



WASP
A I R C R A F T

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WASP 500

Tiltrotor Aircraft with a Tip Jet Driver

Main advantages of tilt rotor aircraft WASP 500

- ▼ Vertical take off and landing
- ▼ High cruise speed – 500 km per hour
- ▼ Payload to max take-off weight (MTOW) ratio – 60%
- ▼ High efficiency: cost of flying hour is 80 USD, cost tonne-km (TKM) 0.5 USD
- ▼ Usage of eco fuel – LPG
- ▼ Manned and unmanned versions



1620 ^{nm}
RANGE OF FLIGHT

>270 ^{KTS}
SPEED

662 ^{lbs.}
PAYLOAD

2+0 ^{PAX}
CAPACITY

Unique solution for air transportation market problems

- ▼ Low requirements for operating infrastructure
- ▼ Vehicle for low cost and high-speed delivery of goods and passengers
- ▼ Environmentally friendly and low noise

Market problems

Main applications:

- cargo delivery to hard-to-reach sites
- regional cargo and passengers transportation
- avia chemical services in agriculture
- long flight duration aviation monitoring (over 10 hours)
- urban air mobility

Airfields in Russia	1990	2019	Change
Civil aviation	2 348	788	- 66%
General aviation	478	343	-28%
Others	22	2	-91%

Highest decline in aviation mobility in local air traffic



Market problems solution

Problem	Solution
High cost of infrastructure support	VTOL
Flying hour cost	Low aircraft cost
	High payload to MTOW ratio
	High cruise speed
	Unmanned aircraft

Technological barrier “3 by 200” according NTI Aeronet for UAV

Parameter	Value
Run way	< 10 m
Payload to MTOW ratio	> 60%
Payload	> 50 kg
Range	> 200 km
Cruise speed	> 200 km per hour
Fuel consumption	< 0.7 g/kg payload/km

