

# **Active Force Material**

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**Investment Start-Up  
Future Advanced Nanomaterial for Aerospace**

# CONTENT

## **1. DEVELOPMENT PLAN**

- 1.1 Introduction in the project
- 1.2 Understanding of Action Force
- 1.3 Active Force Material
- 1.4 Current Status
- 1.5 Company approach
- 1.6 Demo version and test
- 1.7 Road map from start to first sale
- 1.8 Objectives and Vision

## **2. MARKETING PLAN**

- 2.1 Market analysis
  - 2.1.1 Our competitors
  - 2.1.2 Purchase
  - 2.1.3 Capitalization
  - 2.1.4 Collaboration with investors
- 2.2 Offer of unique value
  - 2.2.1 Unique value
- 2.3 Marketing Strategy
  - 2.3.1 Online Marketing
  - 2.3.2 Offline Marketing
- 2.4 Conversion Strategy

## **3. FINANCIAL PLAN**

- 3.1 Unit economy
- 3.2 Investment proposal
- 3.3 Necessary funding
- 3.4 Financial Outlook
- 3.5 Deferred Income and expenses
- 3.6 Accounting policies and financial controls
- 3.7 Dividend policy
- 3.8 Capitalization of the company

## **4. PRESENT RISKS**

- 4.1 Risk of experimenting
- 4.2 Risk of new product

## **5. FOUNDER**

- 5.1 Founder and CEO AFM

## **6. LEGAL INFORMATION**

## **7. CONCLUSION**

# **1.DEVELOPMENT PLAN**

## **1.1 INTRODUCTION**

Goal of this project is to create new profitable Holding Corporation for innovation of advanced propulsion technology into aerospace and other transport industry. The technology is based on new nanomaterial.

The idea of this international nanotech project came to Alexander Frolov in 2016 after his research laboratory Faraday Ltd. company was closed in Russia. It was 15 years research activity in many directions of advanced propulsion and new energy sources. The nanotech project cannot be developed in Russia due to limited facilities of nanotech and microelectronic industry. It is planned to create new company in other country where is high tech microelectronics industry, for example, production of computer processors, or advanced nanotech labs in area of surface nanoengineering.

## **1.2 UNDERSTANDING OF ACTION FORCE**

Let me say here a few words about the technology. I suppose it is important aspect of the business plan since any investor want to understand main idea of the innovation before he will invest his money.

At first, you must have general understanding of reaction force. A reaction force is a force that acts in the opposite direction to an action force. Rocket or propeller propulsion is result of reaction force.

An action force is result of pressure gradient in environmental media. Sailing ship and aerostat are examples of this technology. Fuel is not necessary for this propulsion method. It is fly due to wind or air pressure gradient.

## **1.3 ACTIVE FORCE MATERIAL (AFM)**

In this project we will develop Active Force Material (AFM). It is plates of some material with one-side nano relief. This relief can provide ordering of chaotically moving molecules of air or other gas medium to provide action of unidirectional force. In other words, special nano relief can create “wind effect” and it works as sail for ship. This force can be used as lifting force for aviation, propulsion force or as force to provide torque of some electro-generator.

It is not free energy since we will take off part of kinetic energy from molecules of environmental air. So, we will produce force due to some cooling of the environmental. It is direct energy conversion method.

Size of relief elements must be about 50 – 500 nm to get the effect. Similar relief we can produce with microelectronic factory or other partner if they can operate with 50-500 nm elements.

The power of this effect can be sufficient to be commercial valued technology. Normal air pressure is about 10 tons per 1 square meter of any surface, so 10% gradient of pressure will provide force about 1 ton per 1 square meter of surface. Plates of AFM can be joined in 1 cubic meter volume to provide 100 tons lifting force, Fig.1

