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(First Part)

Military airlift – prospects for Europe

REPORT

submitted on behalf of the Technological and Aerospace Committee
by Mr. Alexander, Rapporteur

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1. Adopted unanimously by the committee.

2. *Members of the committee:* Mr. López Henares (Chairman); MM. *Lenzer, Marshall* (Vice-Chairmen); MM. *Arata, Atkinson, Biefnot, Mrs. Blunck, MM. Cherribi (Alternate: Woltjer), Coviello, Curto, Mrs. Durrieu, Mr. Feldmann (Alternate: Kriedner), Mrs. Gelderblom-Lankhout, Mrs. Guirado, MM. Jeambrun, Le Grand, Litherland (Alternate: Alexander), Lorenzi, Magginas, Nania, Poças Santos, Probst, Sarens, Sofoulis, Theis, Sir Donald Thompson, Mr. Valleix.*

Associate member: Ms *Jørgensen.*

N.B. *The names of those taking part in the vote are printed in italics.*

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Draft Recommendation
on military airlift – prospects for Europe

The Assembly,

- (i) Considering the prime importance of military airlift in crisis-management, from a tactical and a strategic point of view, as shown clearly by recent and present conflicts;
- (ii) Stressing the need for European countries to have adequate means, particularly airborne for armed forces projection in the context of military or humanitarian operations;
- (iii) Considering Europe's need to manage its military airlift resources in common and to co-ordinate its operational requirements by exploiting its economic and industrial capabilities to the full;
- (iv) Recalling the need to renew European large-capacity military airlift fleets, which for the most part are equipped with aircraft operating to the limit of their capacity;
- (v) Noting with satisfaction the existence of a real European potential in existing transport aircraft in several WEU member countries;
- (vi) Stressing nevertheless the need to strengthen and develop this potential in order to ensure a high level of equipment for European armed forces and to maintain European industrial capability in the face of competition from the United States and Russia in military airlift;
- (vii) Considering that much is at stake with the future large aircraft (FLA) programme, not merely for the future of European defence capabilities but for the very survival of the European aeronautics industry;
- (viii) Noting with satisfaction the decision to entrust the continuation of the FLA programme to the Airbus consortium, whose success in the civil sphere testifies to the high level of Europe's technological achievements in aeronautics;
- (ix) Recalling the importance of the success of this programme and that of the MRTT (multi-rôle tanker transport) programme, both for technological progress and the development of European industrial capabilities, and for developing an independent European defence capability;
- (x) Noting nevertheless that any delay in this programme makes it necessary to find short- and medium-term solutions for replacing large capacity military airlift fleets achieved at present through the procurement of American or Russian aircraft with economic consequences for European industry and political consequences for developing an independent European defence;
- (xi) Regretting that WEU and, in particular, WEAG, are not playing a more active rôle in providing impetus and leadership to the FLA and MRTT programmes,

RECOMMENDS THAT THE COUNCIL

1. Take a firm decision on the need to make the FLA and MRTT programmes a success and, if necessary, study the possibility of creating a European military airlift pool based on the FLA and under the responsibility of WEU;
2. Support the activities of the FLA sub-group of WEAG Panel I and give it responsibility, in co-operation with the countries participating in the programme and with the Airbus consortium, for monitoring the FLA production stages and in particular the qualification tests planned for the next century;
3. Develop WEAG's activities so that it can play a decisive rôle in implementing an industrial strategy for European defence, paying particular attention to the aeronautics sector;
4. Draw up an inventory of military airlift means that might be made available to WEU, if necessary, for carrying out the missions defined at Petersburg;
5. Communicate to the Assembly the results of its study on Europe's strategic mobility needs in accordance with its reply to Recommendation 532¹.

1. Recommendation on European armaments co-operation after Maastricht, 2nd December 1992.

Explanatory Memorandum

(submitted by Mr. Alexander, Rapporteur)

I. Introduction

1. Military airlift has become a permanent operational component in conflicts in the world since 1945. The second world war made a decisive contribution with the need to transport troops and equipment over long distances in a short time, to evacuate the wounded or conduct supply missions in a hostile environment. Since then, materials and technology have continually improved with the evolution of conflict and the changing nature of the operations to be carried out, be they humanitarian or military.

2. The humanitarian aspect has become increasingly prominent in operations involving air transport. The same aircraft used to deliver military equipment to anti-Iraqi coalition troops during the crisis in the Gulf and the Gulf war were used some months later for supplying the Kurdish population fleeing from northern Iraq. Franco-German Transalls played their part as "humanitarian taxis" in Africa by transporting medicines, food, doctors and sometimes people and animals from one region to another in various countries of the continent. British, French, Russian, American and other aircraft regularly supply Sarajevo and other towns in Bosnia, sometimes at the cost of the lives of crew members.

3. Antonov, C-17, FLA, Galaxy, Hercules and Transall have become familiar names and acronyms for the general public. But apart from their publicity value, they represent substantial political, military, economic and technological investments with far-reaching implications. The present report considers these aspects at a time when European military airlift fleets are approaching an age where their replacement is imminent, in an environment of increased economic and technological competition between countries and regional groupings. Falling defence budgets, proliferation of low-intensity conflicts and the increased rôle of humanitarian operations require sound choices to be made as resources are limited in a constantly changing world. This is a task that requires great skill on the part of planners and decision-makers in this area.

4. This also explains why there is increasing recourse to international co-operation and the strengthening of other options such as the use of commercial aircraft for military airlift purposes. The combination of these two factors enables costs to be lowered while ensuring high levels of

technological performance and the possibility of having a wider range of aircraft available capable of meeting the needs of various types of military and humanitarian operations. However, it is not just a question of choosing the right equipment. Consideration has also to be given to what is to be transported and where, what backing is available for very long-haul flights, and what supporting infrastructure is available on arrival. These various factors must also be taken into account when defining a military airlift policy.

II. Airlift means and missions

5. By considerably reducing the time factor in any journey, aviation has become an indispensable tool in managing crises in the modern world. For both combat (including helicopters) or transport aircraft, reaction time is virtually immediate as compared with other land and sea transport means. There are undoubtedly greater limitations as regards the load that can be transported, but the use of airlift has a major impact on the management of crises: to give but one example – during the Yom Kippur war in 1973, the United States launched a major operation to provide logistical support to Israel. 26% of the equipment was dispatched by air and arrived in good time, while the remaining 74% dispatched by sea arrived after the end of hostilities¹.

6. Military airlift today has many dimensions corresponding to the tasks to be carried out and the means used. In military missions, such as those during the crisis in the Gulf and the Gulf war and humanitarian missions for Bosnia and Somalia, the common factors are personnel, operating methods and means. The latter correspond to well-defined uses but this does not rule out a degree of interoperability between strategic or inter-theatre and tactical or intra-theatre means.

(a) Missions

7. Military airlift has developed continuously since the second world war both in terms of equipment and missions. The latter can be divided into two broad, non-limitative categories: operations of an essentially military nature and so-called

1. Airlift Conference, London, 31st August-1st September 1995: some thoughts on the development of military air transport, 1918-1995.

humanitarian operations. The first are often undertaken in a framework of open conflict, the second, especially in the years following the Gulf war, follow a period of truce or the end of hostilities.

1. *Airlift and force projection*

8. Whether for transporting personnel or equipment, airlift has the advantage of speed and time-saving and also the possibility of reaching areas that are inaccessible by land or sea. From the major airlift operations of the second world war (Crete, Arnhem) to the Gulf war, the use of airlift has proved essential in conflict and crisis situations. Two examples illustrate its importance in recent years, the Falklands war (1982) and the crisis in the Gulf and the Gulf war (1990-1991).

(i) *The Falklands conflict (2nd April-14th June 1982)*

9. On 2nd April 1982 Argentine troops landed and occupied the Falklands islands with the aim of annexing them to Argentina. The United Kingdom Government led by Mrs. Thatcher decided on a military response and, on 5th April 1992, naval force 317 left Southampton. On 6th April, one of the largest airlift operations undertaken by the United Kingdom – Operation Corporate – began.

10. Corporate's objective was to provide logistic support to the naval operation bound for the islands, using Ascension Island, the mid-point in the Atlantic Ocean between the United Kingdom and the Falkland Islands² as a support base. This operation required unparalleled mobilisation of human resources and equipment to provide airlift until the end of hostilities. In terms of shipping in the South Atlantic, it was necessary to ensure that aircraft could rejoin the fleet and the infrastructure on Ascension Island had to be considerably expanded and improved in a very short time – during the first three weeks there were 163 incoming flights.

