Advanced Regional Jet for the 21 Century
ARJ21-700 Aircraft

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Program Introduction

ARJ21 (Advanced Regional Jet for the 21st Century) is the first passenger jet developed and indigenously produced by the People's Republic of China. The baseline model -700 has 78-90 seats, and is the first project for Commercial Aircraft Corporation of China (COMAC). Now it is at the stage of flight testing and certification. Cooperating closely with suppliers like GE, Honeywell and Rockwell Collins, COMAC strictly followed the certification procedures and standards of FAA, EASA and CAAC in order to design an aircraft aiming for a domestic and oversea market.
Domestic Market Demands

A 90 Seat Regional Jet, the First Aircraft from COMAC

ARJ21 - range and seats

China is a large country with sparse distributed Cities in the large western area. There is strong market demands for air transportation.
Domestic Market Demands

China population is mainly located in the middle and coast area. Western area is large but has less population, so it demands regional jet for travel.

China land is more than 30% occupied by plateau, so the high altitude airport request is one of important design point.
Domestic Market Demands

China railway is mainly concentrated in the eastern area and western area is difficulty to build railway. The air transportation is the best solution.

Principles for the Program

- Based on market demands;
- Compliance of certification standards (CAAC, FAA and EASA);
- Competitive on operation economy and passenger comfort with similar aircraft;
- Fully consider the operation environment in the western area of China,
especially the plateau & hot airports.
Orders

240 confirm and intent orders of ARJ21 have been placed from 10 customers.

Aviation Foundation in China

China aviation industry has 60 years history for aircraft manufacture and development. It has delivered more than 20,000 aircraft and helicopters. There are more than 200 companies and research centers in China.
Aviation Foundation in China

The first commercial aircraft (Y-10) developed in Shanghai China began from 1970s, and its main manufacturer is preexistence of COMAC.

Project Development Model

Close cooperation between COMAC and international suppliers
Program Milestone

ARJ21-700 has done more than 700hrs flight tests. The results have shown that performances have reach its main targets.

Flight Test
Aircraft Overview

Brief Description

- A middle/short-range regional jet.
- Aircraft configuration: single low wing, two aft-fuselage mounted engines, T-tail, tricycle retractable landing gears, supercritical aerofoil, integrated winglet.
- **Control-by-wire** flight control system.
- ARJ21-700 is the base type of ARJ21 series. ARJ21-700 has two configurations: standard range (STD) and enhanced range (ER).
Aircraft Dimensions

<table>
<thead>
<tr>
<th>Aircraft Dimension</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wing Span</td>
<td>27.288 m</td>
</tr>
<tr>
<td>Length Overall</td>
<td>33.464 m</td>
</tr>
<tr>
<td>Height Overall</td>
<td>8.442 m</td>
</tr>
<tr>
<td>Wing Area</td>
<td>79.86 m²</td>
</tr>
<tr>
<td>Wing Sweep Angle</td>
<td>25°</td>
</tr>
<tr>
<td>Track</td>
<td>4.68 m</td>
</tr>
<tr>
<td>Wheel Base</td>
<td>14.878 m</td>
</tr>
<tr>
<td>Max. Fuel Capacity</td>
<td>13231 Liters</td>
</tr>
</tbody>
</table>

Cabin Layout

90 Seat Single Class
at 31 Inch Pitch
- G1, G2: Galley
- L1: Fwd. Lavatory
- L2: Aft Lavatory
- P: Power Center
- A1: Fwd. Attendant Seat
- A2: Aft. Attendant Seat
- S1: Stowage

78 Seat Mixed Class
- G1, G2: Galley
- L1: Fwd. Lavatory
- L2: Aft Lavatory
- P: Power Center
- A1: Fwd. Attendant Seat
- A2, A3: Aft. Attendant Seat
- S1, S2: Stowage
- W: Wardrobe
### ARJ21-700 Design Weights

<table>
<thead>
<tr>
<th></th>
<th>ARJ21-700STD</th>
<th>ARJ21-700ER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Standard</td>
<td>Extended Range</td>
</tr>
<tr>
<td>Operating Empty Weight (kg/lb)</td>
<td>24955 / 55017</td>
<td>24955 / 55017</td>
</tr>
<tr>
<td>Max. Take-Off Weight (kg/lb)</td>
<td>40500 / 89288</td>
<td>43500 / 95902</td>
</tr>
<tr>
<td>Max. Landing Weight (kg/lb)</td>
<td>37665 / 83038</td>
<td>40455 / 89188</td>
</tr>
<tr>
<td>Max. Zero-Fuel Weight (kg/lb)</td>
<td>33890 / 74715</td>
<td>33890 / 74715</td>
</tr>
<tr>
<td>Max. Payload (kg/lb)</td>
<td>8,935 / 19,698</td>
<td>8,935 / 19,698</td>
</tr>
<tr>
<td>Max. Usable Fuel (kg/lb)</td>
<td>10,386 / 22,897</td>
<td>10,386 / 22,897</td>
</tr>
<tr>
<td>Standard Seating Capacity</td>
<td>90</td>
<td>90</td>
</tr>
</tbody>
</table>

