

Operational Excellence

by Airbus

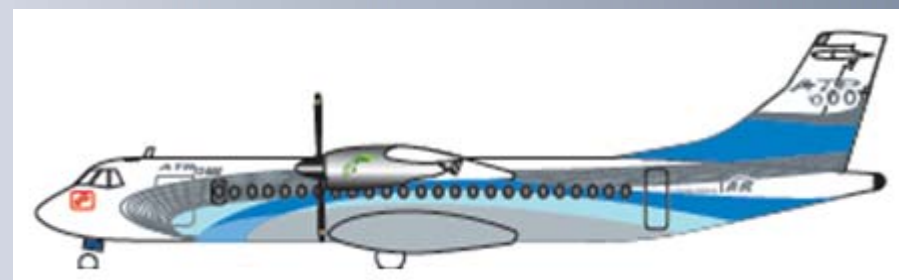
ATR FAL Russia *Industrial Feasibility Study*

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Industrial Strategy Integration - OEYA

Didier GERVAIS

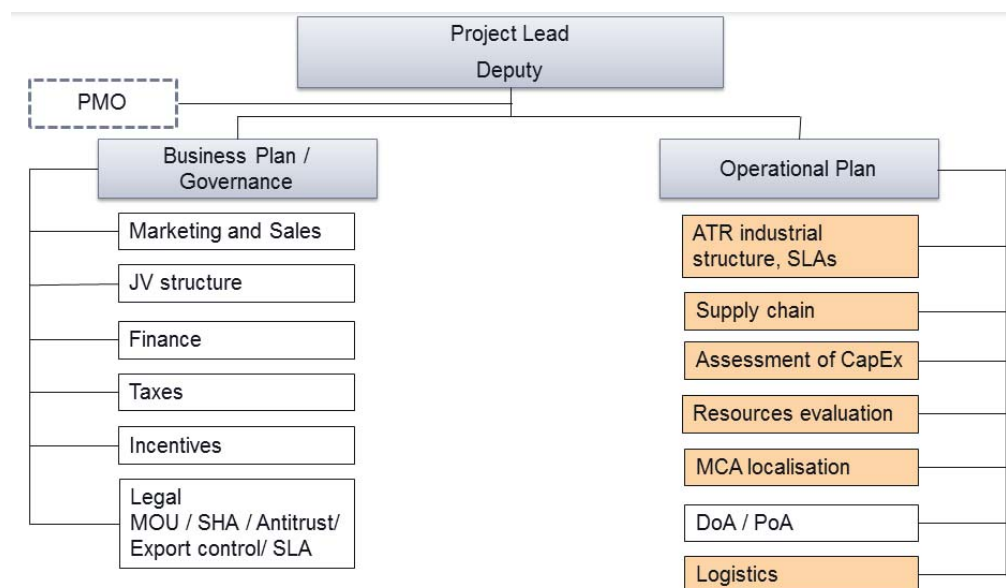
Diversification Programmes - BZY



RUS FAL – Context

Introduction

- MoU signed on August 28th, 2013 between Airbus and Rostec to evaluate the possibility of setting-up an ATR final assembly line in Russia
- Airbus Project Organisation



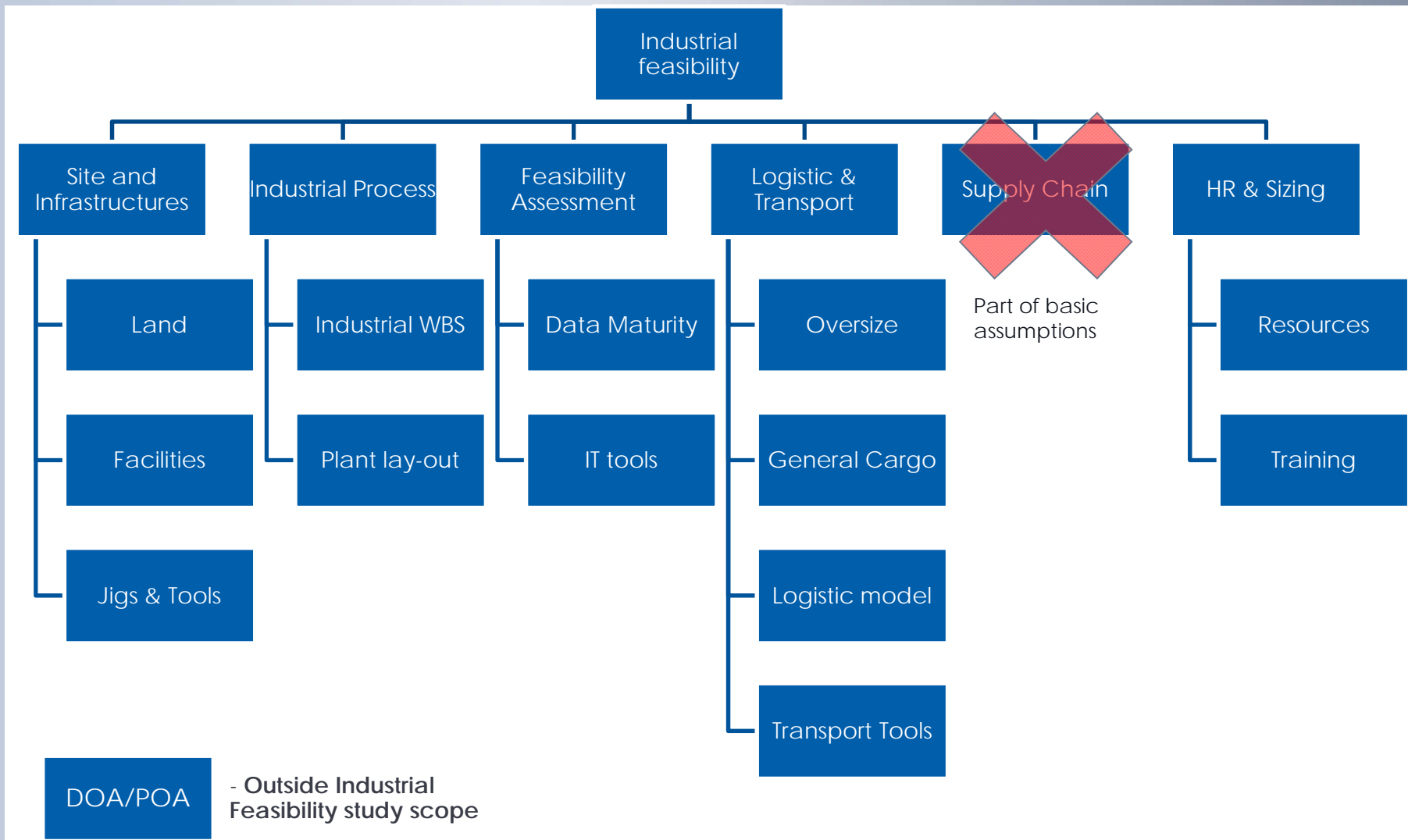
- Scope of the document : industrial feasibility study

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RUS FAL – Industrial Feasibility WBS

WBS



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RUS FAL – Industrial Feasibility WBS

Deliverables

	Site and Infrastructures	Industrial Process	Feasibility Assessment	Logistic & Transport		HR & Sizing
Deliverables	<ul style="list-style-type: none"> -Facilities definition -Surface required -List of tools 	<ul style="list-style-type: none"> -Plant lay-out - Industrial WBS 	<ul style="list-style-type: none"> - FAL technical data assessment - IT tools mapping 	<ul style="list-style-type: none"> -Transport plan - Logistic model - Tools 		<ul style="list-style-type: none"> - Resources (BC/WC/Expat) - Training plan - Learning curve - Org chart
Business Case inputs	<ul style="list-style-type: none"> - Cost (CAPEX) 		<ul style="list-style-type: none"> - Cost (NRC+RC) 	<ul style="list-style-type: none"> - Cost (NRC+RC) 		<ul style="list-style-type: none"> - Cost (NRC+RC) - Resources curve
Macro Planning	Master Schedule – Risk Assessment					