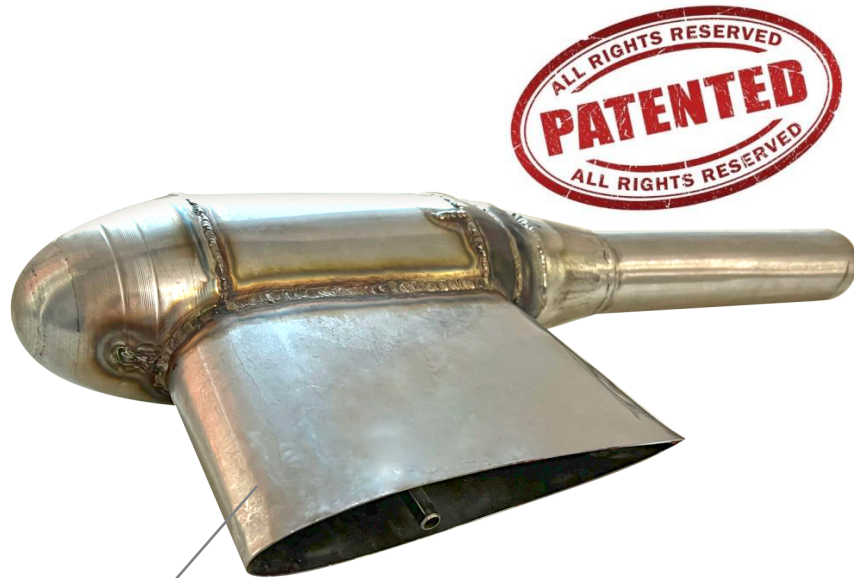


Ideal aircraft

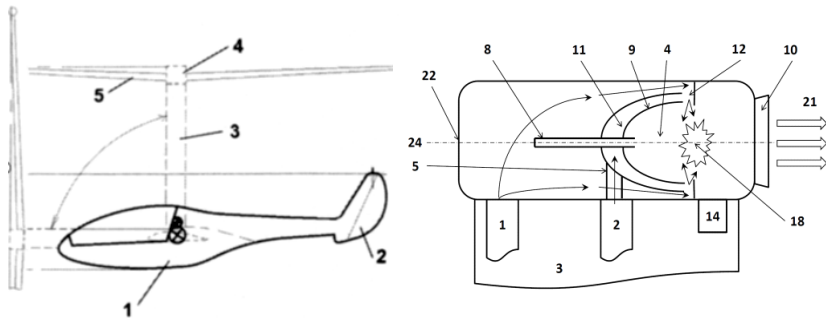
Parameter	Value
Flying control	Unmanned
Run way	0 m
Payload to MTOW ration	> 60%
Payload	> 200 kg
Range	> 100 km
Cruise speed	> 300 km per hour
Fuel consumption	< 0.1 g/kg payload/km



Innovative technology solution



Jet Engine



▼ The layout of the tiltrotor aircraft with tip jet driven rotor

Patent No. 270743. Priority date 2018-11-08

The rotor is attached to a mast that pivots around the aircraft's center of gravity. Advantages: controllability in all phases of flight, including the conversion phase, absence of flutter of the propulsion system and wing structures, simplicity and reliability of the design.

▼ Method of rotor jet driving

Patent No. 2762982. Priority date 2021-03-15.

The rotor is driven by a jet engine located on the blade tip. The gaseous fuel is pumped into the engine by the centrifugal force of the rotor rotation.

Advantage: high efficiency of the rotor due to the absence of additional energy consumption for the preparation of fuel and oxidizer mixture.


▼ Pulse Detonation Jet Engine (PDE)

Patent №2752817. Priority date 2020-12-16.

The design of the PDE with a combustion chamber as a resonator and a detonation initiator using gaseous fuel.

Advantages: stable process of pulsing detonation with high efficiency of the engine with a thrust of 260 N and a weight of 900 g.

Analogues comparison

Picture				
Parameter	WASP 500	Hiller YH-32 Hornet (1954)	В-7 (Миль) (1965)	Sud-Ouest SO.1221 Djinn (1956)
Type of rotor driver	PDE	Ramjet	Turbojet	Compressed-air jets
Engine	PDE WASP, trust 260H	Ramjet Hiller 8RJ2B, thrust 180N	Turbojet AI-7, thrust 550H	Gas turbine engine Turbomeca Palouste IV
Fuel	LPG	Benzine	Benzine	Kerosene
Rotor thrust	470 kgf	490 kgf	1100 kgf	800 kgf
Max take-off weight	500 kg	490 kg	1050 kg	800 kg
Engine weight	900 g	5,9 kg	>30 kg	Turbin engine 70 kg
Empty weight w/o fuel	165 kg	274 kg	580 kg	320 kg
Fuel weight	36 kg	142 kg	150 kg	220 kg
Flight time	2 H	25 min	2H 20 min	2 H
Country	Russia	USA	Russia	France
Mass production	no	yes	no	yes

Conclusion: the main advantage of the WASP-500 over analogues is achieved due to an innovative pulse detonation engine (PDE) with a weight of 900 g and a thrust of 260 N with low fuel consumption.