11. The problem of refuelling aircraft used to carry mail and other supplies to the fleet was somewhat attenuated by Senegal giving United Kingdom aircraft permission to touch down. However as the fleet moved further away from Ascension Island it was necessary to increase the autonomy of the C-130s by equipping them with extra tanks – which had the disadvantage of reducing their carrying capacity – and then by resorting to in-flight fuelling systems. These systems were implemented very quickly, from 15th April to 11th May.

12. The Argentine forces surrendered on 14th June, but airborne logistical support missions were continued until 24th June, the date on which Port Stanley airport was repaired so as to enable

aircraft to land. Moreover, a decision was taken to construct a new airport runway (opened in 1985) designed to take military transport aircraft to ensure rapid reinforcement of forces stationed on the islands in the event of crisis. This solution allows forces to be maintained at minimum levels. A transport unit, Flotilla 1312, was also created in situ. During Operation Corporate, over 8 000 tonnes of equipment were supplied to the naval force and then to forces engaged on the ground, thus contributing to the success of the campaign. At the same time, the effort thus required allowed RAF transport capabilities to be improved and strengthened (all C-130s were subsequently equipped with in-flight fuelling systems) which later proved useful during the Gulf crisis. It should be noted that since then there have been no accidents in spite of the extreme constraints to which aircraft and equipment have been subjected.

(ii) *The crisis in the Gulf and the Gulf war (September 1990 to February 1991)*

13. Operations Desert Shield and Desert Storm gave rise to the largest mobilisation of civil and military airlift capability since the second world war. It should be stressed however that over 80% of the load was carried by commercial aircraft and only 20% by military aircraft. After Iraq's invasion of Kuwait on 2nd August 1990, the United States, with the backing of the United Nations, began to send men and equipment to Saudi Arabia to protect the kingdom against Iraqi attack. Air transport made possible the early arrival of the first detachments of what was to become a multi-national coalition, while showing American determination not to allow Iraqi aggression to go unpunished.

14. These transport operations were not easy to organise since there were no pre-defined plans, the equipment and means required were not ready and priorities were continually changing. Nevertheless, the Air Mobility Command managed to organise in record time a massive airlift linking both coasts of the United States to Saudi Arabia. On the spot, it was necessary to extend and improve existing infrastructure in order to be able to receive aircraft and equipment transported under optimum conditions. To ensure continuity in the flow of transport, massive recourse was had to commercial aircraft of the Civil Reserve Air Fleet-CRAF.

15. In 1990, in the month of August alone, 1 297 missions bound for Saudi Arabia were carried out. Between the start of the crisis and the end of hostilities (February 1991), there were over 12 000 missions. In the theatre of operations, from 10th August 1990 to 7th August 1991, 144 aircraft carried out 14 200 missions, transporting 514 600 passengers (troops and others), 5 000 wounded and 245 200 tonnes of equipment. This unprecedented effort made it possible to put per-

2. Distance between Ascension and the United Kingdom is 3 900 miles (6 240 km).

sonnel, equipment and procedures to the test under extreme conditions and to draw important lessons for the future of air transport. The importance of the mobility factor and of the prepositioning of equipment and the need to have appropriate infrastructure available at strategic points of the globe, are certainly major lessons. This military experience will also be of use subsequently, when it is no longer a matter of force projection but of transporting humanitarian aid to different points of the globe.

2. *The humanitarian rôle of airlift*

16. From the Berlin airlift in 1948 to that of Sarajevo, transport aircraft have always played an important rôle in bringing aid to populations in distress covering large distances to out of the way areas and above all in a short space of time. In the 1980s and in the aftermath of the cold war this rôle increased, not without attendant danger. European countries have acquired major expertise in operations of this type by undertaking them on several continents, sometimes under very difficult conditions. Noteworthy examples are:

(i) *The African theatre*

17. For historical reasons, European countries have retained a political and military presence in Africa, even after the implementation of independence and decolonisation throughout the continent during the second half of this century. Foremost among such countries is France, with a network of military bases in certain African states with which it is linked by defence agreements. To provide links between Paris and these countries and within the latter, France has assigned a major rôle to military airlift, which makes extensive use of C-160 Transall aircraft.

18. This aircraft, designed in the 1960s, quickly proved itself in a difficult African terrain, where it is used for a variety of purposes, either for strictly military tasks relating to the presence of French troops or for humanitarian missions where it has demonstrated its versatility in recent years. In the fight against famine in the Sahel, Sudan or Somalia, the CFAP (Commandement de la force aérienne de projection)³ was able to transport food, medicines and medical staff quickly (from Djibouti) to disaster areas where overland access was frequently difficult or which were cut off by conflicts in progress (as in the case of Sudan or Somalia).

19. The Rwandan crisis led to a major mobilisation of military airlift capability, both in France and in other European countries. Belgium and France committed aircraft for both military and

humanitarian purposes (in Belgium's case to evacuate its troops and European nationals and in that of France to dispatch personnel, equipment and humanitarian aid); moreover, Spanish, United Kingdom and other aircraft of varying types and capacity afforded assistance to populations in distress. These flights were co-ordinated partly through a United Nations structure created to supply Sarajevo, the Air Transport Operations Cell based in Geneva.

(ii) *The humanitarian airlift for Sarajevo*

20. The Bosnian conflict, because of its military and above all its humanitarian dimensions, gave rise to the longest airlift operation in history since the Berlin airlift in 1948-49. Over three years, aircraft belonging to more than twenty countries⁴ transported more than one hundred thousand tonnes of humanitarian aid, in over ten thousand flights, often under extremely difficult conditions, with some aircraft being hit by fire from the various factions on the ground. In order to carry out this enormous humanitarian operation successfully, the Air Transport Operations Cell was created in 1992 under UNHCR (United Nations High Commission for Refugees) management, in order to ensure that aid reached the population of Sarajevo, under siege from Bosnian Serb forces.

21. Monitoring, co-ordination and planning of operations are undertaken by officers of the rank of Lieutenant Colonel or equivalent from France, Germany, the United Kingdom and the United States⁵. The Cell liaises with the Secretariat-General of the United Nations and UNPROFOR and with other United Nations agencies on the ground and non-governmental organisations concerned. The four military officers, assisted by a civilian official, are also in constant contact with the defence and foreign ministries of the countries involved.

22. The airlift began on 3rd July 1992 and operations are still continuing, in spite of several interruptions made necessary by hostilities on the ground. American flights have departure points in Croatia (from Zagreb and Split), in Italy (from Ancona) and in Germany (from Frankfurt). On 3rd September 1992, the airlift was suspended for the first time after the destruction in flight of an Italian G-222, brought down by an anti-aircraft missile fired by a faction which has still not been identified. Subsequently, almost all military airlift aircraft involved in operations have been equipped with protection systems. The persistence of a potential threat led to the formation in 1993 of a high-level working party, made up of senior offi-

3. The CFAP replaced the COTAM (Commandement du transport aérien militaire) in March 1994. It had 294 aircraft of nineteen different types including 127 helicopters (SIRPA Actualité, No. 8, page 32, 25th February 1995).

4. Including virtually all WEU member countries.

5. The United States also carried out an air-supply operation in the Bosnian enclaves of the north-east in 1993-94, which mobilised three C-130 Hercules and a C-160 Transall aircraft.

cers. Based in Naples, it has NATO information and logistics support. This initiative has improved the security and effectiveness of flights but has not prevented other incidents such as machine-gun fire directed at aircraft in flight, or their being "locked in" by radar and anti-aircraft defence systems and the shelling of aircraft on the ground. This constant harassment led to the airlift being suspended between April and September 1995.

23. Experience acquired in many regions of the world, under varying conditions, combining rigorous planning and improvisation, shows the high level of expertise achieved by European countries in the conduct of military airlift operations, and undoubtedly contributes to ensuring their state of readiness to intervene quickly in crisis situations, despite the limited means available to their airforces, as compared with the possibilities of countries such as the United States or Russia.

(b) Means and equipment introduced by transport aviation

24. Transport aviation comprises various categories of aircraft, which often complement one another. Commercial and military models contribute to missions for transporting personnel and equipment, supply missions, health missions or VIP transport. The means can be classified simply in two major categories, even if present trends show preference for a combined approach, strategic transport and tactical transport.

1. Strategic capabilities

25. The term strategic or inter-theatre capability is used to describe aircraft with an intercontinental range over 3 000 nautical miles (5 600 km)⁶. Strategic military airlift aviation is still a virtual monopoly of the United States and the CIS. Europeans have also taken an interest in this area but without much success to date even though the use of Airbus commercial aircraft converted for the purpose might be envisaged, pending the arrival of the FLA.