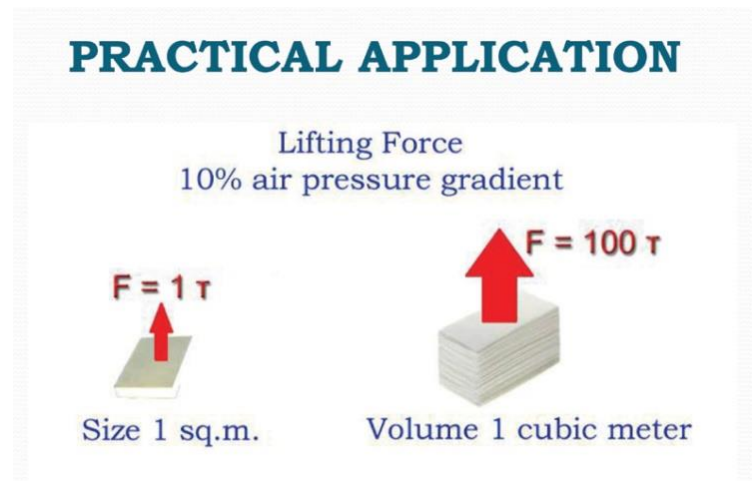


Fig.1 Practical application of the effect

## 1.4 CURRENT STATUS

Active propulsion method was demonstrated by Alexander Frolov as simple experiment during international conference “New Ideas in Natural Sciences”, St.-Petersburg. It is necessary to note the idea was published before in Popular Science magazine Vol. 126, 1935. Then in 2003 the idea was discussed with co-author (Mr. Mikhael Beshok) as nanotechnology, publication in New Energy Technologies magazine.

Several years were spent to find interested nanotech partners in Russia. Simple experiments were organized in Tula but collaboration with nanotech center of Polytechnic University in Tula, Russia, was not productive.

In 2011 - 2013 Alexander Frolov tested some relief structures to measure estimated effect on digital weight scales. Aerogel (delivered from USA), single wall carbon nanotubes (delivered from Novosibirsk) and titan oxide nanotubes were tested with minimum positive results in former laboratory of Faraday Ltd. company. So, we have not reliable results now. Present status of the project is “seed stage” and we try to make next step from idea to prototype. We need partnership with microelectronics factory to organize more experimenting with different types of nano size surface relief to find most effective and non-expensive technology.

## 1.5 COMPANY APPROACH

Idea of this project is based on great demand of market in new technologies for aerospace industry. AFM technology must be tested, verified and patented to start demonstration of prototypes and sale.

It is planned to create new company in USA, EU, China or other country, where is high tech microelectronics industry, for example, production of computer microprocessors. After investor provide funds and new company will be registered, then Founder will start business travels to get agreement with nanotech partners. It is not necessary to build new nanotech laboratory since nanotech equipment is very expensive.

Developing experiments in several World leading laboratories with different types of nano relief we have to get positive results in 6 months, and then we can start patent process.

Nanotech partner will get up to 20% of the patent property. Later, we can create Holding Corporation to develop manufacturing of new material for industrial needs.

## 1.6 DEMO VERSION AND TESTS

Any new technology is risk for existing industry but also it is way to profit in this competitive World market. We will offer demo version of prototypes and independent tests to raise interest of potential customers to our technology. Simple demonstration of the effect is measurement of weight on digital scales. Prototype of AFM can be made as small flat plates with one-side relief. Weight of the plate should be different for side A or side B, Fig. 2

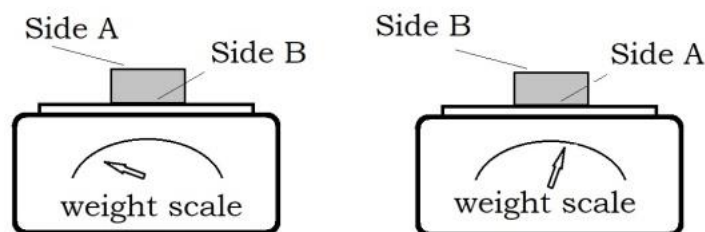


Fig.2 Demonstration of the effect

Later after development of prototypes, the technology can be demonstrated as practical innovation for drones. Main lifting force of the drone can be provided by AFM plates but drone will require some battery to provide control of flight. Applying AFM for drone we can save main part of the battery resource. It will increase its range and time of flight in several times.

It is important to avoid wrong “antigravitation” idea in marketing of this technology. Research projects on gravity are special area of science and we have not intention to develop similar topics in commercial project. AFM effect is not related with gravitation. Active force in this case is result of ordering in molecular motion of gas. Fundamental laws of thermodynamics are true for this technology and we estimate to see cooling effect for AFM plates.

## 1.7 ROAD MAP FROM START TO FIRST SALE

The first sales in sum about 1 M\$ can be provided in the end of 2022 after demonstration of the prototypes. Customers must see workable prototype of small size to sign Contracts and pay advance.

