JANE'S
ALL THE WORLD'S
AIRCRAFT
1975-76

JANE'S ALL THE WORLD'S AIRCRAFT

FOUNDED IN 1909 BY FRED T. JANE

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1975-76

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FOREWORD

At this mid-point in the seventies, the aerospace industry reflects every facet of the wider world. Wasted time, effort and money, on a vast scale, tear at our conscience while so many of our fellow men cry for food and shelter. Inflation, greed, bribery and corruption are tares threatening the rich harvest which stems from where the pioneers of flying planted their dreams seven decades ago. Those who decide what our industry will build and fly seem unimpressed by the intrinsic qualities of a particular project, whether it will help to make the world a better place or give work to thousands of people. The all-important factor, too often, is "Will it make money?"

Convinced that the Concorde could never produce a profit for its operators, fourteen of the airlines once listed as customers for this supersonic transport relinquished their options. Today, after years of development more smooth than anyone would have dared to expect, the Concorde is about to enter scheduled passenger service. Predictably, the cash-flow computers of airlines that lacked the courage to confirm their orders are clattering and clamouring for excessive premiums to be added to the fares charged by those airlines that maintained faith in the project. It will be a sad day for aviation if the International Air Transport Association supports such demands. A premium of 15 per cent above current first class rates might be reasonable. Anything more would simply penalise France and Britain for making possible reductions in travelling time without precedent in history.

Neither country will recoup its half-share of the £1,096 million that development of the Concorde is estimated to have cost. Their recompense is to have an airliner that the world will envy, and the only aerospace industries outside Russia with the experience gained from designing and building such an aircraft. Even the US government and Boeing have nothing tangible to show for the $915,675,000 they invested in a competitor to the Anglo-French airliner. Indeed, their huge variable-geometry Model 2707 seemed to become less and less viable as it evolved towards cancellation.

Great as this expenditure might seem, it represents but a fraction of the total sum that has been poured into stillborn aerospace products, or non-products, throughout the world since the end of the second World War. In a book entitled *Project Cancelled*, published by Macdonald & Jane's in the Summer of 1975, Derek Wood lists 42 major projects cancelled by Britain alone, totalling more than £1,000 million. The fact that the Concorde and the military MRCA have survived tremendous pressures for their abandonment in more recent times may imply that the lesson has been learned at last in the UK; but elsewhere the waste of money and talent continues.

For each new aircraft displayed in the air at the 1975 Paris International Aerospace Show, there seemed to be dozens of models of new projects at various stages of development, many of them clearly competing with each other in the same reluctant markets. Fortunately, it is the normal policy to include a new aircraft in *Jane's* only after somebody has placed a firm order for it, or when metal is being cut on a prototype. Thus, readers would search in vain for the Boeing 7X7, Douglas DC-X-200, Dassault Mercure 200 or Hawker Siddeley "Bident".

Just occasionally a projected type *is* included if it is a variant of an existing production aircraft and seems likely to be ordered before the next edition of *Jane's* is published. This explains the presence of the Hawker Siddeley Maritime Harrier (which has, in fact, been ordered for the Royal Navy since the original entry was type-set and a drawing prepared) and the AEW Nimrod, which remains a "possible". A feeling that the Boeing 727-300B should be omitted, despite the oft-reported likelihood of an imminent go-ahead, was justified in August 1975 when Boeing and its potential customer, United Air Lines, agreed on an indefinite postponement which amounts to virtual cancellation of the stretched tri-jet.

Wasteful though any cancellation must be, when so much work has been put into design studies, wind tunnel testing and other development, it is preferable to building a host of competitive types which leave manufacturers gasping for orders. Allegations and admissions of huge bribes associated with contracts gained under these circumstances, in recent months, have revealed a side of industry that dishonours everyone involved.

Far happier is the evidence that some operators are getting the equipment they want nowadays, instead of what politicians consider it expedient for them to have. The MRCA provides an example of this. With Britain's economy in desperate straits, her German and Italian partners in the MRCA programme might have expected another of the cancellations for which successive governments at Westminster have been notorious. In the mid-sixties it would have mattered little that the RAF needed this formidable combat aircraft to re-equip the major part of its first-line force. But in March 1975 a government defence review stated that the "planned requirement for a total of 385 MRCAs" would be unaffected by enforced economies, although the rate of delivery to the RAF would be reduced by up to one-third. Two months later came the overdue, but nonetheless unexpected, announcement that 25 Maritime Harriers were to be built for service in the Royal Navy's new through-deck cruisers and HMS *Hermes*.

Meanwhile, over on the continent of Europe, four of Britain's NATO allies, in need of a new fighter, were being wooed by Dassault, Saab, General Dynamics and assorted outsiders. In early June Belgium announced its choice of the General Dynamics F-16. Norway, Denmark and the Netherlands had already expressed their preference for this aircraft, rather than the Mirage F1-E or Viggen; so the US manufacturer was assured of a joint contract for a total of 306 F-16s, with options on 42 more. Though saddened by this un-European decision, the Chairman of Dassault recognised that it must have been influenced to a degree by the fact that France is not a military member of NATO. The USAF had already stated its intention of buying up to 650 F-16s, and there is always merit in standardisation among allies.

Merit or not, strange things had been happening in America.....

When the USAF announced in January 1975 that the YF-16 prototypes of the General Dynamics F-16 had met its requirements better than two competing Northrop YF-17s during simultaneous evaluation at Edwards Air Force Base, it was assumed that the US Navy would also order F-16s. Congress had expressed its desire for such commonality, in the interests of economy and military good sense; but the Navy made it clear, in May, that it wanted the Northrop fighter or something very like it. What it would like to have as its air combat fighter is, in fact, known as the F-18 and would be built by McDonnell Douglas, with Northrop's collaboration. There are important differences between the YF-17 and F-18; but the F-16 and F-18 are, of course, entirely different, which is contrary to what Congress had instructed. No final go-ahead for the F-18 had been announced at the time this Foreword was being written; but it will be surprising if the Navy fails to get the fighter it wants.

For anyone who, like *Jane's* Editor, has been privileged to spend days at Edwards AFB with the YF-16, YF-17 and their test pilots, it is easy to understand their attractions. The original brief given to their manufacturers was to design and build aircraft that would embody every possible new feature to improve performance and military efficiency, without the limitations of a rigid specification but with a particular emphasis on light weight and relatively low cost.

This unusual degree of design freedom enabled General Dynamics and Northrop to produce two very remarkable, and very different, fighters, as reference to the detailed descriptions in this edition will indicate. Extremely high thrust-to-weight ratio gave them sparkling performance. Wing-root leading-edge extensions, manoeuvring flaps and other carefully integrated design features helped to ensure a tight turning circle. This presented no problems for pilots on inclined seats, with a superb all-round field of view and equipment like the YF-16's limited-displacement, force-sensing side control stick and fly-by-wire control system. At Edwards, they were pulling 8g in turns as routine and, partway through the flight programme, the USAF officer controlling the project admitted that it would require a Solomon to judge between the two types.

It was easy to work out a compromise, with the USAF buying the YF-16 as a partner for its F-15, which has the same basic engine, and the Navy going for the YF-17 because it tends to prefer two engines. This, more or less, is what happened. However, by the time the YF-17 has been upgraded into the F-18 it is unlikely to prove an inexpensive partner for the Navy's F-14 Tomcat. "We're going to build a low-cost fighter", the budget analyst is alleged to have insisted at a Pentagon conference, "no matter how much it costs". There is no better attitude than this when the tools for national survival are at issue.

This brings us to the Rockwell International B-1 bomber, one of the most controversial aircraft of our time. Even the wealthy United States cannot embark lightheartedly on a $20,000 million programme to build the 244 B-1s that the USAF needs. To prevent unacceptable further cost escalation, despite inflation, the Defense Department is nibbling away one after the other of the aircraft's design features. First major item to go was the emergency escape crew capsule, replaced by conventional ejection seats. More recently it was decided to dispense with engine intake variable geometry, thereby reducing the B-1's maximum speed from Mach 2.2 to a suggested Mach 1.6 at height, in the interests of a reported $230 million cost-cutting operation.

Before NATO's most powerful member degrades the capability of its primary new attack aircraft still further, it should think hard about an editorial entitled "Oranges and Apples" which appeared in a March 1975 edition of *The Daily Oklahoman*. One section of this commented that: "During the peak of the air war over Europe, missions were often carried out by 1,000-plane fleets of B-17 bombers. Each was manned by a crew of 10 or 11 men, meaning that it took over 10,000 men over the target to accomplish its destruction. The 1,000-plane fleet cost more than $150 million just for the aircraft; the personnel cost, in every sense, was incomparably higher. Only one (B-1), with four men aboard, can do the same job the 1,000-plane fleet did, with greater assurance of success and safe return, in far less time, and without the destruction spillover common in the 1940s."

The newspaper went on to remind its readers that few of them now drive a 1955 car, yet the USAF has to make do with B-52 bombers which are "1955 models", patched, updated, refitted and petted until they are worn out. To compare a B-1 with such veterans is like comparing apples to oranges.

Aircraft like the B-1, F-16 and F-18 reflect the willingness of US designers to utilise the advanced products of that nation's vast and imaginative research programmes. Study of this edition of *Jane's* will reveal how many designs already embody the supercritical wing section evolved so recently by Dr Richard Whitcomb of NASA. Combined with flap blowing techniques, it has made possible the USAF's Boeing YC-14 and McDonnell Douglas YC-15 advanced medium STOL transports, one or both of which may become the accepted replacement for more than 1,400 Lockheed C-130 Hercules military and commercial transports sold to date. It is equally interesting to note that the tail surfaces of the F-16 are constructed largely of graphite-epoxy composite laminates. What this means in terms of weight saving, translated into payload, is well portrayed by the illustration of a YF-16 on page 342.

No less interesting is to study closely the available details and illustrations of the latest types of Soviet military aircraft in *Jane's*. For the first time this year there is a three-view drawing of the new Su-19 fighter-bomber, designed under the leadership of Pavel Sukhoi, whose death was announced on the day this Foreword was being written. With Artem Mikoyan, Nikolai Kamov, Mikhail Mil and Andrei Tupolev also dead, and others of the old school of General Designers semi-retired, a new generation of men is now responsible for Soviet aircraft and there can be no doubt of their competence.

Alexei Tupolev's Tu-144 may yet introduce supersonic airline services before the Concorde, though with much less flying experience behind it, particularly if one bears in mind the redesign that took place between the prototypes and the production configuration. Another Tupolev product, the bomber known as "Backfire", looks increasingly formidable as it becomes progressively refined and enters both air force and naval service. Mikoyan's MiG-25, the elusive "Foxbat", snatched back with almost contemptuous ease the time-to-height records held briefly by America's F-15 *Streak Eagle*. And the Mi-24 assault helicopter, deployed at each end of the NATO front line across Europe, poses new problems for those who have to plan a secure shield for the West.

There are, of course, the usual unanswered questions concerning the Soviet aircraft section of the book. Does the continued absence of news and photographs of a rumoured Yakovlev V/STOL counterpart to the British Harrier, to equip the Soviet Navy's new carriers, mean that Russia (like the USA) is having difficulty in matching Hawker Siddeley's achievement in this field? Why has Aeroflot bought Let L-410A local-service transports from Czechoslovakia when both Antonov and Beriev have built aircraft in this category? And what is mounted behind the sloping window in the nose of the latest version of the MiG-23? No doubt the Soviet Air Force would welcome a laser rangefinder and marked target seeker in that position, as on the RAF Jaguar; but would this imply a standard of internal equipment beyond the current Soviet "state of the art"? Several design analysts have settled instead for a nose-mounted camera.

Suggestions that Soviet technology is inferior to that of the West, in any field, are incomprehensible to some people, in view of the USSR's exploits in space. However, the evidence of such shortcomings is incontrovertible, ranging from Egyptian rejection of the Tu-154 tri-jet airliner to setbacks in the Soyuz and Mars exploration space programmes.

If the present climate of East-West détente persists, technology will be shared increasingly between all nations. Meanwhile, Europe is giving a lead which its governments and aerospace industries should support to the utmost. Concorde, Jaguar and MRCA are all European international projects which have worked out well. After a slow start the A300 Airbus is also beginning to attract the orders it deserves. This does not mean that Europe should attempt to be self-sufficient in aviation. America, with its vast resources, is the obvious home for aircraft as large and complex as the Boeing 747. Nor should Europe reject the offer of aircraft like the F-16 which are far in advance of any rival. By sharing in the manufacture of more than 300 F-16s, then assembling and flying them, Europe will improve vastly its own level of technology, without the effort and expense of the research from which it was derived.

Nor is the process one-way, as the export to America of Harriers, Islanders, Aérospatiale helicopters, Rolls-Royce engines, Marconi-Elliott electronic head-up displays, and a host of other aircraft and equipment has demonstrated.

What Europe must avoid is the kind of wasteful competition that has the Hawker Siddeley Hawk and Dassault-Breguet/Dornier Alpha Jet battling against each other in the world market. It will be less easy—understandably so—to get rid of the kind of national pride that caused Dassault to berate its neighbours for preferring an American fighter to the "European Mirage" although the latter had been advertised regularly as "un avion 100% français". Aircraft like the Concorde should help to create a similar pride in true *international* European products. In this respect, it was not too painful for an Englishman to delete from this edition of *Jane's* references to the short/medium-range BAC/MBB/Saab/CASA Europlane and one-nation Hawker Siddeley 146, which might have competed directly with the already existing A300 airbus and VFW-Fokker F28 Fellowship respectively.

Instead, six major European manufacturers (BAC, Hawker Siddeley, Aérospatiale, MBB, Dornier and VFW-Fokker) have announced their intention of working in partnership to meet Europe's domestic airliner needs in the eighties. As a start they are concentrating on an expressed requirement of Air France, British Airways and Lufthansa for 190/220-seat and 120/140-seat transports. Added to links which already exist between European helicopter and missile manufacturers, this can only be viewed as a hopeful development.

An element of unpredictability has been introduced at this stage by the intention of the UK government to nationalise its aerospace industry in the second half of 1976. There was a suggestion at one stage that the move might be deferred indefinitely; some trade union leaders, it seemed, felt that the £300 million likely to be paid as compensation to private shareholders would be better spent on supporting new products in the present companies. In any case, the record of Britain's currently-nationalised (non-aerospace) industries breeds little confidence that aerospace would fare better under state control.

Private or nationalised, its success depends ultimately on the support it receives from the government of the day. Even more, the future will depend on the degree to which the highly experienced and immensely capable industries of Britain, France, Germany, Italy and their smaller neighbours are able to work in harmony.

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"Harmony" is a word that can seldom be associated with our world in the mid-seventies. The war in Vietnam has ended since the last edition of *Jane's* was published, and Dr Kissinger's shuttle diplomacy has led finally to signature of a treaty between Israel and Egypt. Against these two controversial gains, there must be set a dozen areas of ferment throughout the world, from Northern Ireland to Southern Africa, and eastward to the Chinese/Soviet border. Powerful new weapons, including battlefield support missiles, are to be poured into Israel by the USA. Su-20 and MiG-23 variable-geometry attack aircraft, MiG-21 supersonic fighters, and a variety of missiles flow from the Soviet Union to places like Libya, Syria, Iraq, Uganda and Bangladesh. Even when half the people of a country are starving, it seems that a squadron or two of jets are a necessity.

A few nations appear to feel that the acceptance of aircraft from the major powers places them under too great an obligation. This could help to explain the decision by Romania and Yugoslavia to develop a jet combat aircraft of their own, in partnership; and the beginnings of an aircraft industry in places like the Philippines, South Korea, and Egypt. Independence of power blocs may be a good thing; far better would be collaboration on entirely peaceful projects.

The section of *Jane's* which reflects, more than any other, the fragility of détente is that devoted to RPVs. When it first appeared in the book, it was a very small part of the whole, entitled "Drones" and filled with overgrown model aeroplanes at which members of the armed forces all over the world fired guns and missiles for training. The RPVs of today are so different in many cases that the 32 pages in which they are described have a "cloak and dagger" quality to rival James Bond at his best.

For example, Compass Cope "will probably be used by the USAF to replace the RB-57 in its Pave Nickel programme for monitoring radar emissions along the western borders of the German Democratic Republic. Another typical application . . . is that of patrolling areas of the Arctic Ocean to monitor firings from the northern missile test site of the USSR, a task at present carried out by Boeing RC-135 manned aircraft flying from Elmendorf AFB, Alaska." Here is a hint of the background to occasional press stories of attacks on military aircraft in border areas.