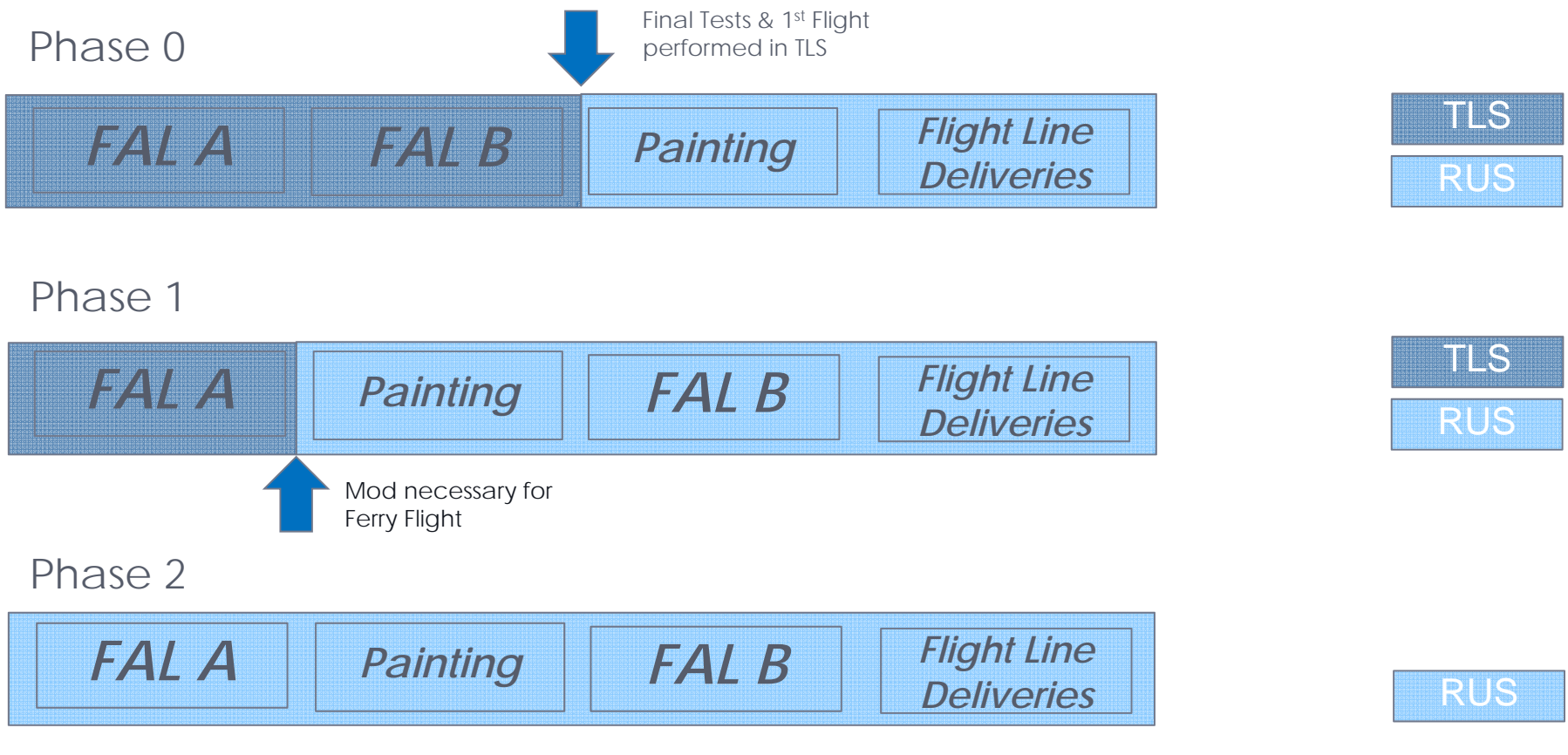
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RUS FAL – Industrial Approach

Basic Assumptions

To minimise risks and demonstrate industrial capability a stepped de-risking approach is proposed:
 Phase 0 → Phase 1 → Phase 2



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RUS FAL – Assumptions Overview

- Jigs and Tools for FAL RUS are a copy of ATR FAL TLS
 - No new tools development
 - No merge of existing stations – No change in industrial process*
- FAL preparation work is done by ATR GIE
 - Permanent back-office for activities under ATR DOA in TLS
- Only “clean” MCA delivered to FAL RUS
 - Pre-FAL activities done in TLS prior kitting & shipping to RUS
- Kitting of all parts is done in TLS for shipping to Ulyanovsk
 - including MCA, Equipment and Cabin Furnishing
 - Engines shipped directly to Russia by P&W
- ATR/EADS/AA Supply Chain capable of rate 100 current 2016
 - Ramp-up to 90 ship-sets by end of 2014

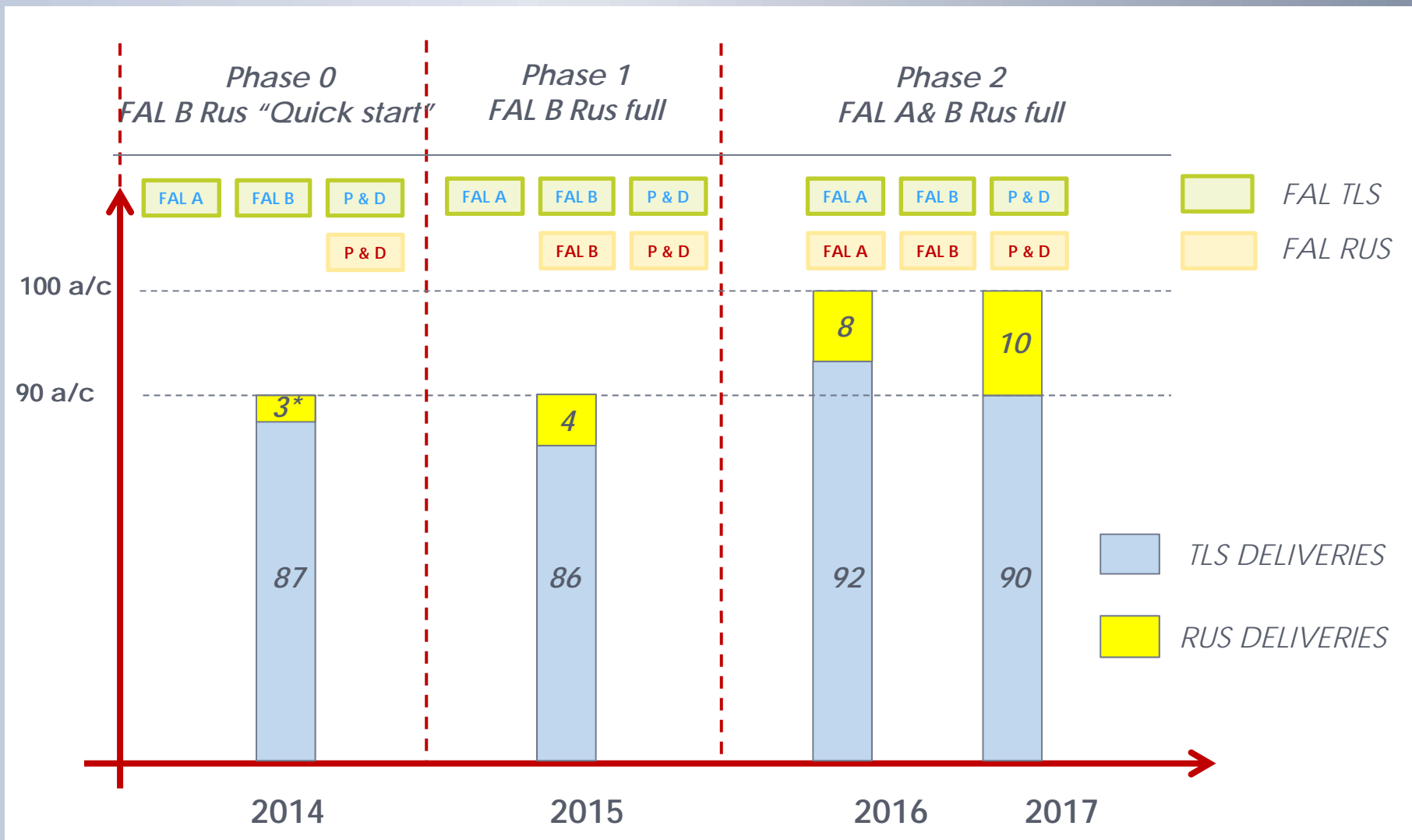
* Except minor deviation in Phase 1

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RUS FAL - Capacity Rate Assumptions

Basic Assumptions



* Slots subjects to prior sales

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RUS FAL – Industrial Feasibility study

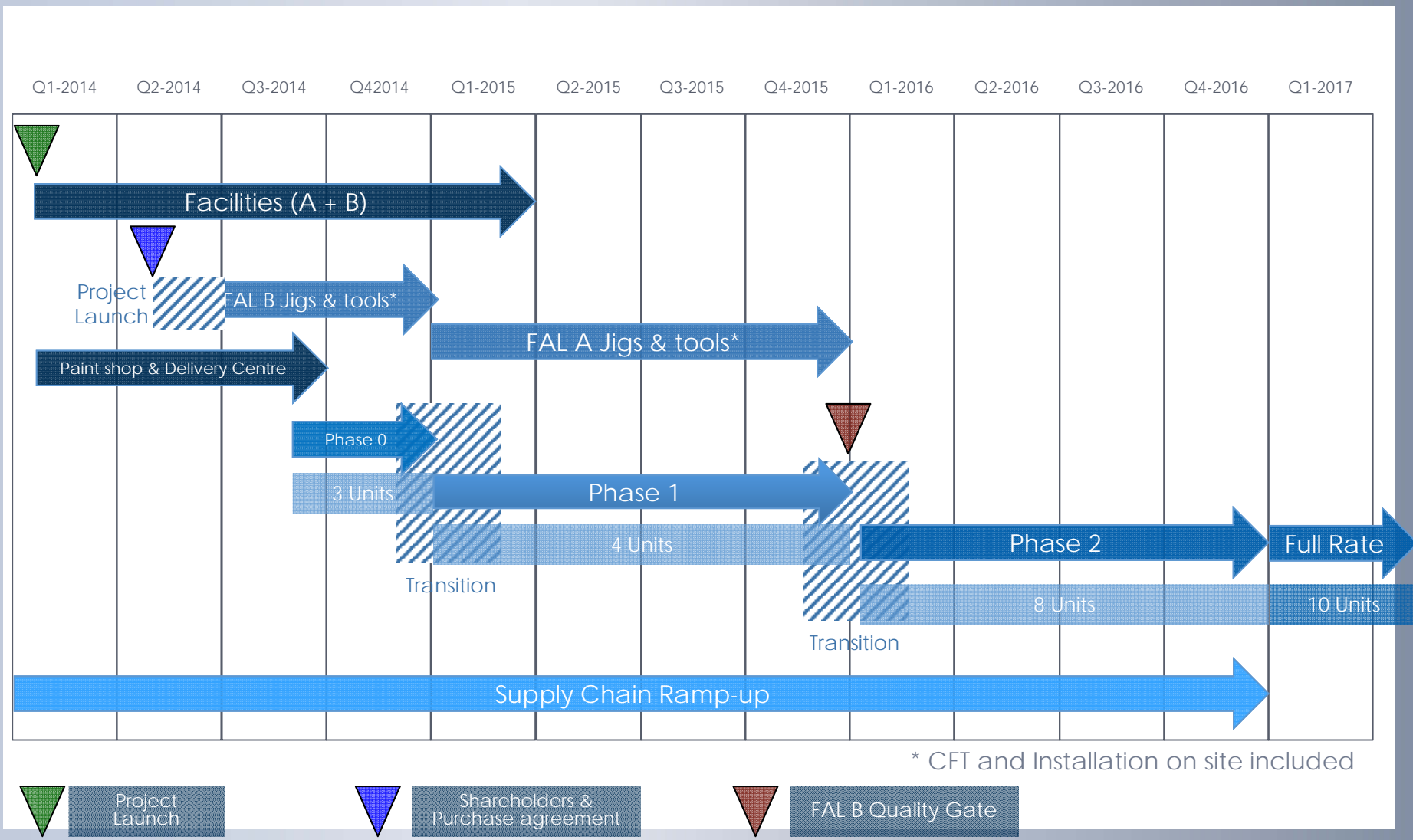
Master Schedule

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RUS FAL - Planning

Master Schedule



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RUS FAL – Industrial Feasibility study

