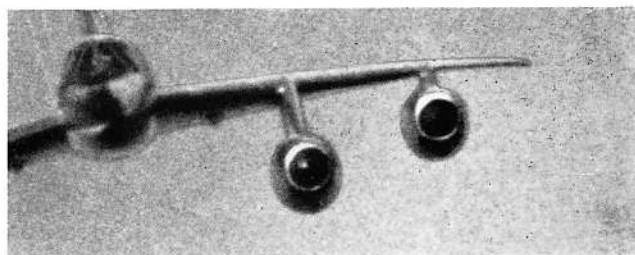
Boundary Layer Control. In one form of boundary layer control, air is tapped from the jet engine to drive a small turbine which sucks in, through small holes in the wing, the thin layer of air flowing directly over the skin of the aircraft and blows it out again, faster and close over the flaps to increase their efficiency and shorten take-off distances. In flight, boundary layer control increases the lift drag ratio and thereby increases range performance. This supercirculation (or "blown flap") form of boundary layer control is employed in the Supermarine Scimitar.

By-Pass Engine. In a by-pass type of engine, only a proportion of the incoming air is burned: the remainder by-passes the combustion system and turbine and rejoins the heated gases in the jet-pipe to mix with them and lower their temperature before the whole mixture is ejected at a lower velocity than in the "simple" jet engine.

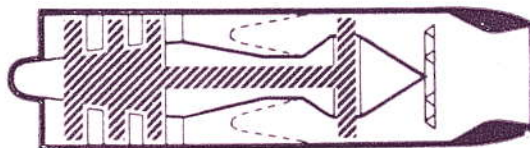


Compound Engine. The compound engine, of which there are several forms, is designed for very long-distance flights. It is a combination of piston and gas turbine engines connected to drive a propeller; the turbine part of the engine is used to increase the supercharging of the piston engine, or it may in addition feed power directly to the propeller. It should not be confused with the turboprop engine (q.v.)

Conical Camber. A type of wing camber with a leading edge which "droops", more towards the tip than at the root. It is so called because, separated from the wing, it is in the form of a section of the surface of a very elongated cone. One effect of conical camber is to improve low-speed handling characteristics of a wing designed for supersonic performance. The Convair Hustler is an aircraft which has a wing with conical camber, the "droop" being plainly visible in some views.

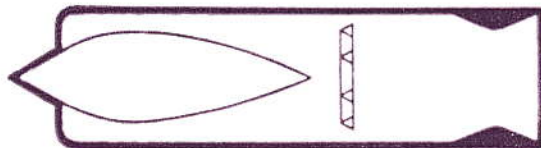


Gas Turbine. The generic name for both jet and turboprop engines, gas turbine, is derived from the name of the spinning disc of blades that provides power internally to drive the compressor (and, in turboprop engines, the propeller as well). Turbine engines can have axial or centrifugal flow compressors, or both, and can be of twin-spool, by-pass, or ducted-fan design, or a combination of each. (The compound engine is only partly a gas turbine.) Re-heat can be applied to a jet engine for extra thrust. The ramjet and rocket motor, which are jets in the very broadest sense, are however *not* gas turbines.



Mach Number. A means of expressing the speed of an aircraft as a ratio of the *local* speed of sound (i.e., according to altitude and temperature).

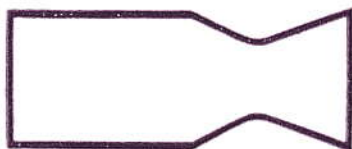
Ramjet. This is a simple "stovepipe" type of engine and has no working parts. It is *not* a gas turbine. It is very expensive on fuel, but gives great power at height and high speed. At normal supersonic speeds below Mach 3.5 it uses more fuel than a turbojet but less than a rocket. The airflow produced by forward speed is rammed direct into a combustion chamber, and the hot gases rush out from the rear end as a high-speed jet.