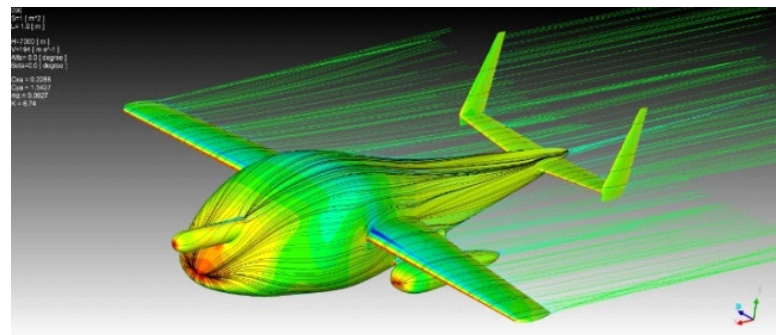
Tiltrotor aircraft with tip jet rotor

Technical specification of tiltrotor aircraft WASP 500

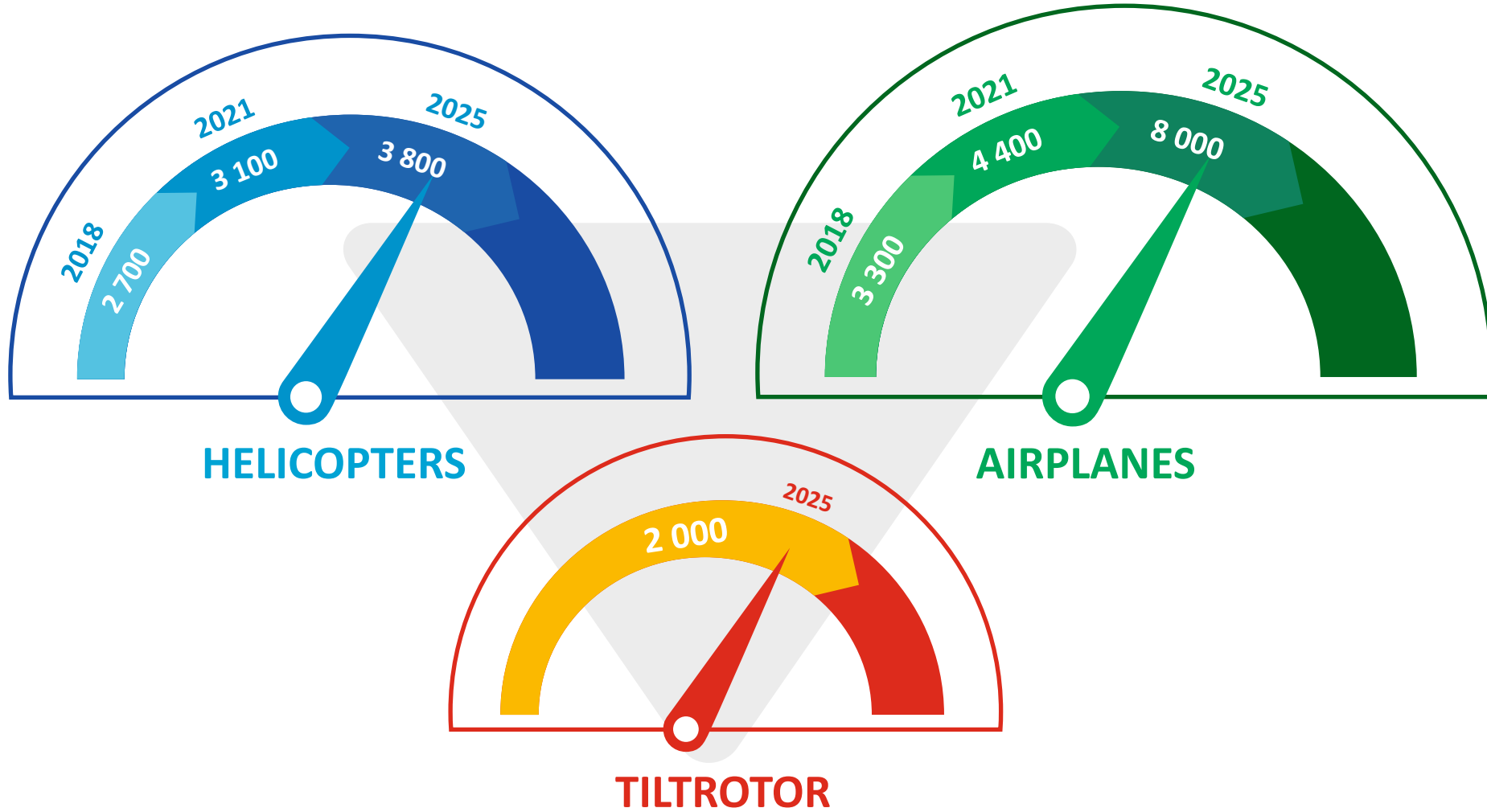
Parameter	Value
Rotor diameter	5,26 m
Rotor weight	14 kg
Rotor blade max attack angle	32 grad
Rotation speed	1300 RPM
Rotor tip speed	Up to 350 m/sec
Jet engine thrust	260 N