On page 554 there is brief reference to a Teledyne Ryan AQM-34 decoy which must have saved the lives of several Israeli aircrew by drawing the fire of 32 Arab surface-to-air missiles during the Yom Kippur war in 1973. It survived all these attempted interceptions, unlike the Northrop Chukars which became expendable decoys in advance of Israeli strikes by piloted aircraft. Other AQM-34s carried reconnaissance cameras, with which countless photographs of vital importance were taken over North Vietnam, as well as noise jammers and chaff dispenser pods for ECM missions.

An AQM-34M has been fitted experimentally with Rockwell Autonetics micro-electronic radio receivers J signed for ejection near an enemy radar target to pick up electronic intelligence data that will facilitate an attack on the target by strike aircraft Then there are new mini-RPVs able to mark targets with laser designators for attack by aircraft and homing missiles; and others that can loiter over hostile air defences for up to four hours, either in unarmed form to draw the enemy's fire and enforce radar silence, or armed with homing devices and an explosive charge to destroy a hostile radar in a "kamikaze" attack.

At the moment there are no plans to follow up successful trials of RPVs in a dogfight role; but they could well hamper the operations of an enemy air force if used as carriers for the self-initiated anti-aircraft munition (SIAM) on which Aeronutronic Ford is said to have been working. SIAMs have only to be dropped near hostile airfields. As long as enemy aircraft stay on the ground, the devices remain inactive; but they fire automatically on any aircraft that attempts to take off or land.

In contrast with this ingenuity and innovation for war, the Sailplanes section is devoted almost entirely to sporting aircraft, with the biggest changes in the pages devoted to hang-gliding, one of the oldest of all forms of flying. Expansion of this part of the book reflects both the continued growth of the sport and the help received from the US Self-Soar Association and from BHGA Safety Representative Miles Handley and Mrs Handley. Listing of any type of glider in *Jane's* is not, of course, a guarantee of its structural integrity or airworthiness; anybody intending to take up the sport of hang-gliding is advised first to contact his national association for advice and assistance. Though exciting, and a low-cost means of getting into the air, hang-gliding—like many sports—can be dangerous for anyone who undertakes it without planned and adequate training.

Another section of *Jane's* which has grown this year and provides a direct link with the days before the Wright brothers is "Airships". Once again, however, the news is mainly of small, amateur-built craft. None of the large lighter-than-air freighters that have received so much press and TV publicity in recent years seems any nearer to flying, and paper projects have no more claim to a place in this section than have their counterparts among the aeroplanes. In view of this, it may seem inconsistent to include a picture of the Heli-Stat project under the Piasecki entry on page 417. The reason, apart from US Navy support for the programme, is that the "Heli" part of the craft already exists and the "Stat" would be simple and quick to fabricate if a go-ahead were given.

* * * * * *

In general, there seems little prospect of an airship revival. We remain on the "technology plateau" to which reference was made in last year's Foreword. The YF-12A still holds its ten-year-old world air speed record. There is still no aeroplane faster than the X-15A. There are no plans for sending anyone else to the Moon, for building aeroplanes bigger than the Boeing 747, or for orbiting Russian cosmonauts and US astronauts simultaneously, again so that they can shake hands over Bognor Regis. Nobody seems to care that Concorde 204 became the first aircraft to make two round trips across the Atlantic, between London Heathrow and Gander, Newfoundland, in a single day, on 1 September 1975. But perhaps it was unreasonable to expect public interest to survive a gestation period of more than thirteen years from when the French and British signed an agreement to develop the aircraft to the date when it will enter passenger service.

The twin factors of inflation and vastly increased oil cost have removed much of the impetus from air travel; Concorde will restore it only for the rich and those travelling on large expense accounts. Exciting though the shapes and technical features of new combat aircraft might be, they are generally no faster and often not so fast as their predecessors. Performance can now be built into their missiles rather than the aircraft—and missiles are dull!

Achievement in modern aircraft design and development is measured in terms of weight saving, reduced fuel consumption to cut costs, and reduced noise and exhaust smoke emission to keep the anti-pollutionists quiet. Whether or not the Concorde may operate into a city like New York depends on whether it is acceptable environmentally. It might even have been grounded altogether had an official US investigation showed that its effect upon the atmosphere presented as much hazard to human health and survival as does the continued worldwide use of aerosol sprays.

Airline statistics have become so astronomical that they no longer mean anything to the average person. Aeroflot, for example, announced that it expected to carry more than 91 million passengers in 1975, plus more than 2,400,000 tons of cargo. One almost longs for the silly figures of a bygone age, when somebody would have worked out that 91 million people, placed end to end, would stretch from Moscow to somewhere unpronounceable.

Yet, despite all the killjoy factors, there is still a magic and excitement in aviation that can be sensed as one turns the pages of a book like *Jane's*. What young man of spirit would not relish a flight in the little F-16? Only a few hundreds or thousands will ever do so; but many more will assuage their thirst for adventure in tiny, exotic homebuilts like Jim Bede's BD-5 or Burt Rutan's VariViggen. Everywhere the "homebuilt" movement prospers, with an incredible variety of designs that range from a 276 mph (444 km/h) baby jet to the incredible 8 hp Flybike and the 100 lb (45 kg) Birdman TL-1 which now rates as "world's lightest".

No fewer than 1,200 amateur-owned aircraft descended on Wittman Field, Oshkosh, Wisconsin, for the 1975 Fly-in of America's Experimental Aircraft Association. Of this total 442 were homebuilts and 212 lovingly-maintained or restored "antiques". The equivalent French rally, organised by the Réseau du Sport de l'Air at Laval, attracted 350 lightplanes, a high proportion of them homebuilt. Sywell 75 International, staged by Britain's Popular Flying Association, boasted a greater total number but a smaller percentage of amateur-built types. Those that did qualify for this category included John Isaacs' beautiful little Scaled-down Spitfire replica. The fact that it has been followed by a replica of the Supermarine S.5 seaplane which won the 1927 Schneider Trophy contest shows that Britain's amateurs are making up in skill and imagination what they lack at the moment in numbers.

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September 1975 JWRT

ACKNOWLEDGEMENTS

The task of recording faithfully so much standardised information on such an immense variety of aircraft—from the 820,000 lb (371,945 kg) Boeing 747-200C to the 100 lb (45 kg) Birdman TL-1—as well as RPVs and targets, sailplanes, hang-gliders, airships, air-launched missiles, spacecraft, research rockets and aero-engines, has kept a large team of people busy throughout the first nine months of 1975. Their task was made more arduous this year by a later-than-planned start and an earlier scheduled publication date. A labour dispute in the early stages of printing added to the problems in a year when the volume of new material to be written, type-set and printed set records. The knowledge that target dates were met reflects the devotion and hard work of everyone from the editorial team to the production staff in the publisher's London office and the printing staff of Netherwood Dalton & Company at Huddersfield, where every copy of *Jane's All the World's Aircraft* has been produced for seventy-six years.

The editorial team remains the same as last year, and the arrangement of the contents of the book is also unchanged. Consideration is being given to the possibility of transferring all homebuilt aircraft to a separate section, and this may be done next year. One obvious problem would be to decide where to put designs like the Pazmany PL-1 and Pitts Special, which are both factory-built and available for amateur construction.

As always, *Jane's* owes an immense debt to the many hundreds of people in the world's aerospace industry who ensure an almost-100% return of the questionnaires despatched to them. The time that many of them devote to the annual task of checking, updating, and tracking down the best available photographs is a reflection of the regard in which *Jane's* is held by its most professional readers.

Other information and photographs come from government agencies, air forces, airlines, colleagues in the aviation press, enthusiasts and friends in every corner of the globe. To list all of them would require several pages, but particular thanks go to "our man in Washington", Norman Polmar, and our good friends of *Air Force Magazine*, whose ever-willing assistance makes even the task of sorting out the US procurement procedure a little easier. Valuable help with other parts of the book has again come from Alex Reinhard (Argentina), Delden Badcock (Australia), Théo Pirard (Belgium), Ronaldo Olive (Brazil), Vico Rosaspina (Italy), Eiichiro Sekigawa (Japan), Javier Taibo (Spain), Dr Ulrich Haller (Switzerland), Wolfgang Wagner of *Deutscher Aerokurier* (Germany), colleagues of the *Biuletyn Informacyjny Instytutu Lotnictwa* (Poland), William Green and Gordon Swanborough of *Air International* (UK), Alan Hall of *Aviation News* (UK), the editorial staffs of *Flight International* (UK), *Aviation Magazine International* (France), *Repules* (Hungary), *FLYGvapenNYTT* (Sweden) and *de Vliegende Hollander* (the Netherlands). The many hundreds of new photographs received from industry and official sources have again been supplemented by superb collections of prints from Howard Levy, Jean Seele, Peter M. Bowers, Gordon S. Williams, Norman E. Taylor, Robert L. Lawson, *Tass* Agency in Moscow and the other photographers whose names are included in the captions to our illustrations.

Not least, our grateful thanks are due to Dennis Punnett of Pilot Press, Roy Grainge and Michael Badrocke, whose skill and craftsmanship produce the three-view drawings which have always been an important feature of *Jane's All the World's Aircraft*.

PHOTOGRAPHS

The Editor and Publishers receive many requests for prints of photographs that appear in *Jane's*. It is not possible for them to offer any form of photographic service; but photographs of a high proportion of the aircraft described in this edition, as well as of many earlier types, are available at normal trade rates from:

Air Portraits, 40 Chadcote Way, Catshill, Bromsgrove, Worcestershire
Flight International, Dorset House, Stamford Street, London SE1 9LU
Stephen Peltz, 9 Cambridge Square, London W.2

Three-view drawings are available to the press from:
Pilot Press Ltd, PO Box 16, Bromley, Kent BR2 7RB
Roy J. Grainge, 12 Bonaly Gardens, Colinton, Edinburgh EH13 0EX

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The Editor has been assisted in the compilation of this edition as follows:

Kenneth Munson	AIRCRAFT SECTION, THE ARGENTINE TO FINLAND, GREECE TO TURKEY, THE UNITED KINGDOM (215-238); RPVS; SAILPLANES.
David Mondey	AIRCRAFT SECTION, GERMANY, THE UNITED KINGDOM (193-215), UNITED STATES OF AMERICA; INDEX
W. T. Gunston	AERO-ENGINES
Michael Taylor	METRIC CONVERSIONS
Maurice Allward	SPACEFLIGHT AND RESEARCH ROCKETS
The Lord Ventry	AIRSHIPS

CONTENTS

THE ARGENTINE REPUBLIC

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This company is producing and developing the Aero Boero 115 BS, 180 and 210/260 series of light monoplanes, and is developing the AG.260 agricultural aircraft.

AERO BOERO 115 BS

The earlier Aero Boero 95 (1969-70 *Jane's*) and Aero Boero 95/115 (1972-73 *Jane's*) are no longer in production, manufacture of the latter version having ended in January 1973. The current production version, first flown in February 1973, is known as the Aero Boero 115 BS. This has a sweptback fin and rudder, increased wing span and greater fuel capacity than the AB 95/115, to which it is otherwise generally similar.

The description which follows applies to the AB 115 BS, of which 20 are under construction initially:

TYPE: Three-seat light aircraft.

WINGS: Braced high-wing monoplane. Wing section NACA 23012. Dihedral 1° 45′. Incidence 3° at root, 1° at tip. Light alloy structure, including skins. Streamline-section Vee bracing strut each side. Aluminium alloy ailerons and flaps.

FUSELAGE: SAE 4130 steel tube structure, Ceconite-covered.

TAIL UNIT: Wire-braced welded steel tube structure, Ceconite-covered. Sweptback vertical surfaces.

LANDING GEAR: Non-retractable tailwheel type. Shock-absorption by helicoidal springs inside fuselage. Main-wheel tyre size 6·00-6, pressure 24 lb/sq in (1·69 kg/cm²). Hydraulic disc brakes. Fully-castoring steerable tailwheel.

POWER PLANT: One 115 hp Lycoming O-235-C2A four-cylinder horizontally-opposed aircooled engine, driving either a McCauley 1C90-7345 or a Sensenich 72CK-050 fixed-pitch propeller. Two wing fuel tanks, total capacity 28·5 Imp gallons (130 litres).

ACCOMMODATION: Normal accommodation for pilot and two passengers in enclosed cabin. Baggage compartment on port side, aft of cabin. Ambulance version can accommodate one stretcher in place of the two passengers.

ELECTRONICS AND EQUIPMENT: One 40A alternator and one 12V battery. VHF radio standard. Provision for dual controls, and night or blind-flying equipment, at customer's option.

DIMENSIONS, EXTERNAL:

Wing span	35 ft 2 in (10·72 m)
Wing chord (constant)	5 ft 3½ in (1·61 m)
Wing aspect ratio	7·05
Length overall	23 ft 10½ in (7·273 m)
Height overall	6 ft 10½ in (2·10 m)
Wheel track	6 ft 8¾ in (2·05 m)
Wheelbase	16 ft 8¾ in (5·10 m)

DIMENSIONS, INTERNAL:

Cabin: Length	6 ft 3 in (1·90 m)
Max width	2 ft 9 in (0·84 m)
Max height	3 ft 11¼ in (1·20 m)

AREAS:
As for Aero Boero 180 RV and RVR

WEIGHTS AND LOADINGS:

Weight empty, equipped	1,168 lb (530 kg)
Max T-O weight	1,697 lb (770 kg)
Max wing loading	9·65 lb/sq ft (47·1 kg/m²)
Max power loading	14·77 lb/hp (6·7 kg/hp)

PERFORMANCE (at max T-O weight, except where indicated):

Max level speed at S/L	113 knots (130 mph; 210 km/h)
Max cruising speed at S/L	102 knots (117 mph; 188 km/h)
Stalling speed, flaps down	39 knots (45 mph; 72 km/h)
Max rate of climb at S/L	1,000 ft (300 m)/min
T-O run, full load	380 ft (115 m)
T-O to 50 ft (15 m), two persons	607 ft (185 m)
Landing from 50 ft (15 m)	500 ft (150 m)
Landing run, heavy braking	150 ft (45 m)
Range with max fuel	429 nm (495 miles; 800 km)

AERO BOERO 180 RV and RVR

The first production three-seat Aero Boero 180 (1972-73 *Jane's*) was delivered in December 1969.

This version was followed by the Aero Boero 180 RV (standard version) and 180 RVR (glider-towing version), the first of which flew for the first time in October 1972. These current versions have extended-span all-metal wings, similar to those of the AB 115 BS, increased fuel capacity, a recontoured fuselage and sweptback vertical tail surfaces.

The description which follows applies to the AB 180 RV and 180 RVR. Seven 180 RVRs had been built and five more ordered by February 1975.

TYPE: Three-seat light aircraft.

WINGS: Strut-braced high-wing monoplane. Streamline-section Vee bracing strut each side. Wing section NACA 23012. Dihedral 1° 45′. Incidence 3° at root, 1° at tip. Light alloy structure, including skins. Ailerons and flaps of aluminium alloy construction.

FUSELAGE: Welded steel tube structure (SAE 4130), covered with Ceconite.

TAIL UNIT: Wire-braced welded steel tube structure, covered with Ceconite. Sweptback vertical surfaces. Ground-adjustable tab on rudder.

LANDING GEAR: Non-retractable tailwheel type, with shock-absorption by helicoidal springs inside fuselage. Main wheels and tyres size 6·00-6, pressure 24 lb/sq in (1·69 kg/cm²). Hydraulic disc brakes. Tailwheel steerable and fully castoring.

POWER PLANT: One 180 hp Lycoming O-360-A1A four-cylinder horizontally-opposed aircooled engine, driving (according to customer's choice) either a Hartzell constant-speed or McCauley 1A200 or Sensenich 76EM8 fixed-pitch propeller. Three wing fuel tanks, total capacity 53 US gallons (44 Imp gallons; 201 litres).

ACCOMMODATION: Normal accommodation for pilot and two passengers in enclosed cabin. Baggage compartment on port side, aft of cabin. Transparent roof panel in 180 RVR.

ELECTRONICS AND EQUIPMENT: One 40A alternator and one 12V battery. VHF radio standard. Provision for night or blind-flying instrumentation at customer's option. Towing hook in 180 RVR.