(i) United States

C-5 Galaxy

26. The Lockheed C-5 Galaxy is one of the world's largest aircraft and the only one that can transport any of the United States Army's combat equipment, including the 74-ton mobile scissors bridge, tanks and helicopters. The aircraft exists in two versions, A and B, produced in 1969 and 1986 respectively. The C-5B can carry fully equipped, combat-ready troops to any area in the world on short notice and provide the full field support necessary to maintain a fighting force. Using the front and rear cargo openings, the

Galaxy can be loaded and off-loaded at the same time. The entire cargo floor has a roller system for rapid handling of palletised equipment. The Galaxy's weight is distributed on its high flotation landing gear, which has 28 wheels. An automatic trouble-shooting system constantly monitors more than 800 test points in the various subsystems of the C-5. The malfunction detection analysis and recording system (MDARS) uses a digital computer to identify malfunctions in replaceable units. Four turbofan engines mounted on pylons under the wings power the C-5.

27. Except for emergencies or unusual circumstances, the C-5 does not carry troops in the lower deck cargo compartment but 73 seats are available in the rear compartment of the upper deck for personnel and operators of equipment being airlifted. The forward deck accommodates a crew of six, a relief crew of seven, and eight mail or message couriers. The flight deck has work stations for the pilot, co-pilot, two flight engineers and two loadmasters. The upper deck's forward and rear compartments have galleys for food preparation, as well as lavatories. The most dramatic display of the Galaxy's capability and value was during operations Desert Shield and Desert Storm. The C-5, along with other airforce transport aircraft, airlifted almost a half-million passengers and more than 577 000 tons of cargo. This included 15 air-transportable hospitals and more than 5 000 medical personnel to run them⁷.

C-141 Starlifter

28. Smaller than the Galaxy, the C-141 Starlifter was the first jet aircraft designed to meet military standards as a troop and cargo carrier. The first C-141A was delivered in 1964 and the first model B was delivered in 1979. The C-141B is a stretched C-141A with in-flight refuelling capability. Conversion of 270 Starlifters from A to B models was completed in 1982. The aircraft can airlift combat forces, equipment and supplies, and deliver them on the ground or by air-drop, using paratroop doors on each side and a rear loading ramp. It can be used for low-altitude delivery of paratroops and equipment, and high-altitude delivery of paratroops. It can also airdrop equipment and supplies using the container delivery system. The C-141 has an all-weather landing system, pressurised cabin and crew station. Its cargo compartment can easily be modified to perform around 30 different missions.

29. About 200 troops or 155 fully equipped paratroops can sit in canvas side-facing seats, or 166 troops in rear-facing airline seats. Rollers in the aircraft floor allow quick and easy cargo pallet loading. In its aeromedical evacuation rôle,

6. SIRPA Actualité No. 8, page 34, 25th February 1995.

7. Source: United States Air Force fact sheet 92-35; INTERNET, <http://www.dtic.dla.mil/airforce.link/pa/factsheets>.

the Starlifter can carry about 103 litter patients, 113 ambulatory patients or a combination of the two. It provides rapid transfer of the sick and wounded from remote areas overseas to hospitals in the United States. During Desert Shield and Desert Storm, a C-141B from the 437th military airlift wing was the first American aircraft into Saudi Arabia, transporting an airlift control element from the 438th military airlift wing. In the following year the C-141B completed the most airlift missions – 7 047 out of 15 800 – supporting the Gulf war. It also carried more than 41 400 passengers and 139 600 tons of equipment. Some C-141Bs have been equipped with intraformation positioning sets that enable a flight of two to 36 aircraft to maintain formation regardless of visibility⁸.

(ii) *Commonwealth of Independent States (CIS):*

Il-76M/MD

30. In the late sixties, the idea was mooted of building a large carrier to replace the An-12. The project was for an aircraft capable of transporting a 40-tonne payload over a distance of 5 000 kilometres in under six hours, particularly during bad weather – testing was carried out in Siberia. The prototype had its maiden flight on 25th March 1971 and was presented in Paris in May 1971. The Il-76 had very interesting potential as a military transport aircraft. Listed as “Candid” by NATO, the Ilyushin was produced in several versions: the Il-76 (Candid A) the original basic version, the Il-76T (an unarmed version with a larger carrying capacity), the Il-76TD, similar in practice to the previous version (increased maximum useful load and weight on take-off) and finally the Il-76M and the Il-76MD (Candid-B).

31. Of these last two versions, built for military use, the Il-76MD is the more sophisticated. Equipped with rear gun turrets and electronic defence systems, this aircraft can carry up to 140 men. There are approximately 400 aircraft of this type in service today in Russia, Ukraine and other CIS and Central European countries and in Iraq and India. The Il-76 was among the aircraft involved in the Sarajevo airlift, the United Kingdom having leased one at least for use in that operation.

An-12

32. Over 900 An-12s, listed as “Cub” by NATO, were built for military or civil use up to 1973 when production was halted. Brought into service by the Soviet airforce as a troop and equipment carrier in 1959, the An-12 was gradually replaced by the Il-76. Nevertheless, there are still 150 or so Cub aircraft equipping military

airlift units on the eastern and southern boundaries of the Russian Federation. There are still An-12s in the air fleets of the CIS and Central European countries and those of Algeria, China, Ethiopia, India, Iraq and the Malagassy Republic. Several versions of this aircraft were produced: the Cub-A, close to the original version, the Cub-B, used by Russian naval airforces, the Cub-C, and finally the Cub-D, with vastly improved electronic systems.

An-22

33. The prototype of the Antonov An-22 Antheus flew for the first time on 27th February 1965. About 50 planes remain in service today used primarily for military support duties. One An-22 was adapted to deliver the wings of production An-124 transports non-stop over the 3 000 km route from Tashkent, where they were built, to the assembly plant in Kiev. The An-22 has a crew of six and a cabin for about 30 passengers. When the rear loading ramp is lowered, a large door which forms the underside of the rear fuselage retracts upward inside the fuselage to permit easy loading of tall vehicles.

An-124

34. The An-124, listed as “Condor” by NATO, had the largest wing-span of any aircraft at the time it was built. The first prototype (SSSR-680125) had its maiden flight on 26th December 1982 and the second (SSSR-82002 Ruslan) in 1985. On 26th July 1985 an An-124 carried a 171 219 kilogramme load at an altitude of 10 750 metres, 53% more than the previous record held by the C-5 at an altitude of 2 000 metres. Deliveries began in 1987. Barring one or two details, the aircraft is virtually identical to the Lockheed C-5 Galaxy. However, it benefits from technologies not available when the C-5 was designed. Its improved wing shape, the use of composite materials and titanium, and the introduction of electrical flight controls made it possible to reduce structural weight and increase fuel capacity. In 1988, it was anticipated that 8 to 10 aircraft, assembled in Ukraine, would be produced each year. In fact, four aircraft a year have been built since 1991, which corresponds to today’s financial and technological means.

2. Tactical transport

35. Aircraft with tactical or intra-theatre capability are the more widespread category. The Lockheed Martin C-130 is now the most commonly found, but Europe also has considerable experience in this area, either through co-operation or within the framework of national programmes. Tactical means, together with support and refuelling facilities, are one of the most important components of military airlift.

8. Source: United States Air Force fact sheet 92-19; INTERNET, <http://www.dtic.dla.mil/airforce.link/pa/factsheets>.

(i) The C-130J Hercules

36. The Lockheed Martin C-130 Hercules, produced in numerous versions for more than 30 years, is the worldwide standard in this class of military transport. The C-130J and the stretched C-130J-30 are the latest versions combining traditional features of the Hercules with new technologies at an acquisition cost that will be about the same as for the C-130H (about 40 million dollars). The major features of the C-130J design include:

- a proven airframe currently in production with over 300 improvements to its structure and subsystems since the 1960s;
- a new and highly efficient propulsion system utilising the AE 2100D3 engine and R391 composite propeller;
- a fully integrated digital avionics suite suitable for two pilot operation;
- the replacement of conventional system cabling with a digital data bus architecture;
- dual mission computers as the central processing element of the avionics suite.

The C-130J is in the process of being evaluated by the United States airforce, which is bringing 450 or so C-130Js into service with a view to replacing its oldest Hercules starting in early 1997. In Europe the RAF has ordered 25 aircraft to replace the old C-130Hs starting in 1997; on 11th October 1995, the Italian Parliament approved the government's proposal to buy 19 C-130Js and other countries will probably place orders in the coming months if the anticipated delay in the FLA programme is confirmed⁹. Outside Europe, the Australian airforce has received budget approval to order 12 C-130Js.

37. The C-130 also exists in two special versions, the AC-130A/H Spectre and the WC-130. AC-130A and H Spectre aircraft are gunship models of the C-130A/H. These heavily-armed aircraft incorporate side-firing weapons integrated with sophisticated sensor, navigation and fire control systems to provide surgical firepower of area saturation during extended periods at night and in adverse weather. A new U model will have an improved weapons suite, 360-degree infrared field of view, all-light-level television sensors and true all-weather capability with a strike radar and one trainable 25 mm Gatling gun, enabling better accuracy, increased standoff range and improved aircraft survivability¹⁰.