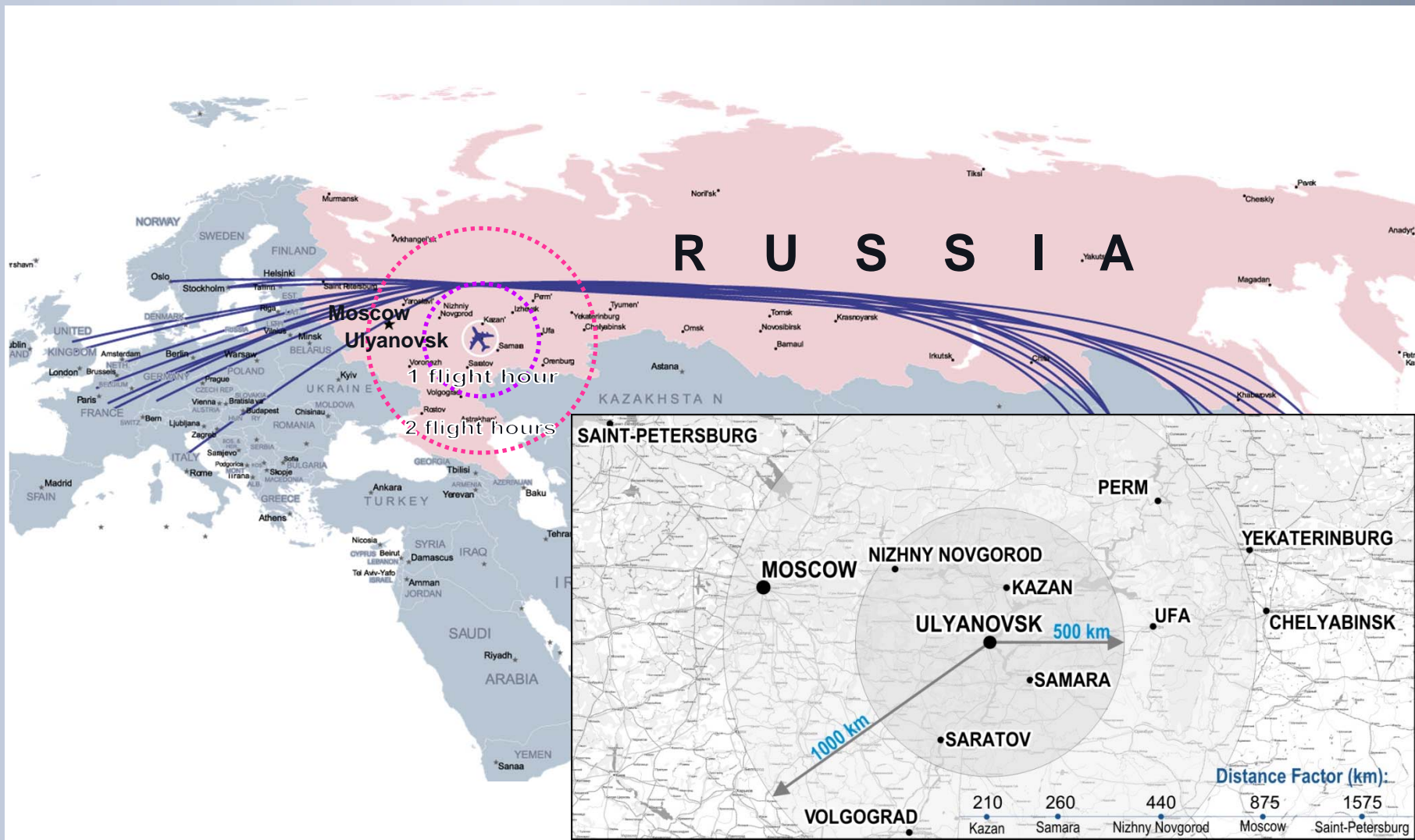
Site and Infrastructures

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RUS FAL – Ulyanovsk SPEZ location

Site and Infrastructures



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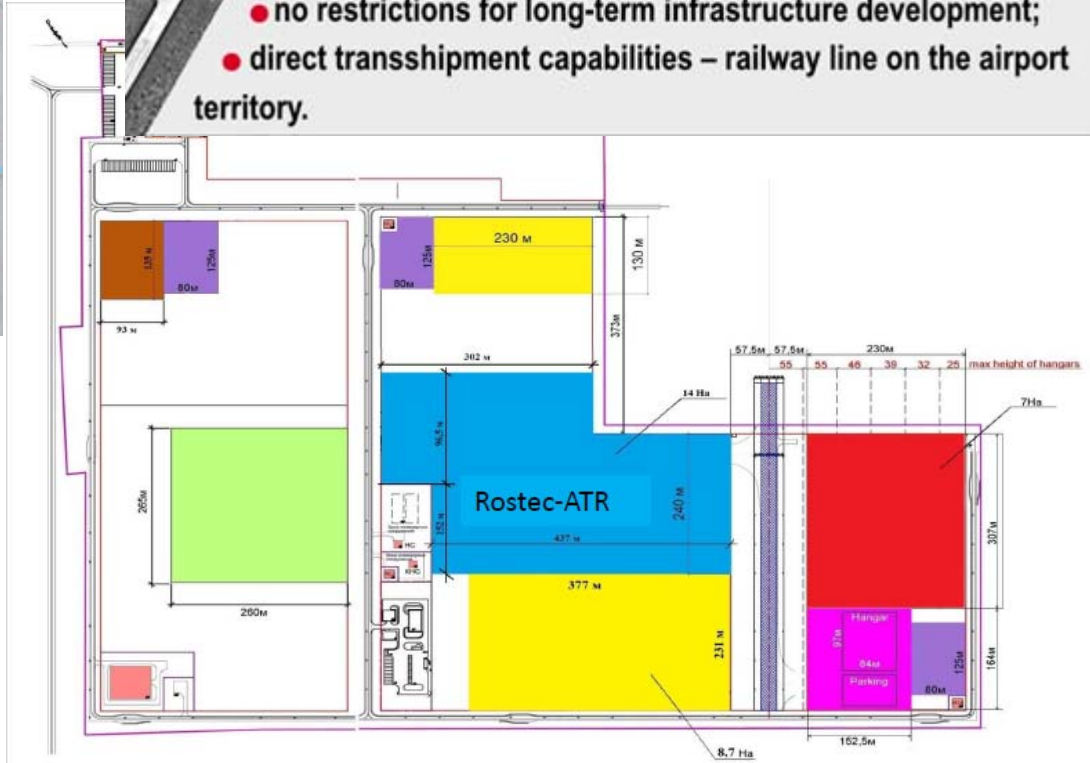
RUS FAL – Land & Facilities

Site and Infrastructures



Ulyanovsk-Vostochny International Airport

- unique 5,100 m long, 105 m wide runway;
- capable to accept all aircraft types;
- capacity: up to 40 aircraft per hour;
- no restrictions for long-term infrastructure development;
- direct transshipment capabilities – railway line on the airport territory.