DIMENSIONS, EXTERNAL:

Wing span	35 ft 2 in (10·72 m)
Wing chord (constant)	5 ft 3½ in (1·61 m)
Wing aspect ratio	7·05
Length overall	23 ft 10½ in (7·273 m)
Height overall	6 ft 10½ in (2·10 m)
Wheel track	6 ft 8¾ in (2·05 m)
Wheelbase	16 ft 8¾ in (5·10 m)

AREAS:

Wings, gross	177·3 sq ft (16·47 m²)
Ailerons (total)	19·81 sq ft (1·84 m²)
Flaps (total)	20·9 sq ft (1·94 m²)
Fin	10·01 sq ft (0·93 m²)
Rudder, incl tab	4·41 sq ft (0·41 m²)
Tailplane	15·07 sq ft (1·40 m²)
Elevators	10·44 sq ft (0·97 m²)

WEIGHTS AND LOADINGS:

Weight empty, equipped	1,212 lb (550 kg)
Max T-O weight	1,860 lb (844 kg)
Max wing loading	10·7 lb/sq ft (52·0 kg/m²)
Max power loading	10·36 lb/hp (4·7 kg/hp)

PERFORMANCE (at max T-O weight, except where indicated):

Max never-exceed speed	134 knots (155 mph; 249 km/h)
Max level speed at S/L:	
RV	132 knots (152 mph; 245 km/h)
RVR	122 knots (140 mph; 225 km/h)
Max cruising speed at S/L	114 knots (131 mph; 211 km/h)
Stalling speed, flaps down	41·5 knots (48 mph; 77 km/h)
Max rate of climb at S/L	1,180 ft (360 m)/min
Time to 1,970 ft (600 m), 75% power, with Blanik two-seat sailplane	3 min 10 sec
Service ceiling	22,000 ft (6,700 m)
T-O run	330 ft (100 m)
T-O to 50 ft (15 m), two persons	615 ft (188 m)
Landing from 50 ft (15 m)	525 ft (160 m)
Landing run	195 ft (60 m)
Range with max fuel	636 nm (733 miles; 1,180 km)

AERO BOERO 180 Ag

This version of the Aero Boero 180 is certificated in the Restricted category for use as an agricultural aircraft. Twenty had been ordered by the Spring of 1975, of which 11 had been completed.

The description of the Aero Boero 180 RV and RVR applies also to the 180 Ag, except in the following respects:

WINGS: Incidence 3° 30′ at root, 2° at tip.

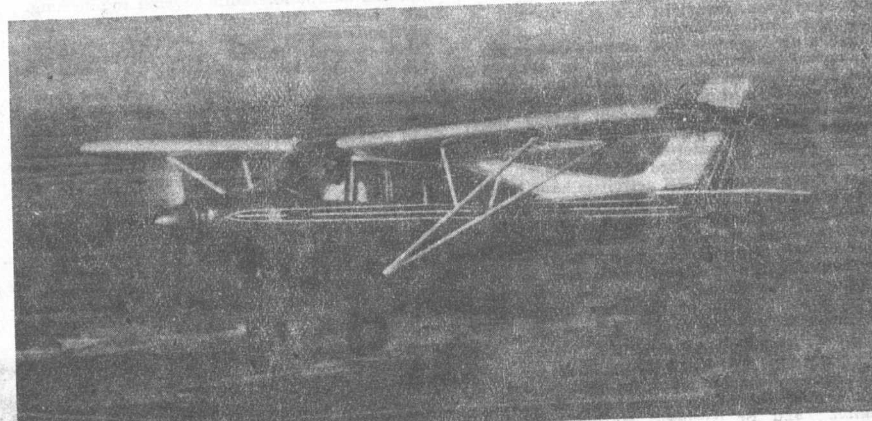
EQUIPMENT: Flush-fitting underfuselage pod containing agricultural chemical. Spraybars fitted along rear bar of Vee strut and horizontally below wings. Electrically-operated rotary atomisers (two each side) fitted to rear bar of Vee strut.

PERFORMANCE (at max T-O weight):

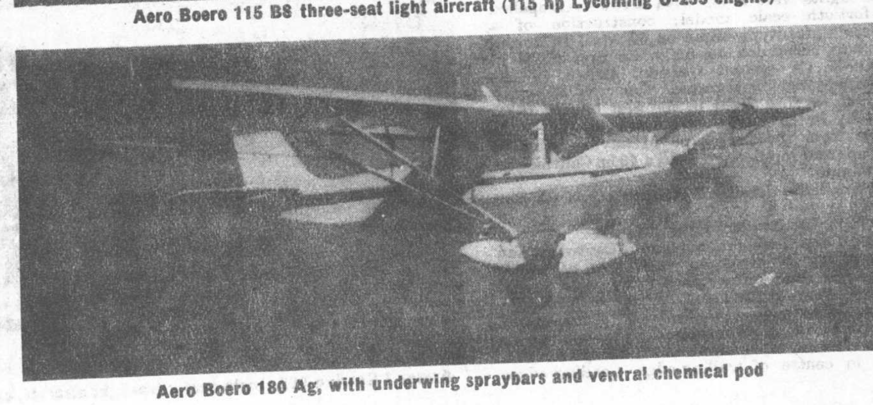
Max never-exceed speed	117 knots (135 mph; 217 km/h)
Max level speed at S/L	109 knots (125 mph; 201 km/h)
Max cruising speed at S/L	100 knots (115 mph; 185 km/h)
Econ cruising speed at S/L	96 knots (110 mph; 177 km/h)
Stalling speed, flaps down	48 knots (55 mph; 89 km/h)
Max rate of climb at S/L	350 ft (107 m)/min
T-O run	700 ft (213 m)
T-O to 50 ft (15 m)	1,100 ft (335 m)
Landing from 50 ft (15 m)	750 ft (229 m)
Landing run	500 ft (152 m)
Range with max fuel	434 nm (500 miles; 804 km)

AERO BOERO 210 and 260

Design of the Aero Boero 210 four-seat light aircraft was begun in 1968, and a prototype was flown for the first time on 22 April 1971. The



Aero Boero 115 BS three-seat light aircraft (115 hp Lycoming O-235 engine)



Aero Boero 180 Ag, with underwing spraybars and ventral chemical pod same prototype, when re-engined with a 260 hp Lycoming O-540 engine, became known as the Aero Boero 260.

A description of the aircraft in its original Aero Boero 210 form can be found in the 1974-75 *Jane's*. No details of the AB 260 have been received for publication.

AERO BOERO AG.260

Aero Boero began the design of this single-seat agricultural monoplane in mid-1971, at which time it was known as the AG.235/260. Construction of a prototype began in October 1971, and this aircraft flew for the first time on 23 December 1972. A static test airframe has also been completed.

No information has been received regarding the production status, if any, of the AG.260.

TYPE: Single-seat agricultural aircraft.

WINGS: Low-wing monoplane. Wing section NACA 23012. Dihedral 5°. Construction, including trailing-edge flaps and ailerons, is of aluminium alloy, with inverted Vee bracing struts on each side.

FUSELAGE: Welded SAE 4130 steel tube structure with plastics covering.

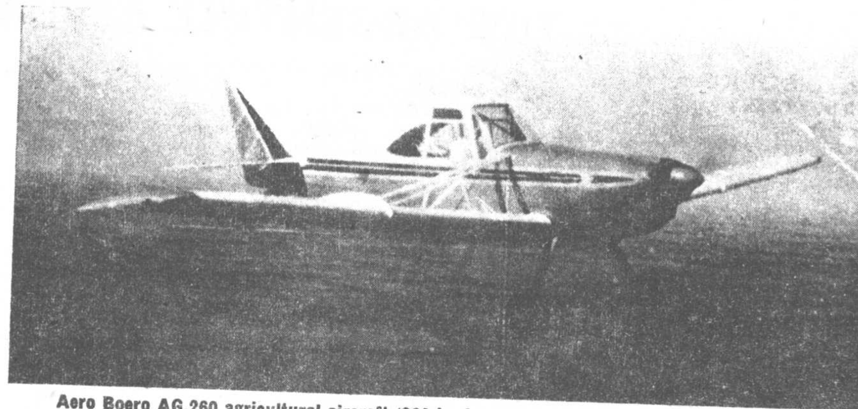
TAIL UNIT: Wire-braced welded steel tube structure with plastics covering.

LANDING GEAR: Non-retractable tailwheel type, with coil spring shock-absorbers. Hydraulic disc brakes on main wheels.

POWER PLANT: One 260 hp Lycoming O-540 six-cylinder horizontally-opposed aircooled engine, driving a McCauley P235/AFA 8456 two-blade propeller. Four wing fuel tanks, total capacity 70·8 US gallons (59 Imp gallons; 268 litres).

ACCOMMODATION: Pilot only, in enclosed cabin. Door on starboard side, which can be jettisoned in an emergency. Cabin heated, and ventilated by adjustable cool-air vents. Utility compartment on port side, aft of cabin.

ELECTRONICS AND EQUIPMENT: VHF radio standard. Non-corrosive glassfibre tank installed forward of cockpit, with capacity of 110 Imp gallons (500 litres) of liquid or 1,102 lb (500 kg) of dry chemical. Quick-dump valve, to jettison contents of tank in an emergency. Engine-driven pump.



Aero Boero AG.260 agricultural aircraft (260 hp Lycoming O-540 engine) *(Alex Reinhard)*

DIMENSIONS, EXTERNAL:

Wing span	35 ft 9 in (10·90 m)
Wing chord (constant over most of span)	5 ft 3½ in (1·61 m)
Wing aspect ratio	6·8
Length overall (tail up)	24 ft 5¼ in (7·45 m)
Height overall (tail up)	6 ft 2¾ in (1·90 m)
Tailplane span	9 ft 11¾ in (3·04 m)
Propeller diameter	7 ft 0 in (2·13 m)

DIMENSION, INTERNAL:

Hopper volume	17·66 cu ft (0·5 m³)

AREAS:

Wings, gross	177·28 sq ft (16·47 m²)
Ailerons (total)	19·81 sq ft (1·84 m²)
Flaps (total)	20·88 sq ft (1·94 m²)
Fin	10·01 sq ft (0·93 m²)
Rudder	4·41 sq ft (0·41 m²)
Tailplane	15·07 sq ft (1·40 m²)
Elevators	10·44 sq ft (0·97 m²)

WEIGHTS AND LOADINGS:

Weight empty	1,587 lb (720 kg)
Max T-O weight	2,976 lb (1,350 kg)
Max wing loading	15·83 lb/sq ft (77·28 kg/m²)
Max power loading	11·44 lb/hp (5·19 kg/hp)

PERFORMANCE (at max T-O weight):

Max never-exceed speed	117 knots (135 mph; 217 km/h)
Max cruising speed at S/L	109 knots (125 mph; 201 km/h)
Econ cruising speed	95·5 knots (110 mph; 177 km/h)
Stalling speed, flaps down	52·5 knots (60 mph; 97 km/h)
Max rate of climb at S/L	1,345 ft (410 m)/min
Service ceiling	21,000 ft (6,400 m)
T-O to 50 ft (15 m)	656 ft (200 m)
Landing from 50 ft (15 m)	394 ft (120 m)
Range with max fuel	593 nm (683 miles; 1,100 km)

AL-AIRE

TALLERES AL-AIRE SCA

ADDRESS: Aerodromo San Fernando, Provincia Buenos Aires

Talleres Al-Aire SCA was established to undertake overhaul and repair work, up to fuselage rebuild standard, on light aircraft.

In addition to this work, its premises were used by some members of AVEX to begin the construction of an aerobatic training aircraft known as the T-11 Cacique, designed by Ing Alfredo Turbay.

Al-Aire also began the construction of a single-seat twin-boom pusher-engined light aircraft known as the AL-2 Tijerete.

No news of either aircraft has been received since 1971, and all known details appeared in the 1974-75 *Jane's*. In early 1975 the founder and proprietor of Al-Aire, Sr May, was killed in a flying accident involving his L-200 Morava aircraft.

AVEX

ASOCIACION ARGENTINA DE CONSTRUCTORES DE AVIONES EXPERIMENTALES

ADDRESS:
Accasusso 1640, Olivos-FCNGBM, Buenos Aires
Telephone: 797-1629

PRESIDENT: Yves Arrambide

SECRETARY: Norberto Marino

AVEX is an Argentine light aircraft association for amateur constructors, similar in concept to the Experimental Aircraft Association in the US. It was formed in 1968 and its members include many people well known among the Argentine aircraft industry, including specialists in most aspects of materials and construction, including the use of glassfibre and plastics.

Some of the recent AVEX activities have been described in the 1971-72 and subsequent editions of *Jane's*. Of 42 current aircraft projects by AVEX members, two have already flown and six others were nearing completion in early 1975: two Gorrions, the Yakstas racer, and single examples of the Evans VP-1, Jodel D.9 and Mignet H-14. Details of the more important Argentinian designs follow:

ARRAMBIDE/MARINO ARMAR I GORRION (SPARROW)

The Gorrion single-seat ultra-light aircraft was designed in collaboration by Mr Yves Arrambide and Sr Norberto Marino in 1971. Trial flights were made with a rubber-propelled one-fortieth scale model; construction of a full-scale prototype began on 30 April 1972, and this was scheduled to make its first flight in mid-1975. A second Gorrion, shown in the accompanying photograph, also was expected to make its first flight in the first half of 1975. Built by Sr E. Puglisi of Rosario, Santa Fé, it differs from the prototype in having rounded wingtips and top-decking, and a 40 hp Continental A40 engine.

All available details of the prototype Gorrion follow:

TYPE: Single-seat ultra-light aircraft.

WINGS: Parasol-wing monoplane. Centre-section braced by N strut on each side of upper fuselage, and outer panels by Vee struts from bottom of fuselage. Wing section NACA 4412 (constant). Dihedral 3° from roots. Incidence 3°. No sweepback. Two-spar wooden structure, of constant chord except for cut-out in centre of trailing-edge. Leading-edges plywood-covered; remainder fabric-covered. Frise-type fabric-covered wooden ailerons. No tabs.

FUSELAGE: Conventional wooden box structure. Aluminium cowling panels; remainder plywood-covered except for fabric-covered top-decking.

TAIL UNIT: Cantilever wooden structure; plywood-covered fin and one-piece tailplane, fabric-covered rudder and elevators. No tabs. Rudder control by cables.

LANDING GEAR: Non-retractable tailwheel type. Glassfibre legs provide all necessary shock absorption. Main units have scooter wheels and brakes.

POWER PLANT: One 39 hp Citröen 3 CV motor-car engine, with reduction gear, driving a two-blade fixed-pitch wooden propeller. Single fuel tank in fuselage, capacity 7·5 Imp gallons (35 litres). Refuelling point on top of fuselage aft of firewall. Oil capacity 0·66 Imp gallons (3 litres).

ACCOMMODATION: Single seat in open cockpit. Windscreen fitted. Headrest faired into top of fuselage.

DIMENSIONS, EXTERNAL:

Wing span (excl tip fairings)	22 ft 11¾ in (7·00 m)
Wing chord (constant)	4 ft 1¼ in (1·25 m)
Wing aspect ratio	5·6
Length overall	15 ft 5¾ in (4·72 m)
Height overall (tail up)	6 ft 5¼ in (1·96 m)
Tailplane span	7 ft 2¾ in (2·20 m)
Wheel track	4 ft 7 in (1·40 m)
Propeller diameter	5 ft 3 in (1·60 m)
Propeller ground clearance	10 in (0·25 m)

DIMENSIONS, INTERNAL:

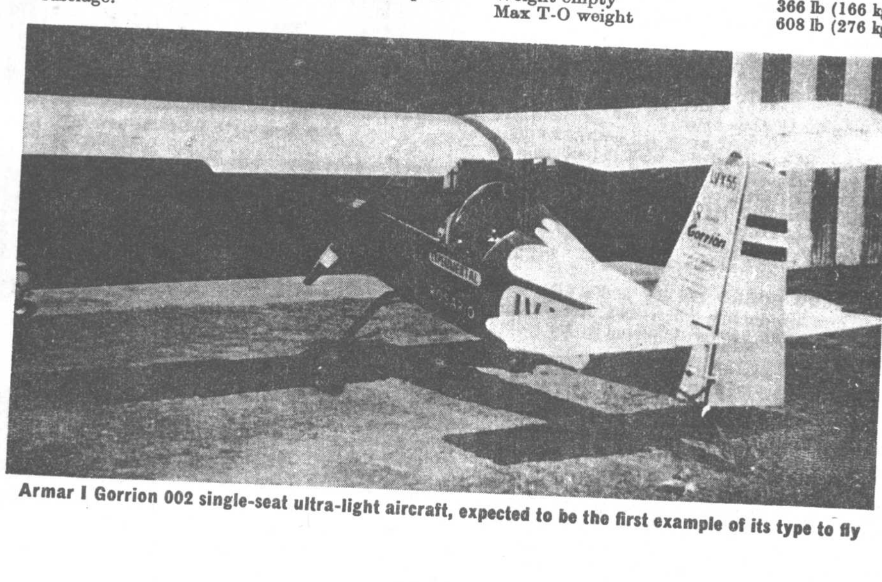
Cabin: Length	4 ft 7 in (1·40 m)
Width (constant)	1 ft 10 in (0·56 m)

AREAS:

Wings, gross	91·5 sq ft (8·50 m²)
Ailerons (total)	12·27 sq ft (1·14 m²)
Fin	3·98 sq ft (0·37 m²)
Rudder	4·74 sq ft (0·44 m²)
Tailplane	6·89 sq ft (0·64 m²)
Elevators	7·53 sq ft (0·70 m²)

WEIGHTS AND LOADINGS:

Weight empty	366 lb (166 kg)
Max T-O weight	608 lb (276 kg)



Armar I Gorrion 002 single-seat ultra-light aircraft, expected to be the first example of its type to fly

Max wing loading 6·6 lb/sq ft (32·0 kg/m²)
Max power loading 15·43 lb/hp (7·0 kg/hp)

PERFORMANCE (estimated, at max T-O weight):
Max level speed at 5,000 ft (1,500 m) 75·5 knots (87 mph; 140 km/h)
Max cruising speed at 5,000 ft (1,500 m) 65 knots (75 mph; 120 km/h)
Stalling speed 30·5 knots (35 mph; 56 km/h)
Service ceiling 9,845 ft (3,000 m)
Range with max fuel 194 nm (223 miles; 360 km)

GHINASSI HELICOPTERS

Sr Sesto Ghinassi is a specialist in, and racer of, motorcycles. He built a small single-seat helicopter, using unapproved materials and a 30 hp engine developed by himself.

