

World Standard Delivery Drone Solutions



New AeRoMission Accomplishment





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History Organization & Vision Technical Overview Products (Drones & D-Nuri)

Company	NARMA Inc.			
CE°	Kijung, Kwon			
Founded Date	2018. 10. 08			
Business Type	UAV R&D / Manufacturing			
TEL	82+ 4-870-3650			
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Web-site	www.narma.co.kr			

<u>History</u>

2023 Participated in CES 2023 Signing on KOICA CTA Seed1 Program(Medical delivery in Kenya)
2022 Acquiring FCC & CE(AF200) Capital Increase(Investment from Hana Ventures & POSTECH Holdings) Acquiring FAR Part107 (sUAS Pilot License) Demonstration flight in Johannesburg and Croatia Demonstration flight in Philippines Maiden flight to deliver antidotes between hospitals in Daejeon, Korea Demonstration flight in South Africa Started development of hydrogen fuel cell equipped UAV Participated in 2022 Dubai Expo Participated in CES 2022

2021 BVLOS Demonstration flight at Korea Drone Expo in Yeouido, Seoul Selected as an excellent research and development innovation prototype (AF200) Capital Increase (Investment from KIBO) Signed MOU for business cooperation with Daejeon Yuseong Police Station (AF100-POLICE) Participated in the Drone Show Korea 2021 Acquired the Korean government's R&D project <Disaster Control and Emergenct Delivery Drones in Mountainous Area> complete

2020 Acquired the Korean Drone Direct Production Certificate Participated in the Commercial UAV Expo Established Narma branch in Silicon Valley (KOTRA) Entered public institution shopping mall 'Venture Nara' (AF100 / AF200) Supplied 20 muti-copter drones(AF60) forAi swarm flight Established Narma branch in South Africa Participated in Daejeon drone testbed construction project Certified as a venture business

2019 Made a demonstration flight in Silicon Valley Selected as a smart SME Participated in the Finland Slush investment Parade Participated the UAV expo US exhibition (Daejeon TP) Registered the CI trade of Narma Inc. Participated in the North American market entry business (Daejeon TP) Participated in the AUVSI US exhibition Participated in Global Startup Festival Participated in the joint demonstration day (Innopolis Daedeok) Participated in Silicon Valley entry business (Daejeon TP)

2018

Registered as a research institute company Esrablished an affiliated research institute Established a corporation (Narma Inc.) Passed the internal deliberation committee for the establishment of a research institute company Completed the development of tiltrotor drone control technology

Organization



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<u>Vision</u>

	Mission	To offer equal welfare with Drones
Vision		To be the world standard of Drone Deliveries
Ø	Goal	To own core technology in Delivery Drones by 2025 and become the wolrd top Delivery service provider by 2030
2	Value	• UAVs with reliability • Commercialized future technology; electric dual Tilt-rotor • Standardized platform for Drone Delivery; D-Nuri

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Technical Overview (1)

| Tilt-rotor Technology

- High-speed flight by tilting rotors after vertical take off
- Overcome the disadvantages of multicopter drones and fixed-wing drones
- ☑ Best for drone delivery service
- Al edge computing technology for surveillance etc.
- Core technology of drone taxi



Technical Overview (2)

R&D Strategy

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Hydrogen Fuelcell Tilt-rotor

- Liquified or compressed hydrogen as a fuel
- Extended flight range and time

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Products

Drone

- **☑** Tilt-rotors
- \cdot Wolrd's first stabilized electric dual tilt rotor drone (VTOL)
- · High speed flight (Over 120km/h)
- · Highest wind resistance (15m/s)
- \cdot Stable automatic flight, Low maintenance cost



Muti-coptors



D-Nuri - Development of Kiosk shuttle delivery system

- **Kiosk**
- \cdot Muti-drone operation
- \cdot Touch Screen
- **Station**
- · Always on & charged (battery 70%)



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D-Nuri

- Reduces pilot's budon.
- Pre-defined flying path.
- Deployment time under 30sec.
- US & Korea Patent