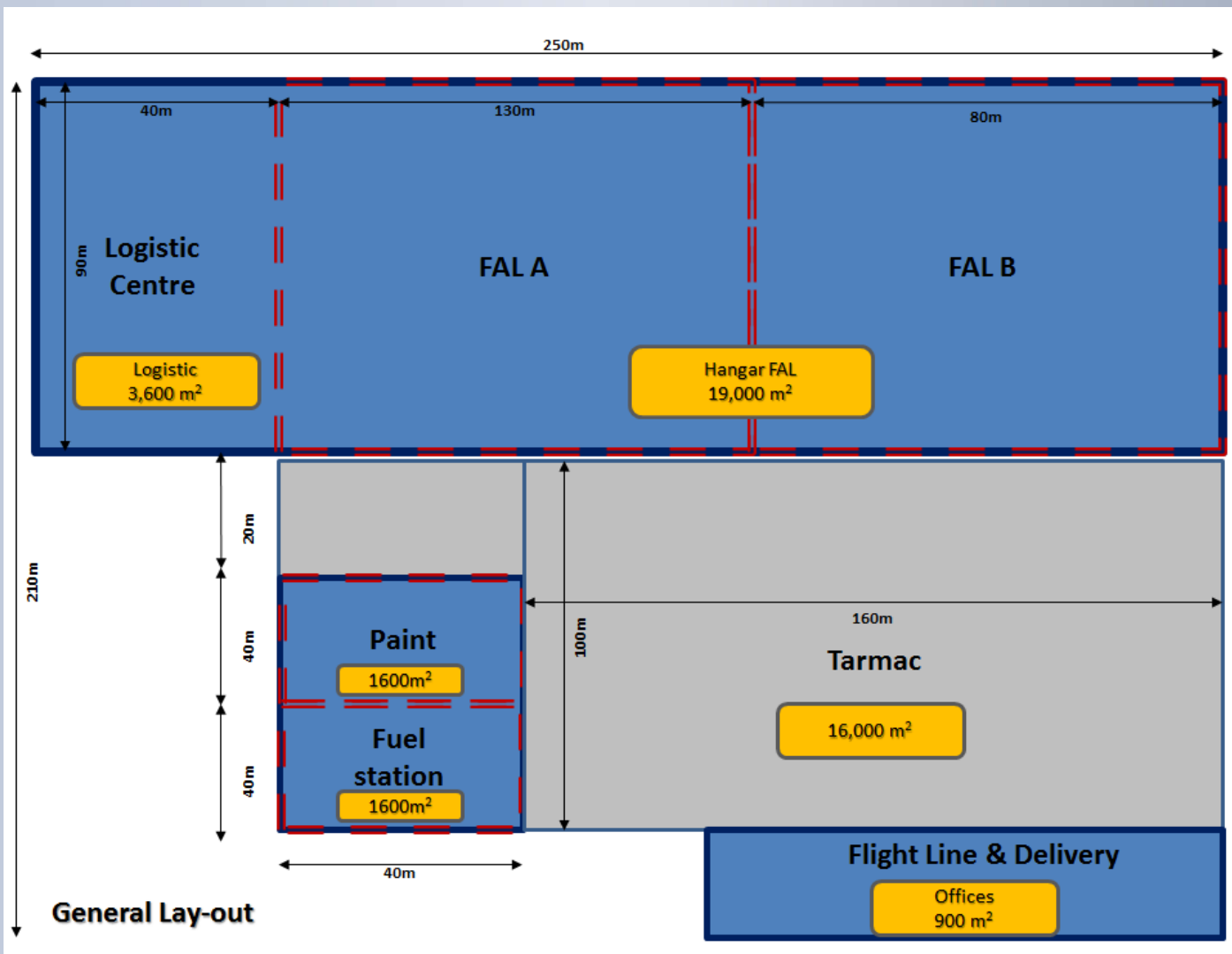


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Site and Infrastructures

RUS FAL – Land & Facilities



FAL	19,000 m ²
Logistic	3,600 m ²
Paint	1,600 m ²
Delivery	900 m ²
Total	25,100 m²
Fuel Station	1,600 m ²
Tarmac	16,000 m ²

Facilities sized for Rate 20 p.a. maximum

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RUS FAL – Land & Facilities CAPEX

Site and
Infrastructures

No.	Building / facility of ATR FAL RUS	Qty	Cost estimation CoC IFF	Comment
1	Final Phase Hangar		0.00 Mio.\$	Part of FAL facilities
2	Run Up Facility		1.50 Mio.\$	Rented in the 1st phase of the project
3	Gauging Area		0.00 Mio.\$	It can be done in FAL B Hangar
4	Fuel Station		2.50 Mio.\$	Estimation - Service can be provide by Airport
5	Garosolve / Hydraulic		0.00 Mio.\$	Not necessary
6	Delivery Center		1.60 Mio.\$	Includes Periport
7	Periport		0.00 Mio.\$	See Delivery Centre
8	Weighing Hangar		0.00 Mio.\$	Can be performed in FAL Hangar
9	FAL Hangar		43.00 Mio.\$	19 000 sqm at 2300 \$ / sqm
10	Paintshop		10.50 Mio.\$	Paint tools included
11	VTP		0.00 Mio.\$	Included in Paint shop
13	Powerhouse		15.00 Mio.\$	For Heating / Air conditioning - ROM Estimation
14	Service Building		0.00 Mio.\$	De-icing station - Fire Brigade services provided by Ulyanovsk Airport
15	MCA Hangar		0.00 Mio.\$	Part of Logistic centre
16	Logistic Center		7.00 Mio.\$	Integrated into FAL building - 3500 sqm at 2300 \$ / sqm
17	ASSC		Mio.\$	
18	Restaurant & Medical		1.30 Mio.\$	100 people / 600 sqm
19	Training Center		0.00 Mio.\$	All training in TLS
20	Main Gate		1.50 Mio.\$	500 sqm @ 2900 \$ / sqm
21	Offices		1.50 Mio.\$	Integrated in Fal building & Delivery Centre
22	Quay Facility		2.00 Mio.\$	To be checked depending on transportation concept (river)
23	Infrastructures		35.00 Mio.\$	5 M\$ Taxi out, paving - 1 M\$ Parking - Miscellaneous infrastructures
	ATR Kitting Centre (TLS)		0.30 Mio.\$	Adaptation costs
	Construction Costs		122.7 Mio.\$	
	Risks	10%	12.27 Mio.\$	
	CoC IFF Global Secondary Cost	0%	0.00 Mio.\$	
	Secondary cost / Design fees	0%	0.00 Mio.\$	
	TOTAL		135.0 Mio.\$	

Assumptions:

Rate 10 - Potential for rate 20
ATR42 & ATR72 Flex
No cost for Land

Total IFF Investment: 135 M\$

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RUS FAL – Jigs and Tools

Site and
Infrastructures

Investment	Title	2013 K\$	Comments
FAL ATR RUS Set Up (max. rate 20 ATR 42/72)	Logistic Jigs and Tools	2,250	Estimate by OET
	Station 50	9,000	Validated by CFT in progress
	Station 47		
	Station 45		
	Station 25		
	Station E1		
	Station E3		
	Customisation tools (FAL B)	6,000	Estimate
	Flight line and FAL mobile test equipment (GSE)	3,750	Estimate based on A320 FAL-US (rate 4)
	Paint Shop tools	-	Included in Paint Shop costs
	Small Items	1,500	Estimate based on A320 FAL-US (rate 4)
Catalogue Items incl. Initial set up consumables	10,000	Estimate based on A320 FAL-US (rate 4)	
Total New FAL		32,500	

Note: 2 WP stations equipment included

Total J&T Investment: 32,5 M\$

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RUS FAL – Industrial Feasibility study

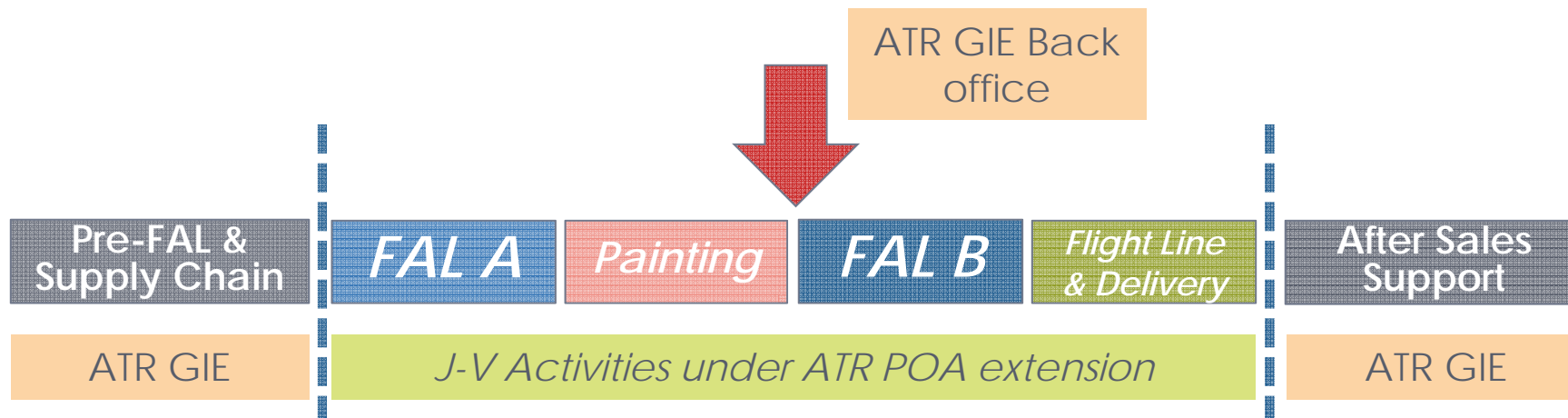
Industrial Process

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RUS FAL – Industrial process

▪ FAL Industrial Process macro view



Assembly & Initial Tests

- MCA Assembly
- Electrical rack installation
- HTP / VTP assembly
- Engines installation
- Nacelle installation
- Preliminary test