### ARJ21-700 Flight Performance

<table>
<thead>
<tr>
<th></th>
<th>ARJ21-700STD</th>
<th>ARJ21-700ER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Cruise Speed</td>
<td>M0.80</td>
<td>M0.80</td>
</tr>
<tr>
<td>Normal Cruise Speed</td>
<td>M0.78</td>
<td>M0.78</td>
</tr>
<tr>
<td>Initial cruise Altitude</td>
<td>35000 ft</td>
<td>35000 ft</td>
</tr>
<tr>
<td>Take-off Field Length</td>
<td>1,700 m</td>
<td>1,900 m</td>
</tr>
<tr>
<td>Landing Field Length</td>
<td>1,600 m</td>
<td>1,700 m</td>
</tr>
<tr>
<td>One Engine out Ceiling</td>
<td>6,200 m</td>
<td>6,200 m</td>
</tr>
<tr>
<td>Range with 90 Pax.</td>
<td>1,200 nm</td>
<td>2,000 nm</td>
</tr>
</tbody>
</table>
Baggage / Cargo Compartment

Under-floor Baggage / Cargo Compartment Volume:
Front Compartment Volume: 14.643 m³ / 517.1 ft³
Rear Compartment Volume: 5.502 m³ / 194.3 ft³
Total Volume: 20.145 m³ / 711.4 ft³

Emissions and Noise

CF34-10A Emissions and Noise

ICAO CAEP/4 standards: Applicable for new engine certification after 2003
**Aircraft Features**

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**Excellent Comfort**

**Cabin Cross Section**

The cabin of ARJ21-700 offers trunk liner’s comfort and large cargo compartment volume.
Excellent Comfort

Cabin

Business Class

Economy Class

Passenger Service Unit

Excellent Comfort

Flight Deck

Pilot’s Seat

Control Wheel & Pedal
Excellent Comfort

**Galleys and Lavatory**

**GALLEY G1**
- 2 half carts, 2 ice drawers, 2 coffee makers, 1 water boiler,
- Sink / water spigot, Waste flap / container, liquid containers and
  misc. compartments

**GALLEY G2**
- 3 full carts, 2 ovens and
  misc. compartments

**LAVATORY**
- Take latest design trend and implement,
- simple, clean, bright & maximum comfort with soft arc line.

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Advantageous Economy

At 2009 Chinese economic conditions, the DOC of ARJ21-700 is 8%
lower than its competitors.

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ARJ21-700 DOC analysis (Stage Distance: 500nm)

Fuel (42%) 36%

Maintenance (10%) 10%

Taxiing (Nei gi) (2%) 2%

Airport (Round trip) (14%) 14%

Ground handling (Qatari) (3%) 3%

NAV (Operate) (2%) 2%

Donates (Outward) (25%) 25%

Other (Outward) (10%) 10%
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ARJ21-700 COMAC PROPRIETARY
Outstanding Environment Friendliness

ARJ21(STD) Emission Prediction

Specific Technologies
Specific Technologies

Advanced technologies like CFD simulations have been extensively applied in designing the ARJ21-700 aircraft, significantly reducing the time and cost of the product development. Meanwhile, by increasing the fuselage width and using advanced systems (flight control/avionics/illumination system, etc), the comfortableness of the passengers has been greatly improved. All these features effectively make the ARJ21-700 much more advantageous than its competitors.

Aerodynamics

Extensive CFD Applications

Wing Design: Integrated wing/engine design enhanced high speed aerodynamic efficiency.
Aerodynamics

High-lift Device Design

Cruise: 0° Take-off: 15° Landing: 40°

Winglet Optimization

Original winglet has flutter problem and high structure weight.

Optimized winglet has smaller size and weight, no flutter problem, and maintains the same aerodynamic performance.
Aerodynamics

Engine Inlet Flow Field Distortion

Short fuselage layout        long fuselage layout
Aerodynamics

Inlet Total Pressure with Different Fuselages

Original IDC = 5.88%  Optimized IDC = 5.0%

Lower distortion index after optimization

Aerodynamics

Significant improvement on deep stall characteristic
## Aerodynamics

### Wind Tunnel Test

<table>
<thead>
<tr>
<th>Layout Design Phase</th>
<th>Detailed Design Phase</th>
<th>Manufacture Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>2003</td>
<td>2004</td>
</tr>
<tr>
<td>2005</td>
<td></td>
<td>2006</td>
</tr>
<tr>
<td>2007</td>
<td>2008</td>
<td></td>
</tr>
</tbody>
</table>

### Wind Tunnel Test

![Wind Tunnel Test Image](image)

ARJ21-700 COMAC PROPRIETARY
Aeroelastic Wind Tunnel Test

Full Scale Static Test
Fatigue & Damage Tolerance Test

Stringer fitting fatigue test

Iron Bird Bench Test
E3 Test

Full Scale Pressurization
Tightness / Rain Test
Corresponding to the advanced 3D digital analogy design method used in ARJ21-700 project, a majority of physical mock-up is replaced by digital mock-up.
The PDM and ERP system have introduced in ARJ21 design and manufacture process and concurrent engineering has been used in development to accelerate the development.
Advanced Avionics System

- Pro Line 21 is a cost effective advanced technology avionic system based on proven airline experience
- It offers system growth and flexibility
- Ethernet based avionics system LAN, its network standard is the same on latest trunk liner.

Electrical Power System

- As a critical system, the quality and reliability of power supply directly affect the performance of the whole aircraft.
- Electrical power system employs constant speed constant frequency generator, ram air turbine (RAT) generator, and no-disruption power supply switch.
- These advanced technologies significantly improve the reliability and safety of electrical system.
- The electrical power supply system has reliable and high-margin power generation, automatic power distribution, trouble diagnosis, status self-examination and warning functions.
Summary

• ARJ21-700 is the first passenger jet developed by COMAC.

• It serves the short/medium range routes with 78-90 seats.

• The program is now on the certification stage as scheduled.

• We expect it to be a success.

Thank you!