9. Defense News, 22nd-29th October 1995.

10. Source: United States Air Force fact sheet 93-06; INTERNET, http://www.dtic.dla.mil/air_force.link/pa/fact-sheets.

38. The WC-130H Hercules is a high-wing, medium-range aircraft used for weather reconnaissance by the Air Force Reserve. It is capable of staying aloft more than 12 hours during missions. The WC-130H provides vital tropical cyclone forecasting information. It penetrates hurricanes at an altitude of 10 000 ft (3 033 metres) to collect meteorological data in the vortex (eye) of the storm. This aircraft is flown exclusively from Keesler Air Force Base, by Air Force Reserve organisations known as the Storm Trackers. Its hurricane reconnaissance area includes the Atlantic Ocean, Caribbean Sea, Gulf of Mexico and central Pacific Ocean areas¹¹.

(ii) The C-160 Transall

39. Originally intended to provide transport between France and North Africa, the C-160 Transall, built jointly by France and Germany, can carry up to 90 passengers and 14 tonnes of miscellaneous equipment or 62 wounded. The Transall is designed to operate in an environment where ground conditions are difficult because of geographical or physical factors. The C-160NG (new generation) can be refuelled in flight which increases the distance it can cover (approximately 1 500 km) and some aircraft of this type can also refuel fighter aircraft and other Transalls. The C-160 undertakes missions of various types such as:

- assault landings and use of unprepared strips by day or night;
- airdropping of all kinds: dropping of freight by gravity or ejection; dropping without parachute of specially prepacked freight; low altitude parachute dropping and high altitude dropping.

The C-160 is present in various regions of the world where France has interests to defend and in the airforces of several countries. It is also equipped with electronic and other types of defence systems.

(iii) The G-222 (Italy)

40. The G-222, five versions of which were built by Aeritalia, is proof of the Italian aeronautics industry's know-how in transport aviation. Designed in the 1970s in the framework of a NATO transport aircraft programme which was subsequently abandoned, the G-222 was brought into service by the Italian airforce in 1978 and exported to many countries throughout the world. Like other aircraft in the same category, the G-222

11. Source: United States Air Force fact sheet 92-60; INTERNET, http://www.dtic.dla.mil/air_force.link/pa/fact-sheets.

was a multi-purpose aircraft used for military and humanitarian purposes. Several versions exist:

- G-222: standard military transport;
- G-222RM: flight inspection version, specially equipped for in-flight calibration of ground radio navigation and communication facilities. First delivered in 1983 to the Italian Air Force;
- G-222SAA: fire-fighting version, with special designed modular dispersal system for water or retardant. This version has been used extensively in many parts of Italy since its delivery in the middle 1980s;
- G-222T: version with Rolls-Royce Tyne turboprops, larger diameter propellers and higher operation weights. More than twenty built, including two in VIP transport configuration;
- G-222VS or G-222GE: electronic warfare version, first flown on 9th March 1978. Carrying a pilot, co-pilot and up to ten system operators, it has a modified cabin fitted with racks and consoles for detection, signal processing and data recording equipment. Externally distinguishable by small 'thimble' radome beneath the nose and a larger 'doughnut' radome on top of the tail fin.

Aeritalia is also reported to have made studies for possible maritime patrol and anti-submarine warfare versions and for a G-222 air tanker. The prototype of a marine oil spill control version was demonstrated in 1986.

(iv) The CN-235M (Spain)

41. The CN-235 is a joint development of Spanish CASA and Indonesian IPTN. Preliminary design of the aircraft was initiated in January 1980, and prototype construction in May 1981. The first CN-235M from the CASA assembly line was delivered in 1987. CASA markets the aircraft in the Americas and Europe, IPTN in Asia, with other markets shared as appropriate. In 1990, following the purchase by Turkey of 52 CN-235 aircraft, CASA and the Turkish aeronautics company, TAI, signed a contract for these aircraft to be assembled in Turkey. The CN-235 also exists in maritime patrol and anti-submarine/anti-surface versions under the name Persuader; Ireland was the first country to equip its airforce with this model. To date, more than 200 of these aircraft have been sold to over twenty countries. Spanish aircraft participate actively in United States humanitarian operations in Bosnia, Rwanda and other countries. This aircraft, which is also in service in the French airforce, testifies to the technical capabilities and know-how of the Spanish aeronautics industry which, with firms involved

in the C-160 Transall programme and the Italian G-222 confirm that Europe has real possibilities of achieving substantial autonomy in military airlift aviation, by procuring aircraft adapted to the specific needs of each country.

42. The experience gained by European manufacturers, although acting separately, whereas the need for the European aeronautics industry to restructure is becoming ever more pressing if it is to maintain its competitiveness on the international market, is helping to keep Europe in the front line in military airlift aviation. This experience is also vital to the success of the FLA project.

***III. Current programmes:
stakes and consequences for Europe***

43. The aftermath of the cold war, the Gulf crisis and the war in the Gulf and humanitarian interventions (Restore Hope, Sarajevo) brought new demands in their wake and contributed to a redefinition of airlift missions and means. Their very high mobility, the need to transport increasingly heavy loads and the limited number of support facilities available make military airlift an essential tool in crisis-management. At the same time, lower defence budgets mean that choices have to be made in this area while the cost of acquiring new models or the replacement of the present ageing air fleets is high.

44. Nor is it a matter of a straightforward military choice – the best aircraft for the armed forces – but of a wider choice with numerous implications. Investment in replacement or new projects means safeguarding jobs and an important and technical and industrial base in an economically competitive world. In this area of growing importance, Europe is lagging behind the United States. The FLA programme is intended to fill the gap by making a high performance aircraft available to Europeans, comparable if not superior to the American C-17, at a cost affordable to the participant countries. In the CIS too, co-operation around the An-70 was born of the need to reduce costs to obtain the best possible technology and to maintain the industrial base of the aeronautics industry.

45. For the countries participating in the FLA programme – Belgium, France, Germany, Italy, Portugal, Spain, Turkey and the United Kingdom¹² – the interest lies not only in replacing the airlift fleet but also in enabling the European aeronautics industry to maintain its world ranking, in the same way as was achieved with the civilian Airbus programme. This is also an important step towards providing European armies with

¹² Belgium, Portugal and Turkey are "associate partners" in the programme.

increased projection capability, which is lacking at present, and ensuring their independence from the United States. This is a matter of a political rather than a technical or industrial nature, the success of the programme being essential for the implementation of a true European defence policy over the medium term.

(a) New programmes: United States and CIS

46. The C-17 Globemaster is undoubtedly the last major American programme of this century. Budget restrictions, a new assessment of the strategic priorities of the United States, the shift from a political, or indeed ideological perception of defence questions to an economic perception have led to extensive consideration of the missions and means that will enable American armed forces to retain a high level of equipment. The C-17, designed during the cold war, has undergone various changes in reaching its present form and was even almost withdrawn on several occasions in favour of renovating the C-130 (J version) fleet or its replacement with commercial aircraft adapted to military requirements within the framework of the NDAA (non-developmental airlift aircraft) programme.

47. The dispersal of the USSR and the emergence of new independent states disrupted the former Soviet aeronautics industry. Works, plant and personnel are no longer located in the same economic and political area, each country having different priorities. Russia and Ukraine, where the aeronautics industry was largely concentrated, have nevertheless succeeded, in spite of political differences, in re-establishing co-operation in this area with the An-70 programme. The economic situation nevertheless makes it difficult to continue, with the result that approaches have been made to western countries regarding co-operation in the area of military airlift.

(i) The C-17 Globemaster III

48. The C-17 is the most flexible airlift aircraft to enter the United States Air Forces's inventory. It is capable of rapid strategic delivery of troops and all types of cargo to main operating bases or directly to forward bases in the deployment area. The aircraft is also able to perform theatre airlift missions when required. The C-17's system specifications impose a demanding set of reliability and maintainability requirements. These requirements include an aircraft mission completion success probability of 93%, only 18.6 aircraft maintenance manhours per flying hour, and full and partial mission capable rates of 74.7 and 82.5% respectively for a mature fleet with 100 000 flying hours¹³.

13. Source: United States Air Force fact sheet 95-06; INTERNET, <http://www.dtic.dla.mil/airforce.link/pa/fact-sheets>.

49. The aircraft is operated by a crew of three (pilot, copilot and loadmaster). Cargo is loaded onto the C-17 through a large afterward door that accommodates military vehicles and palletised cargo. The C-17 can carry virtually all of the United States Army's air-transportable, outsized combat equipment. The aircraft is also able to airdrop paratroopers and cargo. The design of this aircraft lets it operate on small, austere fields. The C-17 can take off and land on runways as short as 900 metres and as narrow as 27 metres wide. Even on such narrow runways, the C-17 can turn around by using its backing capability while performing a three-point star turn. Maximum use has been made of off-the-shelf and commercial equipment, including United States Air Force standardised avionics.