Customisation & Test

- Overhead Bin
- Windows panels
- Seats
- Carpet
- Final Tests

Note: Painting activity sub-contracted

RUS FAL - Industrial Cycle

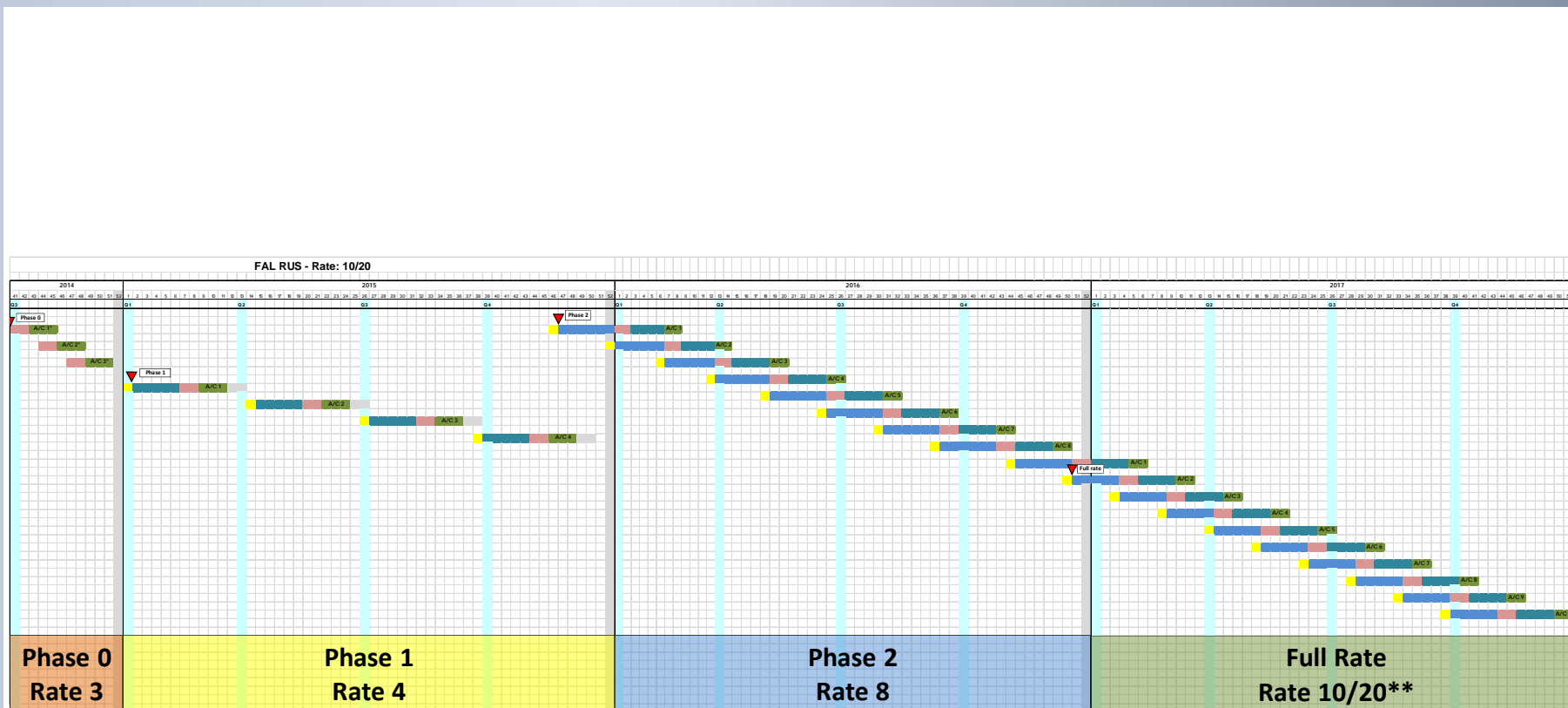
Phase "0"	Paint	FL&D			Total		Buffer
	2 weeks 10 wd	3 weeks 15 wd			5 weeks 25 wd		
Phase "1"	FAL B	Paint	FL&D			Total	Handling
	5 weeks 25 wd	2 weeks 10 wd	3 weeks 15 wd			10 weeks 50 wd	1 week 5 wd
Phase "2"	FAL A		Paint	FAL B	FL&D	Total	
	6 weeks 30 wd		2 weeks 10 wd	4 weeks 20 wd	2 weeks 10 wd	14 weeks 70 wd	
Full Rate	FAL A		Paint	FAL B	FL&D	Total	
	5 weeks 25 wd		2 weeks 10 wd	4 weeks 20 wd	2 weeks 10 wd	13 weeks 65 wd	

Note: No outstanding work considered in FAL cycle (cfr. Basic Assumptions)

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RUS FAL – Production Planning



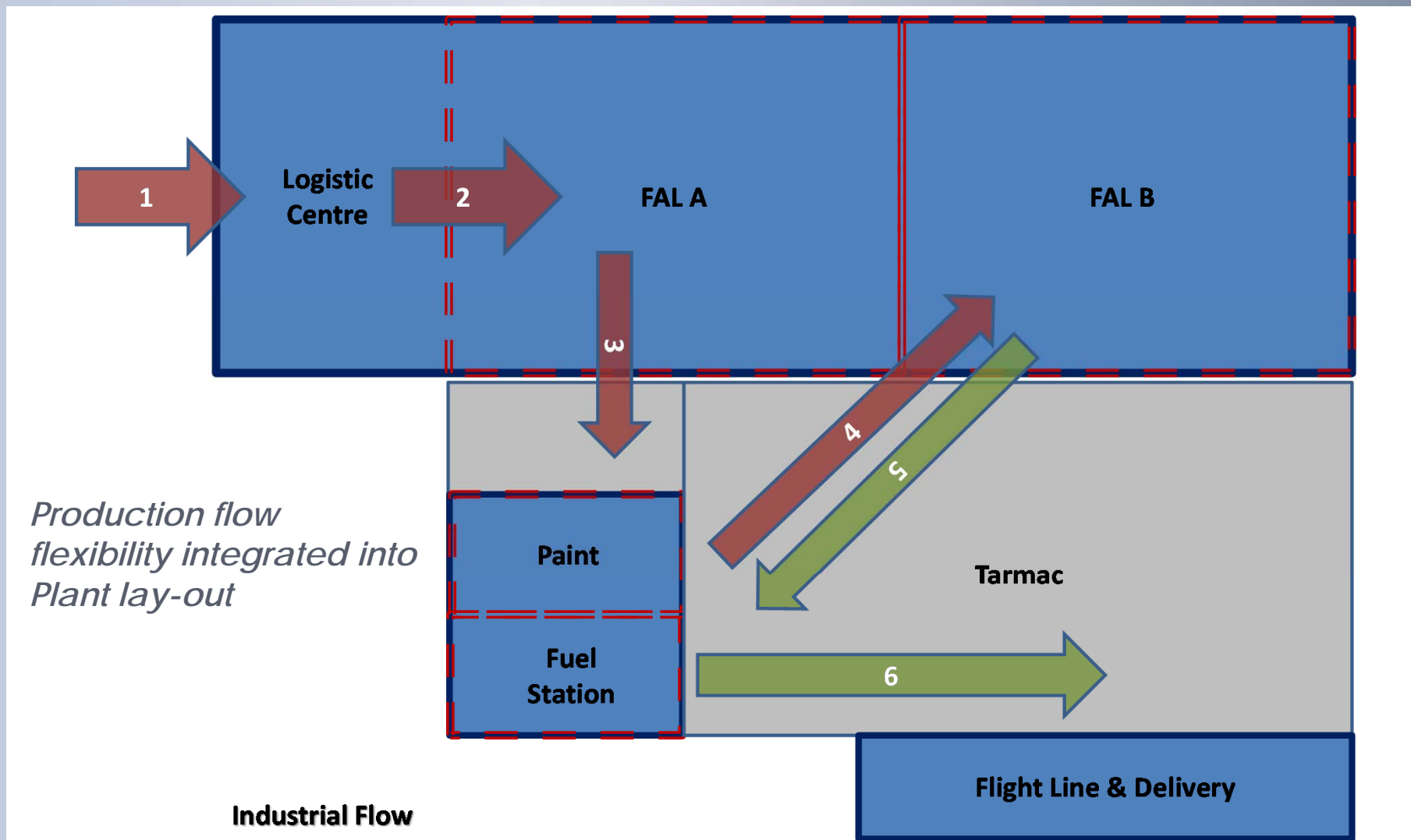
*** Rate 20 achieved with 2 Shifts*

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RUS FAL – Plant Industrial flow