Deferred income in Dec. of 2022 is necessary to provide operation expenses of the company in 2023. Investments in 2021 are not planned. The company must have profit after first sales to continue operations.

2022 Jan.	2022 Febr.	2022 March	2022 2Q	2022 3Q	2022 4Q
Organizing process, registration of the company					
	3D molecular kinetic modeling				
		Travels to nanotech partners, NDA signing			
			Experimenting to get proof of the principle		
				Prototyping	
					Demonstration of prototypes to potential Customers and pre-sale
		Start of patenting			
				Patent protection of intellectual property	
			At the end of 2Q First milestone <b>Demonstration of the effect</b>		Second milestone <b>Signed \$1M contracts and advance payment from first Customers</b>

Further sales can be organized at a higher price. It is depend on type and technical parameters of AFM plates. In any case it is not planned to sale exclusive license. We have to keep technological secrets in the company.

## **1.8 OBJECTIVES AND VISION**

- It is necessary to sing 3 – 5 Agreements about collaboration with World leading nanotech and microelectronics companies in first 3 months of the project.
- Organize 3D modeling of molecular processes for special surface relief.
- Proof of the principle should be demonstrated in second quarter of 2022.
- Attract 10-20 potential Customers to the project during 3rd quarter.
- Get first sales advance payment in 4 quarter of 2022 and complete payment in the beginning of 2023.
- Develop sales up to \$10M in 2024
- To reach the company's capitalization of \$90M in 2026.
- Develop Holding Corporation in 2027 to start mass manufacturing of AFM products for aerospace and other industries. Production of large amounts of standardized AFM products requires special assembly lines.

Manufacturing of AFM plates should be non-expensive process since future application of this innovation material for aerospace will require big amount of the plates. Future market is great. It is all aerospace segment of World market.

## **2 MARKETING PLAN**

### **2.1 Market analysis**

#### **2.1.1 Market segments for AFM**

AFM is innovation for aerospace mainly. It is planned to start practical application of this technology for drones and unmanned aerial vehicles. Global commercial Drones market now is about 11 bil. USD. It is planned to be about 50 bil. USD in 2026. Several hundred companies are producers of drones. So, we have large community of potential customers.

Later we can try to get interest of Aerospace Corporations to AFM product. First samples of AFM plates can be expensive and limited in production so we cannot plan its innovation in aerospace before we build assembly lines to develop mass manufacturing of AFM products.

### **2.1.2 Our competitors**

There is no open information about similar products or research projects. Our potential competitors in this innovation project are Nano technological companies of surface engineering profile. It is necessary to keep the project in confidential state before opening technological processes for public.

We have some competitive advantages:

- This idea of Active Force was tested by Alexander V. Frolov in 1996, later it was developed in many years of experimental and theoretical research work. So, we have fundamental knowledge on this technology.
- It is planned to work with World level nanotech laboratories and microelectronics corporations in one team as partners to reduce R&D cost of the project.
- We will try to develop technology of low cost Active Force materials to win possible competition in future.
- It is possible to provide know-how and technological secrets besides strong patent protection.

### **2.1.3 Purchase**

It is B2B project. First 10-20 buyers should be World leading companies in drones market. After demonstration of the effect we can discuss their requirements on prototypes parameters. Then we can produce prototypes for demonstration and we'll see real financial interest of Customers to business with us. In the case of real demand we can raise prices. Cost of first prototypes will be high and first Customers can be attracted to long-time collaboration if we offer them discounts for future sales. Next stage is development of manufacturing. It is planned to start in 2025-2026. It is also B2B process based on specialized orders from Customers, individual design work to provide technical parameters of AFM products on demand for each Customer.

### **2.1.4 Capitalization**

Capitalization of the company is planned in two stages during 5 years. In 2023 – 2025 the company will collect funds to be ready for organization of manufacturing facilities. In 2026 cost of the company will increased in times after we will set assembly lines and start mass manufacturing process.

Starting from \$250,000 in 2021 the company will have capital about \$134M in 2026 and next stage should raise it in several times after IPO. More detailed about capitalization later in Table 8.



### **2.1.5 Collaboration with investors**

It can be possible reorganize company for IPO after 2026 and in this stage of the project any private investor can take part in the project. Before this level any collaboration with private investors is not useful. This project needs only one main investor for all 2022 – 2026 period.

Optimal investor for AFM project is some Microelectronics Corporation, where we can organize production and tests of AFM plates.