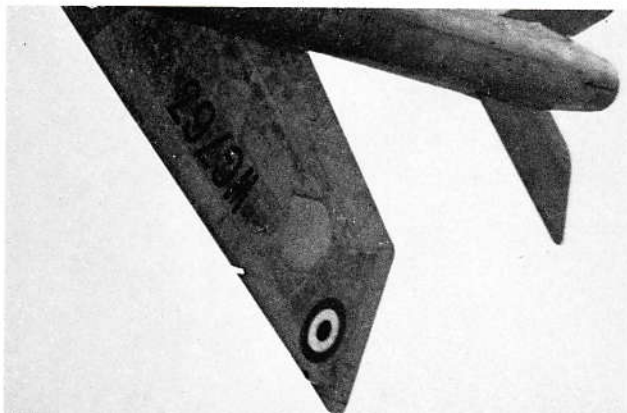
Re-heat. Also referred to as afterburning, this is an effective way of getting great increases in thrust in a jet engine for short periods during acceleration, climb and combat. Neat fuel is injected into the jet-pipe aft of the turbine, and this fuel is burnt by the hot gases as they travel towards the exit of the jet-pipe, thus giving extra thrust. This process is expensive in fuel.



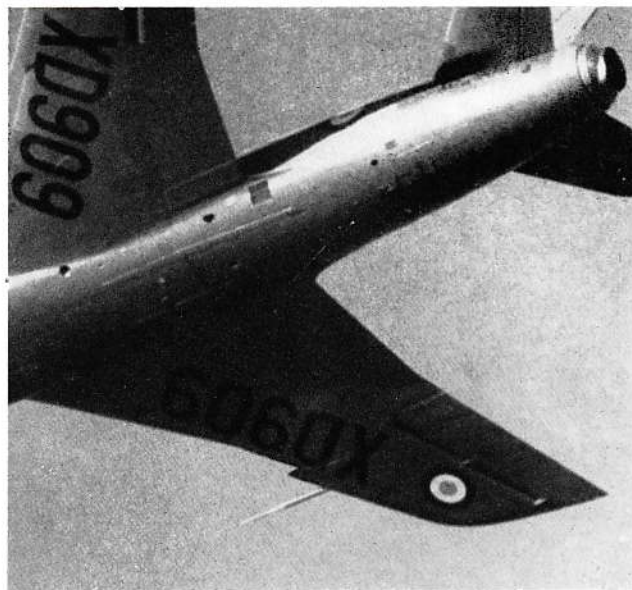
Rocket. The rocket motor (again not a gas turbine) comes into its own for flight very high up above the stratosphere and in space, because it carries all the materials required for combustion inside itself and so can operate without atmosphere (the turbine and ramjet both rely on oxygen from the air to burn with their fuel). The thrust comes from the rapidly expanding gases released by combustion being forced through a nozzle.



Saw-cut. A small slice taken out of the leading edge of a swept wing at approximately two-thirds span which effectively cleans up the airflow over the outer portion of the wing and prevents outward flow. The wing of the P.1B has saw-cuts.



Saw-tooth (sometimes alternatively called "dog-tooth"). A sudden forward increase of wing chord at approximately two-thirds span to give increased lift over the outer portion of the wing and therefore prevent outward flow. The Supermarine Swift has a good example of a saw-toothed leading edge to its wing.



Shock Wave. As an aircraft moves through the air, each portion of it propagates a disturbance which spreads at the local speed of sound. Thus the air ahead of the aircraft is "warned" of its impending approach and starts to move out of the way. When the aircraft speed is equal to or greater than the local speed of sound, *i.e.*, supersonic, the air ahead does not receive prior warning and the boundary of the warning propagation forms a shock wave. Since the air is not warned, and cannot anticipate the coming of the aircraft, the air is displaced in a very violent manner.

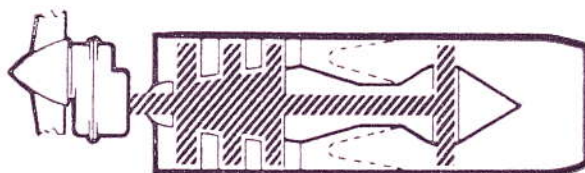
Static Thrust. A measurement, usually in pounds, of the propulsive force generated by a jet engine.

Subsonic. This refers to speeds lower than the speed of sound.

Supersonic. This refers to speeds faster than the speed of sound.

Transonic. This refers to speeds in the region of the speed of sound. An aircraft whose maximum level speed is *subsonic*, but which can reach *supersonic* speed in a dive, is said to be transonic.