This aircraft (described and illustrated in the 1973-74 *Jane's*) was later scrapped, but Sr Ghinassi currently has a new helicopter under construction, for which he is using aircraft quality materials.

ROTOR SYSTEM AND DRIVE: Variable-pitch main and tail rotors, the former driven by chain drive from engine. Symmetrical-section blades, with 7% thickness/chord ratio, of wooden construction with aluminium skin. Max rpm of main rotor 400.

FUSELAGE: Welded steel tube structure.

POWER PLANT: One 30 hp 470 cc two-cylinder four-stroke turbine-cooled engine of own design; max rpm 6,300. Fuel tank capacity 4·4 Imp gallons (20 litres).

ACCOMMODATION: Single seat.

DIMENSIONS, EXTERNAL:
Main rotor diameter 19 ft 8¼ in (6·00 m)
Tail rotor diameter 1 ft 11⅝ in (0·60 m)
Main rotor blade chord 8⅝ in (0·22 m)
Fuselage length 13 ft 1½ in (4·00 m)
Fuselage width 3 ft 3⅜ in (1·00 m)
Height overall 5 ft 1 in (1·55 m)

PERFORMANCE (estimated):
Range 162 nm (186 miles; 300 km)

YAKSTAS RACER

Originally begun by Prof Adolfo Yakstas as a much-modified development of the Baserga H.B.1 (see 1970-71 *Jane's*), this has now evolved into virtually a new design having only the two-cylinder Praga engine in common with its predecessor.

Work was restarted in the Spring of 1974, and in early 1975 the basic structure was almost complete and ready for covering. It was hoped to make the first flight in the Spring of 1975.

TYPE: Single-seat racing monoplane.

FUSELAGE: Aluminium-skinned steel tube forward section. Rear section, aft of main landing gear legs, is of wooden construction with fabric-covered upper and plywood-covered lower surfaces.

TAIL UNIT: Fabric-covered steel tube structure, without sweepback.

LANDING GEAR: Non-retractable tailwheel type. Spring steel main gear legs.

POWER PLANT: One 45 hp Praga B-2 two-cylinder engine, driving a two-blade fixed-pitch propeller with spinner.

ACCOMMODATION: Single seat under two-piece moulded Plexiglas canopy.

DIMENSIONS, EXTERNAL:
Wing span 24 ft 11¼ in (7·60 m)
Wing chord 3 ft 11¼ in (1·20 m)
Length overall 16 ft 8¾ in (5·10 m)
Tailplane span 8 ft 2½ in (2·50 m)

AREA:
Wings, gross 98·2 sq ft (9·12 m²)

CATA

COMPAÑIA ARGENTINA DE TRABAJOS AÉREOS

ADDRESS:
San Justo Aerodrome, Ruta 3, Km 24·7, Casanova (Buenos Aires), Aerodromo Aeroclub Argentino

CATA (FLEET) 150

This company modified a Fleet biplane (LV-ZBZ) by installing a 150 hp Lycoming O-320 flat-four engine, with which the aircraft became known as the CATA (Fleet) 150 and flew for the first time on 3 June 1971. A second aircraft was exhibited at Buenos Aires in late 1972.

All known details of this programme were given in the 1974-75 *Jane's*. No further information has become available since that time.

CHINCUL

CHINCUL S.A.C.A.I.F.I.

HEAD OFFICE:
Mendoza S/N, Calle 6 y 7, Departamento Pocito, Casilla Correo 80, San Juan (San Juan)

WORKS:
25 de Mayo 489, 60 Piso, Buenos Aires

PRESIDENT:
José Maria Beraza

VICE-PRESIDENT:
Juan José Beraza

This company, a wholly-owned subsidiary of La Macarena SRL, Piper's Argentine distributor, concluded an agreement with Piper Aircraft Corporation on 22 November 1971, for manufacture of a broad range of Piper products in Argentina. The proposed plan called for a progression through five manufacturing phases of increasing complexity, designed to permit the gradual assimilation of aircraft manufacturing technology by Chincul.

The programme, officially inaugurated on 20 December 1972, scheduled the completion of 1,000 single-engined and 340 twin-engined Piper aircraft by Chincul. Phase 1, following the delivery of four Senecas and 15 Cherokee kits, was carried out in 1973. Under a programme sponsored by the Comando de Regiones Aéreas, 40 Cherokees were to be built during the first two to three years for use as trainers by Argentine flying clubs, but no information regarding the progress of this programme has been made available, either by Chincul or by Piper Aircraft Corporation.

A new assembly facility in San Juan was inaugurated on 13 December 1972. This facility, occupying a covered area of 30,623 sq ft (2,845 m²), is part of a 129,165 sq ft (12,000 m²) plant which was eventually to be devoted to the assembly of all models of Piper aircraft. Finished aircraft were to be test-flown and certificated by Argentine personnel.

CICARÉ

CICARÉ AERONÁUTICA SC

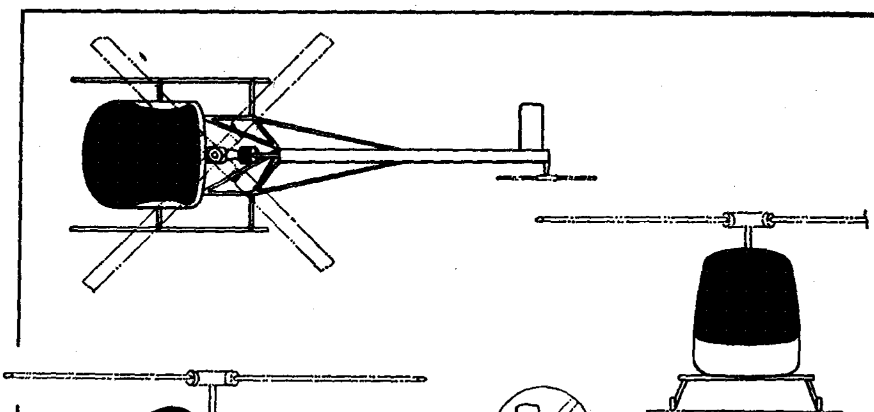
ADDRESS:
Ave Ibañes Frocham s/n, CC24, Saladillo, Provincia de Buenos Aires

ENQUIRIES TO:
Comodoro Antonio R. Mantel, Santa Fé 1256, Buenos Aires

Telephone: Buenos Aires 41-5260

PARTNERS:
Augusto Ulderico Cicaré
Comodoro Ildefonso Domingo Durana
Comodoro Antonio Raúl Mantel

This company was formed in 1972 to undertake the development and construction of small aero-engines and light helicopters. Sr Cicaré, originally an engine designer, has designed and constructed two experimental helicopters, the Cicaré I and Cicaré II, brief details of which appeared in the 1970-71, 1973-74 and 1974-75 *Jane's*. A description follows of the more recently-designed CH-III Colibri:



Cicaré CH-III Colibri two/three-seat light helicopter (*Roy J. Grainge*)

CICARÉ CH-III COLIBRÍ

Design of the CH-III began in August 1973, and a prototype was under construction in 1974. This work is being done, under contract from the Argentine Air Force, to evolve a light helicopter suitable for training and agricultural duties. First flight is scheduled to take place in late 1975 or early 1976.

TYPE: Two/three-seat light helicopter.

ROTOR SYSTEM: Four-blade rigid main rotor and two-blade tail rotor. Blade section NACA 0015. All blades are of glassfibre construction. No rotor brake or blade folding.

ROTOR DRIVE: Ten Vee-belts, via a reduction gearbox, with free-wheel system for autorotation. Main rotor/engine rpm ratio 1 : 6; tail rotor/engine rpm ratio 1 : 1.

FUSELAGE: Steel tube structure, with glassfibre cabin and aluminium tailboom.

TAIL UNIT: Glassfibre horizontal and vertical fixed stabilisers.

LANDING GEAR: Tubular steel skid type.

POWER PLANT: One 190 hp Lycoming HIO-360-D1A four-cylinder horizontally-opposed air-cooled engine, mounted horizontally. Single glassfibre fuel tank, capacity 29·5 Imp gallons (135 litres). Optional auxiliary tank, capacity 16·5 Imp gallons (75 litres).

ACCOMMODATION: Two or three seats side by side in enclosed cabin (instructor and pupil only in training version). Door on each side of cabin. Space for up to 100 lb (45 kg) of baggage. Cabin heated and ventilated.

ELECTRONICS AND EQUIPMENT: VHF radio standard. Mission equipment includes spraying or dusting gear and cargo sling.

DIMENSIONS, EXTERNAL:
Diameter of main rotor 24 ft 6 in (7·47 m)
Main rotor blade chord 6 in (152 mm)
Diameter of tail rotor 3 ft 7·2 in (1·10 m)
Distance between rotor centres 14 ft 0 in (4·27 m)
Length overall 28 ft 0 in (8·53 m)
Height overall 8 ft 1·2 in (2·47 m)
Skid track 6 ft 7·2 in (2·01 m)

AREAS:
Main rotor disc 471·43 sq ft (43·8 m²)
Tail rotor disc 10·18 sq ft (0·95 m²)

WEIGHTS AND LOADINGS:
Weight empty, equipped 1,034 lb (469 kg)
Max payload 500 lb (226 kg)
Max T-O weight 1,764 lb (800 kg)
Max disc loading 3·74 lb/sq ft (18·3 kg/m²)
Max power loading 9·28 lb/hp (4·21 kg/hp)

PERFORMANCE (estimated, at max T-O weight):
Max level and cruising speed at S/L 88 knots (101 mph; 163 km/h)
Econ cruising speed 65 knots (74·5 mph; 120 km/h)
Max rate of climb at S/L 1,181 ft (360 m)/min
Service ceiling 12,800 ft (3,900 m)
Hovering ceiling out of ground effect 5,575 ft (1,700 m)
Range with internal fuel 259 nm (298 miles; 480 km)

FMA (AREA DE MATERIAL CÓRDOBA)

AGRUPACIÓN AVIONES-DEPARTAMENTO INGENIERÍA, GUARNICION AÉREA CÓRDOBA

ADDRESS:
Avenida Fuerza Aérea Argentina Km $5\frac{1}{2}$, Córdoba
Telephone: 45011, 37048 and 44732

DIRECTOR:
Brigadier César F. Ferrante

CHIEF DESIGNER AND ENGINEER:
Vicecomodoro Héctor Eduardo Ruiz

The original Fábrica Militar de Aviones (Military Aircraft Factory) was founded in 1927 as a central organisation for aeronautical research and production in the Argentine. Its name was changed to Instituto Aerotécnico in 1943 and then to Industrias Aeronáuticas y Mecánicas del Estado (IAME) in 1952. In 1957 it became a State enterprise under the title of Dirección Nacional de Fabricaciones e Investigaciones Aeronáuticas (DINFIA), but reverted to its original title in 1968. It is now a component of the Area de Material Córdoba division of the Argentine Air Force.

FMA comprises two large divisions. The Instituto de Investigaciónes Aeronáuticas y Espacial (IIAE) is responsible for the design, manufacture and testing of rockets, sounding equipment and other equipment. The Fábrica Militar de Aviones itself controls the aircraft manufacturing facilities situated in Córdoba. The laboratories, factories and other aeronautical division buildings occupy a total covered area of 1,599,059 sq ft (148,557 m²); the Area de Material Córdoba employs 3,500 persons, of whom about 1,500 are in the FMA.

FMA's head offices are situated in Buenos Aires. It also controls the Centro de Ensayos en Vuelo (Flight Test Centre), to which all aircraft produced in the Argentine are sent for certification tests.

The major aircraft of national design in current production is the IA 58 Pucará counter-insurgency aircraft. Production of the IA 50 GII twin-turboprop general-purpose aircraft ended during the past year.

A twin-turbofan trainer, based on the Pucará, is in the design stage.

FMA is also producing Cessna single-engined aircraft under licence, under a renewed and extended form of the agreement announced in October 1965. First phase called for assembly of 80 aircraft from major assemblies supplied by Cessna. Phase 2 involved assembly of 100 aircraft from detail parts provided by Cessna. Phase 3 involves an estimated 320 aircraft, for which FMA is manufacturing or acquiring in the Argentine as many parts as possible. All aircraft are repurchased by Cessna for sale through its distributors and dealers in Latin America or sold directly by FMA to Argentine government agencies. Forty Cessna Model 150s have been ordered by the Comando de Regiones Aéreas for use as trainers by Argentine flying clubs.

The first A182J (Argentine 182) was completed in August 1966 from the initial batch of twelve sets of components supplied by Cessna, and was delivered to its owner on 2 September 1966. The renewed and extended agreement, announced in April 1971, provided for continued production of the Cessna 182 and, in addition, for the range to be extended to include the Model 150 trainer and the AGwagon agricultural aircraft.

By February 1975, FMA had completed 136 Cessna Model A182s, 27 Model A150 trainers, 8 Model A-A150 Aerobats and 23 Model A188 AGwagons.

IA 50 GII

The original FA1 Guarani I twin-turboprop light transport was described in the 1962-63 *Jane's*.

From it was developed the IA 50 (formerly FA2) Guarani II, the first prototype of which (LV-X27) flew for the first time on 23 April 1963 and introduced more powerful engines, de-icing equipment, a single swept fin and rudder and a shorter rear fuselage. A second prototype (TX-01) was built, followed by a single pre-production aircraft. Production aircraft, designated GII, have flight deck windows of modified size and shape, to meet the US Federal Aviation Agency's CAM 4B requirements, and provision for wingtip auxiliary fuel tanks.

Initial orders were for 18 standard GIIs for communications duties, four for photographic operations with the Military Geographic Institute and one furnished as an executive transport for use by the President of Argentina. The first 18 production aircraft included one VIP transport (serial TX-110), fourteen troop transports (T-111 to T-124) and two photographic and survey aircraft (F-31 and F-32) for the Argentine Air Force; and one staff transport (5-T-30) for the Argentine Navy. The first two were in service with I Air Brigade at El Palomar by March 1967. A contract for a further 15 aircraft was placed in October 1969; production of these was completed during the past year. They have redesigned internal furnishings, and many former steel structural components are replaced by components made of aluminium alloy, to reduce the aircraft's basic empty weight. Thus, with the prototypes and pre-series aircraft, a total of 41 GIIs were built. The 19th aircraft (T-125) was fitted with ski landing gear for use in the Antarctic.

A full description of the GII can be found in the 1974-75 *Jane's*.

TYPE: Twin-engined light transport.

POWER PLANT: Two Turboméca Bastan VIA turboprop engines, each rated at 930 shp plus 165 lb (75 kg) st. Ratier-Figeac FH86 three-blade variable-pitch metal propellers. Water-alcohol injection. Total internal fuel capacity 420 Imp gallons (1,910 litres) in integral tanks in wings. Provision for two wingtip fuel tanks, each with capacity of 77 Imp gallons (350 litres). Oil capacity 4·2 Imp gallons (19 litres) for each engine.

ACCOMMODATION: Crew of two side by side on flight deck. Standard seating in main cabin for 10, 12 or 15 passengers. Door with built-in steps at rear of cabin on port side. The 10-passenger executive version has a baggage compartment (port) and bar (starboard) immediately aft of flight deck; two rows of three inward-facing seats at front of main cabin and two pairs of armchair seats facing each other fore and aft with table between; toilet opposite cabin door. The utility and para-troop transport has seven inward-facing seats on the port side of the cabin and eight on the starboard side. A navigation and radar training version has six seats and comprehensive equipment in the cabin. An ambulance version carries two pairs of stretchers on the port side of the cabin and one pair on the starboard side, with two seats for attendants. All versions have a forward baggage hold and galley, and a toilet at the rear.