50. The C-17 came through a major programme of assessment tests in July-August 1995 with flying colours exceeding the targets set in practically every area – the eleven aircraft in this series of tests transported over five million tonnes of miscellaneous military equipment and approximately 2 800 passengers; they parachuted over 3 000 soldiers and dropped 320 tonnes of military loads and completed 513 missions in 29 days with an availability rate of over 99%¹⁴. These technical performances made the C-17 the first preference of the United States Air Force as the American military transport aircraft for the next century, even though the programme is running 18 months behind schedule and has exceeded its budget by \$2 billion (research and development spending on the C-17 is estimated at \$5.7 billion since 1981¹⁵). To date, 40 aircraft are on order, 21 of which have been delivered, and this figure could rise to 120, according to the wishes expressed by certain American Air Force officials.

51. Nevertheless, the high cost of the C-17 (approximately \$250 million per aircraft¹⁶) makes this last option difficult to follow in a context of falling defence budgets, since procurement of a military airlift fleet composed entirely of C-17 cannot be achieved except at the expense of other current programmes, such as, for example, the F-22 stealth fighter aircraft¹⁷. Another solution would be to offer the C-17 for export, since the air transport fleets of the NATO countries and other United States allies are in the process of being renewed, and to build a transport fleet composed of that aircraft and C-33s, designed in the framework of the NDAA programme. Initial contacts

14. Air & Cosmos/Aviation International, No. 1560, page 35, 8th September 1995.

15. Defense News, 25th September-1st October 1995, page 18.

16. Defense News, 25th September 1995-1st October 1995, page 18.

17. Aviation Week & Space Technology, 2nd October, 1995, Page 63.

with possible buyers were made in November 1994, with Japan, then with NATO and Middle Eastern countries, with McDonnell Douglas envisaged an initial contract for about 50 aircraft over a ten to twenty-year period¹⁸.

(ii) The NDAA (non-developmental airlift aircraft) programme

52. The adaptation of civilian platforms for military uses is a way of diversifying air transport fleets and also of lowering aircraft operating and maintenance costs. The E-3 AWACS and the KC-135 refueller are derived from the Boeing 707; the French airforce uses the Airbus A-300 for its requirements and the Royal Airforce does the same with the Tristar. The NDAA programme, based on thinking along the same lines, was launched in 1994 at the request of the American airforce, given the possibility of a halt in the production of the C-17 and, to date, only Boeing has responded with the 747-400 transport version. This programme is based on the observation that most material and personnel to be transported fall into a general category not requiring specific military capabilities¹⁹ and that these forms of transport can be effected using converted commercial aircraft.

53. The 747-400, the military airlift version of which, the C-33A, is used to complement the C-17, can contribute substantially to lowering the cost²⁰ of renewing the United States' military airlift fleet, as the United States General Accounting Office (GAO) recognised in a report on the C-17 in 1995, according to which the "120-aircraft C-17 programme is not the most cost-effective way to meet airlift requirements... A fleet comprised of 40 C-17s and 64 commercial freighters could meet DoD's airlift requirement... at cost savings of about \$10.7 billion"²¹. The C-33A can carry loads of up to 120 tonnes over a distance of over 7 000 km without refuelling, which places it in the C-5 Galaxy category. Moreover, this programme is also of interest to European countries participating in the FLA project, as there are many commercial models of Airbus which could be adapted to meet military needs to complement the FLA thus giving major military airlift capability at tactical and strategic levels at a cost that can be born by defence budgets and with considerable technological and economic fallout for the European aeronautics industry.

18. Defense News, 25th September-1st October 1995, page 18.

19. During the Gulf crisis and war only 20% of air transport was strictly military (Source: The non-developmental airlift aircraft programme, Airlift Conference, London, 31st August-1st September 1995).

20. The cost of the C-33A is estimated at \$140-150 million, compared with \$250 million for the C-17. Aviation Week & Space Technology, 2nd October, 1995.

21. GAA report, C-17 aircraft: cost and performance issues (1995).

(iii) The An-70 programme

54. In the Commonwealth of Independent States (CIS), both Russia and Ukraine have extensive military transport aircraft fleets. But many of these transports are old and likely to require replacement during the coming 10-15 years. The need for a new strategic heavy-lift transport in the CIS has led to the development of the Antonov An-70, which is being jointly funded by Russia, Ukraine and Uzbekistan. Series production is being set up at two aircraft manufacturing facilities: Kiev in Ukraine and Samara in Russia. The first An-70 prototype was lost in February 1995 when it collided with a chase plane while on its fourth test flight. A second prototype is being readied to resume flight testing in early 1996. The version featuring western avionics and intended for western customers, has the An-77 designation.

55. The An-70 is a medium heavy-lift with a maximum payload capacity of 35 tonnes with a maximum flight range of 5 000 km. It has short take-off and landing capabilities (600 m runway) that allow the aircraft to use about three times more landing strips available and would provide approximately the same improvement in cargo and equipment delivery and mission performance probability under adverse conditions. The future of the An-70 nevertheless remains uncertain because of the economic crises in Russia and Ukraine – hence the approaches made to Western European countries with a view to developing co-operation over this programme, either in avionics components or in engines and other specifications of the An-70 to make it attractive on world markets, especially the civilian An-70T (four-engined) and An-70T-100 (twin-engined) versions. Moreover, the experience gained in developing this aircraft and other airlift aircraft might be useful for developing European capabilities in this area, by reducing costs and speeding up existing programmes.

(b) The FLA programme: stakes and consequences for European defence

56. Launched in 1985, in the framework of the Independent European Programme Group (IEPG), now the Western European Armaments Group (WEAG), the FLA programme has been affected by the vicissitudes of the debate on European defence. Divergent priorities and needs within the group of participant countries, competition from the United States which supplies airlift aircraft to a large part of the European armed forces, are factors to be taken into consideration when assessing the progress of this programme. Its dimension is not just military; its success will have major spinoff for the future of the European aeronautics industry in an environment of worldwide economic competition. Moreover, the FLA will make use of the best available technology and

the most recent advances in materials and aerodynamics which will make it an aircraft in the same or indeed a higher class than the C-17.

57. As in the United States and the CIS, Europe and above all the Airbus consortium, adapts commercial aircraft to military requirements. A version of the A-340 was even considered for military use for a time (the A-340M project). The Airbus MRTT – multi-rôle tanker transport – programme is a further example of European possibilities in this area and adds to the FLA programme. The success of these two programmes will be crucial for the future of the European aeronautical industry and the development of an independent European defence capability.

(i) The FLA programme

58. Developed by the Airbus partners (namely Aérospatiale (France), British Aerospace (United Kingdom), CASA (Spain) Alenia (Italy), Daimler-Benz Aerospace (Germany), and their associate partners, Flabel (Belgium), OGMA (Portugal) and Tusas (Turkey), the FLA has the benefit of considerable European experience which has been consolidated in recent decades through the Airbus and ATR programmes and the C-160 Transall, Italy's G-222 and Spain's CN-235. Created in 1985 with the creation of the FLA subgroup within the IEPG²², the idea of building a European tactical airlift aircraft in co-operation gradually gained ground and developed fully thanks in particular to assistance from the industry, contemporary geopolitical developments and present-day technological progress.

59. The aircraft's characteristics meet European requirements as planned for the long and medium term; it has a hold capacity of 342 m³ and a payload of up to 32 tonnes. With a 16-tonne load the FLA can cover a distance of 5 835 km (or 7 595 kms in convoy) and fly at a cruising speed of Mach 0.68-Mach 0.72. 41.3 m long and 14.4 m high the aircraft can carry a maximum payload of 107 tonnes (by comparison, the Ilyushin Il-76t can take off with a maximum load of 190 tonnes and the American C-130 with 79 tonnes). Its manufacture includes modern technology such as the use of new composites and aluminium alloys and, recently, turboprops have been fitted.

60. The FLA is likely to cost around \$80 million – twice as much as the C-130J, but three times less than the C-17. The countries participating in this programme will need 300 aircraft and other European countries are perceived as potential customers. The management of the FLA programme was transferred to a European consortium through the creation of the Airbus Military Company (AMC) in 1995.

