NEWS from

SHORT BROTHERS
& HARLAND LIMITED

QUEENS ISLAND BELFAST N. IRELAND

PHONE — BELFAST 58444

Night: HOLYWOOD 3718 (FRANK KELLY)
[redacted]
GLENGORMLEY 2571 (TOM GOYER)

31 MAY 1960

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C A MACARTNEY ESQ, SIDNEY-BARTON LTD
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SHORT SC.1 IN COMPLETE VTOL FLIGHT SEQUENCE

TRANSITION DEMONSTRATION AT RAE, BEDFORD

Today, at the Royal Aircraft Establishment, Bedford, the Short SC.1 aircraft will for the first time demonstrate to the press its complete cycle of VTOL flight operations.

It will take off vertically and hover, poised on the thrust of its downward pointing jets, then make a transition to wing-borne forward flight. After a circuit of the airfield it will make a transition back to hovering, and then land vertically.

No other aircraft known to the Western world accomplishes VTOL in this way. The SC.1 is unique in its use of four vertically-mounted jets for lift, with a fifth mounted horizontally in the tail for propulsion. The engines are Rolls-Royce RB.108's.

SUPERSONIC JET-LIFT AIRCRAFT

It is the belief of Short Brothers & Harland Limited that the SC.1 VTOL system points the way to the supersonic jet-lift military and civil aircraft of the future.

This belief is founded not on drawing board development alone but on the solid basis of practical experience with two prototype aircraft. The SC.1 has been used not merely to prove the principle of jet lift in an aircraft; it has also made remarkable progress towards the complete solution of safety and engineering problems associated with autostabilisation (see separate handout).

The success of the SC.1 flight development programme heralds the end of runways, the coming of aircraft that can land blind with complete safety in all weathers, and of fighters that can operate from a few square yards of ground in forward areas or from the decks of small ships. The need to operate from an airfield downwind is eliminated, meaning a considerable reduction in the area of the countryside where the noise of aircraft exasperates the population.

OTHER VTOL AIRCRAFT TYPES

Other types of VTOL aircraft - and there are many - operate in a variety of ways. Some use what is known as deflected slipstream, a method by which slipstream from propellers is deflected downwards for take off and landing by large flaps or even by tilting a large portion of the wing. Others use rotors which rotate horizontally at take off, then tilt forward to operate like normal propellers in forward flight; some aircraft in this category even tilt the entire wing.

In the turbine-powered class there are aircraft with ducted fans mounted at the wing-tips which tilt through 90 degrees and others with large fans buried in the wings.

One type of fan engine can be installed so that cool air from the fan in front and hot air from the jet are separately channelled to nozzles controllable in direction. This arrangement is suitable for a single engined fighter or fighter-bomber and particularly so for short take off and landing runs; the nozzles can be rotated rearward for acceleration along the runway and at take-off speed can be directed downward to give both lift and thrust.

Such an engine, however, is unsuitable for supersonic speeds.

PURE JET LIFT

Jet lift, using pure jet engines, can be provided in two ways - by deflecting the thrust of the propulsive engines or, as is done in the SC.1, by providing separate lifting engines.

It was at one time thought that batteries of jet lift engines used only at take-off and on landing would be too much of a deadweight penalty in normal flight, and would mean too small a payload.

This argument is now recognised as no longer valid. In recent years the improvement in the specific weight of jet engines has been unexpectedly rapid. Six years ago ten pounds of jet thrust per pound of engine weight was considered a remote possibility. Today, at least one proponent of jet lift has spoken of engines that lift sixteen times their own weight.

PERFORMANCE COMPARISONS

Thus of all these various types - and possible hybrids -

/ jet lift .....

jet lift aircraft based on the design formula of the SC.1 offer by far the best performance.

These are the approximate speed brackets for the different types :

	Design cruising speed
Simple helicopter	0 to 150 mph
Compound helicopter	125 to 250 mph
Convertiplane (Tilt wing or Tilt Rotor)	125 to 350 mph
Ducted fan	300 to 650 mph
Pure jet	300 to 3000 mph

(Rocket power units, attaining speeds of 6,000 mph and more and so most suitable for interplanetary and extra-atmospheric flight, are not considered in this comparison).

NEED FOR HIGH SPEED VTOL AIRCRAFT

The need for higher speed VTOL aircraft is clear. They are needed to reach inaccessible places which have no runways and, by development of blind flying facilities, to provide supersonic travel with assured all-weather operation.

In the military field the need is immediate. SC.1 type jet lift aeroplanes are required as heavy transports or as strike, reconnaissance and fighter aircraft, independent of runways which are both vulnerable and slow to construct.

Aircraft of this kind are not a decade away. As the result of progress achieved with the SC.1, Shorts believe that military VTO strike aircraft could be operational in 5 - 7 years, although supersonic VTO transports are probably 10 - 12 years off.

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24th May 1960.

Dear Miss Field,

On behalf of Short Bros. & Harland Limited, we have pleasure in inviting you to a press facility visit to the Royal Aircraft Establishment, Bedford, on Tuesday, May 31st, to see the transition flight by Tom Brooke-Smith in the Shorts S.C.1, VTOL research aircraft. You will appreciate that this arrangement is subject to suitable weather conditions and the availability of the aircraft, but in the event of any alteration in the programme I will, of course, telephone you immediately.

The party will travel by the 9.25 a.m. train from St. Pancras and will return from Bedford by the 3 p.m. train, arriving at St. Pancras at 4.12 p.m. If you wish to catch an earlier train back, there is the 2.16 p.m. out of Bedford, arriving in London at 3.18 p.m. Refreshments and luncheon will be provided at Bedford. I shall forward your rail tickets within the next few days. If you prefer to travel to Bedford independently, the demonstration is scheduled for approximately 11 a.m.

I shall be most grateful if you will telephone me to say whether or not you will be able to join us, so that I may make the necessary travel and other arrangements.

Yours sincerely,

John A. Heimer.

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THE SHORT SC.1 VTOL RESEARCH AIRCRAFT

The SC.1 is Britain's first all jet-powered VTOL aircraft project.

Dimensions : Length - 24ft 5in
Wingspan - 23ft 6in

Engines : Five RB.108 jets.

The aircraft has been designed and built by Shorts under contract from the Ministry of Aviation. The Company is handling all design and development work on the aircraft, including the auto-stabiliser and control systems. These are the responsibility of the Company's Precision Engineering Division, working in conjunction with the Royal Aircraft Establishment.

The SC.1 is a small delta-wing aircraft with no tailplane. Four of its five RB.108 engines are mounted vertically in a central engine bay and the fifth exhausts horizontally at the tail giving thrust for forward flight.

The four lifting engines are mounted in crosswise pairs, each pair swinging on an axis, so that the lifting thrust centre may be directed fore and aft on transition from vertical to forward flight and vice versa. After vertical take-off the engines are inclined backwards to give a forward thrust component and before vertical landing they can be moved forward to give braking thrust.

AUTOSTABILISER SYSTEM

All five engines have a compressor bleed supplying high pressure air to a common duct which feeds air nozzles used for stability control in hovering flight. These control nozzles are positioned at the wing tips and nose and tail. Emission of air from the nozzles is controlled by the aircraft's electro-hydraulic auto-stabiliser but the pilot can, when necessary, take over from the system.

Other ducts supply compressed air from the thrust engine to the four lifting engines when these are to be relit before landing.