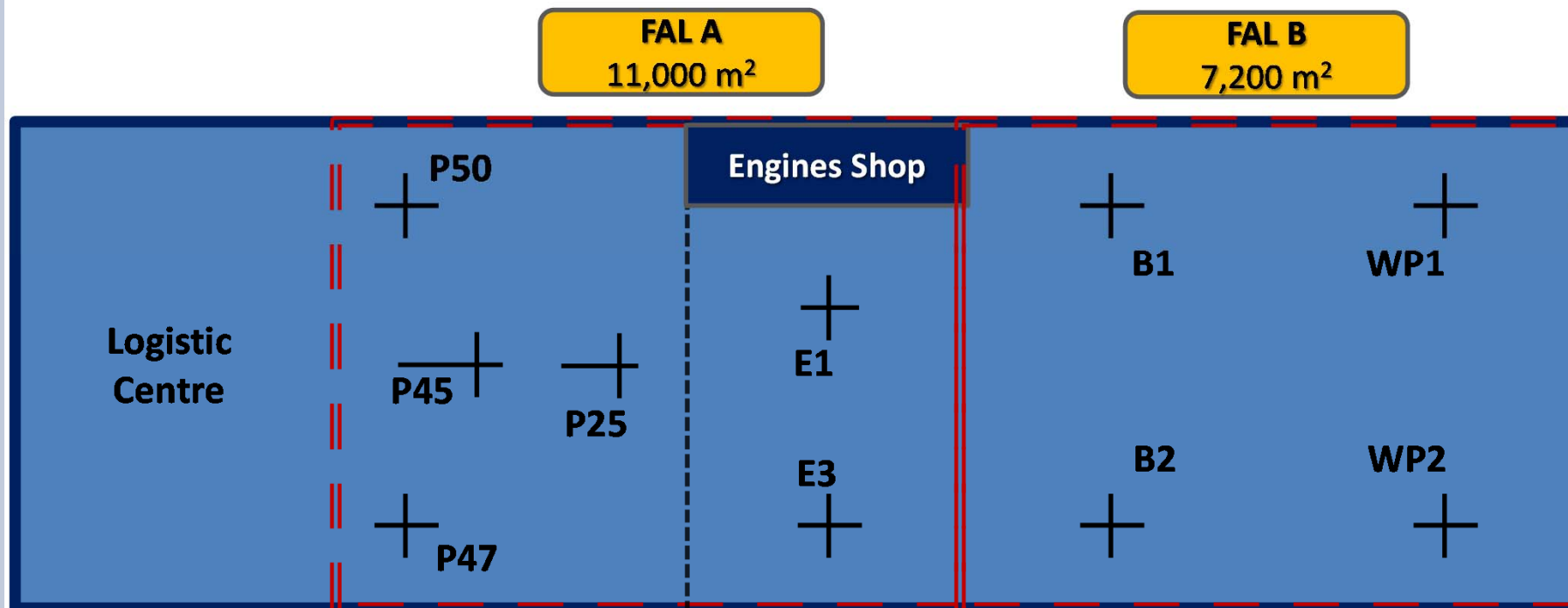
Industrial Process



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RUS FAL – Plant Layout



FAL A & B detailed Lay-out

*Facilities sized
for Rate 20 p.a.
maximum*

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RUS FAL – Industrial WBS

FALA

- **Station P50** : VTP & HTP junction & functional tests
 - HTP is attached to VTP
 - Rudder installation (elevators already installed)
 - Functional Tests
 - Preparation for junction to Fuselage (P45)
- **Station P47**: Fuselage
 - Electrical harnesses and VU racks installation (120VU, 80VU, 90VU)
 - Cockpit floor installation
 - Flight controls, Air Conditioning and cockpit already installed
 - Landing Gears already installed
- **Station P45**: Wing to Fuselage junction
 - MCA alignment
 - Wing positioning
 - Tail plane to fuselage junction
 - Nacelles installation
 - Wiring tests

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RUS FAL – Industrial WBS

FALA

- **Station P25** : Final assembly and additional tests
 - Engine installation on wing
 - Karman fairings (wing to fuselage) installation
 - Nacelles close up
 - Preliminary flight controls test, de-icing, probes, oxygen...
 - Preliminary air conditioning test
- **Station E1** : Power-on & Landing Gear tests
 - All electrical systems powered
 - MLG ,NLG and brakes functional tests
- **Station E3** : Functional tests & Close-up
 - Fuselage pressurisation
 - Cockpit lining installation
 - Close-up

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RUS FAL – Industrial WBS

FALB

- **Station B1 & B2:** Customisation activity
 - Cabin interiors and cargo furnishing
 - Final tests on avionic systems
 - Radio tests
 - Final functional test: throttle, flight controls (mechanical), electrical connectivity...

FL&D

- **Flight Line & Delivery**
 - Engine run up tests
 - First Flight & Flight tests
 - Acceptance flight
 - Administrative work for ToT

WP

- **Working Party positions**
 - Complete post-FAL outstanding work
 - A/C late modifications
 - Pre-delivery & delivery adjustments
 - Additional flexibility for customization activities

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RUS FAL – Industrial Feasibility study

Feasibility Assessment

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RUS FAL – Data Maturity

Analysis results

- About 800-1000 Job Cards for ATR FAL TLS*
 - All documents in French
- Preliminary investigation indicates no major gap between job instructions and job performed*
 - Minor deviations, if any, will be covered during the training phase
- The level of details within job instruction is considered sufficient to perform the task for an aviation industry professional*
 - Training is TLS class & on-the job necessary to level-up J-V BC to the minimum required standard
- Data maturity critical activities outside J-V scope
 - FAL DOA tasks performed by TLS back-office
 - Manufacturing engineering

Identified actions

- Translation of all technical documents into English/Russian

* Source ATR

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RUS FAL – IT tools

Assumptions

- RUS FAL to use the same IT tools/system than TLS FAL
- 30 Laptops
- 10 Desktops
- 40 IP phones
- 10 Tokens

NRC

- Estimation based on existing studies : **3,5 M\$**

RC

- Hardware (including refresh every 3,5 years): **108 K\$** per year
- Software & Support: **180 K\$** per year

Note: cost does not include local IT personnel and WLAN access fee

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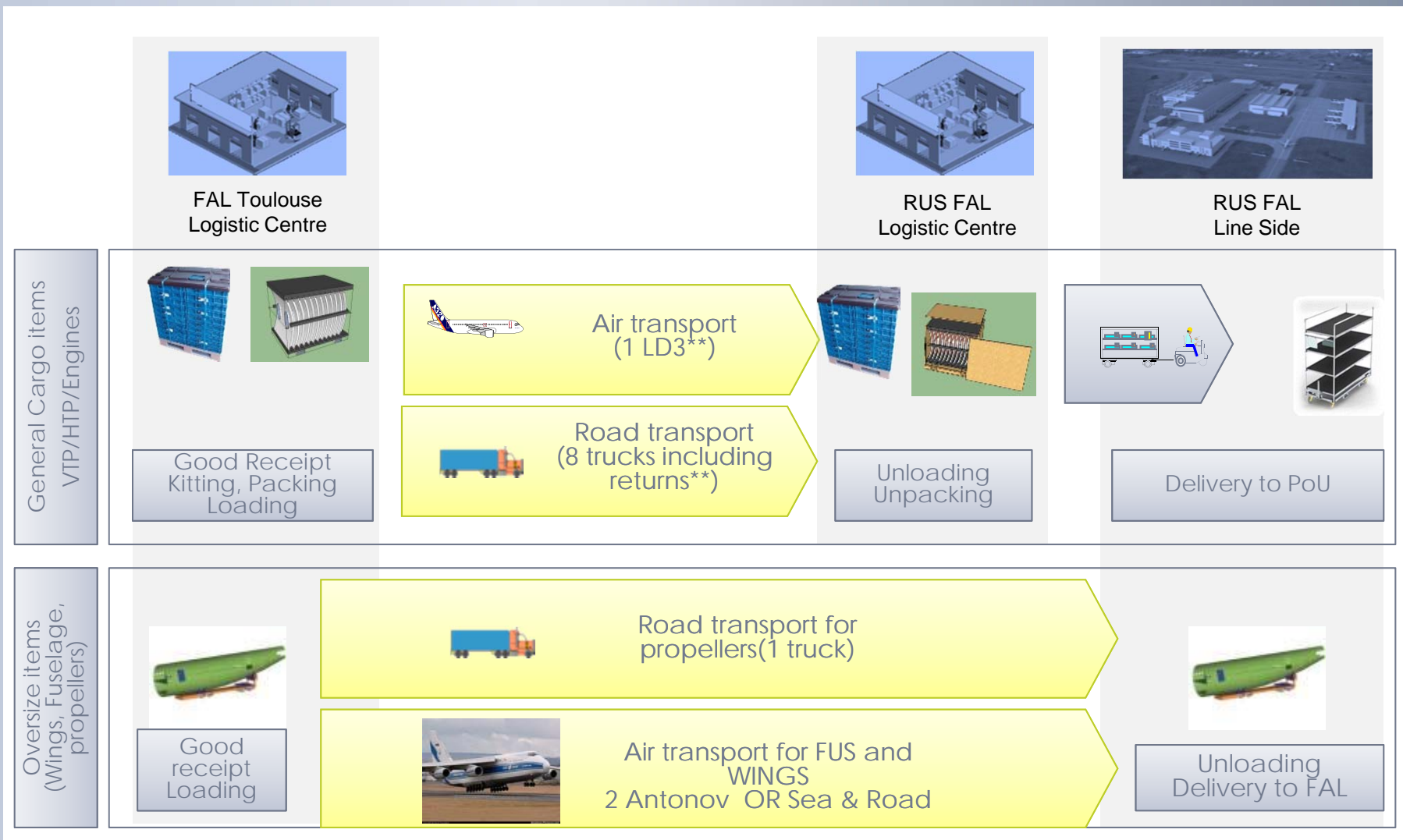
RUS FAL – Industrial Feasibility study

Logistic & Transport

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RUS FAL – Transport & Logistics Model



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RUS FAL – Transport & Logistics Assumptions

Logistic &
Transport

- ATR 72 equivalent to 100 m³ cargo volume
- Equivalent of Rate 1 per month considered
- Custom activities not included
- For MCA, no specific transport jigs and packing activities considered with ANTONOV solution
- Internal transport of MCA not considered (activity usually integrated in Manufacturing processes)
- IT tool implementation not included
- Building cost not included
- Catalogue tools, non-flying consumables not included
- Production scheduling activities not included

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RUS FAL - Oversized components

Logistic &
Transport



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RUS FAL – Transport & Logistic Cost Air & Road

Logistic &
Transport

RC	Solution	Cost per A/C	Comments
Fuselage & Wings	2 Antonov (AN124)	570 k€	Includes Airfreight, ground handling but no origin/destination charges and custom clearance Excluding custom clearance
Engines	1 truck	8 k€	
HTP/VTP	2 trucks	16k€	
Propellers	1 specific truck	15 k€	
General Cargo items	Kitting in Toulouse	7 k€	
	Logistics in Russia	30 k€	
	5 trucks	40 k€	Including returns (1), excluding custom clearance
	Air transport (1 LD3)	4 k€	
ATR Logistics in Russia	-	-	Included in J-V white collars
Total RC		690K€	

NRC	Solution	Cost	Comments
Warehouse Equipment	Toulouse warehouse adaptation	200 k€	Shelving, racking, cantilevers...
	Russia warehouse	250 k€	Shelving, racking, cantilevers... (based on 3000 m ² logistic centre)
Delivery Means	Re-usable kitting solutions	500 k€	4 ship sets to kit all general cargo items
Total NRC		950 k€	