Turboprop Engine. Basically, this is a turbine engine in which the energy of the gases, instead of acting as a jet, is almost entirely used to turn a turbine connected to a conventional propeller.



Rossiia



AN unexpected arrival at Le Bourget for the 23rd Salon de l'Aeronautique was the titanic Tupolev Tu-114, the Rossiya. It easily dwarfed every other aeroplane in the Show, America's huge Cargomaster included, and mere dimensions alone could never convey the sense of size so well as a picture like this. The small view in the opposite corner marks the start of a recognition lesson overleaf.

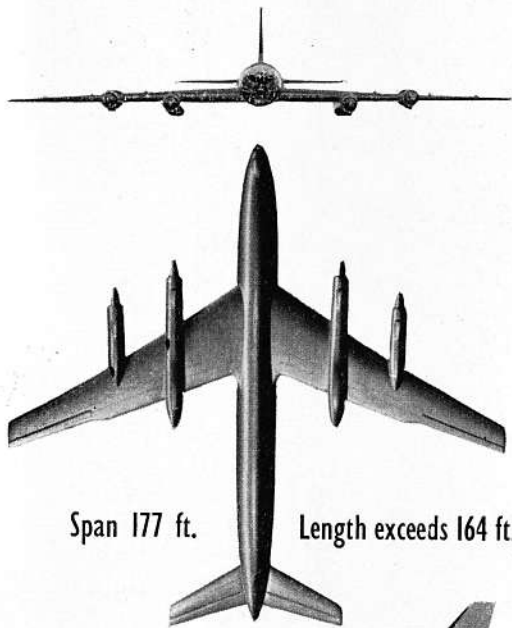
Span 177 ft. Length more than 164 ft.
Four Kuznetsov NK-12 turboprop engines
Loaded Weight 400,000 lbs.

“ . . . He doth bestride the narrow world
Like a Colossus; and we petty men
Walk under his huge legs, and peep about . . . ”
SHAKESPEARE (*Julius Caesar*, Act. I, Sc. II).



Rossiya

(NATO Code Name : Cleat)



Span 177 ft.

Length exceeds 164 ft.

ANDREI TUPOLEV'S far-ranging, crowd-carrying Colossus has been much in the news this summer—in fact in June it was bustin' out all over. At the beginning of that month it flew down to the Mediterranean to bring Mr. Krushchev back from Albania; a week or so later it made its surprise appearance at Le Bourget for the closing stages of the Paris Air Show; and at the end of the month it flew Russia's First Deputy Premier, Frol Kozlov, and Tupolev himself non-stop from Moscow to New York (in just over 11 hours at an average 420 m.p.h.). Whilst in New York, Tupolev was reported as saying that some 12-15 Rossiyas were ready for service and would start operations with *Aeroflot* this autumn. For the lesson here all you need are pencil, paper and perseverance: with these your results should be perfect.



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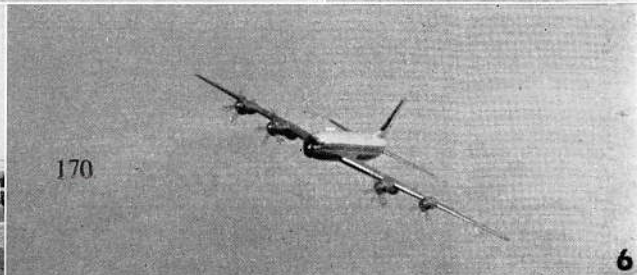
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Briefs

A collection of items of news and interest which may help your recognition.

Canadian Capers

Eight squadrons of the Royal Canadian Air Force serving under NATO in Europe are to be equipped with American F-104 Starfighter interceptors. Discussions took place recently on plans to put the Starfighters into imminent production in Canada. Avro (Canada) Ltd. will probably be among those concerned with production (214 Starfighters are to be ordered), but the solution of Canada's home defence problem is still ultimately dependent upon the inclusion of the Bomarc-B missile, it is understood.

* * *

Titled Trio

Just in time to save this month's "Briefs" from having an all-Canadian flavour came this photo from Convair of their three flight-test 880 jet transports on the San Diego tarmac. Six months intensive testing have proved that a 615 m.p.h. level speed is possible, and the first Convair 880 for airline use is due to reach Trans World Airlines this month. May we draw the attention of other aircraft manufacturers to the informative, as well as decorative, appearance of these tail fins? If only identification were always made so easy for us!