## **2.2 Offer of unique value**

### **2.2.1 Unique value of AFM for aerospace**

We offer unique product for aerospace. AFM plates can create lifting and propulsion force without reactive mass outflow, so aerial vehicle can save fuel or resource of its battery. Range and time of flight can be increased by this way. Also important aspect of AFM propulsion technology is reliability of design. AFM is not located in one place of the vehicle. Many small AFM plates can be distributed on all surfaces of the vehicle to provide lifting force. In this case any damage of several AFM plates is not critical for correct operation of the device. This property is important for any aviation device.

### **2.2.2 Unique value of AFM for power industry**

Power industry can use two properties of AFM product. Active Force can be used to rotate some electro generator. Other property is temperature gradient. The gradient can produce electricity by means of thermoelectric Peltier effect. It is direct heat energy conversion to useful electrical power for Customers.

## **2.3 Marketing strategy**

### **2.3.1 Online marketing**

The main objective of online marketing campaign is to generate leads from potential Customers. AFM product is new sector of World market. We'll need targeted marketing actions to attract interest of aerospace industry.

To achieve this plan, the AFM marketing team will use following tools: online targeted advertising, SEO promotion of our web site, development of AFM brand in social networks.

### **2.3.2 Offline marketing**

There are standard methods of marketing in B2B processes. We know industry segment of our potential Customers and we can use direct contacts.

Visits and presentations, participation in industry exhibitions and conferences also are necessary for this case.

Organization of AFM informational events for the target industrial segment let us to understand the Customer needs to develop more practical applications of AFM product.

## **2.4 Conversion strategy**

Before AFM plates are not standardized it is exclusive custom B2B production processes. At first, potential Customer will agree technical parameters of prototype with our design team. Then lawyers agree terms of the Contract on production and manufacturing of the plates will be started. Conversion of this stage is very high, up to 100% business contacts will lead to sale.

Sales in second stage of the project (after we'll set assembly lines) are similar to sales of electronic chip and microprocessors for computers. Conversion ratio of orders to sales should be about 30% or more.

Team of experienced sales managers is important to develop worldwide sales. We'll create system of training and knowledge control to provide high qualification of our sales managers.

## **3 FINANCIAL PLAN**

### **3.1 Unit economy**

Now it is difficult to plan real production cost and purchase price for manufacturing stage of the project. By analogy with microchip technology it can be non-expensive for large amount of units. Here we can use terminology "AFM chip plates" since chip production technology here is considered as technological basis. Also please note possibility for another technological way based on electrochemistry and surface nanoengineering.

Cost of production can be estimated on the basis of averaged indicators for the chip plate technological process. In this case we consider 180 nm reliefs on plates of 200 mm diameter (Table 1). You can see the cost of production for 1000+ units are twice less than small quantity of product.

TABLE 1

Quantity	Cost of microchip photo mask USD	Cost of one plate USD
More than 1000 units	80 000	400
Up to 24 units	80 000	800

Optimal way is to set own 180 nm chips manufacturing and assembly lines but it is better to place orders in production facilities of our business partner. Now we see World leaders in this technology: TSMC, Intel and Samsung.

Simplified cycle of work with nanotech partner:

1. Schema description development
2. Topology Creation
3. Transfer of technological files to the Producer
4. Production of the plates
5. Delivery
6. Experimenting and measurements of the effect in our lab.

Most expensive work here is design and manufacture of photo masks to get optimal relief on surface of the plate. It cost about \$7000 for 1000nm relief, \$100 000 for 180nm relief and up to 5M\$ for 32nm relief.

The costs of making photo masks and preparing a production can become real high barrier for our innovation projects. In the project we can consider \$250 000 budget only as 20% co-operation with nanotech or microelectronic partner. Partnership allows us to minimize cost of Research stage to get optimal relief (it is depend on photo mask topology).

It is planned to return 20% profit to nanotech partner.

There is average cost of production of 300 mm diameter plates, Table 2:

180 nm	\$400
90 nm	\$1400
65 nm	\$1600
45 nm	\$1900
28 nm	\$2400
7 nm	\$6000

Let's assume we have Active Force effects with 180 nm plates. For example, Customer placed order for 1,000 units and 10,000 units of AFM plates. Table 3 is example of unit economy (cost of Research stage is not considered here, we suppose the photo mask of the chip is available from our business partner).