Specification for helicopter and airplane modes

Parameter	Helicopters	Airplanes
Angle of rotor axes decay	90 grad	0 grad
Rotor blade max attack angle	12 grad	32 grad
Max rotation speed	25 RPS	25 RPS
Rotor thrust	Up to 470 kgs	Up to 470 kgs
Wing lift	0 kgs	Up to 470 kgs

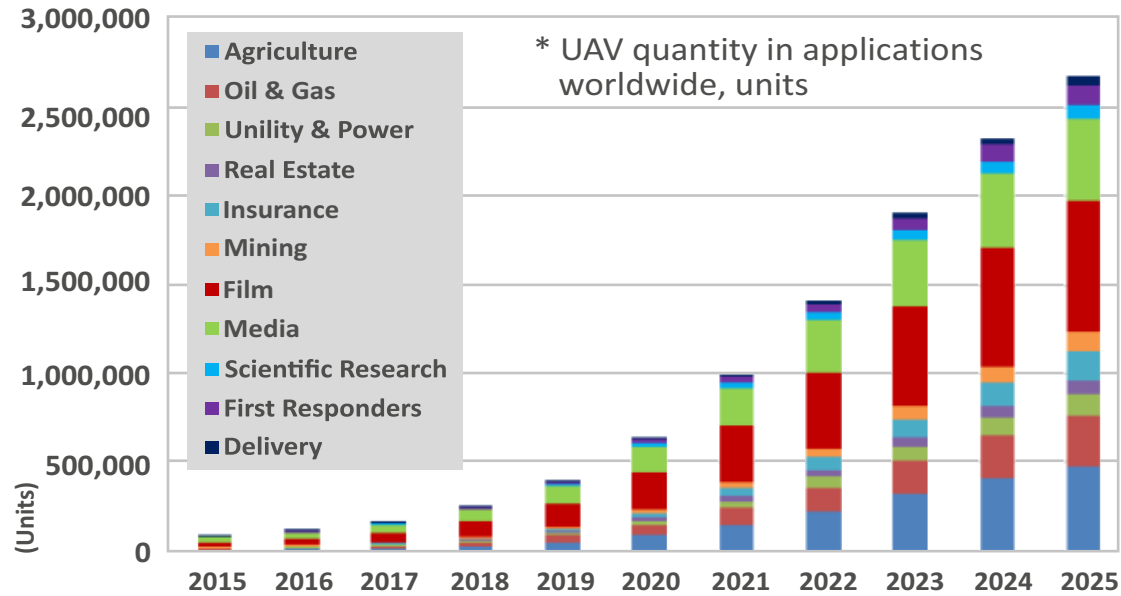


Market trends for 2021-2025 in Russia



Sources: AOPA-Russia, HeliRussia 2019. Numbers – in pcs.

UAV market trends in 2021-25



Forecast of heavy UAV market (NTI Aeronet)

Class	Aircraft cost	35% market share 2030 in RU	12% world market share in 2030
3 by 200	\$60-125K	> 100 pcs	\$200M
3 by 500	\$200-250K	> 300 pcs	\$600M
1500	\$800-1000K	> 500 pcs	\$2000M

CAGR 2018-2024 UAV market – 20.5% per year (CompTIA)

UAV cargo deliver market: 2018 – \$24M, 2027 - \$1.6B (The Insight Partners)

“We need serious vehicles with a good payload (minimum 100 kg), with a good flight range (350-400 km), with stable communication channels. **This is the only way to reduce the delivery cost.**”



Maxim Akimov

General Director of the Russian Post.
01/21/2021, interview with the “Russian newspaper”

* J’son & Partners Consulting

Comparison of Flight Performance



ROBINSON R22

Crew
 Max Airspeed
 Cruise Speed
 Rate of Climb
 Max Range (No Reserve)
 Endurance
 Maximum Operating Altitude