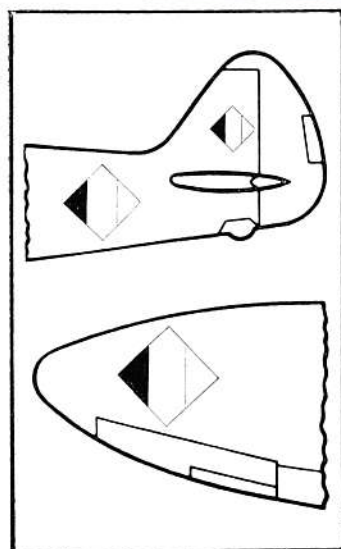
A.S.R. Addition

The Grumman Albatross, used for many years now as a search-and-rescue amphibian by the United States forces, is to be introduced into the R.C.A.F. in 1960 under the designation CSR-110. An order for 10 machines has been placed: they will differ from the standard Albatross in having a retractable nosewheel (specially designed for use when beaching) and more powerful engines. The photograph shows an SA-16A Albatross of the U.S. Air Force.

* * *

Two Maritime Marathons

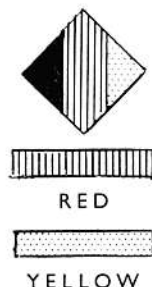
The Canadair Argus, which is serving with the R.C.A.F. Maritime Air Command, was recently demonstrated to the Canadian press. A party of reporters were flown on a 3,000-mile trip from Greenwood, Canada, to Bermuda and back to Montreal non-stop in 13 hours. Another Argus, in June, set what is believed to be a Canadian distance record with an 18 hr. 48 min. flight from Greenwood across the Atlantic to the Irish coast and back non-stop—4,500 miles—without refuelling.



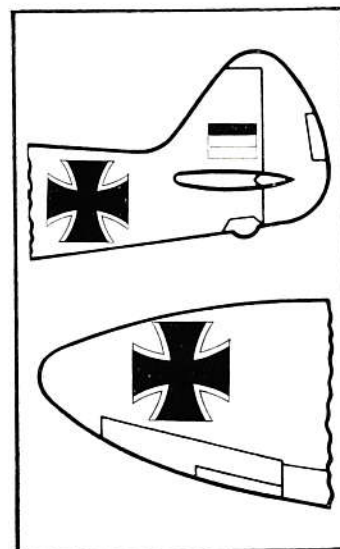
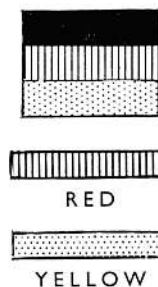
EAST GERMANY

Aircraft National Markings

FROM time to time the *Journal* will publish new or revised diagrams of national insignia as information becomes available and space permits. The Aircraft National Markings Chart (Air Diagram 4625) has not been withdrawn, but it will not be reprinted in its entirety. Each larger drawing should be treated as below and stuck on to the Chart to keep it fully amended.



Each large diagram should be coloured in accordance with the smaller "key" and then affixed in its appropriate position on A.D.4625.