22. Independent European Programme Group, now the Western European Armaments Group - WEAG.

61. The present period is regarded as a feasibility study stage which will allow greater specialisation of the aircraft if necessary. The maiden flight is scheduled for early 2002 and the first deliveries for 2004. Moreover, with Airbus's industrial management system, fears of programme "drift" such as occurred with the Eurofighter are receding; this management style should lead to 12% savings and restrict development costs to F 26 million for a unit price of F 380 million. These factors enhance the credibility of the FLA in the face of C-130J supporters, influenced by Lockheed Martin's offensive to sell its cargo aircraft in Europe. It is certainly unfortunate that countries such as the United Kingdom are having to replace their existing airlift fleet at a time when the FLA is still only a wooden mock-up. A flying prototype at the Farnborough air show in 1996 should make a crucial difference in clearing minds and determining courses of action.

(ii) The MRTT programme

62. The Airbus multi-rôle tanker transport (MRTT) is designed to meet the future requirement for a cost-effective tanker transport aircraft for which there is a forecast demand of up to 100 aircraft between 1998 and the year 2010²³. The aircraft developed by Aérospatiale, British Aerospace and Daimler Benz Aerospace is a wide-bodied multi-rôle tanker transport based on the Airbus A-310-300. It will provide a suitable replacement for the current generation of strategic tankers, particularly B-707 or VC-10 based aircraft, as well as meeting requirements of new tanker operators. The MRTT options can include boom, pod or both methods of refuelling, additional military avionics and self defence systems. The transport capability is enhanced by the addition of a main deck cargo door and the installation of a cargo loading system which allows palletised freight to be carried on the main deck.

63. The MRTT programme has similarities with the American NDAA in that it involves the adaptation of an existing platform to military requirements and not the design of an entirely new aircraft. This programme also demonstrates European capabilities in the crucial area of in-flight refuelling. The MRTT/FLA duo make up the necessary whole for the development of an independent military airlift capability giving Europe intervention capability on a world scale. The success of the two programmes is therefore becoming a major issue in implementing a true European defence policy and that is the fundamental underlying interest in bringing them to fruition.

64. Defence policy must be understood in the military sense and also in its wider meaning as

23. British Aerospace Airbus Information, June 1995.

including a major industrial and economic component essential to the implementation of a credible European defence. With the FLA and MRTT, the airforces of the countries concerned will have modern, high performance means adapted to their needs, while developing, as in the case of NH-90 helicopter, true European interoperability in military airlift. The diversity of European fleets will not disappear and American aircraft will continue to be present, but the arrival of the FLA and MRTT to renew the military airlift capability of no less than eight countries will be a most important step towards building an independent European defence.

65. The example of the C-130 Hercules in operation with the armed forces of many countries worldwide should serve to illustrate the full potential of the FLA when it enters service. Different versions of the C-130 undertake, in addition to all rôles of air transport: maritime air operations, offensive air support, electronic warfare, air-to-air refuelling, surveillance and reconnaissance, search and rescue. So although this report deals with military airlift, its prospects should not be confined to it. The FLA has always been envisaged to fulfil a large spectrum of missions as a possible future multi-rôle platform for the armed forces of the European countries and for export. In addition, like the Airbus family of civil transport before it, different versions of the FLA could break the virtual United States stranglehold on the military large aircraft market. An example is the way the former Soviet Union was adept at employing different versions of the same airframe in a variety of tasks. The approach to the development of the FLA should therefore follow a similar concept in order to ensure the volume in production that will be necessary to make it viable as a competitor to United States aircraft.

66. From a strictly military point of view, the FLA will considerably enhance the force projection capabilities of European countries by enabling them to act in case of need in regions where their interests might be at stake, without depending on a third party with the appropriate means but unwilling to commit itself to their cause. This also means that thinking must now be started on future needs and missions for European military airlift, if one is to avoid the situation of the Eurofighter programme which was conceived as a European contribution to Europe's defence in the framework of NATO, in a cold war context. Subsequent changes have made the need for this aircraft less pressing, at least for some of the countries involved. Conversely, the crises in the Gulf, in Africa and at the very heart of Europe have created an awareness of the need for independent force projection capability, making the pursuit of the FLA and MRTT programmes and their completion within a reasonable timescale more necessary than ever.

67. At the same time, the very survival of the European defence industry capability is at stake – a complex issue since the interests of the various countries are far from developing in the same direction and at the same speed. Although, on the civilian side, the success of the Airbus consortium, created in 1969, needs no justification, progress still needs to be made in military aspects to achieve the same result. Airbus is still mainly a commercial success without major political implications in terms of a pivot on which the stability and prosperity of the western world turns, namely transatlantic relations. The latter take on particular importance in defence matters where economic considerations are also present.

68. For those who are opposed to the principle of European preference in the military sphere, the procurement of American equipment is one means of maintaining an American presence in Europe and not providing additional arguments for those who, in the United States Congress and certain pressure groups, claim that Europe is practising unfair industrial competition while benefiting from American military protection. From another point of view, equipping armed forces with European equipment enables Europe to maintain and develop its industrial and technological capabilities even if it is essential to concentrate and rationalise efforts while retaining freedom of action in the face of the ups and downs of American foreign policy. In the absence of a redefinition of transatlantic relations in defence matters and of a better expression of the interests of each party in this area, the choice lies mid-way between the two positions: in other words it is necessary to continue to buy American equipment to meet short-term needs (C-130J aircraft, Apache helicopters) and to enhance European co-operation in the medium- and longer-term in order to achieve equipment "Europeanisation" (FLA, NH-90, not to forget European satellite programmes) and hence the implementation of an independent European defence policy.

69. However, to achieve this balance it is necessary for Europeans to express a coherent and clear political will in this direction, first in WEU, then in the Atlantic Alliance. WEU has a rôle to play here since it identifies itself as the only European defence organisation and has an armaments structure, WEAG, which, theoretically, should be responsible for following up the FLA programme in terms of the specifications required for each type of mission for which it is intended. This would be a first step towards European standardisation of equipment which would have substantial implications for future programmes of the same type in all areas – land, sea and air, not to mention space. In the absence of any joint political directive, the follow-up to the FLA programme will be determined by the demands and needs of each country with the attendant risks of delay.

70. The FLA is also of vital interest to the European aeronautics industries, allowing them to demonstrate their technological know-how and to remain competitive in a difficult economic environment, characterised by steady reductions in defence budgets. This programme falls fully within the scope of a common industrial defence policy, which should be backed more actively by WEU. This is to some extent a flagship programme, any delay in which would have serious consequences for the development of a European arma-

ments policy. Yet without such a policy there will be no credible European defence capable of ensuring that Europe's interests are respected throughout the world, on an equal footing with the other economic and political powers of the 21st century. WEU here has a rôle as a major political driving force, both in military and industrial terms, this rôle being moreover the only one that justifies its function as the European pillar of the Atlantic Alliance and defence component of the European Union.

APPENDIX I

*Military airlift – historical background**The beginnings of military airlift and the second world war*

The use of military airlift aircraft during the second world war drew extensively on the development of civil aviation during the previous years. However, there were certain military developments during the period between the two world wars. Thus, immediately after the first world war, the RAF brought the Vickers Vernon into service which was capable of transporting twelve soldiers. This plane was used for troop transport to the Middle East to keep order in the British mandates in Palestine and Mesopotamia.

Civil aviation in the thirties represented a decisive stage in the development of military airlift. Thus, particularly in Great Britain with the Bristol Bombay (twin-engined aircraft with fixed landing gear/1935/50 models) and especially in Germany, where the Junker Ju-52/m, given the nickname "Aunt Julie", originally a triple-engine commercial aircraft, was produced in numerous military variants and employed for a variety of uses (bomber, ambulance, glider launches...). Several variants of this aircraft were developed as the war went on: the g5e in 1939: more powerful engine, possibility of being equipped with skis, wheels or floats; g7e in 1941: greater load capacity; g9e in 1942: reinforced undercarriage and finally, g9e. However, Germany did not stop there: after the Dornier DO-24 (a triple-engined hydro plane produced in 1935) which was used for sea rescue, drawing on the lessons of the failure of another plane, the Arado Ar-232 (twin-engined) Germany started producing the four-engined Arado 232-B.

From the onset of the war, Italy requisitioned the 34 models of the SIAI Marchetti SM 75 (triple-engine) designed in 1937 by Ala Littoria and then, as it had also done for the Fiat G-12 designed in 1939, developed it into a triple-engined large-capacity carrier: the SIAI SM-82 Marsupial.

Japan drew directly on the Lockheed 14-Electra for building and improving its Kawasaki Ki-56. The Mitsubishi Ki was also originally a commercial aircraft belonging to the national airline Dai Nippon.