1+1
 102 kts (189 km/h)
 up to 96 kts (178 km/h)
 16.4 fps
 approx 250 nm (460 km)
 3 h
 14 000 ft

Powerplant Approved fuel
 Horsepower
 Fuel Consumption
 MTOW
 Payload
 Interrepair Period

AVGAS 100LL - UL91
 131 hp
 10 US gal/h
 1 370 lbs (622 kg)
 492 lbs (223 kg)
 2 200 h

from 312,000 U.S. Dollars
 (Retail Price)



WASP 500

1+1
 270 kts (500 km/h)
 250 kts (470 km/h)
 Up to 66 fps
 Up to 1 620 nm (3 000 km)
 Up to 4 h
 Up to 26,000 ft

LPG
 174 hp
 8 US gal/h
 1 100 lbs (500 kg)
 660 lbs (300 kg)
 20 000 h

from 150,000 U.S. Dollars
 (Expected Retail Price)

Source: <https://robinsonheli.com/r22-specifications/>

Comparison of service cost of VTOL aircrafts



Parameter	MI-17	MI-8	ANSAT	Robinson R22	KAGU 150	WASP 500
Crew, (People)	2	2	2	2	UAV	UAV
Payload, (kg)	4000	3900	1166	1230	120	300
Payload to MTOW ratio	36%	35%	32%	37%	24%	60%
Range, (km)	620	620	505	488	320	3000
Cruise speed, (km/H)	230	220	220	152	160	470
Cost						
Flight hour, (USD)	1300	700	1350	280	86	67
Ton*km with max payload, (cents)	160	83	530	800	452	47
Ton*km with 200 kg payload, (USD)	29	16	31	9	9	0.7
Passenger transportation for 200 km, (USD)	41	23	44	368	108	14
Fuel consumption, cents/payload kg/ km	0,042	0,045	0,108	0,100	0,096	0,0007

Comparison of UAV technical specifications



Параметр	Condor	Braeron	KAGU-150	WASP 500
Company	Drone Delivery Canada	Design Corp «Aviareshenia»	Taiber/UAVOS	WASP Aircraft
Max speed	? km/H	75 km/H	209 km/H	500 km/H
Cruise speed	120 km/H	50 km/H	160 km/H	470 km/H
Rate of climb	2 m/sec	? m/sec	5 m/sec	up to 30 m/sec
Range	200 km	350 km	320 km	up to 3 000 km
Max altitude	? m	? m	up to 5000 m	up to 8 000 m
Fuel	Gasolin B-91/115	Gasolin B-91/115	Gasolin B-91/115	LPG
Max power	? HP	? HP	115 HP	Эквив. 174 HP
Fuel consumption	? л/ч	? л/ч	20 л/ч	30 л/ч
Max take off weight (MTOW)	476 кг	350 kg	500 kg	500 kg
Payload	180 кг	50 kg	120 kg	300 kg
Inter Service Period	? H	500 H	1200 H	20 000 H

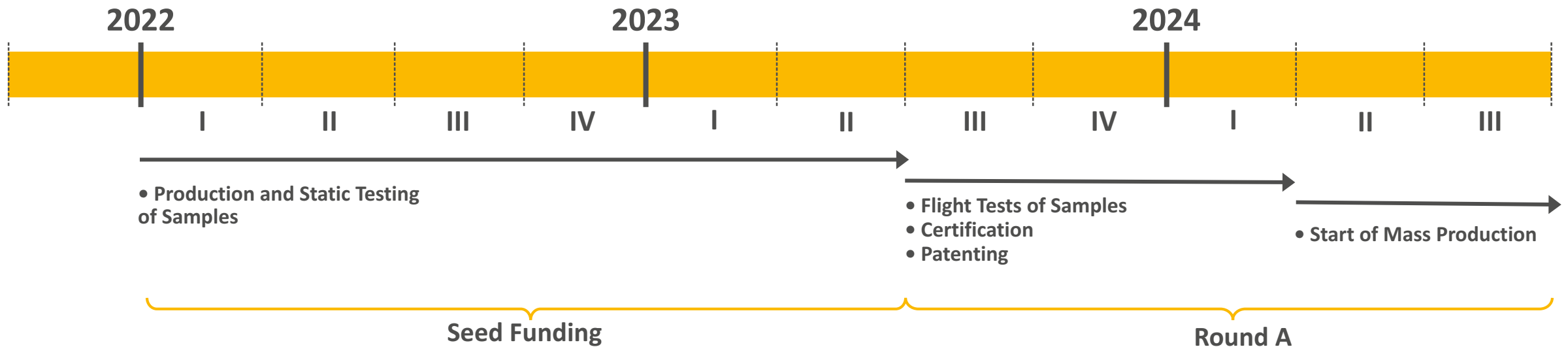
Sources: <https://dronedeliverycanada.com/technology/>