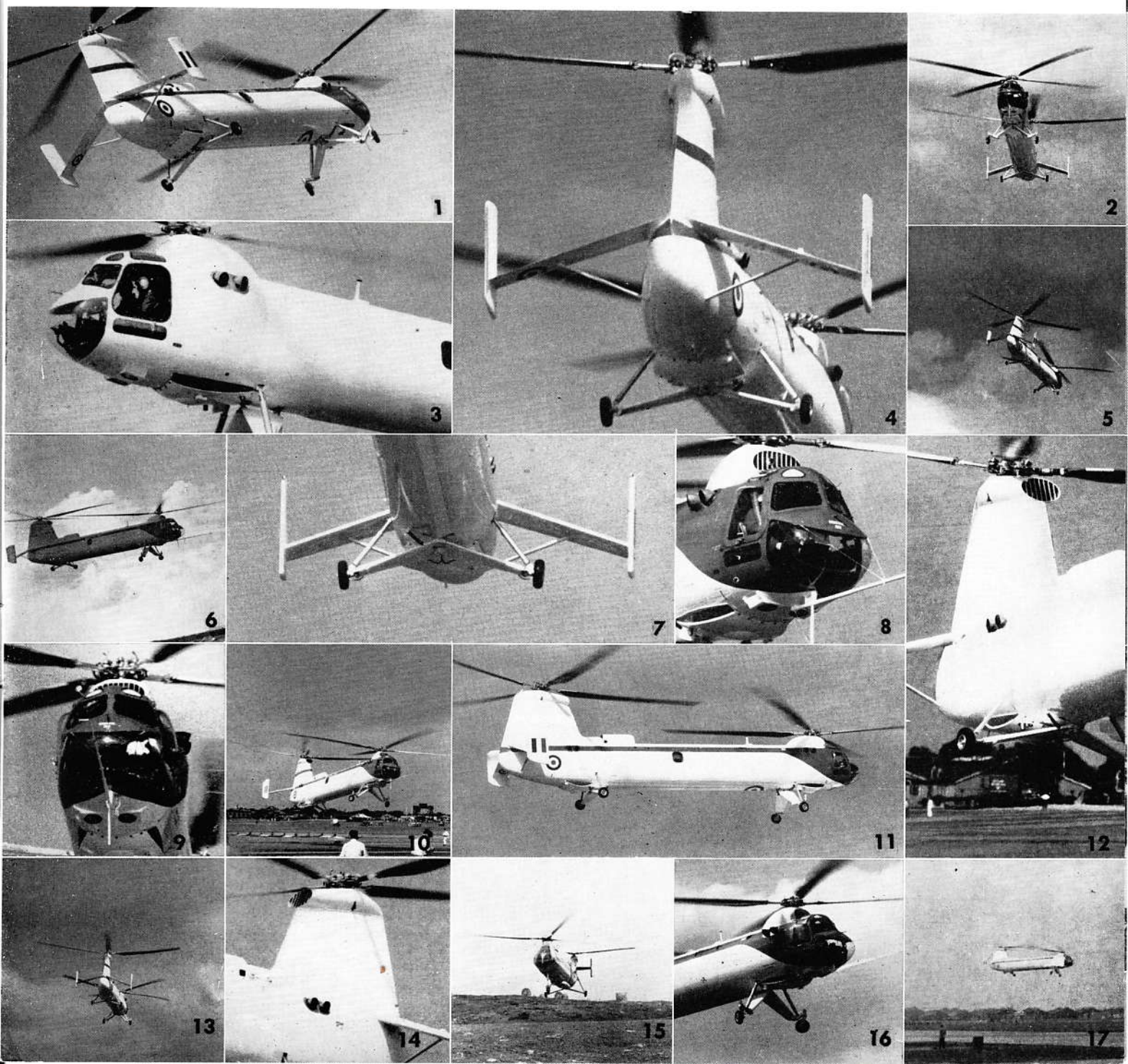


WEST GERMANY

BRISTOL 192

THE BRISTOL 192 bears no relation to the cigarette of the same name, although we may be pardoned for thinking so, especially when that long cylindrical body is finished in white as it is here. At the forward end is the Bristolian nose we know so well from the Sycamore, while on and around the tail fin lie a regular cluster of assorted grilles and apertures (dare we say—filter tips?). This general-purpose helicopter will be in R.A.F. service soon. Take a tip—learn the Bristol!