The Americans also took advantage of their civil and commercial aircraft for military purposes. The Lockheed C-56 Lodestar (a light

twin-engined aircraft) was simply model 18 of the Beech C-45 Expenditure derived from the commercial model B-185. The real spearhead of the United States airforce was the Douglas C-47 Skytrain, originally the famous DC-3 which revolutionised civilian transport in the thirties. More than 13 000 of this aircraft were produced; there were numerous variants (C-47 B and C-53 or Skytrooper; for towing gliders, parachuting) with a universal presence in all the allied airforces (known as the Dakota in the RAF). The firm McDonell Douglas had substantial success with the C-45 Skymaster, derived from the four-engined DC-4 designed in 1935, civil production of which was however halted in 1942, because of its very great military interest (11 000 aircraft in service, including the Sacred Cow, President Roosevelt's aircraft).

During the second half of the war, the Germans had only variable success in building military airlift aircraft. Thus the partial failure of the Ju-290 (a four-engined aircraft derived from the 1936 Ju-90) was partly due to the lack of materials (the aircraft was made of steel, wood and canvas). Conversely, the Messerschmit Me-323 (a six-engined carrier/glider with sufficient power to fly at high altitudes after assisted take-off) 198 of which were produced up to April 1944, was used intensively in the Mediterranean and on the eastern front for supplying troops cut off by Russian offensives.

The United States air force added two other aircraft to its collection in July 1942 to replace the Douglas DC-3. These were the Curtis C-46 Commando (3 200 aircraft) and the Lockheed C-69 Constellation.

The United Kingdom, although largely equipped with American aircraft, also continued home production. In 1943 and 1944, two military airlift aircraft were produced: the Armstrong Whitworth Albermarle and the Avro York.

Airlift gliders also played a major part in the second world war. Being silent and difficult to detect, they proved irreplaceable in operations involving the deployment of airborne troops. Thus, from 1942 the RAF built 3 655 Airspeed Horsa (each carrying 25 soldiers with equipment) and 412 Hamilcar General Aircraft (able to transport a 7-ton tank). The United States airforce increased production of its Waco CG-4A from 1942 (13 909 aircraft) a part of which was sup-

plied to the RAF under the name Hadrian, while Germany produced 1 528 Gotha GO-242 aircraft (each carrying 21 soldiers and their equipment).

The post-war period

The United States

The outcome of a study carried out during the war, the Fairchild C-82 Packet, suitable for parachuting troops and heavy material, came into service too late to be used in the fighting. Modernised and rechristened the C-119, it continued in service until the end of the seventies along with the twin-engined Fairchild C-132 Provider (1955). In the mid-fifties, Boeing started production of the KC-135, the first jet-propelled military airlift aircraft. 732 of these aircraft were built and used primarily for in-flight refuelling. On the strategic level, the Douglas C-124 Globemaster (1947), in active use until 1961, was overtaken in 1957 by the Douglas C-133 Cargomaster (turbo-prop) the first in its class able to transport the huge missiles of the fifties and itself overtaken in 1959 by the C-133B, more powerful and with greater load capacity (in service until the seventies). In the early sixties, Lockheed brought out the LC-141 Starlifter, a large four-engined aircraft intended for the military airlift service units. However, the American airlift aircraft which has provided the best replacement for the C-147 has been the Lockheed C-130 Hercules (a multi-purpose four-engined turboprop), the most widespread aircraft during the eighties. Almost 2 000 of these aircraft have been sold to date.

In 1975-1976, a short landing and take-off aircraft, the Boeing YC-14 (copied by the Russians with the An-72) came into production.

In January 1980 the C-X programme, which later became the C-17 Globemaster 3, began in the United States. This programme attempted to link the strategic and tactical fields and thus replace the C-141 (strategic) and the C-130 (tactical). The C-17 is fitted with four engines; the aircraft's size is close to that of the DC-10 (length: 53.4 m, wing span: 50.2 m). It has a maximum load of 80 tons and a range of 4 450 km. Pending entry into service of the C-17, modernisation of the existing C-141, C-5 and C-130 aircraft has been continued.

USSR-CIS

In the airlift race between the major powers, the USSR emerged with full honours. From the experience acquired in the production of the An-10 and An-12 (large four-engined turbo-prop planes for civil and military use), the huge An-22 was built from the designs of Oleg Antonov and exhibited at the Paris airshow as the heaviest ever built. Fifty of them were produced up to

1974 and brought into service by Aeroflot and the Soviet airforce. The Antonov 26 and Ilyushin Il-76T appeared in the late sixties. The first of these, although it had the same general appearance as the An-24, was an almost entirely new design of a multifunctional nature (cargo, parachute troop carrier, passenger carrier, ambulance craft). The Ilyushin Il-76T (four-engined, 1971), even further specialised and improved, can carry a forty-ton payload over a distance of 5 000 km in a flight time of less than six hours.

The Russians do not at present seem to have the means of developing a C-17-type programme; the Antonov An-400 Condor remains a rough equivalent of the Galaxy which dates back to 1969.

Intended to replace the An-12 airlift aircraft, the An-70 made its first flight in December 1994. The An-70, with its extremely innovative propulsion system (first aircraft in the world to be fitted with four high-speed fan turbojets), is built by a consortium which brings together 20 or so Ukrainian, Russian and Uzbek aeronautical firms.

Western Europe

In Europe, the major developer of airlift aircraft in the immediate post-war period was the RAF; its Handley Page Hastings (aircraft with four piston engines) built in two versions (C-1 in 1947 and C-2 in 1950) remained at the forefront in terms of strategic airlift, and then was employed in tactical operations during the sixties. In 1956 the Blackburn Beverley, the largest and more powerful piece of military equipment ever achieved in Great Britain (four-engined high wing aircraft with fixed landing gear) went into service with the RAF. During the sixties, new airlift aircraft such as the Britannia, the Argosy, VC-10 and Hercules were brought into service. January 1964 was marked by the take-off of the Short Belfast, a heavy payload carrier and the forerunner of the C-Mk 1 series.

The French Nord 2501 Noratlas (two-beam twin-engined) had its maiden flight on 27th November 1950 and remained in service for twenty years. 211 of these aircraft were built for the French army and 200 for the German airforce. More powerful versions derived from the Nord 2501 followed thanks to the addition of two wing-end turbojets (2502, 2504 and 2508). The latter had SNECMA Hercules radial engines which were replaced by American Pratt and Whitney engines. Collaboration between France and Germany began properly in 1959 with the Transall C-160 project (twin turbo-engined average-sized carrier; maiden flight on 25th February 1963), a programme which was resumed in 1976 in order to develop an improved and more powerful version (up-to-date electronic equipment, flight refuelling boom, increased tank capacity).

The Italian industry also tried to maintain a certain level of activity. It produced the AerItalia C-222 (multi-purpose triple-engined turbojet; 1970) and the G-222 SAMA (1976), two models which extended the 1964 American De Havilland DHC-5 Buffalo type aircraft.

Spain is also present in the area of tactical airlift with the CN-235 M (twin-turboprop commuter and utility transport). This joint Spanish-Indonesian project has been highly successful judging by the number of aircraft already sold in the world (more than 200 in over 20 countries) since 1987. The CN-235 also exists in a naval patrol and anti-submarine/anti-surface version known as "Persuader".

In the area of new programmes, the Future Large Aircraft (FLA) and the MRTT (multi-rôle tanker transport) is a very important factor not only for the maintenance and development of Europe's defence aeronautics capability but also for the political and defence implications. The FLA, supplied in airlift, refueller and marine patrol versions will give armed forces increased tactical, virtually strategic mobility without being dependent on American air support. The MRTT, a refueller to complement the FLA will provide the latter with an independent global range. The success of these two programmes, entrusted to the Airbus consortium will make a decisive contribution to strengthening the force projection capabilities of European armies in the next century.