DIMENSIONS, EXTERNAL:
Wing span (without tip-tanks) — 64 ft $3\frac{1}{2}$ in (19·59 m)
Wing chord (centre-section, constant) — 9 ft 1 in (2·75 m)
Wing aspect ratio — 9
Length overall — 50 ft $2\frac{1}{2}$ in (15·30 m)
Length of fuselage — 46 ft $10\frac{1}{2}$ in (14·28 m)
Height over tail — 18 ft 5 in (5·61 m)
Tailplane span — 21 ft 4 in (6·50 m)
Wheel track — 15 ft $11\frac{1}{4}$ in (4·86 m)
Wheelbase — 11 ft $1\frac{3}{4}$ in (3·40 m)

DIMENSIONS, INTERNAL:
Cabin, excl flight deck:
Max length — 16 ft 2 in (4·93 m)
Max width — 4 ft 9 in (1·45 m)
Max height — 5 ft $5\frac{1}{2}$ in (1·66 m)
Floor area — 131·3 sq ft (12·20 m²)
Volume — 618 cu ft (17·5 m³)

AREAS:
Wings, gross — 450 sq ft (41·81 m²)
Ailerons (total) — 38·2 sq ft (3·55 m²)
Trailing-edge flaps (total) — 51·73 sq ft (4·81 m²)
Vertical tail surfaces (total) — 60·5 sq ft (5·62 m²)
Horizontal tail surfaces (total) — 79·0 sq ft (7·34 m²)

WEIGHTS AND LOADINGS:
Weight empty, equipped — 8,650 lb (3,924 kg)
Max payload — 3,307 lb (1,500 kg)
Max T-O weight:
with tip-tanks — 17,085 lb (7,750 kg)
without tip-tanks — 15,873 lb (7,200 kg)
Max landing weight — 14,330 lb (6,500 kg)
Max wing loading:
with tip-tanks — 37·9 lb/sq ft (185 kg/m²)
without tip-tanks — 35·0 lb/sq ft (170·9 kg/m²)
Max power loading:
with tip-tanks — 8·38 lb/ehp (3·8 kg/ehp)

PERFORMANCE (at max T-O weight):
Max never-exceed speed — 277 knots (320 mph; 515 km/h)
Max level speed — 269 knots (310 mph; 500 km/h)
Max cruising speed — 265 knots (305 mph; 491 km/h)
Econ cruising speed — 243 knots (280 mph; 450 km/h)
Stalling speed — 79 knots (90 mph; 145 km/h)
Max rate of climb at S/L — 2,640 ft (805 m)/min
Service ceiling — 41,000 ft (12,500 m)
Service ceiling, one engine out — 11,000 ft (3,350 m)
T-O run — 1,380 ft (420 m)
T-O to 50 ft (15 m) — 2,200 ft (640 m)
Landing from 50 ft (15 m) — 1,970 ft (600 m)
Landing run — 820 ft (250 m)
Range with max fuel — 1,389 nm (1,600 miles; 2,575 km)
Range with max payload — 1,076 nm (1,240 miles; 1,995 km)

IA 58 PUCARÁ

This twin-turboprop COIN (counter-insurgency) combat aircraft was developed to meet an Argentine Air Force requirement. Originally known as the Delfin, it was later renamed Pucará. An unpowered aerodynamic prototype was described in the 1968-69 *Jane's*. The first powered prototype, designated AX-01, flew for the first time on 20 August 1969, powered by AiResearch TPE 331 engines. It was described in the 1971-72 *Jane's*.

A second prototype, designated AX-02, flew for the first time on 6 September 1970 with 1,022 ehp Turboméca Astazou XVIG turboprop engines, and the production version is powered by engines of this type.

An order for 30 Pucarás has been placed by the Argentine Air Force, and the first of these (A-501) flew for the first time on 8 November 1974. It is anticipated that this order will be increased to 70 aircraft. Interest in the Pucará has also been expressed by the air forces of Bolivia, Libya and Peru.

The following description applies to the production version:

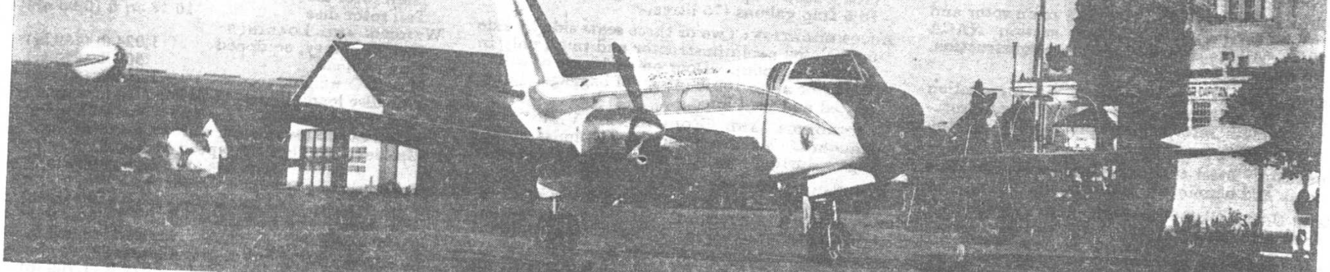
TYPE: Twin-turboprop counter-insurgency aircraft.

WINGS: Cantilever low-wing monoplane. Wing section NACA 64_2A215 at root, NACA 64_1A212 at tip. Dihedral 7° on outer wing panels. Incidence 2°. No sweepback. Conventional semi-monocoque fail-safe structure of duralumin. Frise-type fabric-covered duralumin ailerons and all-dural slotted trailing-edge flaps. No slats. Balance tab in starboard aileron, electrically-operated trim tab in port aileron. Kléber-Colombes pneumatic de-icing boots on leading-edges.

FUSELAGE: Conventional semi-monocoque fail-safe structure of duralumin. Door-type air-brakes at rear which form tailcone when closed.

TAIL UNIT: Cantilever semi-monocoque structure of duralumin. Fixed-incidence tailplane and elevators mounted near top of fin. Trim tab in rudder and each elevator. Kléber-Colombes pneumatic de-icing boots on leading-edges.

LANDING GEAR: Retractable tricycle type, all units retracting forward hydraulically. Shock-absorbers of Kronprinz Ring-Feder type, designed by Vicecomodoro Ruiz. Single wheel on nose unit, twin wheels on main units, all with Dunlop tubeless Type III tyres size



FMA IA 50 GII twin-turboprop multi-purpose aircraft of the Argentine Air Force, fitted with wingtip tanks

7·50-10. Tyre pressures: 41 lb/sq in (2·88 kg/cm²) on main units, 35 lb/sq in (2·46 kg/cm²) on nose unit. Dunlop hydraulic disc brakes. No anti-skid units.

POWER PLANT: Two 1,022 ehp Turboméca Astazou XVIG turboprop engines, each driving a Hamilton Standard 33LF/1015-0 three-blade metal propeller. Fuel in two fuselage tanks and one self-sealing tank in each wing, with total capacity of 313 Imp gallons (1,422 litres). Attachment point beneath each wing at junction of centre and outer panels for external weapons or jettisonable auxiliary fuel tank of 66 Imp gallons (300 litres). Oil capacity 2·6 Imp gallons (11·75 litres).

ACCOMMODATION: Crew of two in tandem on Martin-Baker Mk AP06A ejection seats beneath transparent moulded canopy. Rear seat slightly elevated. Bulletproof windscreen.

SYSTEMS: Hydraulic system, pressure 3,000 lb/sq in (210 kg/cm²), supplied by two engine-driven pumps, actuates landing gear, flaps, wheel brakes and airbrakes. Wing and tail unit de-icing by engine bleed air. Electrical system includes two 300A 28V starter/generators for DC power and two 500/750VA rotary inverters for 115V AC power. One 36Ah SAFT Voltabloc 4006 battery. No APU at present.

ELECTRONICS AND EQUIPMENT: Blind-flying instrumentation standard. Radio equipment includes Bendix DFA-73A-1 ADF, Bendix RTA-42A VHF communications system, Bendix RNA-2bc VHF navigation system, Northern N-420 HF 55B communications system, amplifier and audio-selector system with AS-A-31 panel. Optional equipment includes weather radar, IFF and VHF/FM tactical communications system.

ARMAMENT AND OPERATIONAL EQUIPMENT: Two 20 mm Hispano cannon and four 7·62 mm FN machine-guns in fuselage. One attachment point beneath centre of fuselage and one beneath each wing outboard of engine nacelle for a variety of external stores, including auxiliary fuel tanks. Librascope 335336 gunsight and one AN/AWE programmer.

DIMENSIONS, EXTERNAL:
- Wing span: 47 ft 6¾ in (14·50 m)
- Wing chord at root: 7 ft 4¼ in (2·24 m)
- Wing chord at tip: 5 ft 3 in (1·60 m)
- Wing aspect ratio: 6·95
- Length overall: 46 ft 3 in (14·10 m)
- Length of fuselage: 43 ft 8¼ in (13·32 m)
- Fuselage: Max width: 4 ft 0¾ in (1·24 m)
- Height overall: 17 ft 7 in (5·36 m)
- Tailplane span: 15 ft 5 in (4·70 m)
- Wheel track (c/l of shock struts): 13 ft 9¼ in (4·20 m)
- Wheelbase: 11 ft 5 in (3·48 m)
- Propeller diameter: 8 ft 6 in (2·59 m)

DIMENSIONS, INTERNAL:
- Cabin: Floor area: 31·2 sq ft (2·90 m²)
- Volume: 96·8 cu ft (2·74 m³)

AREAS:
- Wings, gross: 326·1 sq ft (30·30 m²)
- Ailerons (total): 35·41 sq ft (3·29 m²)
- Trailing-edge flaps (total): 38·53 sq ft (3·58 m²)
- Fin: 37·30 sq ft (3·465 m²)
- Rudder, incl tab: 16·84 sq ft (1·565 m²)
- Tailplane: 49·51 sq ft (4·60 m²)
- Elevators, incl tabs: 28·11 sq ft (2·612 m²)

WEIGHTS AND LOADINGS:
- Weight empty: 8,900 lb (4,037 kg)
- Max T-O weight: 14,300 lb (6,486 kg)
- Max landing weight: 12,800 lb (5,806 kg)
- Max wing loading: 44 lb/sq ft (214·8 kg/m²)
- Max power loading: 7 lb/ehp (3·18 kg/ehp)

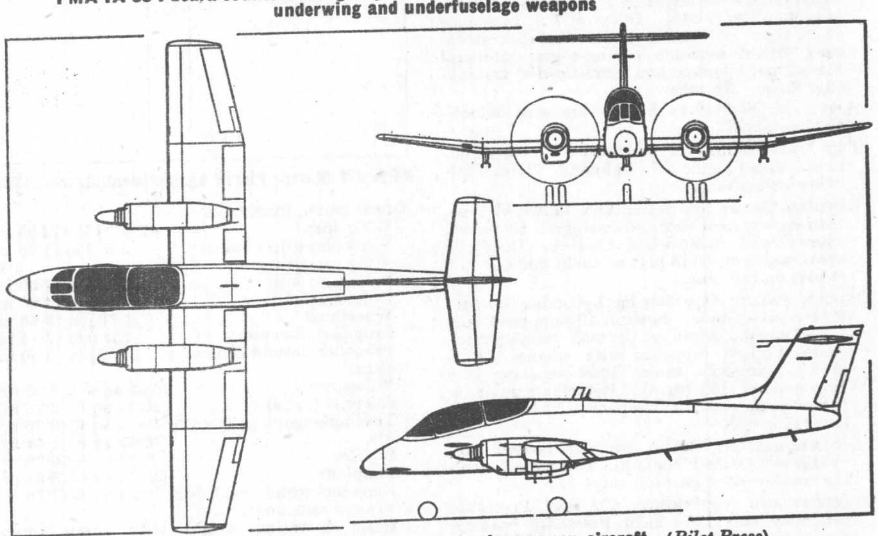
PERFORMANCE (at max T-O weight, except where indicated):
- Max never-exceed speed: 404 knots (466 mph; 750 km/h)
- Max level speed at 9,840 ft (3,000 m): 281 knots (323 mph; 520 km/h)
- Max cruising speed: 261 knots (301 mph; 485 km/h)
- Econ cruising speed: 232 knots (267 mph; 430 km/h)
- Stalling speed, flaps down, at 10,560 lb (4,790 kg) AUW: 77·5 knots (89 mph; 142·5 km/h)
- Max rate of climb at S/L 3,543 ft (1,080 m)/min
- Service ceiling at 13,668 lb (6,200 kg) AUW, 0° flap: 27,165 ft (8,280 m)
- Service ceiling, one engine out, at 10,934 lb (4,960 kg) AUW, 0° flap: 17,533 ft (5,344 m)
- T-O run: 985 ft (300 m)
- T-O to 50 ft (15 m): 2,313 ft (705 m)
- Landing from 50 ft (15 m) at 11,243 lb (5,100 kg) AUW: 1,978 ft (603 m)
- Landing run at 11,243 lb (5,100 kg) AUW: 656 ft (200 m)
- Range with max fuel at 16,400 ft (5,000 m): 1,641 nm (1,890 miles; 3,042 km)

FMA TWIN-ENGINED TRAINER

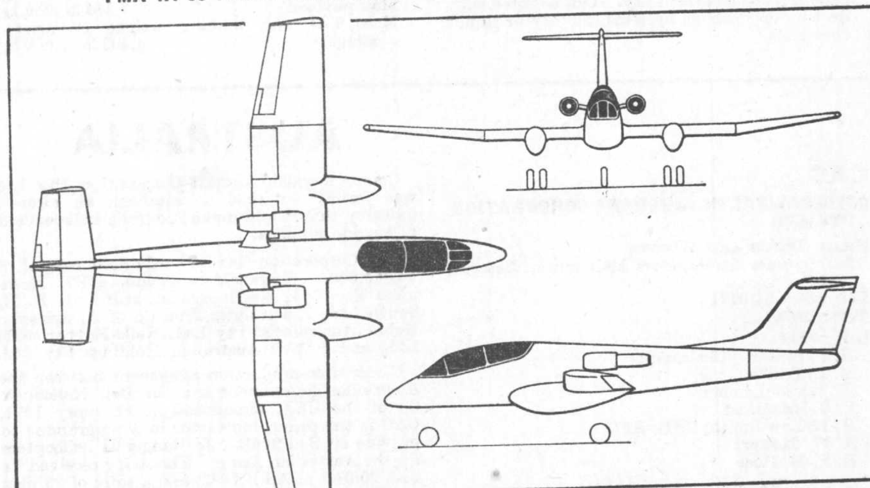
Based on the airframe of the Pucará, Vicecomodoro Ruiz has designed a tandem two-seat training aircraft, to be powered by two Turboméca Astafan turbofan engines. As shown in the accompanying three-view drawing, these

First production example of the FMA IA 58 Pucará for the Argentine Air Force taking off for its first flight on 8 November 1974

FMA IA 58 Pucará counter-insurgency aircraft for the Argentine Air Force, equipped with underwing and underfuselage weapons



FMA IA 58 Pucará twin-turboprop counter-insurgency aircraft (*Pilot Press*)



FMA tandem two-seat training aircraft (two Turboméca Astafan turbofan engines) (*Roy J. Grainge*) engines will be mounted in pods on the fuselage sides above the wing, with streamlined landing gear fairings replacing the turboprop engine nacelles of the standard Pucará. The following details are provisional:

DIMENSIONS, EXTERNAL: As IA 58 Pucará

WEIGHTS:

Weight empty, equipped	8,377 lb (3,800 kg)
Max T-O weight	14,330 lb (6,500 kg)

PERFORMANCE:

Max critical Mach number	0·73
Service ceiling	32,800 ft (10,000 m)

RACA

REPRESENTACIONES AERO COMERCIALES ARGENTINAS SA

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This company is the representative or dealer in Argentina for a number of world aerospace companies, and is the exclusive national distributor or for the Concorde (jointly with the French distributor), BAC One-Eleven, Shorts Skyvan Srs 3 and Canadair CL-215 aircraft, and the MBB BO 105 and Hughes helicopters. Under a licence agreement concluded in December 1972 RACA is undertaking, with Argentine government approval (granted in mid-1973), the progressive local manufacture of a minimum of 120 Hughes Model 500 helicopters (see US section) from knock-down components. These are known locally as RACA-Hughes 500s.

The programme will cover a period of eight years, for military and civil customers in Argentina and neighbouring countries. In anticipation of this programme, RACA expanded its workshop facilities at San Fernando aerodrome to a covered area of 49,514 sq ft (4,600 m²).