(E.c. Q4-2013, €/ \$ 1.45, Rate 1)

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RUS FAL – Transport & Logistic Cost Alternative Solution (Sea/Road)

- Transport includes
 - Fuselage = 111,38 m³
 - Wing = 99 m³
 - HTP = 22 m³
 - VTP = 36 m³
 - Propellers = 31,2 m³
- **Preliminary study**
- **Not validated for winter period**
- **Alternative options (e.g. Rostov > Ulyanovsk by river) still under review**

- Itinerary & lead-time
 - Toulouse > Anvers : Road – 1 017 Km – 3 days
 - Anvers > Rostov : Standard ship– 3 882 Nm – 11 days + stops = 21 days
 - Rostov > Ulyanovsk : Road – 1 303 km – 5 days

Total lead time **29 days**

Estimated cost **380 K€**

Total RC per A/C (full ship-set) 469 K€

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RUS FAL – Industrial Feasibility study

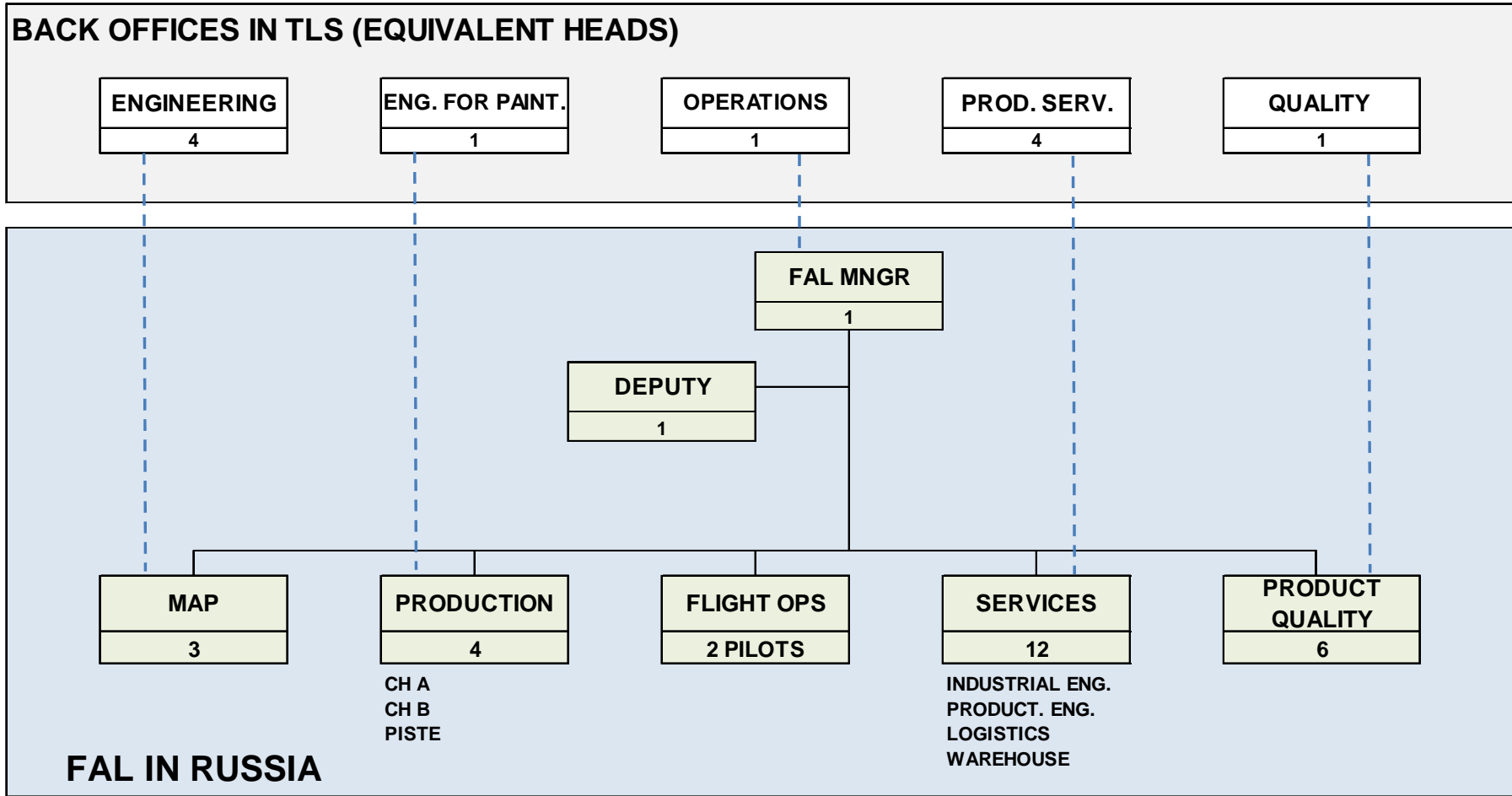
HR & Sizing

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RUS FAL - Organisation Chart

HR & Sizing



TOT. BACK OFFICES 11
 TOT. FAL RUSSIA 29

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RUS FAL – HR Assumptions

HR & Sizing

	FAL A	Painting	FAL B	Flight Line Deliveries
Activity Effective Hours	2500 MH (850 MH tests)	750 MH*	1200 MH (400 MH tests)	300 MH

Blue Collars Nominal Working Hours	<i>1600 p.a.</i>	White Collars Nominal Working Hours	<i>1600 p.a.</i>
Blue Collars Effective Working Hours**	<i>1200 p.a.</i>	White Collars Effective Working Hours	<i>1200 p.a.</i>

* Estimation, activity outsourced: cost 180K\$ per A/C

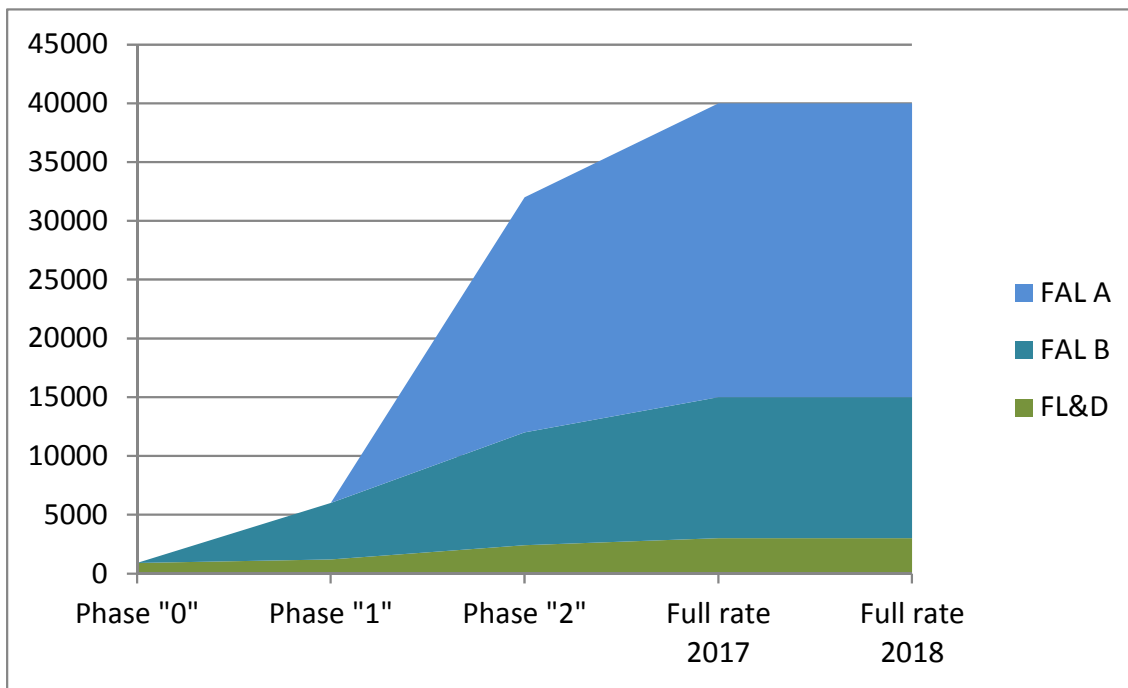
** Source ATR

RUS FAL – Resources plan

HR & Sizing

									Rate 10	
	wd	MH	FTE	MH	FTE	MH	FTE		MH	FTE
Phase "0"	30	900	6	0	0	0	0		900	6
Phase "1"	40	1200	5	4800	13	0	0		6000	18
Phase "2"	80	2400	7	9600	15	20000	23		32000	45
Full rate 2017	100	3000	6	12000	14	25000	24		40000	44
Full rate 2018	100	3000	6	12000	12	25000	22		40000	40
	Paint	FL&D	Corrected	FAL B	Corrected	FAL A	Corrected		Grand Total	