WASP customers and sales forecast

Продукт	Price	Application	Customers in Russia	Worldwide customers
UAV WASP 500	\$135K	Regional transportation		
		Cargo delivery to hard-to-reach sites		
		Agriculture (spraying)		
Manned WASP 500	\$150K	General aviation		
Tip jet rotor with swashplate and control system	\$90K	R&D and manufacturing of tiltrotor aircrafts		

Project development schedual

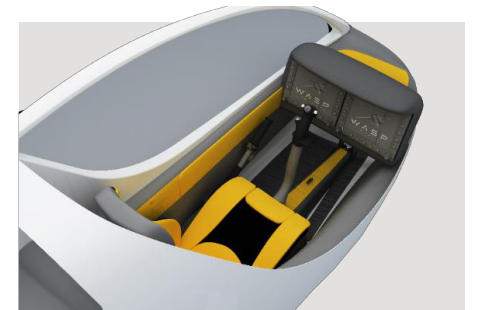
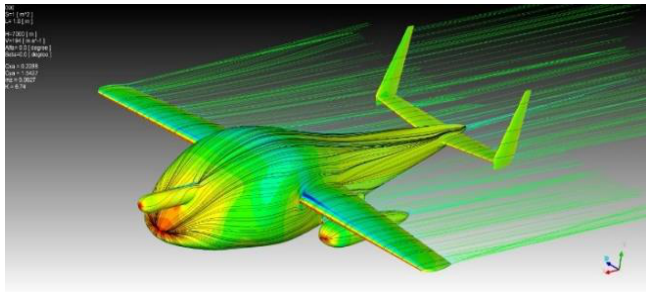
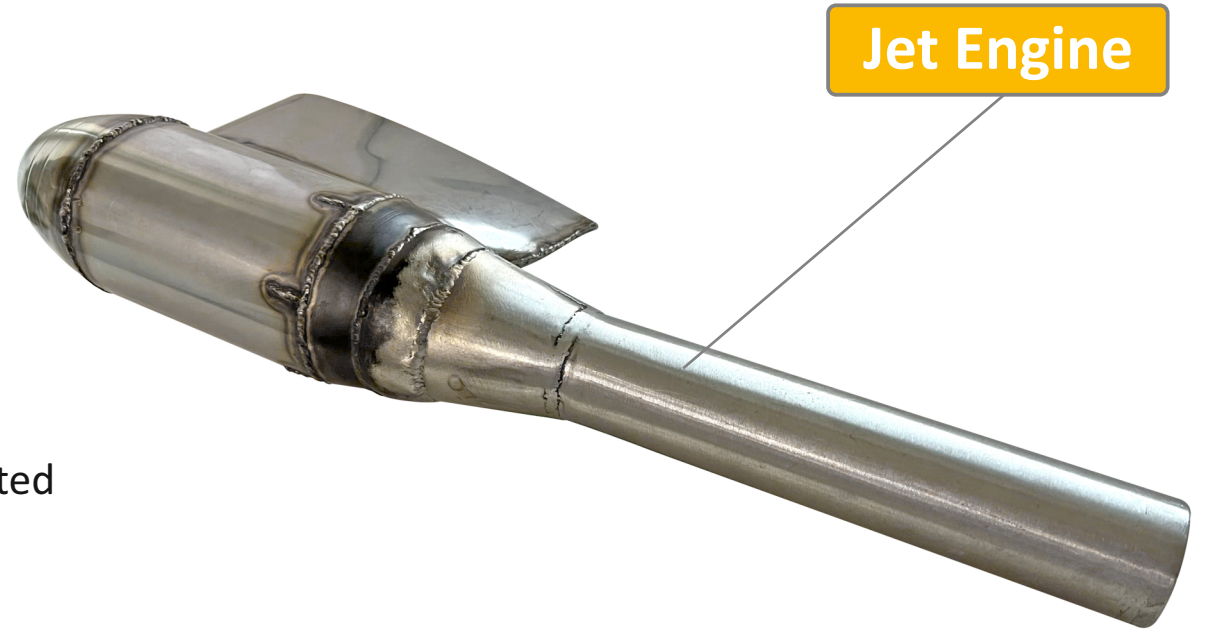
Start	Funding	Goals	Production	Revenue
Q1-2022 – Q2-2023	Seed funding – \$1.6 M	<ul style="list-style-type: none"> • Assembling and static testing of 2 samples • Flight tests of samples • Patenting • Certification 	WASP 500 – 1 pcs WASP 500 UAV – 1 pcs	-
Q3-2023 – Q3-2024	Round A*	<ul style="list-style-type: none"> • Mass production of WASP 500 • Expansion to worldwide market 	WASP 500 – 15 pcs	\$1,5 M