By January 1975, 25 RACA-Hughes 500s had been ordered, of which eight had been delivered: two each to the government of the province of Córdoba and Yacimientos Petrolíferos Fiscales, one to the government of the province of Santiago del Estero, and three to Agua y Energía Eléctrica. Twenty-four Hughes 500s were operating in Argentina before the initiation of the RACA-Hughes programme.

RRA

RONCHETTI RAZZETTI AVIACIÓN SA

ADDRESS:
Aeropuerto Internacional Rosario, Casilla Correo 7, Funes, Santa Fé Province

Telephone: Rosario 58251 or Funes 93276

PRESIDENT: Julio E. Razzetti

HEAD OF DESIGN AND DEVELOPMENT TEAM (RRAFAGA): Ing Norberto S. Cobelo

HEAD OF PRODUCTION: Julio Di Giuseppe

RRAFAGA J-1 MARTIN FIERRO

The J-1 Martin Fierro is a single-seat agricultural aircraft, designed in Argentina by a team led by Ing Norberto S. Cobelo. Design began in September 1972, and construction of the first of two prototypes started three months later. This aircraft was expected to make its first flight during 1975. Five production J-1s have been ordered.

TYPE: Single-seat agricultural aircraft.

WINGS: Cantilever low-wing monoplane. Thickness/chord ratio 15%. Dihedral 7°. Incidence 2° at root. All-metal single box-spar structure, with detachable leading-edges. All-metal Frise-type ailerons and semi-Fowler trailing-edge flaps. No tabs.

FUSELAGE: Welded tube structure with detachable metal skin.

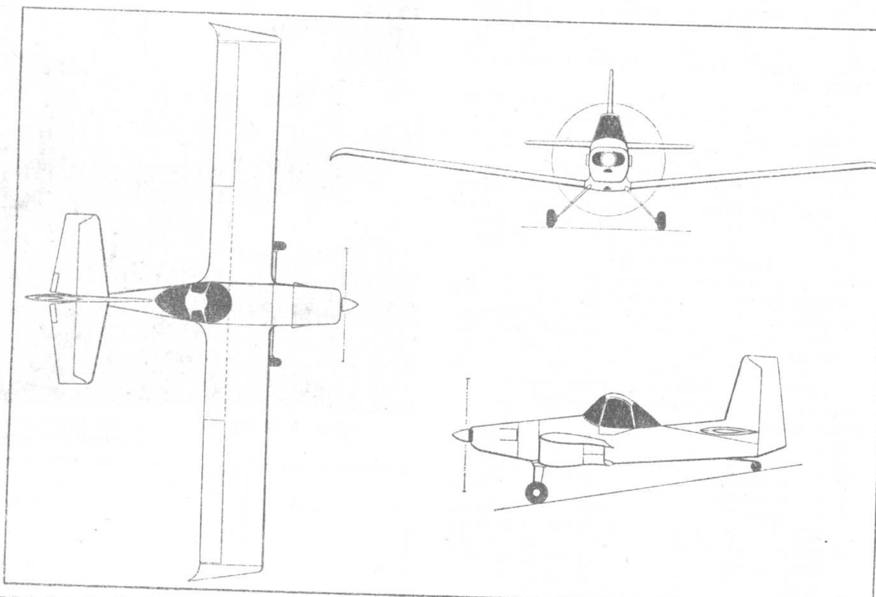
TAIL UNIT: Cantilever all-metal two-spar structure. Fixed-incidence tailplane. Trim tab in each elevator.

LANDING GEAR: Non-retractable tailwheel type, with spring steel shock-absorption. Cleveland wheels and main-wheel brakes. Goodyear tyres, size 8·50-10 (8 ply) on main units, 2·80-8 (4 ply) on tail unit.

POWER PLANT: One 300 hp Lycoming IO-540-K1JG six-cylinder horizontally-opposed air-cooled engine, driving a Hartzell variable-pitch constant-speed propeller with spinner. Fuel in two wing-root tanks, total capacity 35·6 Imp gallons (162 litres). Refuelling point on top of each tank. Oil capacity 2·64 Imp gallons (12 litres).

ACCOMMODATION: Single seat in heated and ventilated framed cockpit. Downward-opening window/door on each side.

SYSTEMS AND EQUIPMENT: 60A 12V Prestolite generator and 12V 30Ah Prestolite battery. Single hopper, forward of cockpit, of 187 Imp gallons (850 litres) capacity. Can be fitted with dusting or spraying systems, for dry or liquid chemicals.



RRA J-1 Martin Fierro agricultural aircraft (300 hp Lycoming IO-540-K1JG engine) *(Roy J. Grainge)*

DIMENSIONS, EXTERNAL:

Wing span	42 ft 7¾ in (13·00 m)
Wing chord (constant)	5 ft 3 in (1·60 m)
Wing aspect ratio	8·12
Length overall	22 ft 11½ in (7·00 m)
Height overall	13 ft 1½ in (4·00 m)
Wheelbase	7 ft 10½ in (2·40 m)
Propeller diameter	7 ft 0 in (2·13 m)
Propeller ground clearance	1 ft 7¾ in (0·50 m)

AREAS:

Wings, gross	223·9 sq ft (20·80 m²)
Ailerons (total)	29·71 sq ft (2·76 m²)
Trailing-edge flaps (total)	29·71 sq ft (2·76 m²)
Fin	15·50 sq ft (1·44 m²)
Rudder	10·33 sq ft (0·96 m²)
Tailplane	28·42 sq ft (2·64 m²)
Elevators (total, incl tabs)	18·94 sq ft (1·76 m²)

WEIGHTS AND LOADINGS:

Basic operating weight with spray equipment	2,028 lb (920 kg)
Max payload	1,874 lb (850 kg)
Max T-O and landing weight (Restricted category)	4,409 lb (2,000 kg)
Max wing loading	19·69 lb/sq ft (96·14 kg/m²)
Max power loading	14·70 lb/hp (6·67 kg/hp)

PERFORMANCE (estimated, at max FAR Pt 23 Aerobatic T-O weight):

Max never-exceed speed	188 knots (217 mph; 349 km/h)
Max level speed at S/L, clean	130 knots (150 mph; 241 km/h)
Econ cruising speed at S/L, clean	114 knots (131 mph; 211 km/h)
Stalling speed, flaps up	55 knots (63 mph; 102 km/h)
Stalling speed, flaps down	43 knots (49 mph; 79 km/h)
Max rate of climb at S/L	950 ft (290 m)/min
Service ceiling	12,000 ft (3,660 m)
T-O run	550 ft (168 m)
T-O to 50 ft (15 m)	824 ft (251 m)
Landing from 50 ft (15 m)	800 ft (244 m)
Landing run	280 ft (85 m)
Max range, 45 min reserves	265 nm (305 miles; 490 km)

AUSTRALIA

CAC

COMMONWEALTH AIRCRAFT CORPORATION PTY LTD

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GENERAL MANAGER: R. L. Abbott

SECRETARY: E. W. Stodden

Commonwealth Aircraft Corporation Pty Ltd was formed in 1936 to establish an aircraft industry that would make Australia independent of outside supplies.

The Corporation has an authorised capital of $6,000,000. Shareholders include BHP Nominees Pty Ltd; North Broken Hill Ltd; B. H. South Ltd; Electrolytic Zinc Co of Australasia; Nobel (Australasia) Pty Ltd; Rolls-Royce (1971) Ltd; and P & O Australian Holdings Pty Ltd.

Under a co-production agreement between the Australian government and the Bell Helicopter Co of the USA, announced in February 1971, CAC is the prime contractor in a programme to provide 56 Bell 206B-1 JetRanger II helicopters for the Australian Army. The Army received its first 206B-1 in April 1973, and a total of 29 plus 2 civil JetRangers had been delivered by the end of January 1975. Two Bell 206B-1s were delivered in the Spring of 1973 to the Royal Australian Navy.

A constant overhaul programme for Atar engines used by the RAAF is maintained, together with an overhaul programme for Sabre aircraft and Avon engines operated by the air forces of Malaysia and Indonesia.

Other contracts include a variety of offset work for Boeing, Sikorsky, Pratt & Whitney and Hawker Siddeley Aviation; and manufacture of components for the Government Aircraft Factories Nomad and New Zealand Aerospace Industries CT/4 Airtrainer (which see).

Rex Aviation Ltd, Bankstown Aerodrome, New South Wales, a wholly-owned subsidiary of CAC, is the distributor of Cessna aircraft and Hughes 300 and 500 helicopters in Australia and New Guinea.

Details of the company's aero-engine activities can be found in the "Aero-engines" section.

CORBY

JOHN CORBY

ADDRESS:

86 Eton Street, Sutherland, NSW 2232

Mr Corby, a consultant aero engineer, has designed and is marketing plans for a single-seat ultra-light homebuilt aircraft known as the Starlet.

By early 1975 nine Starlets had been completed and a further 29 were known to be under construction in Australia and New Zealand.

CORBY CJ-1 STARLET

The first Starlet (VH-ULV) was built by Mr Erle Jones (Secretary and former President of the ULAA, Latrobe Valley Aero Club) and Mr John Brown. Details of this aircraft were given in the 1974-75 *Jane's*.

The following description applies to the standard Corby Starlet, except where indicated:

TYPE: Single-seat ultra-light homebuilt aircraft.

WINGS: Cantilever low-wing monoplane of wooden construction. Wing section NACA 43012A. Dihedral 6°. Incidence 2° 30′ at root, —1° at tip. Laminated main spar of solid spruce, subspars of spruce, built-up girder-type ribs and D-shaped nose section. Plywood covering from leading-edge to main spar, remainder fabric covered. Provision for dismantling into two equal halves. Ailerons, of spruce with birch plywood covering, deflect 15° up and down.

FUSELAGE: Plywood-covered spruce structure.

TAIL UNIT: Cantilever type, of similar construction to wings. Fixed-incidence tailplane. Plywood-covered fixed surfaces; fabric-covered rudder and elevators. Elevators deflect 30° up, 20° down; rudder deflects 25° to left and right.

LANDING GEAR: Non-retractable two-wheel type standard. Separate spring steel leaf-type shock-absorbing main legs, attached directly to fuselage via a solid spruce/ash beam which also serves as the wing leading-edge attachment member. Wheels, tyres and brakes of customer's choice, subject to minimum main wheels of 3½ in (89 mm) diameter with 4·00-4 tyres and Olympic go-kart hubs. Sturmey Archer cycle drum/shoe brakes may be used. Leaf-spring tailskid, or tailwheel at customer's option. Wheel fairings optional.

POWER PLANT: Any suitable engine of up to 75 hp and 160 lb (72 kg) weight, driving a two-blade propeller. Fuel tank, capacity 8-10 Imp gallons (36·45 litres), aft of engine firewall. Oil capacity 5 lb (2·25 kg).

ACCOMMODATION: Single seat. Sliding canopy optional. Baggage locker behind seat.

DIMENSIONS, EXTERNAL:

Wing span	18 ft 6 in (5·64 m)
Wing chord at root	4 ft 4 in (1·32 m)
Length overall	14 ft 9 in (4·50 m)
Fuselage: Max width	1 ft 9¾ in (0·55 m)
Height overall	4 ft 10 in (1·47 m)
Tailplane span	6 ft 6 in (1·98 m)
Wheel track	4 ft 6 in (1·37 m)
Propeller diameter: standard	4 ft 9 in (1·45 m)
prototype	4 ft 4 in (1·32 m)
Propeller ground clearance	10 in (25·5 cm)

AREAS:

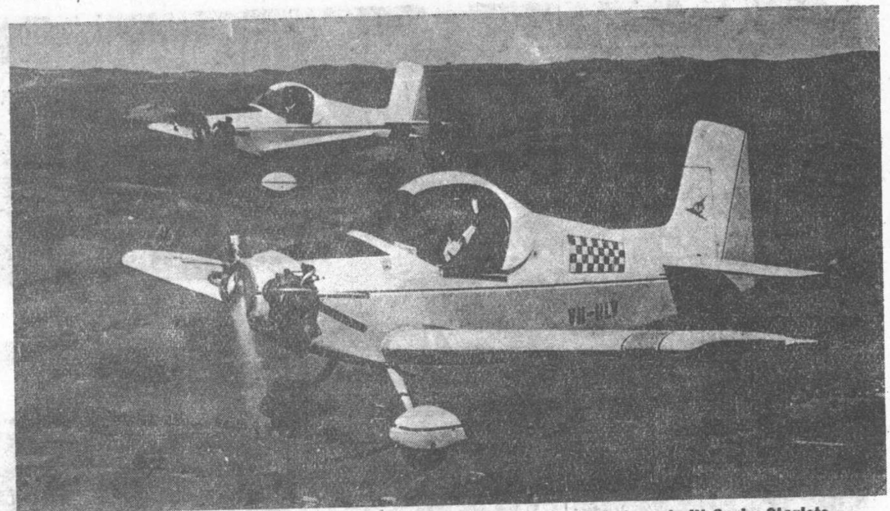
Wings, gross	68·50 sq ft (6·36 m²)
Horizontal tail surfaces (total)	13·75 sq ft (1·28 m²)
Vertical tail surfaces (total)	7·40 sq ft (0·69 m²)

WEIGHTS:

Weight empty	405-420 lb (183-190 kg)
Max T-O weight (semi-aerobatic)	650 lb (295 kg)

PERFORMANCE (prototype, with 49 hp engine, at 650 lb; 295 kg AUW):

Max never-exceed speed	138 knots (159 mph; 255 km/h) IAS
Max level speed	117 knots (135 mph; 217 km/h) TAS
Max cruising speed	107 knots (123 mph; 198 km/h) TAS
Stalling speed, power off:	42 knots (49 mph; 79 km/h) TAS
	30 knots (35 mph; 57 km/h) IAS
Typical rate of climb at S/L	700-850 ft (213-259 m)/min
Service ceiling	14,500 ft (4,420 m)
T-O to, and landing from, 50 ft (15 m)	1,000-1,100 ft (305-335 m)
g limits	±4·5



Mr Bernie Hansford (foreground) and Mr Bill Micah flying their homebuilt Corby Starlets (*The Herald & Weekly Times, Melbourne*)

GOVERNMENT OF AUSTRALIA

DEPARTMENT OF MANUFACTURING INDUSTRY

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Government Aircraft Factories

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AIRFIELD AND FINAL ASSEMBLY WORKSHOPS:

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Telephone: Lara 82 1202

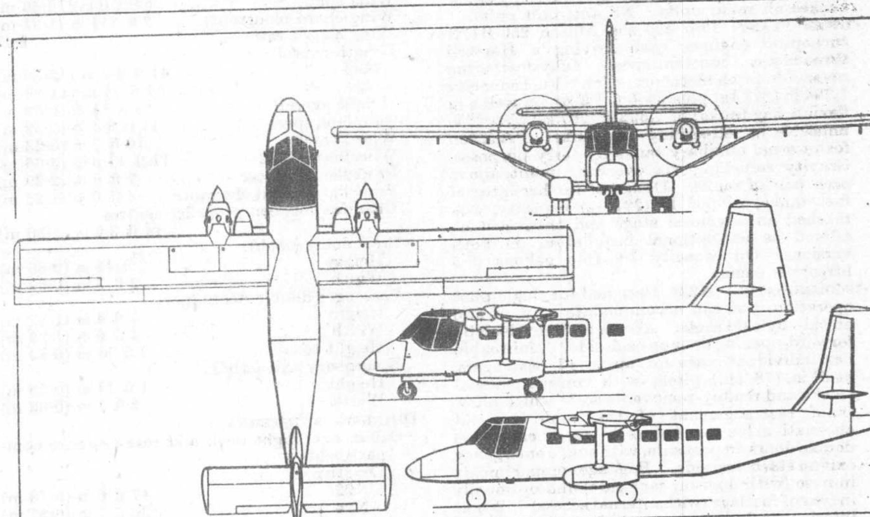
MANAGER: G. J. Churcher, BEngSc, MIEAust

The Government Aircraft Factories are units of the Defence Production facilities owned by the Australian government and operated by the Department of Manufacturing Industry. Their functions include the design, development, manufacture, assembly, maintenance and modification of aircraft and guided weapons. At Avalon airfield, subassembly of components, final assembly, modification, repair and test-flying of jet and other aircraft are undertaken.

The Factories' major recent activity was the production of Dassault Mirage III-O fighters and III-D operational trainers for the RAAF as prime contractor. Current activity includes development and production of the GAF Nomad twin-turboprop STOL transport, and the manufacture under subcontract of wing flaps for the Fokker-VFW F28 Fellowship twin-turbofan transport, as sole source supplier.

The Jindivik and Turana target drones are described in the "RPVs and Targets" section of this edition.

The GAF are producing rudders and elevators for the Boeing 727 under contract to The Boeing Company; and are subcontractors to Commonwealth Aircraft Corporation in manufacturing bonded structures (main and tail rotor blades and fuselage panels) for Australian-produced examples of the Bell 206B-1 JetRanger II helicopter.