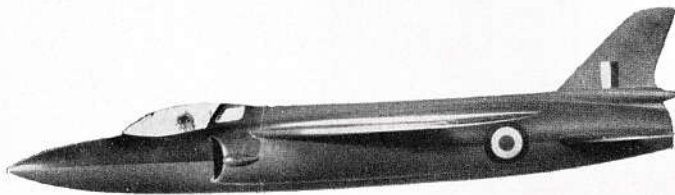
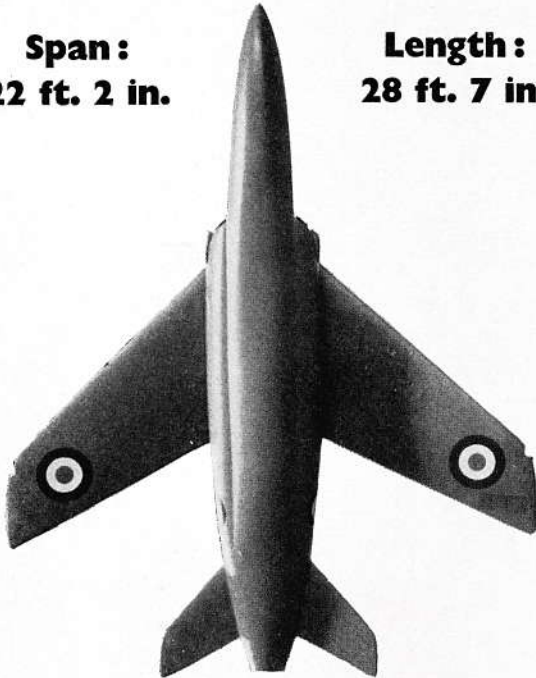
Rotor diameter 48 ft. 8 in.
Fuselage length 54 ft. 4 in.





Span :
22 ft. 2 in.

Length :
28 ft. 7 in.



Dear Gnat,

You may remember we met in the static park at Farnborough last year, and very nice you looked too in your Finnish finish. I'm sure Mr. Petter must have been very proud of you, and I am told that Mr. Nehru is quite sold on you too, not to mention Marshal Tito being interested. You certainly seem to know how to win friends and influence people.

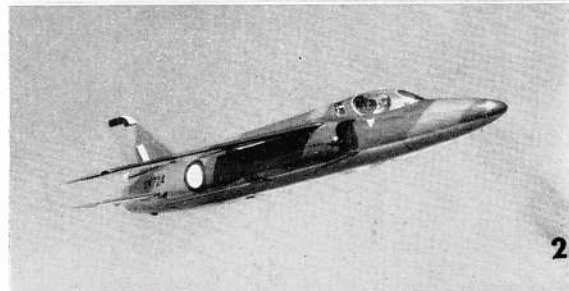
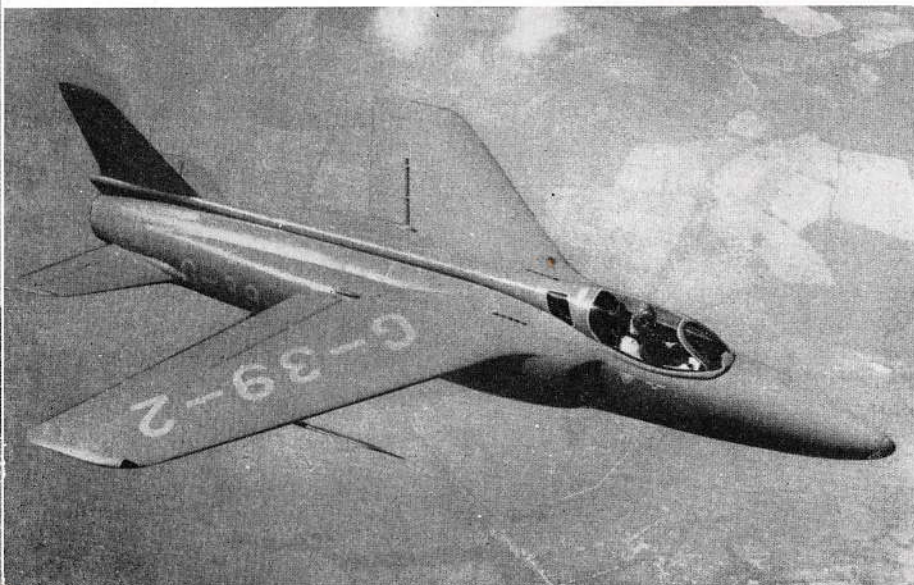
Of course, you're just the right kind of chap for countries with small budgets who want an adaptable fighter-bomber-trainer with a good modern performance, that is able to use small or improvised airfields and doesn't want a lot of looking after. And I hear that when you've grown up a bit more you will be doing all this at well over Mach One. Judging, too, by some of the pictures I have seen of you, you carry a pretty varied selection of hardware with you on your business trips. I'm sure I shouldn't like to meet up with you on a dark night!

With all best wishes,

Yours sincerely,

THE EDITOR.