* Value and time will be selected at the end of Seed Funding Round

Project status in Q1 2022

- ▼ Assembled in metal: rotor with tip jet drivers, navigation unit and its testing equipment
- ▼ Gas dynamic, load and strength modeling were completed
- ▼ Draft design of WASP 500 completed
- ▼ The design of the WASP 500 cabin has been completed
- ▼ The design and software of the UAV control system was completed
- ▼ Computer simulation of blowing WASP 500
- ▼ Received patents and formed a patent strategy



Proposal to investor

Financing of project development for 18 months

Seed funding

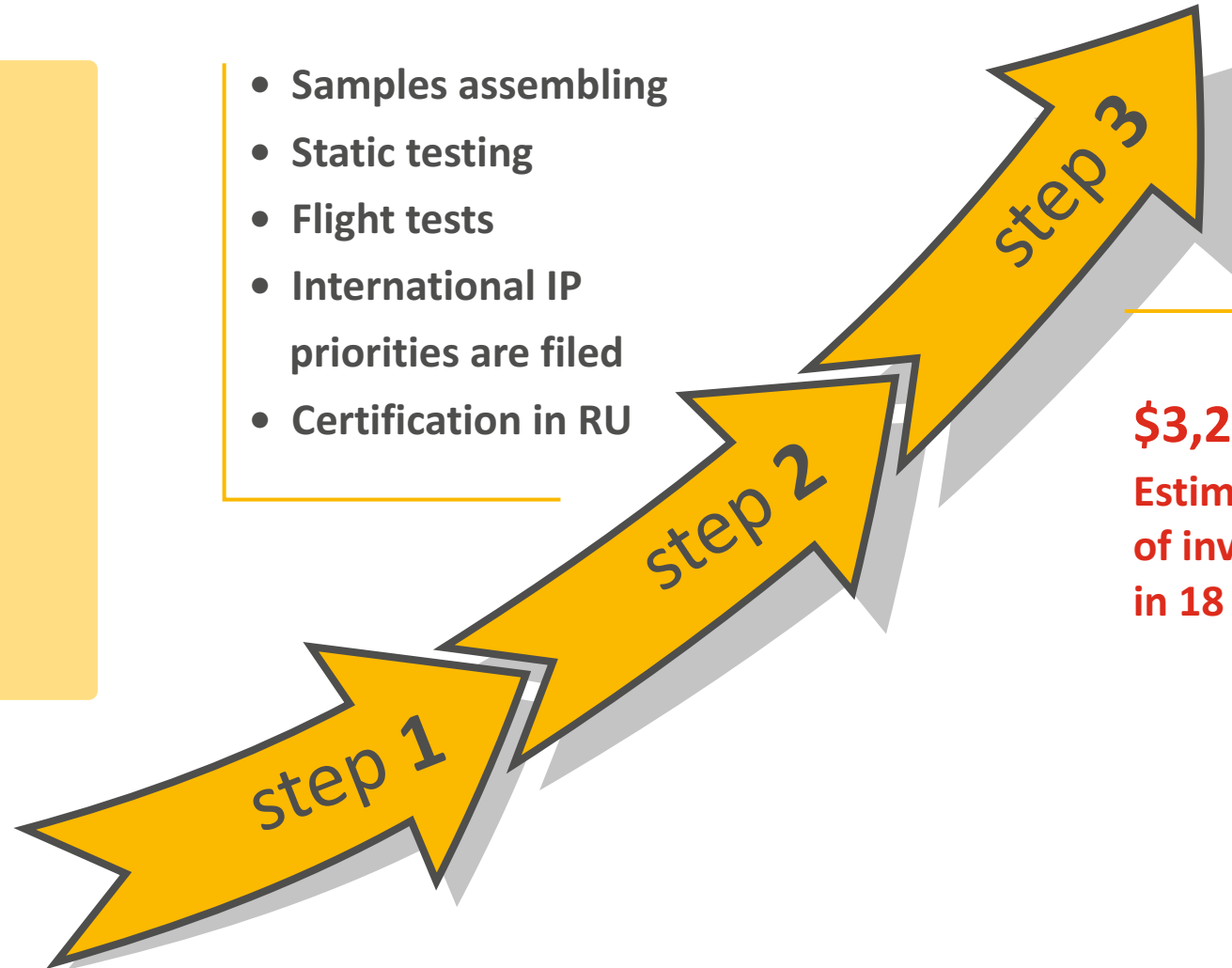
Q1-2022 – Q2-2023

Goals in Q1 2023:

- Complete of WASP 500 certification in RU
- Start of mass production
- Start of sales

- Samples assembling
- Static testing
- Flight tests
- International IP priorities are filed
- Certification in RU

\$1,6 M



\$3,2 M

Estimated cost of investor shares in 18 months

Plan of project development till 2030

Model	Number of rotors	Payload	Capacity (persons)	Start of mass production start
WASP 500	1	600 lbs	2	2023
WASP 1000	2	1200 lbs	4 (2+2)	2024
WASP 1500	2	2200 lbs	8 (2+6)	2026
WASP 2000	4	3500 lbs	12 (2+10)	2028
WASP 3500	4	5500 lbs	22 (2+20)	2030



WASP 1000 has applications which hold biggest market share

Команда проекта



Pleshkov Dmitry

CEO

Experience in R&D management in optoelectronics industry (Center for Strategic Research UOMZ, Shvabe Holding). Experience in creating and developing innovative projects (representative office of UOMZ in China, Styled Ltd). Business angel.



Bormotov Andrey

Chief designer

Experience in testing aircraft jet engines (UMPO). Experience in the development of light aircrafts for general aviation. Inventor.



Shishov Aleksandr

COO & CFO

Experience in creating and managing innovative start-ups in telecommunications (Corvette-Telecom LLC, "Onlime" brand) and optoelectronics (Light Engines Corporation Ltd). Serial entrepreneur, business angel, inventor.



Vasin Pavel

Head of avionics aircraft equipment department

Experience - 24 years in the development and modernization of avionics and weapons systems, for example, the modernization of the "Sapphire-29" radar (version N019) of the MiG-29BM aircraft. Equipment for the restored aircraft R-6. Development of a small-sized aviation complex for light aircrafts for general aviation. Release of software for aviation simulators.



Shegay Arcadiy

Plane and cabin designer

Experience - 15 years in the development of the design of various high-load composite structures and equipment for their production, for example, radio-transparent fairings for aircraft IL-96, TU-204, TU-214, etc.



Thanks for Your Attention

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