Government Aircraft Factories N22 Nomad, with additional side view (*bottom*) of N24 (*Pilot Press*)

GOVERNMENT AIRCRAFT FACTORIES NOMAD

This small, twin-turboprop utility aircraft is in production at the GAF. The first of two Model N2 prototypes (VH-SUP) was flown for the first time on 23 July 1971; it was followed by the second aircraft (VH-SUR) on 5 December 1971.

Design certification for the Nomad is to US FAR 23 requirements administered by the Australian Dept of Transport; the domestic Type Certificate for the N2 was issued on 11 August 1972. The basic design incorporates features of common interest to military and civil operators, including quick role-change capabilities and the ability to operate from short fields and unprepared surfaces.

Two versions have so far been announced, as follows:

N22. Short-fuselage version, currently in production for the Australian Army Aviation Corps and commercial operators. The two prototypes were built to this standard.

N24. Higher-capacity version, with lengthened fuselage. Design includes the insertion of a 43 in (1·09 m) section in the cabin, and increased forward baggage capacity.

Production of 70 Nomads has been authorised by the Australian government. This number includes 11 for the Australian Army, 6 for the Indonesian Navy, 2 for the Peruvian Army, 12 for the Philippine Air Force, and 6 of the N24 version for the Northern Territory Aeromedical Service. The Type Certificate for the N22 production aircraft was issued on 29 April 1975, and deliveries began in that month.

The following description applies generally to both versions, except where a specific model is indicated:

TYPE: Twin-turboprop STOL utility aircraft.

WINGS: Braced high-wing monoplane. Basic NACA 23018 wing section, modified to incorporate increased nose radius and camber. Dihedral 1° from roots. Incidence 2°. No sweepback. Two-spar fail-safe torsion-box structure of riveted light alloy. Full-span double-slotted trailing-edge flaps. All-metal ailerons, which droop with the flaps and transfer their motion progressively to slot-lip ailerons as the flaps extend, resulting in full-span flap. Controls actuated manually by cables and pushrods. Pneumatic de-icing of leading-edges optional. Small stub wings at cabin floor level support the main landing gear fairings

Prototype N22 version of the Government Aircraft Factories Nomad STOL utility aircraft

from which a single strut on each side braces the main wing.

Fuselage: Conventional semi-monocoque riveted light alloy structure of stringers and frames.

Tail Unit: Cantilever all-metal structure. One-piece all-moving tailplane, with inset trim and anti-balance tab. Tailplane and rudder actuated manually by cables. Trim tab in rudder. Pneumatic de-icing of leading-edges optional.

Landing Gear: Retractable tricycle type, with electrical retraction by means of single actuator in the fuselage. GAF oleo-pneumatic shock-absorbers. Single rearward-retracting steerable nosewheel, tyre size 8·00-6, pressure 35 lb/sq in (2·46 kg/cm²). Twin wheels, tyre size 8·00-6, pressure 29 lb/sq in (2·04 kg/cm²), on each main unit. Main wheels retract forward into streamlined fairings at outer ends of stub wings. Dual hydraulically-operated single-disc brakes on main units. No anti-skid units.

Power Plant: Two 400 shp Allison 250-B17B turboprop engines, each driving a Hartzell three-blade constant-speed fully-feathering reversible-pitch metal propeller. Fuel capacity 1,794 lb (813 kg) plus 25 lb (11·3 kg) unusable in flexible bag tanks; or 1,692 lb (767 kg) plus 25 lb unusable in self-sealing bag tanks. Provision for internal auxiliary tanks for ferry purposes. Gravity refuelling via overwing point above each pair of tanks. Design of further integral fuel tanks, of 500 lb (227 kg) capacity, has reached an advanced stage and these will be offered as an optional installation on both versions. Oil capacity 1·9 Imp gallons (8·5 litres) per engine.

Accommodation (N22): Designed for single-pilot operation, but can accommodate crew of two on side-by-side seats. Access to flight deck by forward-opening door on each side. Main cabin has individual seats for up to 12 passengers, at 31 in (78 cm) pitch, with continuous seat tracks and readily-removable seats which allow rapid rearrangement of the cabin to suit alternative loads. Access to main cabin via double doors on port side, with single emergency exit on starboard side. Baggage compartments in nose (with door on each side) and optionally in rear of fuselage (with internal access). Whole interior, including flight deck, is heated and ventilated.

Accommodation (N24): Flight deck accommodation and access as for N22. Lengthened main cabin, with similar internal provision to N22 for up to 15 passengers, and access via double port-side doors as in N22. Enlarged nose baggage compartment. Rear baggage compartment of same capacity as N22. Ventilation and heating system with individual adjustable outlets.

Systems: No air-conditioning, hydraulic or pneumatic system normally, but air-conditioning is proposed for future models and pneumatic airframe de-icing is available optionally. Electrical system comprises a 28V 150A DC starter/generator on each engine, and a 22Ah battery with AC inverters. Other optional systems include oxygen demand system for crew and continuous-flow system for passengers; electrical de-icing for propellers, cabin floor hatch and underwing pylon racks.

Electronics and Equipment: Provision is made for a wide range of nav/com equipment to meet specific customer requirements. Other optional items include full IFR instrumentation and a lightweight weather radar.

Armament and Operational Equipment (N22): The military variant has been designed to have four underwing hardpoints capable of accepting up to 500 lb (227 kg) loads, including gun and rocket pods. The nose bay can be utilised to accommodate surveillance and night vision aid equipment. Removable seat armour and self-sealing fuel tanks can be fitted for added protection.

Dimensions, external:
- Wing span: 54 ft 0 in (16·46 m)
- Wing chord (constant): 5 ft 11¼ in (1·81 m)
- Wing aspect ratio: 9·11
- Length overall:
  - N22: 41 ft 2·4 in (12·56 m)
  - N24: 47 ft 1½ in (14·36 m)
- Height overall: 18 ft 1½ in (5·52 m)
- Tailplane span: 17 ft 8·4 in (5·39 m)
- Wheel track: 10 ft 7 in (3·23 m)
- Wheelbase: N22: 11 ft 11·6 in (3·65 m)
- Propeller diameter: 7 ft 6 in (2·29 m)
- Propeller ground clearance: 4 ft 0 in (1·22 m)
- Distance between propeller centres: 14 ft 3·6 in (4·36 m)
- Crew doors (each):
  - Height: 2 ft 10 in (0·86 m)
  - Width: 2 ft 3 in (0·69 m)
- Passenger double doors (port):
  - Height: 4 ft 4 in (1·32 m)
  - Width: 4 ft 0 in (1·22 m)
  - Height to sill: 2 ft 11 in (0·89 m)
- Emergency exit (stbd):
  - Height: 1 ft 11 in (0·58 m)
  - Width: 2 ft 1 in (0·63 m)

Dimensions, internal:
- Cabin, excl flight deck and rear baggage compartment:
  - Length:
    - N22: 17 ft 0 in (5·18 m)
    - N24: 20 ft 7 in (6·27 m)
  - Max width: 4 ft 3 in (1·30 m)
  - Max height: 5 ft 2·4 in (1·58 m)
  - Floor area:
    - N22: 70·25 sq ft (6·53 m²)
    - N24: 87·0 sq ft (8·08 m²)
  - Volume:
    - N22: 360·0 cu ft (10·19 m³)
    - N24: 440·0 cu ft (12·46 m³)
- Baggage compartment volume (nose):
  - N22: 27·0 cu ft (0·76 m³)
  - N24: 40·0 cu ft (1·13 m³)
- Baggage compartment volume (optional, rear):
  - N22, N24: 28·0 cu ft (0·79 m³)

Areas:
- Wings, gross: 324·0 sq ft (30·10 m²)
- Ailerons (total net): 27·4 sq ft (2·55 m²)
- Trailing-edge flaps (total net): 105·6 sq ft (9·81 m²)
- Fin: 39·1 sq ft (3·63 m²)
- Rudder, incl tab: 31·1 sq ft (2·89 m²)
- Tailplane, incl tabs: 78·0 sq ft (7·25 m²)

Weights and Loadings:
- Manufacturer's basic weight empty:
  - N22: 4,451 lb (2,019 kg)
  - N24: 4,549 lb (2,063 kg)
- Typical operating weight empty:
  - N22: 4,666 lb (2,116 kg)
- Max disposable load:
  - N22: 3,834 lb (1,739 kg)
- Max T-O and landing weight:
  - N22, N24: 8,500 lb (3,855 kg)
- Max wing loading:
  - N22, N24: 26·2 lb/sq ft (127·9 kg/m²)
- Max power loading:
  - N22, N24: 10·625 lb/shp (4·819 kg/shp)

Performance (at max T-O weight, ISA at S/L, except where indicated otherwise):
- Normal cruising speed:
  - N22, N24: 168 knots (193 mph; 311 km/h)
- Stalling speed, power off, flaps up, at AUW of 7,500 lb (3,402 kg):
  - N22, N24: 65 knots (75 mph; 121 km/h)
- Stalling speed, power off, flaps down, at AUW of 7,500 lb (3,402 kg):
  - N22, N24: 47 knots (54·5 mph; 88 km/h)
- Max rate of climb at S/L, both engines, T-O rating for 5 min:
  - N22, N24: 1,410 ft (430 m)/min
  - N22, N24 (ISA + 25°C): 1,080 ft (329 m)/min
- Rate of climb at S/L, one engine out, max continuous rating:
  - N22, N24: 230 ft (70 m)/min
  - N22, N24 (ISA + 25°C): 40 ft (12 m)/min
- Service ceiling, both engines, climbing at 100 ft (30·5 m)/min, max cruise rating:
  - N22, N24: 22,500 ft (6,860 m)
- Min ground turning radius:
  - N22, N24: 38 ft 3 in (11·66 m)
- Runway LCN at max T-O weight:
  - N22, N24: 2·3
- T-O run:
  - N22, N24 (FAR 23): 720 ft (219 m)
  - N22, N24 (STOL): 600 ft (183 m)
  - N22, N24 (FAR 23), ISA + 25°C: 1,020 ft (311 m)
  - N22, N24 (STOL), ISA + 25°C: 880 ft (268 m)
- T-O to 50 ft (15 m):
  - N22, N24 (FAR 23): 1,350 ft (411 m)
  - N22, N24 (STOL): 980 ft (299 m)
  - N22, N24 (FAR 23), ISA + 25°C: 1,920 ft (585 m)
- Landing from 50 ft (15 m), AUW of 7,500 lb (3,402 kg):
  - N22, N24 (FAR 23): 1,295 ft (395 m)
  - N22, N24 (STOL): 710 ft (216 m)
  - N22, N24 (FAR 23), ISA + 25°C: 1,370 ft (418 m)
- Landing run, AUW of 7,500 lb (3,402 kg):
  - N22, N24 (FAR 23): 620 ft (189 m)
  - N22, N24 (STOL): 340 ft (104 m)
  - N22, N24 (FAR 23), ISA + 25°C: 675 ft (206 m)
- Max range at 90% power, reserves for 45 min hold:
  - N22 at S/L: 660 nm (760 miles; 1,223 km)
  - N22, N24 at 10,000 ft (3,050 m): 855 nm (985 miles; 1,585 km)

HAWKER DE HAVILLAND

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This company manufactures components and equipment, and carries out repair and overhaul work, for a wide range of military and civil aircraft and aero-engines, propellers and accessories.

Details of these and other activities can be found in the 1971-72 *Jane's*. More recently, Hawker de Havilland Australia has been appointed sole source supplier of main cabin doors and engine access doors for the Westland/Aérospatiale Lynx helicopter.

A subsidiary of the company, Hawker Siddeley Electronics Ltd, is engaged in guided weapons and other defence contracts.

Another subsidiary, Hawker de Havilland Research Pty Ltd, is an approved research organisation and is actively engaged in a number of design and development contracts for the Australian defence authorities.

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TECHNICAL ASSISTANT:
George Jacquemin

The original Ganagobie was designed and built by the brothers William and James Lobet at Lille, France, and made its first flight in 1953, powered by an old Clerget engine. After modification and redesignation as Ganagobie 02 it flew for a further 30 hours before being grounded by engine failure in 1954, and later became Ganagobie 2 when fitted with a two-stroke target drone engine. Further modifications were then incorporated.

The second aircraft, Ganagobie 3, was built in Alberta, Canada, by Mr La Rue Smith; built of birch plywood, it was somewhat heavier than the first aircraft and was powered by a 72 hp McCulloch engine. A later Ganagobie 3 was fitted with a 40 hp Continental engine, and this version is also suitable for converted Volkswagen engines of 1,500 cc and above. The "ultra-light" version, known as the Ganagobie 4, is suitable for 48 hp Nelson and other small two-stroke engines. Very light okoumé mahogany, and other weight-saving features, may be used in its construction. Latest version is the Ganagobie 05.

GANAGOBIE 05

The Ganagobie 05 is a small, high-wing single-seat aircraft, designed primarily for amateur construction. Its general appearance is shown in the accompanying illustration.

Construction of the basic homebuilt aircraft is all-wooden; but production versions are under consideration, either in kit form with a fabric-covered steel tube fuselage and wooden wings and tail, or in factory-built form with all-metal fabric-covered wing and tail control surfaces. The following description applies to the all-wood homebuilt version:

TYPE: Single-seat homebuilt light aircraft.

WINGS: Braced high-wing monoplane. Wing section NACA 23012. Constant-chord wings, with main and auxiliary spars and semi-circular tips. Centre-section integral with top of fuselage. Main panels have dihedral and can be detached for storage and transit, being carried in frames attached to the landing gear and cabane fittings on each side of the fuselage. A special frame fits over the rear of the fuselage to provide added support. Wooden spars and ribs, with non-structural plywood or aluminium leading-edge and fabric covering. Cable-operated plain ailerons. No flaps. Wings braced to fuselage by streamline-section steel tube vee strut assembly on each side.

Ganagobie 05 single-seat ultra-light cabin monoplane

FUSELAGE: Basically wooden structure, of diamond-shaped cross-section, consisting of spruce longerons, 12 bulkheads and formers, and plywood covering. Steel tube engine mounting frame and wing root cabane structure.

TAIL UNIT: Plywood-covered wooden fin and strut-braced tailplane; fabric-covered wooden elevators and horn-balanced rudder. Struts detachable to permit horizontal surfaces to fold upwards for storage and transit. Rudder and elevators cable-operated. Trim tab on port elevator.

LANDING GEAR: Non-retractable main wheels and tailskid or (optionally) tailwheel. Main wheels are mounted on tripod struts, the main legs of which have rubber-in-compression shock-absorption, and are of 8 in (20·3 cm) diameter with 8·00-4 tyres. Spoon-type tailskid mounted at end of a flat spring beneath rear fuselage. Front-wheel brakes are necessary if a tailwheel is fitted.

POWER PLANT: Aircraft is designed for a modified VW engine of at least 35 hp, with direct-drive two-blade propeller; a typical engine is the Sportavia Limbach SL 1700 D. Alternatively, geared-down VW engines with either vee-belt or gear reduction drive may be installed, provided that aircraft does not exceed its weight and CG range limitations. Fuel in two wing tanks between main and auxiliary spars; almost all of fuel load is usable.

ACCOMMODATION: Single seat in fully-enclosed cabin, with upward-opening door on each side. Ventilation devices in each transparent door panel. Seat belt attached to bulkhead.

DIMENSIONS, EXTERNAL:
Wing span 24 ft 3¼ in (7·40 m)
Wing chord (constant) 3 ft 11¼ in (1·20 m)
Wing aspect ratio 6·25
Length overall 16 ft 1¾ in (4·92 m)
Height overall 6 ft 0 in (1·83 m)
Tailplane span 7 ft 9¾ in (2·38 m)
Wheel track 4 ft 11 in (1·50 m)
Propeller diameter (direct drive) 4 ft 11 in (1·50 m)

AREAS:
Wings, gross 92·25 sq ft (8·57 m²)
Ailerons (total) 11·61 sq ft (1·079 m²)
Fin 5·02 sq ft (0·466 m²)
Rudder 4·71 sq ft (0·438 m²)
Tailplane 10·63 sq ft (0·988 m²)
Elevators, incl tab 6·51 sq ft (0·605 m²)

WEIGHTS AND LOADING:
Weight empty 630 lb (285 kg)
Max T-O weight 800 lb (362 kg)
Max wing loading 8·88 lb/sq ft (43·4 kg/m²)

PERFORMANCE (at max T-O weight, theoretical, with SL 1700 D engine):
Max level speed 98 knots (113 mph; 182 km/h)
Max cruising speed (75% power) 87 knots (100 mph; 161 km/h)
Stalling speed 41 knots (47 mph; 76 km/h)
Service ceiling 10,000 ft (3,050 m)

MILLICER

HENRY MILLICER

ADDRESS:
12 Murdoch Street, Camberwell, Victoria 3124

Mr Millicer, who in 1953 designed the original Airtourer light aircraft (see under "Aerospace" heading in New Zealand section), has recently designed an ultra-light aeroplane known as the Airmite.