Table 3

Production expenses	\$400x1,000=\$400K	\$400x10,000=\$4M
Customer expenses	\$600K	\$6M
Profit before tax	\$200K	\$2M
Sales Taxation 7%	\$14K	\$140K
Profit	\$186 000	\$1 860 000

Let's calculate economy of 2023 year in the case of successful collaboration with microchip producer. Again, cost of Research stage to develop optimal mask is not considered here.

Suppose we'll sign 10 Contracts with Customers in 2023 to get total orders in sum of 10 000 plates. We see in Table 3 the profit is about \$1 860 000. Now we have to include into consideration 12 months expenses of the company for office, salary, patenting, marketing, lawyers and others in total sum about \$30 000 per month or \$360 000 per 12 months.

So, 2023 profit \$1 860 000 minus expenses is equal to \$1 500 000. So, we can plan some dividends in 2023.

### **3.2 Investment proposal**

Initial stage of 12 months requires \$250 000 funding.

Collaboration will be created as new company with shares of several owners.

Investors are invited to own 39% of the company. Founder 31%.

Nanotechnology lab partner 20%. Top Managers 5% and Co-Authors 5%.

### **3.3 The necessary funding**

Here is planned investments about \$96 000 in first 6 months to get proof of the principle, produce first samples on new material for demonstration of the estimated effect and develop prototypes for demonstration to Customers.

Other \$154 000 are planned to patent the technology, start marketing and sales in second half-year of the project. TOTAL: \$250 000 for 12 months

Table 4

	1	2	3	4	5	6	7	8	9	10	11	12
Office	2000	1000	500	500	500	500	500	500	500	500	500	500
Travels	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Salary	3000	4000	8000	9000	9000	9000	9000	9000	9000	9000	9000	9000
Subcontractors	0	4000	5000	6000	5000	5000	4000	4000	4000	4000	3000	2000
Patent	0	0	0	0	0	1000	2000	2000	5000	5000	20000	15000
IT	2000	1000	500	500	500	500	500	500	500	500	500	500
Consulting	0	1000	1000	1000	1000	2000	2000	2000	2000	2000	2000	2000
Misc.	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
<b>TOTAL</b>	<b>9000</b>	<b>13000</b>	<b>17000</b>	<b>19000</b>	<b>18000</b>	<b>20000</b>	<b>20000</b>	<b>20000</b>	<b>23000</b>	<b>23000</b>	<b>37000</b>	<b>31000</b>

### 3.4 Financial outlook

The Table 5 presents some calculations of deferred income and expenses (2021-2025)

Calculations are based on following indicators:

- The average production cost of 180 nm chip 300 mm diameter plates
- Average operational expenses of the company up to \$30 000 per month
- Average order is 1000 units of AFM plate

Discount factor here is 50%

Table 5

Year	Expenses USD	Income USD	Delta	Coefficient	NPV USD
2022	250 000	Deferred 180 000	-70 000	1.5	-105 000
2023	500 000	1 000 000	895 000	0.44	393 800
2034	900 000	10 000 000	10 393 800	0.29	3 014 202
2025	1 600 000	30 000 000	33 014 202	0.19	6 272 698
2026	3 100 000	90 000 000	96 272 698	0.13	12 515 450

ROI calculation:  $ROI = 100\% \times (0.39 \times 12515450) / 250000 = 1952\%$

So, 39% investor in 2026 will get profit about \$20 to \$1 of investments.

### 3.5 Deferred income and expenses

We plan to get deferred income from Customers in the end of 2022. It is necessary to provide total sum of \$180 000 advance payments in Dec. of 2022. Delivery of AFM plates can be planned in May of 2023. Completed payment from first Customers in total sum of \$820 000 planned in June of 2023.

Average expenses of the company were demonstrated in Table 4. Look at December 2022 column; it is the same expenses for monthly operations in 2023. Future operational activity of the company should be constant value.

Since 2024 it is not planned to use deferred payments. Customers should pay after testing of the product.

### 3.6 Accounting policies and financial controls

Financial accounting of the company will be organized as collection and analysis of information by financial department, accounting of all transactions, daily control and management of all financial activity of the company to detect possible problems in financial areas.

### 3.7 Dividend policy

The company plans to distribute up to 50% of retained earnings starting this process from Dec. 2022 and then plan it on a quarterly basis. Table 6 and Table 7 consider investments with 50% discount factor to calculate NPV.