Workload ramp-up (MH)* - Blue Collars



* Effective Hours on A/C

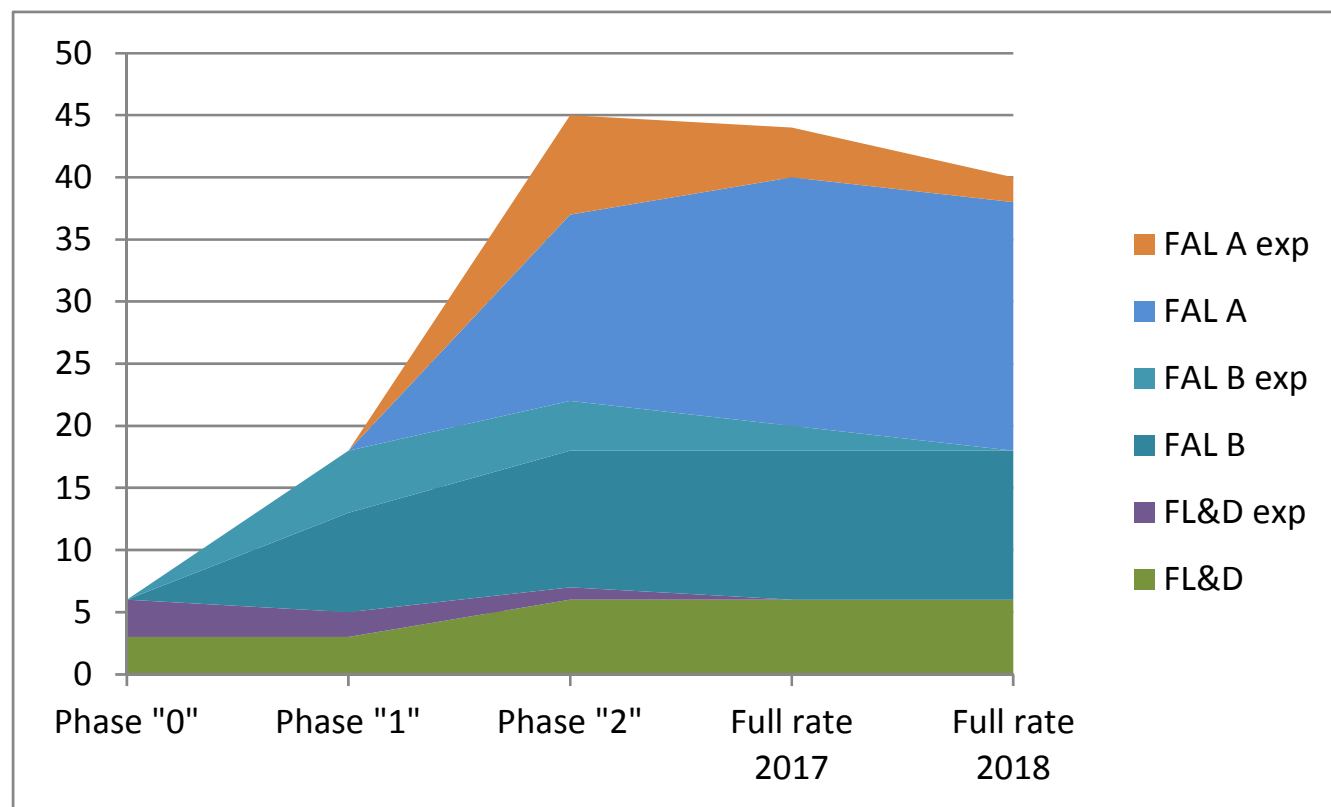
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RUS FAL – Resources plan

HR & Sizing

Resources planning (FTE)*
- Blue Collars



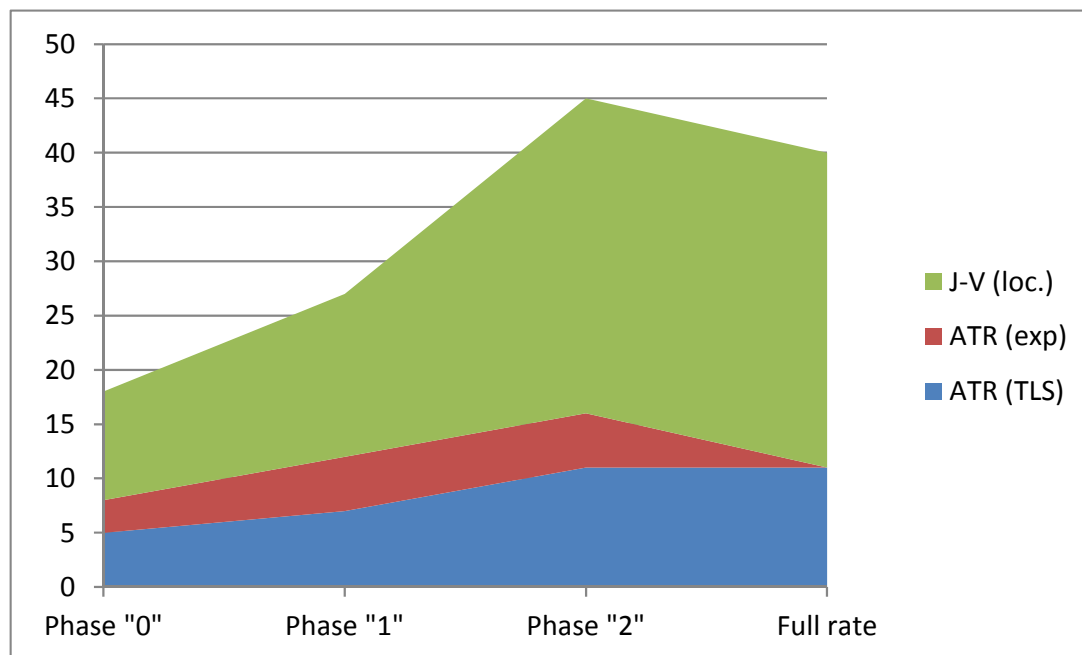
* Learning curve and productivity factor included

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RUS FAL – Resources plan

HR & Sizing



Resources planning (FTE)*
- White Collars

* 3 Additional FTE as local representatives of PW/EADS/AleniaAermacchi

	FTE			
Phase "0"	18	5	3	10
Phase "1"	25	7	5	15
Phase "2"	43	11	5	29
Full rate	40	11	0	29
	<i>Total</i>	<i>ATR (TLS)</i>	<i>ATR (exp.)</i>	<i>J-V (loc.)</i>

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RUS FAL - Training Needs

HR & Sizing

Blue Collar

- Basic Training
 - Mechanic
 - Electric
- A/C type specific trainings
 - Structure mechanics
 - Furnishing mechanics
 - Aircraft mechanic
 - Aircraft electrical

White Collar

- Intercultural Training
- Administrative support
- IT tools

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RUS FAL - Training Plan BC

HR & Sizing

		Phase 0 2014		Phase 1 2015		Phase 2 2016		Full Rate 2017 +	
BC FTE	J-V	3		3+8		6+11+15		6+12+22	
	ATR	3		2+5		1+4+8		2+4 → 0	
		H1	H2	H1	H2	H1	H2	H1	H2
	Trainees (TLS)	3	8	11	10	8	-	-	-

- Basic knowledge of Aviation industry required
- English speaking staff (language course not included)
- Training duration 6 months per profile
 - Structure Mechanics (50% of workforce)
 - Electricians (15% of workforce)
 - Test engineers (35% of workforce)
- Painters training not included
 - Estimated 12 months

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RUS FAL - Training Plan WC

HR & Sizing

		Phase 0 2014		Phase 1 2015		Phase 2 2016		Full Rate 2017 +	
WC FTE	J-V	10		15		29		29	
	ATR	3		5		5		0	
		H1	H2	H1	H2	H1	H2	H1	H2
	Trainees (TLS)	10	5	10	4	-	-	-	-

- Basic knowledge of Aviation industry required
- English speaking staff (language course not included)
- Training duration < 6 months per profile
 - IT tools training included

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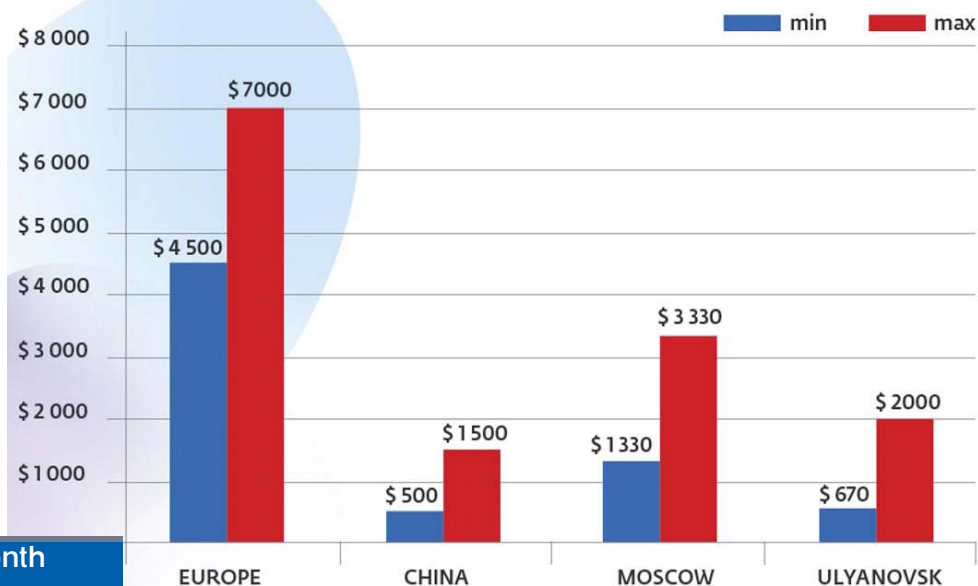


RUS FAL – Inputs for Business Case

HR & Sizing

Aviation Industry salaries in Russia

SALARY OF AIRCRAFT MAINTENANCE TECHNICIANS & ENGINEERS PER MONTH



[Source ROSTEC]	KRub/Month
Workers (blue collars)	40
Major white collars	48
Minor white collars	35
Top management	205

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RUS FAL – Inputs for Business Case

HR & Sizing

Training Blue Collar

- 6 months Russian salary expat. in TLS per trainee
 - 40 FTE to be trained
- 9 FTE European salary (instructors) for 6 months time

Training White Collar

- 6 months Russian salary expat. in TLS per trainee
 - 29 FTE to be trained
- 6 FTE European salary (instructors) for 6 months time

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