MILLICER AIRMITE

Mr Millicer, who was for 10 years Chief Aerodynamicist of the Australian Government Aircraft Factories, is currently principal lecturer in aeronautics at the Royal Melbourne Institute of Technology. Assisted by students at the RMIT, he is building the prototype of the Airmite, an all-metal single-seat ultra-light aeroplane built mainly of aluminium alloy.

It is designed for marketing in kit form, and to be capable of assembly in a normal-sized garage or workshop by homebuilders of average abilities, using standard commercially-available pop-riveting tools. First flight is provisionally scheduled for 1976, and further details will not be released until nearer that time.

DIMENSIONS, EXTERNAL:
Wing span 19 ft 0 in (5·79 m)
Length overall 18 ft 0 in (5·49 m)

WEIGHT:
Max T-O weight 800-990 lb (362-449 kg)

PERFORMANCE (approx):
Max level speed 200 knots (230 mph; 370 km/h)
Stalling speed 42 knots (48·5 mph; 78 km/h)
Range 570 nm (656 miles; 1,055 km)

TRANSAVIA

TRANSAVIA CORPORATION PTY LTD

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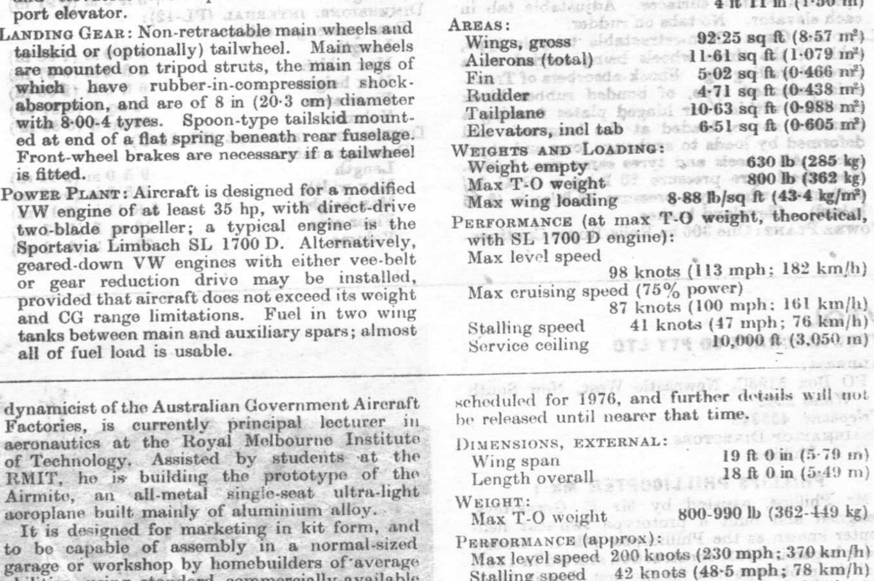
Transavia Corporation was formed in 1964 as a subsidiary of Transfield Pty Ltd, one of Australia's largest construction companies.

Its first product is the multi-purpose PL-12 Airtruk.



Transavia PL-12 Airtruk agricultural aircraft (300 hp Continental IO-520-D engine) *(K. Meehan)*

TRANSAVIA PL-12 AIRTRUK

The Airtruk, designed by Mr Luigi Pellarini, was originally type-certificated on 10 February 1966, for spreading fertiliser and for seeding. Swath width is up to 35 yd (32 m) and of unusual uniformity. A liquid-spraying conversion, developed in 1968, is capable of covering a 33 yd (30·2 m) swath. This version has an engine-driven spray pump and a liquid chemical capacity of 180 Imp gallons (818 litres). The PL-12's unconventional layout keeps the tails clear of chemicals, and also permits rapid loading by a vehicle which approaches the aircraft between the tails.

The three-seat prototype Airtruk flew for the first time on 22 April 1965. Delivery of production Airtruks began in December 1966, and a total of 72 PL-12s had been built by December 1974, for customers in Australia, Denmark, India, New Zealand, Thailand and East and South Africa.

Production of the PL-12 was continuing in 1975, together with that of the **PL-12-U**, a multi-purpose cargo/passenger/ambulance/aerial survey version of which a prototype flew for the first time in December 1970. Certification of this version was granted in February 1971, by which time two production aircraft had been completed, and deliveries began later in the year.

Airtruks are being assembled by Flight Engineers Ltd in New Zealand (which see).

The following description applies to both the PL-12 and PL-12-U, except where a particular version is indicated:

TYPE: Single-engined agricultural (PL-12) or multi-purpose (PL-12-U) aircraft.

WINGS: Strut-braced sesquiplane. Wing section NACA 23012. Dihedral 1° 30′ on upper wings. Incidence (upper wings) 3° 0′. Conventional all-metal structure, covered with Alclad sheet. All-metal trailing-edge flaps and ailerons, covered with ribbed Alclad sheet, and operated manually. Small stub wings below fuselage, braced to cabin by a single strut and to upper wings by a Vee strut on each side.

FUSELAGE: Pod-shaped structure, of 4130 welded steel tube construction with 2024 Alclad covering and glassfibre tailcone.

TAIL UNIT: Twin units, each comprising a fin, rudder and separate T tailplane and elevator, and each carried on a cantilever tubular Alclad boom extending from the upper wings. Small bumper fairing underneath each fin. Manually-operated control surfaces. Adjustable tab in each elevator. No tabs on rudder.

LANDING GEAR: Non-retractable tricycle type, each of the three wheels being carried on a pivoted trailing leg. Shock-absorbers of Transavia patented type, of bonded rubber block moulded within four hinged plates forming a diamond shape, loaded at the long axis and deformed by loads to exchange long and short axes. All wheels and tyres same size, 8·00-6. Nosewheel tyre pressure 20 lb/sq in (1·41 kg/cm²); main-wheel tyre pressure 32 lb/sq in (2·25 kg/cm²). Cleveland brakes.

POWER PLANT: One 300 hp Rolls-Royce Continental IO-520-D six-cylinder horizontally-opposed aircooled engine, driving a McCauley D2A34C58/90AT-2 two-blade constant-speed metal propeller. Two upper-wing fuel tanks, total usable capacity 40 Imp gallons (181·5 litres). Optional long-range installation of second tank in each upper mainplane, increasing total capacity to 82 Imp gallons (373 litres). Refuelling point above each upper wing. Oil capacity 2·5 Imp gallons (11·4 litres).

ACCOMMODATION (PL-12): Single-seat cockpit, with door on starboard side. Two-seat cabin aft of chemical hopper/tank for carriage of ground crew, with door at rear of lower deck. Accommodation heated and ventilated.

ACCOMMODATION (PL-12-U): Single-seat cockpit as in PL-12. By removing the central hopper or tank, passenger cabin is enlarged to seat one passenger on upper deck (back to back with pilot's seat) and four more passengers on lower deck. Doors on upper deck (starboard side) and lower deck (port side). Lower-deck cabin is heated.

SYSTEMS: 12V electrical system standard.

ELECTRONICS AND EQUIPMENT: Optional equipment for PL-12-U includes VHF (also available optionally for PL-12), HF, ADF, artificial horizon and directional gyro.

DIMENSIONS, EXTERNAL:

Wing span	39 ft 3½ in (11·98 m)
Wing chord (constant)	5 ft 9 in (1·75 m)
Length overall	21 ft 0 in (6·40 m)
Length of fuselage	13 ft 0 in (3·96 m)
Height overall	9 ft 0 in (2·74 m)
Tailplane span (each)	7 ft 0 in (2·13 m)
Distance between tailplanes	11 ft 5 in (3·48 m)
Wheel track	10 ft 0 in (3·05 m)
Wheelbase	6 ft 3 in (1·91 m)
Propeller diameter	7 ft 4 in (2·23 m)
Min propeller ground clearance	1 ft 0 in (0·30 m)
Passenger door (PL-12, rear):	
Height	3 ft 2 in (0·97 m)
Passenger doors (PL-12-U, stbd upper and port lower, each):	
Height	3 ft 0 in (0·91 m)

DIMENSIONS, INTERNAL (PL-12):

Rear passenger cabin:	
Length	6 ft 0 in (1·83 m)
Max width	3 ft 2 in (0·97 m)
Max height	6 ft 8 in (2·03 m)
Floor area	4 sq ft (0·37 m²)
Volume	30 cu ft (0·85 m³)

DIMENSIONS, INTERNAL (PL-12-U):

Passenger cabin:	
Length	9 ft 0 in (2·74 m)
Max width	3 ft 2 in (0·97 m)
Max height	6 ft 11 in (2·11 m)
Floor area	18 sq ft (1·67 m²)
Volume	74 cu ft (2·10 m³)

AREAS:

Wings, gross	256 sq ft (23·8 m²)
Ailerons, total	18·0 sq ft (1·67 m²)
Trailing-edge flaps, total	18·0 sq ft (1·67 m²)
Fins, total	14·0 sq ft (1·30 m²)
Rudders, total	6·0 sq ft (0·56 m²)
Tailplanes, total	28·0 sq ft (2·60 m²)
Elevators, total, incl tabs	14·0 sq ft (1·30 m²)

WEIGHTS AND LOADINGS:

Weight empty:	
PL-12	1,710 lb (775 kg)
PL-12-U	1,830 lb (830 kg)
Max T-O weight:	
PL-12 (normal category)	3,800 lb (1,723 kg)
PL-12 (agricultural category)	4,090 lb (1,855 kg)
PL-12-U	3,800 lb (1,723 kg)
Max landing weight (both)	3,800 lb (1,723 kg)
Max wing loading:	
PL-12	16·2 lb/sq ft (79 kg/m²)
PL-12-U	15·0 lb/sq ft (73 kg/m²)
Max power loading:	
PL-12	13·7 lb/hp (6·21 kg/hp)
PL-12-U	12·7 lb/hp (5·76 kg/hp)

PERFORMANCE (at max T-O weight except where indicated):

Max never-exceed speed	
PL-12	180 knots (207 mph; 333 km/h)
PL-12-U	150 knots (172 mph; 276·5 km/h)
Max level speed at S/L, ISA:	
PL-12	103 knots (119 mph; 192 km/h)
PL-12-U	112 knots (129 mph; 208 km/h)
Max cruising speed (75% power) at S/L, ISA:	
PL-12	95 knots (109 mph; 175 km/h)
PL-12-U	102 knots (117 mph; 188 km/h)
Stalling speed, flaps up:	
PL-12	55 knots (64 mph; 103 km/h)
PL-12-U	52 knots (60 mph; 97 km/h)
Stalling speed, flaps down:	
PL-12	52 knots (60 mph; 97 km/h)
PL-12-U	50 knots (58 mph; 94 km/h)
Max rate of climb at S/L:	
PL-12	600 ft (183 m)/min
PL-12-U	800 ft (244 m)/min
Service ceiling (both versions)	10,500 ft (3,200 m)
*T-O run:	
PL-12	1,095 ft (334 m)
PL-12-U	900 ft (274 m)
*T-O to 50 ft (15 m):	
PL-12	1,850 ft (564 m)
PL-12-U	1,500 ft (457 m)
Landing run (both versions, at max landing weight)	600 ft (183 m)
Normal range with standard fuel	286 nm (330 miles; 531 km)
Ferry range, standard fuel	330 nm (380 miles; 611 km)

**DCA Australia technique*

VTOL

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CHAIRMAN OF DIRECTORS:
D. A. Phillips

PHILLIPS PHILLICOPTER Mk 1

Mr Phillips, assisted by Mr P. Gerakiteys, designed and built a prototype two-seat helicopter known as the Phillicopter Mk 1. Design work began in 1962, construction started in 1967, and the prototype flew for the first time in 1971. Flight trials were continuing in early 1975. Orders for the Phillicopter have been held in abeyance pending the completion of these trials.

TYPE: Two-seat light helicopter.

ROTOR SYSTEM: Two-blade main and tail rotors. Main rotor blades, of NACA 0012 section and fully-extruded hollow-section construction, are attached to hub by solid grips. Fixed tab on each trailing-edge. Tail rotor blade construction similar to main rotor blades.

ROTOR DRIVE: Via three gearboxes: one transfer box, one reduction box and one tail rotor box. Main rotor/engine rpm ratio 1 : 5·66; tail rotor/engine rpm ratio 1 : 1.

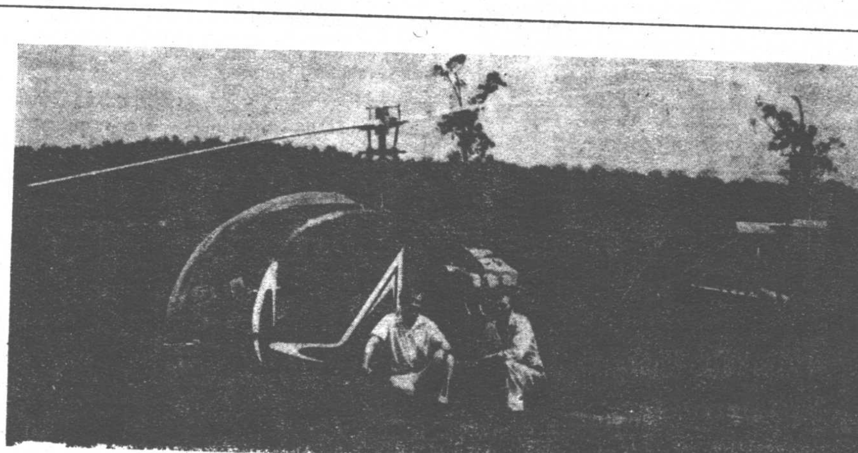
FUSELAGE: Tubular steel airframe, with aluminium and glassfibre covering.

TAIL UNIT: Tubular steel open space-frame. Tailplane incidence adjustable manually on ground.

LANDING GEAR: Tubular skid type. Shock-absorption through bending and torsion of cross-members. Ground handling wheels. Float gear available optionally.

POWER PLANT: One 145 hp Rolls-Royce Continental O-200-C four-cylinder horizontally-opposed aircooled engine. Single fuel tank, capacity 18 Imp gallons (82 litres). Oil capacity 1·25 Imp gallons (5·7 litres).

ACCOMMODATION: Side-by-side seating for pilot and one passenger. Door on each side of cabin. Accommodation ventilated.



Phillips Phillicopter Mk 1 prototype (145 hp Rolls-Royce Continental O-200-C engine) *(S. J. Cherz)*

SYSTEMS AND EQUIPMENT: Battery for electrical power. Radio fitted.

DIMENSIONS, EXTERNAL:

Main rotor diameter	25 ft 6 in (7·77 m)
Tail rotor diameter	4 ft 0 in (1·22 m)
Distance between rotor centres	13 ft 9 in (4·19 m)
Main rotor blade chord (each)	8 in (20·3 cm)
Length overall, rotors fore and aft	28 ft 10 in (8·79 m)
Length of fuselage	21 ft 10 in (6·65 m)
Height to top of rotor hub	8 ft 0 in (2·44 m)
Height overall	8 ft 4 in (2·54 m)
Skid track	6 ft 4 in (1·93 m)

DIMENSIONS, INTERNAL:

Cabin: Length	5 ft 4 in (1·63 m)
Max width	3 ft 10 in (1·17 m)
Max height	4 ft 2 in (1·27 m)

AREAS:

Main rotor blades (each)	9·56 sq ft (0·89 m²)
Tail rotor blades (each)	0·50 sq ft (0·046 m²)
Main rotor disc	510·00 sq ft (47·38 m²)
Tail rotor disc	12·56 sq ft (1·17 m²)

WEIGHTS AND LOADINGS:

Weight empty	1,050 lb (476 kg)
Max T-O and landing weight	1,650 lb (748 kg)
Max disc loading	3·24 lb/sq ft (15·82 kg/m²)
Max power loading	11·35 lb/hp (5·15 kg/hp)

PERFORMANCE (at max T-O weight):

Max level speed	78 knots (90 mph; 145 km/h)
Max cruising speed	74 knots (85 mph; 137 km/h)
Econ cruising speed	60·5 knots (70 mph; 112·5 km/h)
Max rate of climb at S/L	1,200 ft (365 m)/min
Vertical rate of climb at S/L	300 ft (91 m)/min
Service ceiling	16,000 ft (4,880 m)
Hovering ceiling in ground effect	8,000 ft (2,440 m)
Hovering ceiling out of ground effect (optimum)	6,000 ft (1,830 m)
Range with max fuel	200 nm (230 miles; 370 km)