Table 6 Dividends in %

Period	Expected return on \$250 000 investments
2022	0
2023	157 %
2024	1200 %
2025	2500 %
20256	5006 %

Table 7 Dividends in absolute value (\$)

Period	Absolute profit \$	50%
2022	\$0	\$0
2023	\$895 000	\$447 500
2024	\$10 393 800	\$5 196 900
2025	\$33 014 202	\$16 507 101
20256	\$96 272 698	\$48 136 349

### **3.8 Capitalization of the company**

Strategy of the company is long-term growth up to IPO or resale of this business. In 2026 it is planned to organize Initial Public Offering. Perhaps it will be timely to sale the company on this level.

Calculating on capitalization of the company is made according to the formula

Average monthly profit x 12 x 5 (multiplier) x 0.7 (risks)

Table 8

Period	Monthly profit	Assessed value \$	Growth in %
2022	0	250 000	0
2023	83 000	3 486 000	1394
2024	830 000	34 860 000	13944
2025	2 490 000	44 820 000	17928
20256	7 470 000	134 460 000	53784

## **4 PRESENT RISKS**

### **4.1 Operational risks**

First stage of experimenting is great risk. The idea can be realized by many methods and we have to find optimal technology to provide maximum effect and minimum cost of production.

Operational risks can be reduced by collaboration with high professional nanotech lab team of our business partner. Nanotech partner must use his existing lab equipment to reduce cost of the project.

Investor can stop the project after 6 months stage in the case of insufficient results of experimenting.

### **4.2 New product risk**

Innovations always are risk projects but we offer real value idea that is new quality of propulsion technology. This innovation allows our customers to get competitive advantages for their products by means of innovation of AFM.

Introduction of our product on global market will be organized by means of on-line and off-line marketing.

Our business is B2B model so mainly we need direct contacts with potential customers. Serious risk is related with possible attempts of competitors to still the technology. We have to provide high level of technological secrets and strong patent protection of Intellectual Property.

## 5 FOUNDER



### **Founder Alexander V. Frolov**

Team of the project will be created in cooperation with microelectronics nanotech business partner.

Since 1991 Alexander V. Frolov has been developing research activity in area on new aerospace technologies and alternative energy sources. He has scientific publications in many countries since 1994, including books “New Energy Sources” and “New Aerospace Technologies”. In 2001-2016 he was Founder, owner and CEO of research laboratory Faraday Ltd. Company in St.-Petersburg. More information <http://www.faraday.ru>

Key skills: Research activity, personnel management, marketing and sales.

Education: In 1984 graduated from St.-Petersburg Telecom University, honors diploma in wireless telecom. The best inventor of the University in 1983.

Expert of Russian Physical Society since 1993.

1984-1989 Military officer in Russian Army, telecom division.

1991-1993 Research engineer GRANIT Corporation, St.-Petersburg.

1993 – 1994 Entrepreneur, marketing and sales.

1994 - 2000 Telecom engineer, wireless equipment.

2001 - 2016 Founder and CEO of Faraday Ltd. Company in St.-Petersburg.

2016 – 2019 Sales manager, Russia.

2019 - currently self-employed consultant in area of clean energy projects.

## 6 LEGAL INFORMATION

At the moment this project is represented by Founder. Legal structure should be created as JSC in collaboration with investor. Country is not important but it is better to develop activity in area of production facilities of the future nanotech or microelectronics partner.

## 7 CONCLUSION

We offer unique innovation project. AFM is technology to change propulsion methods in aerospace industry. Starting experimenting we will develop business relationships with World level Nano electronics corporations. Our AFM products allow them to open and develop new segment of market.



Investors are invited to join Active Force Material project to become part of great innovation process.

More details on request. Contact Alexander V. Frolov

## **CONTACTS**

Alexander V. Frolov Founder AFM project

+7 980 7243309 WhatsApp

Facebook <https://www.facebook.com/alexander.frolov.564>

YouTube <https://www.youtube.com/channel/UCYrsqWHCvyirwJfNxwyD9QA>

ResearchGate [https://www.researchgate.net/profile/Alexander\\_Frolov14](https://www.researchgate.net/profile/Alexander_Frolov14)

Emails

[a2509@yahoo.com](mailto:a2509@yahoo.com)

[alexanderfrolov@hotmail.com](mailto:alexanderfrolov@hotmail.com)

Disclaimer: All of the information above is subject to adjustment and is not finalized.