P.S. Heard the other day from your swollen-headed brother who is going into the R.A.F. He has grown another foot.





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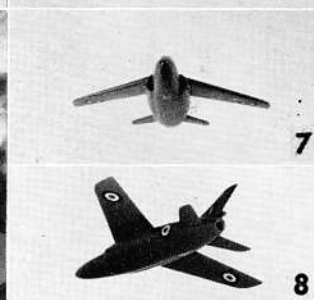
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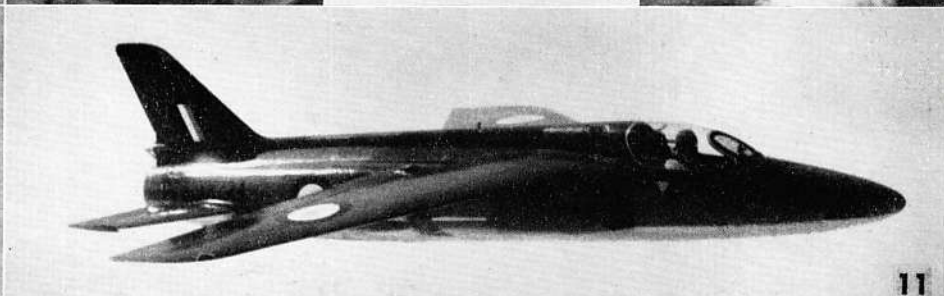
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SPOTTING THE GNAT

Prepare a list of the numbers (1-26) and give the targets a quick look over. Some may strike you as more easy to identify than others: work these out using the given key information, and when you are certain of an identity write the name "Gnat" on your list against the relevant number. The more you solve, the more you learn and the easier the identifying of the remainder becomes. After a final check of your results, compare them with ours on the rear cover.



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26



Cover Picture: Almost a complete panoply of aviation in one picture—bomber, fighter, transport, trainer and missile. Flying by is the first intercontinental Boeing 707 in B.O.A.C. livery, while on the ground are a BOMARC missile (left) and an R.A.F. Victor (centre). Beyond the Victor stands a Delta Dagger interceptor, and to its right a Canadian Silver Star trainer. The picture was taken by a Boeing photographer at the "Golden Anniversary of Flight" air show at Vancouver in July.

ROSSIYA

The target views are all **Rossiys** except Nos. 12 and 21, which are **Bear** bombers.

BRISTOL 192

The target views are all of the **Bristol 192** except No. 15, which is a **Vertol H-21 Workhorse**.

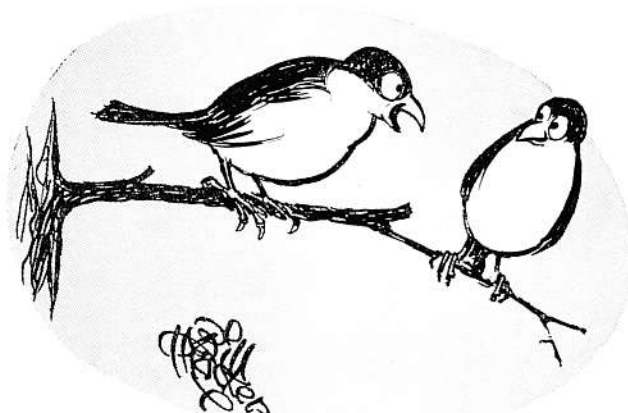
GNAT

The target views are all **Gnats** except No. 13, which is a **Hunter**, and No. 17, which is a **Swift 5**.