APPENDIX II

Main design features of airlift aircraft

UNITED STATES

Strategic transport:

C-5 Galaxy (Lockheed)

- length overall: 75.54 m (247 ft 10 in)
- height overall: 19.85 m (65 ft 1 in)
- max payload: 118 387 kg (261 000 lb)
- max fuel weight: 150 815 kg (332 500 lb)
- max TO weight: 379 657 kg (837 000 lb)
- max zero-fuel weight: 288 030 kg (635 850 lb)
- max landing weight: 288 415 kg (635 850 lb)
- max level speed at 7 620 m: 919 km/h (571 mph)
- max cruising speed at 7 620 m: 888/908 km/h (552-564 mph)
- TO run: 3 697 m (12 000 ft)
- landing run, max landing weight: 725 m (2 380 ft)
- range with max payload: 5 526 km (3 434 miles)
- range with max fuel: 10 411 km (6 469 miles)

New programmes:

C-17 Globemaster III (Mc Donnell Douglas)

- length overall: 53.4 m (174 ft)
- height overall: 16.8 m (54 ft)
- max TO weight: 265 306 kg (585 000 lb)
- max payload: 78 109 kg (171 839 lb)
- TO run: 2 500 m (8 200 ft)
- landing run: 1 000 m (3 280 ft)
- range with max payload: 4 400 km (2 734 miles)
- cruising speed: 750-800 km/h (466-497 mph)

Tactical transport:

C-130 Hercules (Lockheed)

- length overall: 29.81 m (97 ft)
- height overall: 11.83 m (38 ft)
- empty weight: 33 673 kg (74 080 lb)
- max zero fuel weight: 53 230 kg (117 106 lb)
- max payload: 18 057 kg (39 725 lb)
- max TO weight: 79 379 kg (174 634 lb)
- max landing weight: 70 307 kg (154 675 lb)
- max fuel weight: 20 520 kg (45 240 lb)
- range with max payload: 3 791 km (2 356 miles)
- range with max fuel: 19 634 km (12 200 miles)
- landing run, with max landing weight: 697 m (2 300 ft)
- cruising speed: 550-600 km/h (341-372 mph)

C-141 Starlifter (Lockheed)

- length overall: 51 m (168 ft 4 in)
- height overall: 11.9 m (39 ft 3 in)
- range: 4 022 km (2 500 miles)
- thrust: 9 112 kg (20 250 lb)
- max TO weight: 145 395 kg (323 100 lb)
- ceiling: 12 424 m (41 000 ft)
- cruising speed: 800 km/h (500 mph)

Main design features of airlift aircraft

CIS

Strategic transport:

IL-76M/MD

- length overall: 46.59 m (152 ft 10 in)
- height overall: 14.76 m (48 ft 5 in)
- max payload: 48 000 kg (105 820 lb)
- max TO weight: 190 000 kg (418 875 lb)
- max level speed: 850 km/h (528 mph)
- cruising speed: 750-800 km/h (466-497 mph)
- TO speed: 210 km/h (131 mph)
- approach and landing speed: 220-240 km/h (137-149 mph)
- normal cruising height: 9 000-12 000 m (29 500-39 370 ft)
- TO run: 850 m (2 790 ft)
- landing run: 450 m (1 475 ft)
- max range, with reserves: 6 700 km (4 163 miles)

An-12

- length overall: 33.10 m (108 ft 7 in)
- height overall: 10.53 m (34 ft 6 in)
- weight empty: 28 000 kg (61 730 lb)
- max payload: 20 000 kg (44 090 lb)
- max TO weight: 61 000 kg (134 480 lb)
- max level speed: 777 km/h (482 mph)
- max cruising speed: 670 km/h (416 mph)
- landing speed: 200 km/h (124 mph)
- TO run: 700 m (2 300 ft)
- landing run: 500 m (1 640 ft)
- range with max payload: 3 600 km (2 236 miles)
- range with max fuel: 5 700 km (3 540 miles)

An-124

- length overall: 69.10 m (226 ft 8 in)
- height overall: 20.78 m (68 ft 2 in)
- max payload: 150 000 kg (330 693 lb)
- max fuel: 230 000 kg (507 063 lb)
- max TO weight: 405 000 kg (892 872 lb)
- max cruising speed: 865 km/h (537 mph)
- approach speed: 230-260 km/h (143-162 mph)
- landing run at max landing weight: 800 m (2 608 ft)
- range with max payload: 4 500 km (2 797 miles)
- range with max fuel: 16 500 km (10 255 miles)

20

An-22

- length overall: 57 092 m (190 ft)
- height overall: 12.53 m (41 ft)
- max payload: 80 000 kg (176 350 lb)
- max TO weight: 250 000 kg (551 160 lb)
- max level speed: 740 km/h (460 mph)
- TO run: 1 300 m (4 260 ft)
- landing run: 800 m (2 620 ft)
- range with max payload: 5 000 km (3 100 miles)
- range with max fuel: 10 950 km (6 800 miles)

New programmes:

An-70

- length overall: 39.9 m (130 ft)
- height overall: 16.1 m (52 ft)
- max payload : 35 000 kg (77 000 lb)
- cruising speed: 750-800 km/h (466-497 mph)
- T.O run: 1 370 m (4 466 ft)
- landing run with max landing weight: 1 010 m (3 292 ft)
- cruising altitude: 9 000-12 000 m (5 593-7 458 miles)

Main design features of airlift aircraft

WESTERN EUROPE

Tactical transport:

C-160 Transall

- length overall: 17 m (55 ft)
- height overall: 2.98 m (10 ft)
- max payload: 16 000 kg (35 200 lb)
- cruising speed: 536 km/h (333 mph)
- optimal distance: 1 500 km (932 166 miles)

New programmes:

FLA

- length overall: 41.3 m (134 ft)
- height overall: 14.4 m (46 ft)
- max payload: 30 000 kg (66 000 lb)
- cruising speed: 785 km/h (488 mph)
- max TO weight: 107 000 kg (235 400 lb)
- max zero fuel weight: 80 500 kg (177 100 lb)

G-222 (Italy)

- length overall: 22.70 m (74 ft 5 in)
- height overall: 9.80 m (32 ft 1 in)
- weight empty: 14 590 kg (32 165 lb)
- max payload: 9 000 kg (19 840 lb)
- max fuel load: 9 400 kg (20 725 lb)
- max T.O weight: 28 000 kg (61 730 lb)
- max landing weight: 26 500 kg (58 420 lb)
- max zero fuel weight: 24 400 kg (53 790 lb)
- max level speed at 40 575 m: 540 km/h (336 mph)
- T.O run: 662 m (2 172 ft)
- landing run at max landing weight: 545 m (1 788 ft)
- range with max payload: 1 371 km (852 miles)

CN-235 M (Spain)

- length overall: 21 353 m (70 ft)
- height overall: 8 177 m (26 ft 10 in)
- weight empty: 8 600 kg (18 960 lb)
- max payload: 5 000 kg (11 025 lb)
- max fuel: 4 230 kg (9 325 lb)
- max TO. weight: 15 100 kg (33 290 lb)
- max landing weight: 15 050 kg (33 180 lb)
- max zero fuel weight: 13 600 kg (29 980 lb)
- max cruising speed at 3 050 m: 452 km/h (280 mph)
- TO run: 554 m (1 818 ft)
- landing run: 286 m (939 ft)
- landing run at max landing weight: 1 240 km (771 miles)

APPENDIX III

Aircraft carrier fleets of European countries, members of NATO

GERMANY

Aeroplanes:
C-160 (Transall): 85
B 707-320C: 4
Tu-154: 2
A-310: 3
VFW-614: 3
CL-601: 7
L-410S: 4

Helicopters:
UH-1D: 104
Mi-8S: 6

BELGIUM

Aeroplanes:
C-130H: 12
B-727QC: 2
HS-748: 3
Merlin IIIA: 5
Falcon 20: 2
Falcon 900: 1

DENMARK

Aeroplanes:
C-130H: 3
Gulfstream III: 3

SPAIN

Aeroplanes:
C-130H: 7
C-212: 32
CN-235: 18
AS-332: 6
B707: 3
Falcon 20: 5
Falcon 50: 1
Falcon 900: 2

22 **FRANCE**

Aeroplanes:
DC-8F: 4
A310-300: 2
C-160/-160NG: 61
C-130, C-130-H: 15
DH-6: 10
EMB-121: 4
CN235: 8
Falcon 20: 7
Falcon 50: 4
Falcon 900: 2
MS-760: 25
TBM-700: 12
N-262: 23

Helicopters:
SA-330: 26
SA-365: 3
AS-332: 7
AS-355: 30

GREECE

Aeroplanes:
C-130H: 10
C-130B: 7
YS-11: 6
C-47: 4
Do-28: 12
Gulfstream: 1

Helicopters:
AB-205A: 14
AB-212: 4

ICELAND

Aeroplanes:
(nil)

ITALY

Aeroplanes:
G-222: 40
C-130H: 12
Gulfstream III: 2
Falcon 50: 4
PD-808: 18
B-707-320: 2

Aircraft carrier fleets of European countries, members of NATO

LUXEMBOURG

Aeroplanes:
(nil)

UNITED KINGDOM

Aeroplanes:
VC-10: 25
Hercules: 61
Tristar K-1: 2
Tristar C-2: 3

NORWAY

Aeroplanes:
C-130H: 6
Falcon 20C: 3
DHC-6: 3
Helicopters:
Bell 412 SP: 18

TURKEY

Aeroplanes:
C-130: 13
C-160D: 19
CN-235: 22
Gulfstream: 12
Citation: 2


NETHERLANDS

Aeroplanes:
F-27: 14
C-130H-30: 2
DC-10-30: 2

PORTUGAL

Aeroplanes:
C-130H: 6
C-212: 22
Falcon 20: 1
Falcon 50: 3
Helicopters:
SA-316: 21
SA-330: 10

Source: Military Balance 1995-96; IISS 1995

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