» AF200



| Specification

Drone Type	Drone Type Electric dual tilt-rotor(eVTOL)		2x rotors during operation	
Dimensions	ons 183×101×52cm [WxLxH] Drone battery		4x Li-lon battery (403Wh each)	
	11kg empty (airborn reel drop delivery system)	Avionico	2x GNSS system	
Weight	17kg with batteries	AVIONICS	3x Magnetometer	
	22kg max. take-off weight	Connoctivity	1x Cellular Data Link (4G or 5G)	
Payload	5kg max.weight	Connectivity	1x RF Data Link & Video Link (5.8Ghz)	

| Range Estimation

Payload	5KG	4KG	3KG	2KG	1KG	0KG
Direct one-way flight	40km	47km	54km	56km	58km	60km
Flight time	37min	42min	45min	47min	49min	50min

| Operation

Flight speed	20m/s default cruise speed, 35m/s max. speed			
Climb speed	2m/s climb rate, 1.5m/s descent rate			
Max. flight time	25min (hovering with 3kg payload), 45min (level flight with 3kg payload)			
Max. altitude	3000m AMSL			
Auto-landing accuracy	1.5m			
Wind resistance	15m/s average wind, 17m/s gusts			

| Derivative model

AF200-DELIVERY

AF200EX

AF200FC

» AF200-DELIVERY

- \cdot Wider operational area than muti-coptor drones
- · Specially developed winch sys. to deliver emergency kit securely and accurately



» AF200EX

· Add batteries without payload to maximize flight distance (over 70km)



>> AF200FC (under development)

- \cdot Choice of liqurfied and compressed hydrogen
- \cdot Max. flight time more than 2 hours, Max. flight distance more than 200km



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» AF100







| Specification

Drone Type	Electric dual tilt-rotor(eVTOL)	Propulsion	2x rotors during operation
Dimensions	100×86×30cm [WxLxH] Drone battery		1x Li-po battery (403Wh)
	4kg	Avionico	1x GNSS system
Weight	5.9kg with batteries	Avionics	2x Magnetometer
	7kg max. take-off weight	Connoctivity	1x Cellular Data Link (4G or 5G)
Payload	1.1kg max.weight	Connectivity	1x RF Data Link & Video Link (5.8Ghz)

| Range Estimation

Payload	1KG	0KG
Direct one-way flight	26km	32km
Flight time	25min	30min

| Operation

Flight speed	22m/s default cruise speed, 32m/s max. speed			
Climb speed	2m/s climb rate, 1.5m/s descent rate			
Max. flight time	20min (hovering 1kg payload), 25min (level flight 1kg payload)			
Max. altitude	3000m AMSL			
Auto-landing accuracy	1.5m			
Wind resistance	12m/s average wind, 15m/s gusts			

| Derivative model

AF100-AED

AF100-POLICE

» AF100-AED

 \cdot AED delivery within golded time in evert of cardiac arrest during outdoor activities (5km, 3min)

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» AF100-POLICE

- \cdot High speed flight VTOL tilt rotor drone
- \cdot Real-time observation using EO·IR







| Specification

		AF60	AF70	AF160	
Drone Type		Quad-copter	Hexa-copter	Hexa-copter	
Dimensions[WxLxH]		98×70×36cm (with prop) motor wheelbase 65cm	104×94×36cm motor wheelbase 70cm	239.2×239.2×69cm (with prop) motor wheelbase 162.4cm	
	only airframe	1.6kg	2.2kg	13kg	
Woight	with battery	2.2kg	3.5kg	21kg	
weight	payload	1.5kg	2.5kg	20kg	
	max, take-off weight	3.7kg	6.0kg	41kg	
Altitude	max, altitude	150m	150m	150m	
Flight speed	max, speed	10m/s	5m/s	10m/s	
	cruise speed	5~6m/s	5m/s	5~6m/s	
Max, flight time hovering		20min	18min	30min	
Operating temperature		-10 ~ +40°C	-10 ~ +40°C	-10 ~ +40°C	
Connectivity		RF/LTE	RF/LTE	RF/LTE	
		2.5GHz/SKT(B1/3/5)	2.1GHz/SKT(B5/B3/B1)	2.4GHZ/SKT(B1/3/5)	
Operating software		QGC	QGC	QGC	

KARI Spin-off Company!

World Standard of Delivery Drone Solutions

New AeRo Mission Accomplishment



World Standard Delivery Drone Solutions





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