SOLUTIONS TO TESTS AND LESSONS

MIRAGE III AND DELTA DART

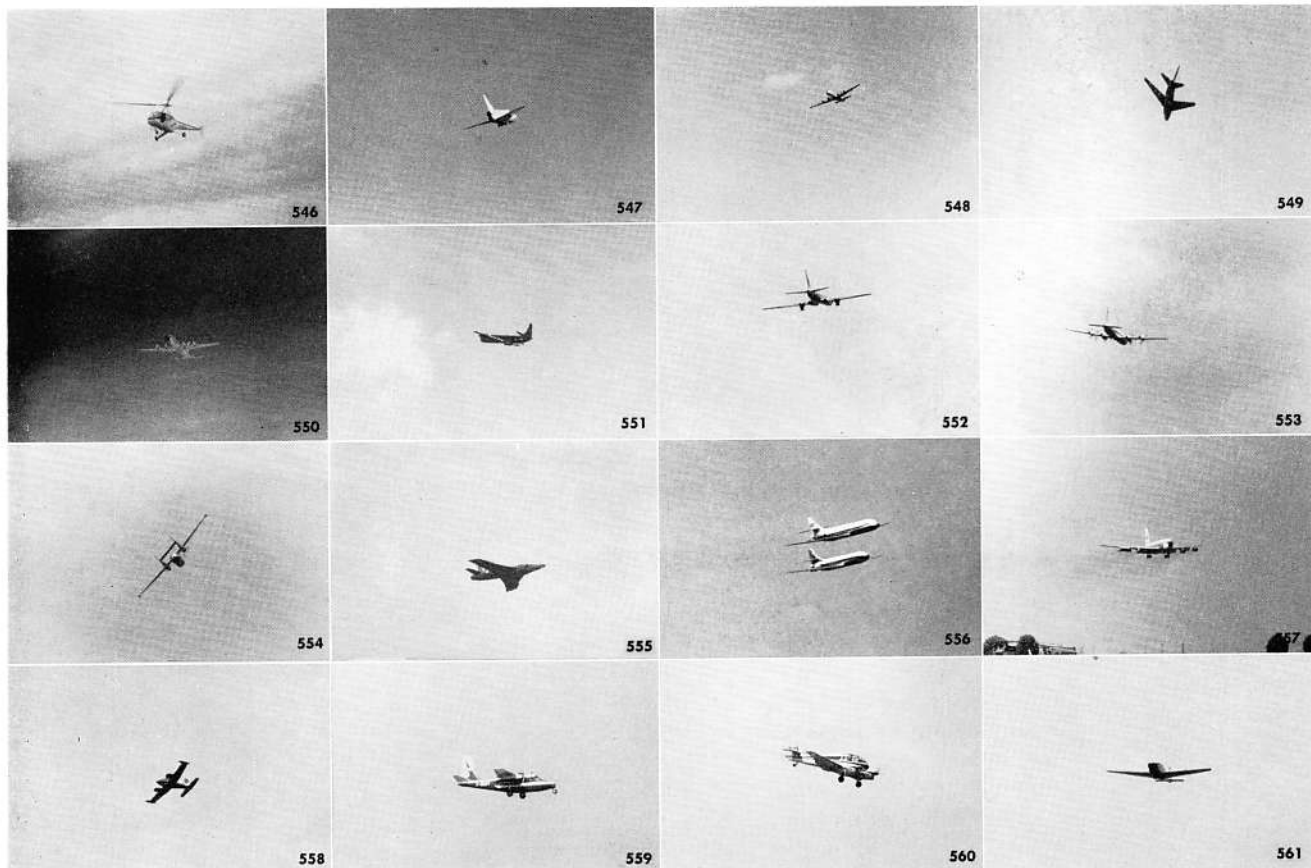
- | | | | |
|---------------|----------------|----------------|----------------|
| 1. Delta Dart | 10. Mirage III | 19. Mirage III | 28. Mirage III |
| 2. Mirage III | 11. Mirage III | 20. Mirage III | 29. Delta Dart |
| 3. Mirage III | 12. Mirage III | 21. Delta Dart | 30. Mirage III |
| 4. Mirage III | 13. Delta Dart | 22. Delta Dart | 31. Mirage III |
| 5. Delta Dart | 14. Mirage III | 23. Mirage III | 32. Delta Dart |
| 6. Delta Dart | 15. Delta Dart | 24. Mirage III | 33. Mirage III |
| 7. Mirage III | 16. Mirage III | 25. Delta Dart | 34. Delta Dart |
| 8. Delta Dart | 17. Delta Dart | 26. Mirage III | 35. Mirage III |
| 9. Mirage III | 18. Delta Dart | 27. Mirage III | |



"... and her figure is simply divine: aerofoil section N.A.S.A.9763."

AIRBORNE HEADACHES

No. 66



Submission dates for answers to Airborne Headaches No. 66 will be notified by Group Headquarters.